AP-42 Section 9.7
Reference 8
Report Sect.
Reference

Emission Factor Documentation for AP-42 Section 9.7

Cotton Ginning

Final Report

For U. S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Emission Factors and Inventory Group

EPA Contract No. 68-D2-0159
Work Assignment No. 3-01

MRI Project No. 4603-01

June 1996

Emission Factor Documentation for AP-42 Section 9.7

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Final Report

For U. S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Emission Factors and Inventory Group
Research Triangle Park, NC 27711

Attn: Mr. Dallas Safriet (MD-14)

EPA Contract No. 68-D2-0159
Work Assignment No. 3-01

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June 1996

NOTICE

The information in this document has been funded wholly or in part by the United States Environmental Protection Agency under Contract No. 68-D2-0159 to Midwest Research Institute. It has been reviewed by the Office of Air Quality Planning and Standards, U. S. Environmental Protection Agency, and has been approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

PREFACE

This report was prepared by Midwest Research Institute (MRI) for the Office of Air Quality Planning and Standards (OAQPS), U. S. Environmental Protection Agency (EPA), under Contract No. 68-D2-0159, Work Assignment No. 3-01. Mr. Dallas Safriet was the requester of the work.

Approved for:

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June 27, 1996

Mr. Dallas Safriet
Emission Factor and Inventory Group (MD-14)
U. S. Environmental Protection Agency
Research Triangle Park, N.C. 27711

Re: Review and Update of Food and Agricultural Sections, Chapter 9, AP-42
EPA Contract No. 68-D2-0159; Work Assignment 3-01
MRI Project 4603-01-03

Dear Mr. Safriet:

This letter confirms transmittal of three bound copies and one unbound reproducible master of the Final Report on AP-42 Section 9.7, Cotton Ginning. One copy of the final report on a 3.5-inch disk is also enclosed.

If you have any questions, please contact me at 677-0249, ext. 5224.

Sincerely,

Brian Shrager
Associate Environmental Engineer

5 Enclosures

cc: C. Roberts, EPA (MD-33)
K. Koeller-Anna, MRI/NC (w/o Enclosures)
Project File

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EMISSION FACTOR DOCUMENTATION FOR AP-42 Section 9.7
Cotton Ginning

1. INTRODUCTION

The document *Compilation of Air Pollutant Emission Factors* (AP-42) has been published by the U. S. Environmental Protection Agency (EPA) since 1972. Supplements to AP-42 have been routinely published to add new emission source categories and to update existing emission factors. AP-42 is routinely updated by EPA to respond to new emission factor needs of EPA, State and local air pollution control programs, and industry.

An emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. Emission factors usually are expressed as the weight of pollutant divided by the unit weight, volume, distance, or duration of the activity that emits the pollutant. The emission factors presented in AP-42 may be appropriate to use in a number of situations, such as making source-specific emission estimates for areawide inventories for dispersion modeling, developing control strategies, screening sources for compliance purposes, establishing operating permit fees, and making permit applicability determinations. The purpose of this report is to provide background information from test reports and other information to support revisions to AP-42 Section 6.7, Cotton Ginning.

This background report consists of five sections. Section 1 includes the introduction to the report. Section 2 gives a description of the cotton ginning industry. It includes a characterization of the industry, a description of the different process operations, a characterization of emission sources and pollutants emitted, and a description of the technology used to control emissions resulting from these sources. Section 3 is a review of emission data collection (and emission measurement) procedures. It describes the literature search, the screening of emission data reports, and the quality rating system for both emission data and emission factors. Section 4 details how the revised AP-42 section was developed. It includes the review of specific data sets, a description of how candidate emission factors were developed, and a summary of changes to the AP-42 section. Section 5 presents the AP-42 Section 9.7, Cotton Ginning. Supporting documentation for the emission factor calculations is presented in the appendices.

2. INDUSTRY DESCRIPTION

Cotton is a natural fiber crop derived from a herbaceous plant of the *Malvaceae* family. The fibers (lint) grow from and are attached to the surface of the seeds, which are located inside a capsule or boll. When mature, the bolls open, exposing the fiber and seed. Raw cotton, called "seed cotton" is then harvested by machine from the fields. The series of mechanical processes for cleaning the seed cotton, separating the fibers from the seeds, and baling the lint cotton is called ginning. Section 2.5 summarizes terminology associated with cotton production and processing.

2.1 INDUSTRY CHARACTERIZATION[1-10]

Cotton ginning (SIC 0724) takes place throughout the southern part of the United States (a region known as the Sunbelt). The four main production regions can be classified as:

- Southeast—Virginia, North Carolina, South Carolina, Georgia, Alabama, and Florida
- Mid-South—Missouri, Tennessee, Mississippi, Arkansas, and Louisiana
- Southwest—Texas and Oklahoma
- West—New Mexico, Arizona, and California

The majority of the ginning facilities are located in Texas, Mississippi, Arkansas, California, and Louisiana.

The industry trend is toward fewer gins with higher processing capacity. In 1979, 2,332 active gins in the United States produced 14,161,000 bales of cotton. By the 1994/1995 season, the number of cotton gins in the United States dropped to 1,306, but about 19,122,000 bales were produced. The average volume processed per gin in 1994/1995 was 14,642 bales, compared with 7,096 bales during the 1989/1990 season.

Cotton ginning is seasonal. It begins with the maturing of the cotton crop, which varies by region, and ends when the crop is finished. Each year the cotton ginning season starts in the lower Southwest Region in midsummer, continues through the South Central and other geographical regions in late summer and early autumn, and ends on the upper Southwest Region in late autumn and early winter. Most of the cotton is ginned between October 1 and December 31. The bulk of the crop from each geographical region is ginned in 6 to 8 weeks. During the remainder of the year, the gin is idle.

Different varieties of cotton are grown, depending on regional conditions. The variety of cotton grown dictates the harvesting method and to a small extent affects the ginning process. All U.S. cotton in commercial production is now harvested by machine; hand picking is no longer practiced. Two types of machines are used: pickers and strippers. Machine-picked cotton normally accounts for 70 to 80 percent of the total cotton harvested, while machine-stripped cotton normally accounts for 20 to 30 percent of the total cotton harvested. Machine picking differs from machine stripping mainly in the method by which the seed cotton is removed from the plant. The spindle picker machine selectively separates the exposed seed cotton from the open bolls or capsules while the mechanical stripper removes the entire capsule with seed cotton plus bract, leaf, and stem components in the harvested material. A field may be picked more than once during harvest. "Second pick cotton" usually has more trash than "first pick." "Ground cotton" may also be picked up from the ground after picking. It has a high waste content.

Stripper-type cotton is a shorter plant than picker-type and is grown in the more arid areas of Texas, Oklahoma, and eastern New Mexico. Fields are stripped only once during harvest. Strippers collect up to six times more leaves, burs, sticks, and trash than the spindle picker machines. Stripper-harvested cotton may produce as much as 1,000 pounds (lb) of trash per 480-lb bale of lint, compared to 150 lb of trash per 480-lb bale from picker-harvested cotton. Early season stripper harvest usually has more green bolls, while late season harvest usually has more trash overall. The higher ratio of trash to cotton resulting from machine-stripping requires gins to have additional equipment for cleaning and trash extraction.

In addition to the types of cotton, cotton fibers are classified as upland or extra long staple. Both types may be grown in the same area. Some facilities may devote separate gins to each type.

The modular system of seed cotton storage and handling has been rapidly adopted. This system stores seed cotton in the field after harvesting until the gin is ready to process it. Modules can also be transported longer distances, allowing gins to increase productivity. In 1994, 78 percent of the U.S. crop was handled in modules.

2.2 PROCESS DESCRIPTION

Typically, modern cotton gins produce 10 to 60 480-lb bales/hour and 1,000 to 80,000 bales/season. Because of the elimination of hand picking, gin operators have installed additional extracting and cleaning machines to maintain quality and grade levels demanded by their mill customers. About 1,500 lb of picker-harvested seed cotton or about 2,400 lb of stripper-harvested seed cotton produce a 480-lb bale of lint cotton. Cotton gins can remove 90 to 99 percent of the trash and all of the seed from the lint.

The modern gin is equipped with many accessories that employ several different physical principles to dry the seed cotton; remove green bolls; separate soil, stick, and capsule components (burs) from seed cotton; remove lint from seed; humidify if necessary; remove plant and soil trash from ginned lint; align and smooth the fibers; and package the fiber into a bale for transport and storage.

A typical cotton ginning facility is divided into five processing areas: unloading system; seed cotton drying and cleaning system; overflow system; ginning and lint cleaning system; and battery condenser and baling system. Each stage is shown in Figure 2-1 and is briefly described below. The first three stages are usually referred to as the high pressure side of the plant, while the last two (lint cleaning through baling) are called the low pressure side, reflecting the pressures used in the air conveying systems.

The proportion of cotton ginning products varies with the nature of the raw cotton, its method of harvest, and the ginning equipment. Moisture content of raw cotton can range as high as 20 percent (before drying) in the humid Southeast to as low as 4 percent in arid areas. Machine-picked seed cotton typically yields about 55 percent cottonseed, 34 percent cotton lint, 1.5 percent cotton motes, and 9.5 percent trash (3.3 percent burs, 4.8 percent leaf and dirt, 1.4 percent sticks). Stripped cotton typically yields about 41 percent cottonseed, 23 percent lint, and 36 percent trash (23.4 percent burs, 7.2 percent leaf and dirt, 5.4 percent sticks).

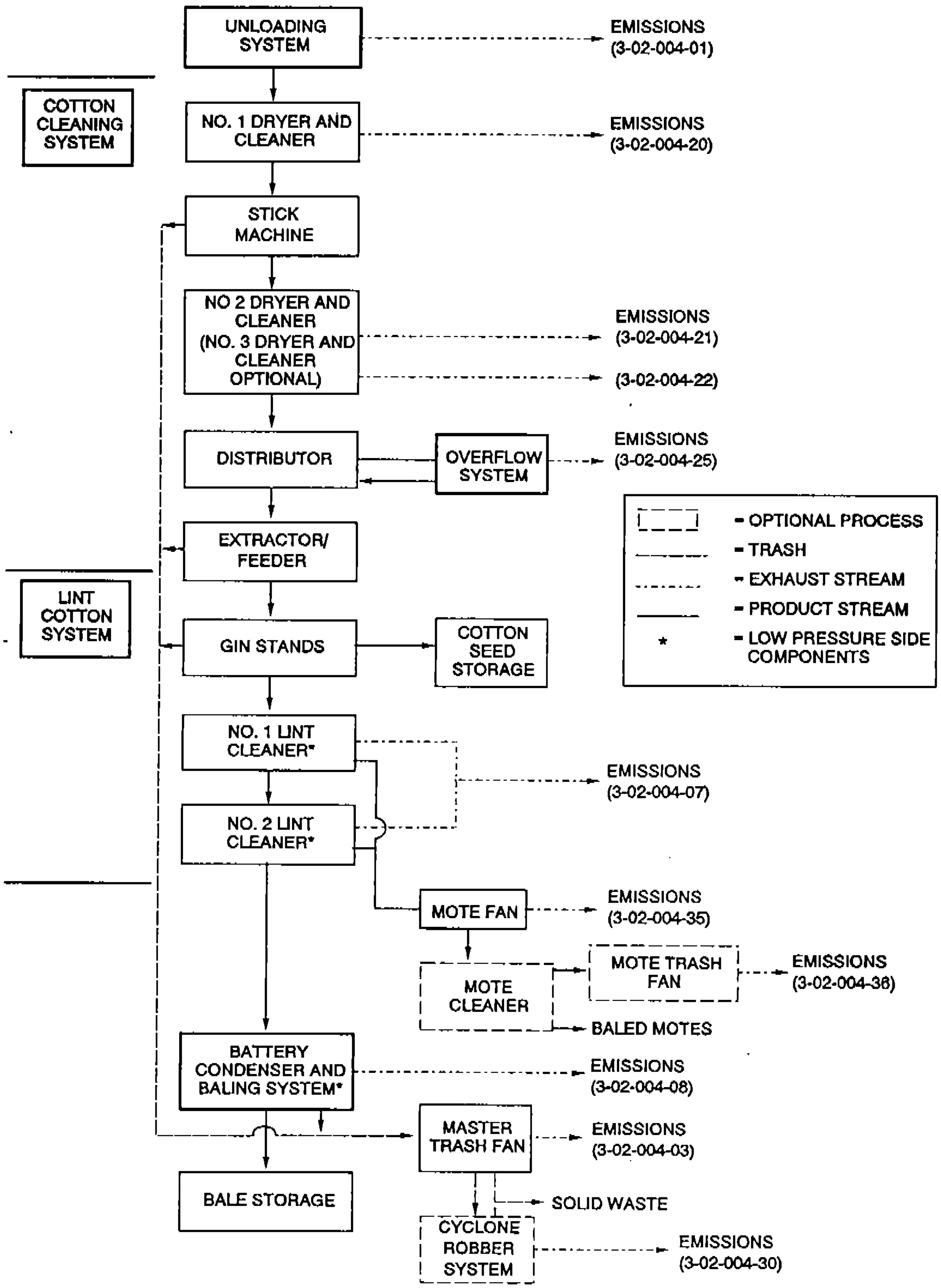

Figure 2-1. Flow diagram of cotton ginning process. (Source Classification Codes in parentheses.)

2.2.1 Unloading System

2.2.1.1 Unloading System. Module trucks and trailers transport cotton from the field to the gin. A pneumatic system removes the cotton from the trailers, and either a pneumatic system or a module feeder removes the cotton from modules. A combination conveyer and pneumatic system conveys the cotton to a separator and feed control unit. Prior to this first separator point, some gins use a stone and green boll trap for preliminary trash removal. The screen assembly in the separator allows air to escape but collects the cotton and allows it to fall into the feed control unit. The conveying air then flows from the separator to a cyclone system, where it is cleaned and discharged to the atmosphere.

2.2.2 Seed Cotton Cleaning System

Cotton is subjected to three basic conditioning processes--drying, cleaning, and extracting--before it is processed for separation of lint and seed. To ensure adequate conditioning, cotton gins typically use two conditioning systems (drying, cleaning, extracting) in series (see Figure 2-1).

Seed cotton dryers are designed to reduce lint cotton moisture content to 5 to 8 percent to facilitate cleaning and fiber/seed separation. A high-pressure fan conveys seed cotton through the drying system to the first seed cotton cleaner, which loosens the cotton and removes fine particles of foreign matter (e.g., leaf trash, sand, and dirt). In the second cleaner, large pieces (e.g., sticks, stems, and burs) are removed from the cotton by a different process, referred to as "extracting." Different types of extractors may be used, including bur machines, stick machines, stick and bur machines, stick and green leaf extractors, and extractor/feeders. These machines remove burs, sticks, stems, and large leaves, pneumatically conveying them to the trash storage area. The cotton is pneumatically conveyed to the next processing step. Typically, all conveying air is cleaned by a cyclone before being released to the atmosphere.

2.2.3 Overflow System

After cleaning, the cotton enters a screw conveyor distributor, which apportions the cotton to the extractor/feeders at a controlled rate. The extractor/feeders drop the cotton into the gin stands at the recommended processing rates. If the flow of cotton exceeds the limit of the extractor/feeder systems, the excess cotton flows into the overflow hopper. A pneumatic system (overflow separator) then returns this cotton back to the screw conveyor distributor, as required. Typically, the air from this system is routed through a cyclone and cleaned before being exhausted to the atmosphere.

2.2.4 Ginning and Lint Handling System

Cotton enters the gin stand through a "huller front," which performs some cleaning. Saws grasp the locks of cotton and draw them through a widely spaced set of "huller ribs" that strip off hulls and sticks. (New gin stands do not have huller ribs.) The cotton locks are then drawn into the roll box, where fibers are separated from the seeds. After all the fibers are removed, the seeds slide down the face of the ginning ribs and fall to the bottom of the gin stand for subsequent removal to storage. Cotton lint is removed from the saws by a rotating brush, or a blast of air, and is conveyed pneumatically to the lint cleaning system for final cleaning and combing. The lint cotton is removed from the conveying airstream by a condenser that forms the lint into a batt. The lint batt is fed into the first lint cleaner, where saws comb the lint cotton again and remove part of the remaining leaf particles, grass, and motes. Most condensers are covered with fine mesh wire or fine perforated metal, which acts to filter short lint fibers and some dust from the conveying air.

2.2.5 Battery Condenser and Baling System

Lint cotton is pneumatically transported from the lint cleaning system to a battery condenser, which is a drum covered with fine mesh screen or fine perforated metal that separates the lint cotton from the conveying air. The lint cotton is formed into batts and fed into a baling press, which compresses the cotton into uniform bales.

Most gins use a double-press box for packaging the cotton into bales. The lint drops into one press box and fills it while a bale is being pressed and strapped in the other box. Approximately 480 lb (217 kilograms [kg]) of cotton is pressed into a bale before it is wrapped with a cover and strapped. Modern gins are presently equipped with higher-tonnage bale presses that produce the more compact universal density cotton bales. In 1995, 96 percent of the U.S. crop was pressed into universal density bales at the gins. The finished cotton bale is transported to the textile mill for processing into yarn. Motes are sometimes cleaned and baled also.

2.3 EMISSIONS

Particulate matter (PM) is the primary air pollutant emitted from cotton ginning. All processes in a gin involve dust generation from the trash, seeds, and lint cotton. The amount of PM emissions varies depending on the type of gin, geographic region, type of cotton, harvest method, trash content, climate, production rate, and type and number of controls used by the facility. Typically, the air from each step in the process goes through a control device before being vented to the atmosphere.

Cotton fields may be treated with any of several agricultural crop protection chemicals, including fertilizers, pesticides, and harvesting aids (such as defoliants and desiccants). Little information is available on residues of such chemicals on the PM emissions from a cotton gin. The harvesting of cotton can pick up bits of soil, but little information is available on emissions of silica or metallic compounds during cotton ginning. Finally, cotton dryers are fired by gas (or oil), which produces CO_2 and small amounts of combustion by-products, but the extent of drying required varies widely; average emissions are expected to be minimal.

2.4 EMISSION CONTROL TECHNOLOGY[1,7-15]

Cyclones are the principal control for PM emissions on high-pressure airstreams in cotton gins. Properly designed and operated high-efficiency cyclones remove over 99 percent of particulate by weight, and nearly 100 percent of particulate greater than 25 microns (μm). Cyclones operated in series have also proven successful. Two types of cyclones that are used are 2D-2D and 1D-3D cyclones. Both the body and the cone of a 2D-2D cyclone are twice as long as the cyclone diameter. The body of a 1D-3D cyclone is the same length as the diameter, and the cone length is three times the diameter. In many cases, 1D-3D cyclones display slightly higher PM control efficiencies than 2D-2D cyclones.

Skimmers are used as initial control devices with a secondary control device following the skimmer. They may be used on high-pressure systems in place of cyclones or on low-pressure systems. The collection efficiency has been reported at 50 percent removal of PM by weight.

Unifilters handle exhaust from low- and high-pressure systems. Laboratory testing found an average of 99 percent removal of PM by weight. In operation, the unifilters have had performance problems such as clogging and rapid degradation of the filter media.

In-line air filters have been used on low-pressure systems, but are rarely used in today's cotton gins. Past testing indicated the in-line filters had a 75 percent PM removal efficiency.

A condenser drum covering may reduce particulate by about 50 percent in a low-pressure system. By covering the condenser drum with fine metal screen or with perforated metal, large diameter particulate emissions can be effectively eliminated.

Disposal of combustible gin wastes (burs, leaves, stems, sticks, dirt) by open burning or simple teepee incinerators was practiced by over 35 percent of the gins before 1970, but all waste incineration has been eliminated by pollution control regulations. Today, most gin waste is removed from the gin site and spread on farm land as a soil additive.

2.5 SUMMARY OF TERMINOLOGY

Bale — A compressed and bound package of cotton lint, typically weighing about 480 lb.

Batt — Matted lint cotton.

Boll — The capsule or pod of the cotton plant.

Bur (or burr) — The rough casing of the boll. Often referred to as hulls after separation from the cotton.

Condenser — A perforated or screened drum device designed to collect lint cotton from the conveying airstream, at times into a batt.

Cotton — General term used variously to refer to the cotton plant (genus *Gossypium*); agricultural crop; harvest product; white fibers (lint) ginned (separated) from the seed; baled produce; and yarn or fabric products. Cotton is classified as upland or extra long staple depending on fiber length.

Cottonseed — The seed of the cotton plant, separated from its fibers. The seeds constitute 40 percent to 55 percent of the seed cotton (depending on the amount of trash) and are processed into oil meal, linters, and hulls, or are fed directly to cattle.

Cyclone — A centrifugal air pollution control device for separating solid particles from an airstream.

Cyclone robber system - A secondary cyclone trash handling system. These systems are not used at most cotton gins.

Cylinder cleaner — A machine with rotating spiked drums that open the locks and clean the cotton by removing dirt and small trash.

Extractor — Equipment for removing large trash pieces (sticks, stems, burs, and leaves). The equipment may include one or more devices, including a stick machine, bur machine, green-leaf machine, and a combination machine.

Extractor-feeder — A device that gives seed cotton a final light extraction/cleaning and then feeds it at a controlled rate to the gin stand.

Fly lint (or lint fly) — Short (less than 50 μm) cotton fibers, usually emitted from condensers and mote fan.

Gin stand — The heart of the ginning plant where gin saws (usually several in parallel) separate the cotton lint from the seeds.

High pressure side — The portion of the process preceding the gin stand (including unloading, drying, extracting, cleaning, and overflow handling systems) in which material is conveyed by a higher pressure air, and exhausts are typically controlled by cyclones.

In-line filter — A screen device with wiping brush or arm that removes fly lint and dust from conveying air before the air is discharged to the atmosphere.

Lint cleaner — A machine for removing foreign material from lint cotton.

Lint cotton — Cotton fibers from which the trash and seeds have been removed by the gin.

Low pressure side — The portion of the process following the gin stand (including lint cotton cleaning and batt formation process) in which material is conveyed by low pressure air, and exhausts are typically controlled by condensers.

Mote — A small group of short fibers attached to a piece of the seed or to an immature seed. Motes may be cleaned and baled.

Picker harvester — A machine that removes cotton lint and seeds from open bolls with rotating spindles, leaving unopened bolls on the plant. "First pick" cotton is obtained from the initial harvest of the season. It usually contains less trash than "second pick" cotton, obtained later in the harvest season. "Ground cotton" is obtained by picking up between the rows at season's end and has a high trash content.

Seed cotton — Raw cotton, containing lint, seed, and some waste material, as it comes from the field.

Separator — A mechanical device (e.g., wire screen with rotary rake) that separates seed cotton from conveying air.

Skimmer — A curved air pollution control device that can separate part of the waste (leaves, dust, fly lint) from an airstream by centrifugal force. The skimmed (dirty) air is cleaned (e.g., cyclone filter) before discharge while the main airstream can be discharged.

Stripper harvester — A machine that strips all bolls — opened (mature) and unopened (immature or green) — from the plant; strippers are used on short cotton plants, grown in arid areas of Texas, Oklahoma, and New Mexico. They collect larger amounts of trash (leaves, stems, and sticks) than picker harvesters.

REFERENCES FOR SECTION 2

1. *Source Assessment: Cotton Gins*, EPA-600/2-78-004a, U. S. Environmental Protection Agency, Cincinnati, OH, January 1978.

2. *Control Technology Assessment of Raw Cotton Processing Operations*, Enviro Control Inc. Prepared for the National Institute for Occupational Safety and Health, Cincinnati, OH, June 15, 1980.

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4. A. C. Griffin and E. P. Columbus, *Dust in Cotton Gins: An Overview.* Prepared for the U. S. Cotton Ginning Laboratory, Stoneville, MS, 1982.

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11. M. N. Gillum and S. E. Hughs, *Velocity Effects on Operating Parameters of Series Cyclones*, Transaction of the American Society of Agricultural Engineers, 1983, 26(2):606-609.

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14. Oliver L. McCaskill and Richard A. Wesley, *Tests Conducted on Exhausts of Gins Handling Machine Picked Cotton*, The Cotton Gin and Oil Mill Press, September 5, 1970, pp. 7-9.

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3. GENERAL DATA REVIEW AND ANALYSIS PROCEDURES

3.1 LITERATURE SEARCH AND SCREENING

Data for this investigation were obtained from a number of sources within the Office of Air Quality Planning and Standards (OAQPS) and from outside organizations. The AP-42 background files located in the Emission Factor and Inventory Group (EFIG) were reviewed for information on the industry, processes, and emissions. The Factor Information and Retrieval (FIRE), Crosswalk/Air Toxic Emission Factor Data Base Management System (XATEF), and VOC/PM Speciation Data Base Management System (SPECIATE) data bases were searched by SCC code for identification of the potential pollutants emitted and emission factors for those pollutants. A general search of the Air CHIEF CD-ROM also was conducted to supplement the information from these data bases.

Information on the industry, including number of plants, plant location, and annual production capacities, was obtained from the USDA Economic Research Service and other sources. The Aerometric Information Retrieval System (AIRS) data base also was searched for data on the number of plants, plant location, and estimated annual emissions of criteria pollutants. A number of sources of information were investigated specifically for emission test reports and data. A search of the Test Method Storage and Retrieval (TSAR) data base was conducted to identify test reports for sources within the cotton ginning industry. Copies of these test reports were obtained from the files of the Emissions, Monitoring, and Analysis Division (EMAD). The EPA library was searched for additional test reports. Using information obtained on plant locations, State and Regional offices were contacted about the availability of test reports. Publications lists from the Office of Research and Development (ORD) and Control Technology Center (CTC) were also searched for reports on emissions from the cotton ginning industry. In addition, representative trade associations, including the National Cotton Council of America, were contacted for assistance in obtaining information about the industry and emissions.

To screen out unusable test reports, documents, and information from which emission factors could not be developed, the following general criteria were used:

1. Emission data must be from a primary reference:

a. Source testing must be from a referenced study that does not reiterate information from previous studies.

b. The document must constitute the original source of test data. For example, a technical paper was not included if the original study was contained in the previous document. If the exact source of the data could not be determined, the document was eliminated.

2. The referenced study should contain test results based on more than one test run. If results from only one run are presented, the emission factors must be down rated.

3. The report must contain sufficient data to evaluate the testing procedures and source operating conditions (e.g., one-page reports were generally rejected).

A final set of reference materials was compiled after a thorough review of the pertinent reports, documents, and information according to these criteria.

3.2 DATA QUALITY RATING SYSTEM[1]

As part of the analysis of the emission data, the quantity and quality of the information contained in the final set of reference documents were evaluated. The following data were excluded from consideration:

1. Test series averages reported in units that cannot be converted to the selected reporting units;

2. Test series representing incompatible test methods (i.e., comparison of EPA Method 5 front half with EPA Method 5 front and back half);

3. Test series of controlled emissions for which the control device is not specified;

4. Test series in which the source process is not clearly identified and described; and

5. Test series in which it is not clear whether the emissions were measured before or after the control device.

Test data sets that were not excluded were assigned a quality rating. The rating system used was that specified by EFIG for preparing AP-42 sections. The data were rated as follows:

A — Multiple tests that were performed on the same source using sound methodology and reported in enough detail for adequate validation. These tests do not necessarily conform to the methodology specified in EPA reference test methods, although these methods were used as a guide for the methodology actually used.

B — Tests that were performed by a generally sound methodology but lack enough detail for adequate validation.

C — Tests that were based on an untested or new methodology or that lacked a significant amount of background data.

D — Tests that were based on a generally unacceptable method but may provide an order-of-magnitude value for the source.

The following criteria were used to evaluate source test reports for sound methodology and adequate detail:

1. Source operation. The manner in which the source was operated is well documented in the report. The source was operating within typical parameters during the test.

2. Sampling procedures. The sampling procedures conformed to a generally acceptable methodology. If actual procedures deviated from accepted methods, the deviations are well documented. When this occurred, an evaluation was made of the extent to which such alternative procedures could influence the test results.

3. Sampling and process data. Adequate sampling and process data are documented in the report, and any variations in the sampling and process operation are noted. If a large spread between

test results cannot be explained by information contained in the test report, the data are suspect and are given a lower rating.

4. Analysis and calculations. The test reports contain original raw data sheets. The nomenclature and equations used were compared to those (if any) specified by EPA to establish equivalency. The depth of review of the calculations was dictated by the reviewer's confidence in the ability and conscientiousness of the tester, which in turn was based on factors such as consistency of results and completeness of other areas of the test report.

3.3 EMISSION FACTOR QUALITY RATING SYSTEM[1]

The quality of the emission factors developed from analysis of the test data was rated using the following general criteria:

A--Excellent: Developed from A- and B-rated source test data taken from many randomly chosen facilities in the industry population. The source category is specific enough so that variability within the source category population may be minimized.

B—Above average: Developed only from A- or B-rated test data from a reasonable number of facilities. Although no specific bias is evident, it is not clear if the facilities tested represent a random sample of the industries. The source category is specific enough so that variability within the source category population may be minimized.

C—Average: Developed only from A-, B- and/or C-rated test data from a reasonable number of facilities. Although no specific bias is evident, it is not clear if the facilities tested represent a random sample of the industry. In addition, the source category is specific enough so that variability within the source category population may be minimized.

D—Below average: The emission factor was developed only from A-, B-, and/or C-rated test data from a small number of facilities, and there is reason to suspect that these facilities do not represent a random sample of the industry. There also may be evidence of variability within the source category population. Limitations on the use of the emission factor are noted in the emission factor table.

E—Poor: The emission factor was developed from C- and D-rated test data, and there is reason to suspect that the facilities tested do not represent a random sample of the industry. There also may be evidence of variability within the source category population. Limitations on the use of these factors are footnoted.

The use of these criteria is somewhat subjective and depends to an extent upon the individual reviewer. Details of the rating of each candidate emission factor are provided in Section 4.

REFERENCE FOR SECTION 3

1. *Technical Procedures for Developing AP-42 Emission Factors and Preparing AP-42 Sections*, EPA-454/B-93-050, Office of Air Quality Planning and Standards, U. S. Environmental Protection Agency, Research Triangle Park, NC, October 1993.

4. REVIEW OF SPECIFIC DATA SETS

4.1 INTRODUCTION

This section describes how the revised AP-42 section on cotton ginning was developed. First, descriptions of data sets reviewed for this revision are presented, followed by a discussion of how candidate emission factors were developed from the data. Finally, the proposed changes to the existing AP-42 section on cotton ginning are summarized.

4.2 REVIEW OF SPECIFIC DATA SETS

Fourteen new references were obtained and reviewed for use in developing emission factors from cotton ginning operations, and two references from the existing background file were also used. These sixteen references are described in Sections 4.2.1 through 4.2.16 of this report. References 17 through 19 were used for background information, but do not contain any emission data.

4.2.1 Reference 1

This report documents the results of an emission test conducted at Westfield Gin in Riverdale, California on November 14 and 15, 1991. The gin processes picker-harvested cotton. Total PM and PM-10 emissions from a main trash stockpiler cyclone, a No. 2 incline cleaner cyclone, and a gin feed trash cyclone were quantified using CARB Method 5 and a cascade impactor for particle sizing. The main trash stockpiler was equipped with cyclones, but the number and size of the cyclones is not known. Each of the other two sources were equipped with two 38-inch 2D-2D cyclones. To determine the total emissions from the No. 2 incline cleaner and the gin feed trash fan, the measured emissions were doubled because only one of two cyclones controlling each process was tested. Three test runs were conducted on each source, and run-by-run production rates in bales per hour were provided for each test. A description of the facility is not included in the report, but was obtained from San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) personnel.

The total PM data for the No. 2 incline cleaner and the gin feed trash fan are assigned an A rating. The PM-10 data are assigned a B rating because flowrates were adjusted during the test runs to maintain isokinetic sampling (EPA Method 201A, which is similar to the method used, requires that a constant flow rate through the sizing device be maintained during testing). The data for the main trash stockpiler cyclone are not rated and are not used for emission factor development because the process configuration is not known. Otherwise, the test methodology appeared to be sound, and no problems were reported during testing. Appendix A contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.2 Reference 2

This report documents the results of an emission test conducted at Airways Gins in Fresno, California, on November 21 and 22, 1991. The gin processes picker-harvested cotton. Total PM and PM-10 emissions from a mote trash cyclone, a No. 3 incline cleaner cyclone, and an overflow separator cyclone were quantified using CARB Method 5 and a cascade impactor for particle sizing. The mote trash system was equipped with a single 20 inch 1D-3D cyclone, and each of the other two processes was equipped with dual 40 inch 1D-3D cyclones. To calculate total emission rates from each source, the measured emission rates were multiplied by the number of cyclones used to control emissions from each source. These total emission rates are based on the assumption that the emissions are the same from all cyclones controlling a particular process. Three test runs were conducted on each source, and run-by-run production rates in bales per hour were provided for each test. A description of the facility is not included in the report, but was obtained from SJVUAPCD personnel.

The total PM data are assigned an A rating. The PM-10 data are assigned a B rating because flowrates were adjusted during the test runs to maintain isokinetic sampling (EPA Method 201A requires that a constant flow rate through the sizing device be maintained during testing). Otherwise, the test methodology appeared to be sound, and no problems were reported during testing. Appendix B contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.3 Reference 3

This report documents the results of an emission test conducted at Mount Whitney Cotton Gin in California on November 29 and 30, 1990. The gin processes picker-harvested cotton. Total PM and PM-10 emissions from a cyclone controlling the west plenum (unloading, dryers, and cleaners), a cyclone controlling the east plenum (overflow separator and main trash fans), a mote cyclone, and a mote condenser cyclone (assumed similar to mote trash fans at other facilities) were measured using CARB Method 5 and a cascade impactor for particle sizing. Based on the magnitude of emissions and a note in the report that states that the test was conducted prior to 1991 modifications, the cyclones tested are assumed to be 2D-2D cyclones. The documentation includes a note that this test was performed prior to control system modifications, and several other reports discuss similar plants that switched from 2D-2D to 1D-3D cyclones at around the same time. To calculate total emission rates from each source, the measured emission rates were multiplied by the number of cyclones used to control emissions from each source (15 cyclones controlling the unloading, drying, and cleaning operations; 4 overflow separator/main trash cyclones; 2 mote cyclones; and 1 mote trash cyclone). These total emission rates are based on the assumption that the emissions are the same from all cyclones controlling a particular process. Two test runs were conducted on each source. Process rates and a description of the processes tested are not included in the report, but were obtained from SJVUAPCD personnel.

The total PM data are assigned a B rating because only two test runs were performed. The PM-10 data are assigned a B rating because only two test runs were performed and flowrates were adjusted during the test runs to maintain isokinetic sampling (EPA Method 201A requires that a constant flow rate through the sizing device be maintained during testing). Otherwise, the test methodology appeared to be sound, and no problems were reported during testing. Appendix C contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.4 Reference 4

This report documents the results of an emission test conducted at Stratford Growers in California on November 27 and 28, 1990. The gin processes picker-harvested cotton. Total PM and PM-10 emissions from a trash cyclone, a No. 1 dryer and cleaner cyclone, a No. 2 dryer and cleaner cyclone, and a mote cyclone were quantified using CARB Method 5 and a cascade impactor for particle sizing. Based on the magnitude of emissions and a note in the report that states that the test was conducted prior to 1991 modifications, the cyclones tested are assumed to be 2D-2D cyclones. The documentation includes a note that this test was performed prior to control system modifications, and several other similar plants switched from 2D-2D to 1D-3D cyclones at around the same time.

To calculate total emission rates from each source, the measured emission rates were multiplied by the number of cyclones used to control emissions from each source (two trash cyclones, four No. 1 dryer and cleaner cyclones, four No. 2 dryer and cleaner cyclones, and six mote cyclones). These total emission rates are based on the assumption that the emissions are the same from all cyclones controlling a particular process. Two test runs were conducted on each source, and production rates in bales per hour were provided for each test. A description of the facility is not included in the report, but was obtained from SJVUAPCD personnel.

The total PM data are assigned a B rating because only two test runs were performed. The PM-10 data are assigned a B rating because only two test runs were performed and flowrates were adjusted during the test runs to maintain isokinetic sampling (EPA Method 201A requires that a constant flow rate through the sizing device be maintained during testing). Otherwise, the test methodology appeared to be sound, and no problems were reported during testing. Appendix D contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.5 Reference 5

This report documents the results of an emission test conducted at County Line Gin in Hanford, California, on December 3 and 4, 1990. The gin processes picker-harvested cotton. Total PM and PM-10 emissions from a mote cyclone, a lint trap (cleaner) cyclone, a suction cyclone, and a No. 1 dryer cyclone were quantified using CARB Method 5 and a cascade impactor. The mote system was equipped with two 60-inch 2D-2D cyclones, the lint cleaners were equipped with sixteen 38-inch 2D-2D cyclones, the unloading system was equipped with four 34-inch 2D-2D cyclones, and the No. 1 dryer and cleaner was equipped with six 38-inch 2D-2D cyclones. To calculate total emission rates from each source, the measured emission rates were multiplied by the number of cyclones used to control emissions from each source. These total emission rates are based on the assumption that the emissions are the same from all cyclones controlling a particular process. Two test runs were conducted on each source, and production rates in bales per hour were provided for each test. A description of the processes tested is not included in the report, but was obtained from SJVUAPCD personnel.

The total PM data are assigned an B rating because only two test runs were conducted. The PM-10 data are assigned a B rating because flowrates were adjusted during the test runs to maintain isokinetic sampling (EPA Method 201A requires that a constant flow rate through the sizing device be maintained during testing). Otherwise, the test methodology appeared to be sound, and no problems were reported during testing. Appendix E contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.6 Reference 6

This report documents the results of an emission test conducted at County Line Gin in Hanford, California on December 8-11, 1991. The gin processes picker-harvested cotton. The facility is the same facility discussed in Reference 5, but modifications were made to the PM control system following the Reference 5 test and before this test program was conducted. Total PM and PM-10 emissions from a mote cyclone, a lint cleaner cyclone, a suction cyclone, an overflow cyclone, a No. 1 dryer cyclone, a No. 2 dryer cyclone, a gin stand trash cyclone, and a battery condenser cyclone were quantified using CARB Methods 5 and 501 (cascade impactor). The mote system was equipped with four 44-inch 1D-3D cyclones, the unloading system was equipped with three 46-inch 1D-3D cyclones, the lint cleaners were equipped with eight 48-inch 1D-3D cyclones, the overflow separator was equipped with a single 40-inch 1D-3D cyclone, the No. 1 dryer and cleaner was equipped with four 41-inch 1D-3D cyclones, the gin stand trash system was equipped with two 38-inch 1D-3D cyclones, the battery condenser was equipped with four 49-inch 1D-3D cyclones, and the No. 2 dryer and cleaner was equipped with four 40-inch 1D-3D cyclones. To calculate total emission rates from each source, the measured emission rates were multiplied by the number of cyclones used to control emissions from each source. These total emission rates are based on the assumption that the emissions are the same from all cyclones controlling a particular process. Three test runs were conducted on each source, and production rates in bales per hour were provided for each test.

The total PM data are assigned an A rating. The PM-10 data are assigned a B rating because flowrates were adjusted during the test runs to maintain isokinetic sampling (EPA Method 201A requires that a constant flow rate through the sizing device be maintained during testing). Otherwise, the test methodology appeared to be sound, and no problems were reported during testing. Appendix F contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.7 Reference 7

This report documents the results of an emission test conducted at Westfield Gin in Riverdale, California, on November 12, 1992. The gin processes picker-harvested cotton. Total PM and PM-10 emissions from a main trash cyclone (a 38-inch 1D-3D cyclone) were quantified using CARB Methods 5 and 501 (cascade impactor). To calculate the total emission rate from the source, the measured emission rate was multiplied by the number of cyclones used to control emissions from the source (two main trash cyclones). This total emission rate is based on the assumption that the emissions are the same from both cyclones controlling the process. Three test runs were conducted, and run-by run production rates in bales per hour were provided.

The total PM data are assigned an A rating. The PM-10 data are assigned a B rating because flowrates were adjusted during the test runs to maintain isokinetic sampling (EPA Method 201A requires that a constant flow rate through the sizing device be maintained during testing). Otherwise, the test methodology appeared to be sound, and no problems were reported during testing. Appendix G contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.8 Reference 8

This report documents the results of an emission test conducted at West Valley Cotton Growers in Riverdale, California, on October 28, 1993. The gin processes picker-harvested cotton. Total PM and PM-10 emissions from a battery condenser cyclone and a No. 3 dryer cyclone were quantified using CARB Methods 5 and 501 (cascade impactor). The battery condenser was equipped with one 80-inch 1D-3D cyclone, and the No. 3 dryer and cleaner was equipped with three 38-inch 1D-3D cyclones. To calculate total emission rates from each source, the measured emission rates were multiplied by the number of cyclones used to control emissions from each source. These total emission rates are based on the assumption that the emissions are the same from all cyclones controlling a particular process. Three test runs were conducted on each source, and run-by-run production rates in bales per hour were provided for each test.

The total PM data are assigned an A rating. The PM-10 data are assigned a B rating because flowrates were adjusted during the test runs to maintain isokinetic sampling (EPA Method 201A requires that a constant flow rate through the sizing device be maintained during testing). Otherwise, the test methodology appeared to be sound, and no problems were reported during testing. Appendix H contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.9 Reference 9

This report documents the results of an emission test conducted at Dos Palos Cooperative Gin in Dos Palos, California, on November 27-29, 1992. The gin processes picker-harvested cotton. Total PM and PM-10 emissions from a mote cyclone, a lint cleaner cyclone, an unloading cyclone, an overflow cyclone, a No. 1 dryer cyclone, a No. 2 dryer cyclone, and a battery condenser cyclone were quantified using CARB Methods 5 and 501 (cascade impactor). The mote system was equipped with four 42-inch 1D-3D cyclones, the lint cleaners were equipped with six 48-inch 1D-3D cyclones, the unloading system was equipped with three 46-inch 1D-3D cyclones, the overflow separator was equipped with one 36-inch 1D-3D cyclone, the No. 1 dryer and cleaner was equipped with two 50-inch 1D-3D cyclones, the No. 2 dryer and cleaner was equipped with two 50-inch 1D-3D cyclones, and the battery condenser was equipped with four 48-inch 1D-3D cyclones. To calculate total emission rates from each source, the measured emission rates were multiplied by the number of cyclones used to control emissions from each source. These total emission rates are based on the assumption that the emissions are the same from all cyclones controlling a particular process. Three test runs were conducted on each source, and production rates in bales per hour were provided for each test.

The total PM data are assigned an A rating. The PM-10 data are assigned a B rating because flowrates were adjusted during the test runs to maintain isokinetic sampling (EPA Method 201A requires that a constant flow rate through the sizing device be maintained during testing). Otherwise, the test methodology appeared to be sound, and no problems were reported during testing. Appendix I contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.10 Reference 10

This report documents the results of an emission test conducted at Halls Gin in Halls, Tennessee, on October 25-27, 1988. Testing was conducted during processing of the first harvest of picker-harvested cotton. Filterable PM emissions were measured at all of the ducted emission points at the facility. These emission points include four suction cyclones, four No. 1 dryer (inclined cleaner) cyclones, four No. 2 dryer (inclined cleaner) cyclones, two overflow cyclones, two mote trash cyclones, two cotton waste disposal cyclones, three mote press cyclones, the battery condenser vent (controlled by 80 mesh screening), three ducts venting emission from three first- and second-stage lint cleaners (controlled by perforated drums), and three ducts venting emission from three third-stage lint cleaners (controlled by 80 mesh screening). All of the cyclones tested are 2D-2D cyclones, which have a 2:1 ratio of cone length to cyclone diameter and a 2:1 ratio of body length to cyclone diameter. Rader hi-volume samplers were used to measure PM emissions from these sources. Stack volumetric flow rates were estimated using fan specifications, and were corrected to dry standard conditions. These flow rates were not checked using a velocity traverse or other method, and represent a theoretical flow rather than an actual measurement. Also, the presence of cyclonic flow was not discussed in the report, and could potentially bias the samples taken at the cyclone outlets. The exhaust stream moisture contents were determined by taking the dry and wet bulb temperatures at each exhaust location and reading the corresponding moisture content from a psychrometric chart provided in the report. Three samples were taken at each source, and production rates in bales per hour were provided for each day of testing.

The data from this report are assigned a D rating because of the limitations in the accuracy of the flow rates and the potential biases from cyclonic flow discussed above. Appendix J contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.11 Reference 11

This report documents the results of EPA-sponsored emission testing conducted at Marana Gin in Marana, Arizona, on November 2-19, 1977. One of the two gins tested processed short-staple picker-harvested cotton, and the other gin processed long-staple picker-harvested cotton. For the gin processing long-staple cotton, total PM emissions from the unloading fan, No. 1 dryer and cleaner, No. 2 dryer and cleaner, master trash fan, and mote system controlled with high-efficiency cyclones were quantified using EPA Method 5. Total PM emissions from the lint cleaners and battery condenser were controlled by screen cages and were quantified using Rader high-vol samplers (similar to the Reference 10 test procedure). For the gin processing short-staple cotton, total PM emissions from the unloading fan, No. 1 dryer and cleaner, No. 2 dryer and cleaner, second stage seed cotton cleaning, master trash fan, and gin stand feeder trash fan controlled with high-efficiency cyclones were quantified using EPA Method 5. Total PM emissions from the lint cleaners and battery condenser were controlled by screen cages and were quantified using Rader high-vol samplers (similar to the Reference 10 test procedure). Three test runs were conducted on each source, and production rates in bales per hour were provided for each test.

The data for all of the sources except the unloading fan (long-staple cotton), the lint cleaners, and battery condenser are assigned an A rating. The test methodology appeared to be sound, and no problems were reported during testing. The data for the unloading fan (long-staple cotton) are assigned a B rating because only two valid test runs were performed. The data for the lint cleaners and battery condenser are assigned a D rating because the isokinetic sampling rates were greater than 300 percent for most of the test runs, which should bias the emission rates low. Appendix K contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.12 Reference 12

This report documents the results of EPA-sponsored emission testing conducted at Westside Farmers Cooperative Gin No. 5 in Tranquility, California, on November 15-22, 1977. The gin processed picker-harvested cotton. Total PM emissions from the unloading fan, Nos. 1 and 2 dryers and gin stand trash, Nos. 1 and 2 seed cotton cleaners, mote system (combined), and mote cleaner controlled with high-efficiency cyclones were quantified using EPA Method 5 (and a high volume sampler for comparison purposes). Total PM emissions from the first and second stage lint cleaners and battery condenser controlled with screen cages were also quantified using EPA Method 5. Three test runs were conducted on each source, and an average production rate was provided for the entire test period.

The data for all of the sources except the mote cleaner, lint cleaners, and battery condenser are assigned a B rating because only an average process rate was provided in the report. The test methodology appeared to be sound, and no problems were reported during testing. The data for the mote cleaner are assigned a D rating because none of the test runs were within the isokinetic limits specified by Method 5, and the data for the lint cleaners and battery condenser are assigned a C rating because the stack extensions were shorter than required and may have caused a negative bias. Appendix L contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.13 Reference 13

This report documents the results of an emission test conducted at Elbow Enterprises in Visalia, California, on November 7-8, 1994. The gin processes picker-harvested cotton. Total PM and PM-10 emissions from a No. 1 dryer and cleaner cyclone and a lint cleaner cyclone were quantified using CARB Methods 5 and 501 (cascade impactor). The No. 1 dryer and cleaner was equipped with three high-efficiency cyclones and the lint cleaner was equipped with twelve high-efficiency cyclones. To calculate total emission rates from each source, the measured emission rates were multiplied by the number of cyclones used to control emissions from each source. These total emission rates are based on the assumption that the emissions are the same from all cyclones controlling a particular process. Three test runs were conducted on each source, and production rates in bales per hour were provided for each test.

The total PM data are assigned an A rating. The PM-10 data are assigned a B rating because flowrates were adjusted during the test runs to maintain isokinetic sampling (EPA Method 201A requires that a constant flow rate through the sizing device be maintained during testing). Otherwise, the test methodology appeared to be sound, and no problems were reported during testing. Appendix M contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.14 Reference 14

This report documents the results of an emission test conducted at Stratford Growers in Stratford, California, on October 26-28, 1994. The gin processes picker-harvested cotton. Total PM and PM-10 emissions from a lint cleaner cyclone, unloading cyclone, master trash cyclone, mote trash cyclone, cyclone robber system, and feeder trash cyclone were quantified using CARB Methods 5 and 501 (cascade impactor). The lint cleaners were equipped with six 56-inch 1D-3D cyclones, the unloading system was equipped with three 42-inch 1D-3D cyclones, the master trash fan was equipped with one 48-inch 1D-3D cyclone, the mote trash fan was equipped with one 28-inch 1D-3D cyclone, the cyclone robber system was equipped with two 1D-3D cyclones, and the feeder trash fan was equipped with one 40-inch 1D-3D cyclones. To calculate total emission rates from each source, the measured emission rates were multiplied by the number of cyclones used to control emissions from each source. These total emission rates are based on the assumption that the emissions are the same from all cyclones controlling a particular process. Three test runs were conducted on each source, and production rates in bales per hour were provided for each test run.

The data used for emission factor development are, in some cases, slightly different from the data presented in the report. This is a result of a calculation error in the report. Specifically, in the calculation of the total PM weight, a negative value was reported for the impinger catch in several test runs. In the report, this negative value was used to reduce the total PM value. For purposes of emission factor development, MRI treated these negative weights as zero rather than including the negative value.

The total PM data are assigned an A rating, except for the data for the mote trash fan, which are assigned a B rating because one of the test runs did not meet the isokinetic requirements. The PM-10 data are assigned a B rating because flowrates were adjusted during the test runs to maintain isokinetic sampling (EPA Method 201A requires that a constant flow rate through the sizing device be maintained during testing). Also, the PM-10 tests on the lint cleaner and the mote trash fan included only two valid test runs. Otherwise, the test methodology appeared to be sound, and no problems were reported during testing. Appendix O contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.15 Reference 15

This report documents the results of an emission test conducted at Alta Vista Gin in Mendota, California, on November 3-4, 1994. The gin processes picker-harvested cotton. Total PM and PM-10 emissions from a battery condenser cyclone, a mote cyclone, and a lint cleaner cyclone were quantified using CARB Methods 5 and 501 (cascade impactor). The battery condenser was equipped with two 42-inch 1D-3D cyclones, the mote system was equipped with three 42-inch 1D-3D cyclones, and the lint cleaner was equipped with six 56-inch 1D-3D cyclones. To calculate total emission rates from each source, the measured emission rates were multiplied by the number of cyclones used to control emissions from each source. These total emission rates are based on the assumption that the emissions are the same from all cyclones controlling a particular process. Three test runs were conducted on each source, and production rates in bales per hour were provided for each test.

The data used for emission factor development are, in some cases, slightly different from the data presented in the report. This is a result of a calculation error in the report. Specifically, in the calculation of the total PM weight, a negative value was reported for the impinger catch in several test runs. In the report, this negative value was used to reduce the total PM value. For purposes of emission factor development, MRI treated these negative weights as zero rather than including the negative value.

The total PM data are assigned an A rating. The PM-10 data for the battery condenser and lint cleaner are assigned a B rating because flowrates were adjusted during the test runs to maintain isokinetic sampling (EPA Method 201A requires that a constant flow rate through the sizing device be maintained during testing). The PM-10 data for the mote system are assigned a D rating because the isokinetic requirements of Method 201A ($\pm$20 percent) were not met during two of three test runs. Otherwise, the test methodology appeared to be sound, and no problems were reported during testing. Appendix O contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.16 Reference 16

This report documents the results of an emission test conducted at Dos Palos Cooperative Gin in Dos Palos, California, on October 31 through November 2, 1994. This test was performed at the same facility as the test documented in Reference 9. However, the control device configuration was modified prior to this test. The gin processes picker-harvested cotton. Total PM and PM-10 emissions from an unloading cyclone, an overflow cyclone, a mote cyclone, a No. 2 dryer cyclone, and a battery condenser cyclone were quantified using CARB Methods 5 and 501 (cascade impactor). The unloading system was equipped with four high-efficiency cyclones, the overflow system was equipped with two high-efficiency cyclones, the mote system was equipped with four high-efficiency cyclones, the No. 2 dryer and cleaner was equipped with four high-efficiency cyclones, and the battery condenser was equipped with four high-efficiency cyclones. To calculate total emission rates from each source, the measured emission rates were multiplied by the number of cyclones used to control emissions from each source. These total emission rates are based on the assumption that the emissions are the same from all cyclones controlling a particular process. Three test runs were conducted on each source, and production rates in bales per hour were provided for each test.

The data used for emission factor development are, in some cases, slightly different from the data presented in the report. This is a result of a calculation error in the report. Specifically, in the calculation of the total PM weight, a negative value was reported for the impinger catch in several test runs. In the report, this negative value was used to reduce the total PM value. For purposes of emission factor development, MRI treated these negative weights as zero rather than including the negative value.

The total PM data are assigned an A rating. The PM-10 data are assigned a B rating because flowrates were adjusted during the test runs to maintain isokinetic sampling (EPA Method 201A requires that a constant flow rate through the sizing device be maintained during testing). Otherwise, the test methodology appeared to be sound, and no problems were reported during testing. Appendix P contains copies of report excerpts, raw data sheets, and emission factor calculations.

4.2.17 Review of FIRE and SPECIATE Data Base Emission Factors

The PM emission factors provided in FIRE are the same factors that are presented in the Cotton Ginning section of the 1977 version of AP-42. The PM-10 emission factors in FIRE are based on the PM emission factors from the 1977 version of AP-42. Several emission factors for arsenic emissions are also included in FIRE, but there is a lack of supporting documentation for these factors. No new data were found in SPECIATE.

4.2.18 Review of Test Data in AP-42 Background File

The test data in the background file are from emission tests conducted before 1978, and most of the tests were conducted before 1972. Two of the test reports are described in Section 4.2.11 and 4.2.12 of this report. Two other references in the background file entitled "Particulate Emissions from Commercial Cotton Ginning Operations" and "Particulate Emissions of a Cotton Gin in the Texas Stripper Area" contain emission data, but do not provide sufficient background documentation of the emission tests. In addition, the test method used in these reports was not an EPA reference method and may not be comparable to other available data. Therefore, data from these two references were not used for emission factor development. The other data in the background file are no longer used for emission factor development because they are not fully documented and are outdated. Although no new uncontrolled emission data are available, the uncontrolled emission factors previously tabulated in AP-42 are based on testing conducted in 1960 at a pilot plant that does not resemble modern operations. In addition, the accuracy of the test method used to quantify PM emissions is unknown. Therefore, the data for uncontrolled operations are not considered representative of the industry and are not included in the revised AP-42 section.

4.3 DEVELOPMENT OF CANDIDATE EMISSION FACTORS

Emission factors were developed by grouping the data from similar combinations of source, pollutant, and control device, discarding the inferior data sets, and averaging the emission factors derived from each data set. In some cases, data were available from multiple tests on the same source. In such cases, the emission factors from the tests on that source were averaged first, and the resulting factor was then averaged with the factors from other similar sources. Table 4-1 presents the available emission data from References 1 through 16. Table 4-2 shows how the data were combined to develop candidate emission factors. Table 4-3 presents the candidate emission factors that are included in the revised AP-42 section.

TABLE 4-1. SUMMARY OF TEST DATA FOR COTTON GINNING[a]

Source	Pollutant	No. of test runs	Data rating	Emission factor range, kg/bale (lb/bale)	Average emission factor, kg/bale (lb/bale)	Ref. No.
No. 2 dryer and cleaner	Total PM	3	A	0.087-0.11 (0.19-0.25)	0.10 (0.22)	1
No. 2 dryer and cleaner	PM-10	3	B	0.025-0.058 (0.054-0.13)	0.042 (0.093)	1
Gin feed trash fan	Total PM	3	A	0.028-0.035 (0.062-0.077)	0.031 (0.068)	1
Gin feed trash fan	PM-10	3	B	0.017-0.020 (0.037-0.043)	0.018 (0.040)	1
Mote trash fan	Total PM	3	A	0.026-0.035 (0.058-0.076)	0.031 (0.067)	2
Mote trash fan	PM-10	3	B	0.014-0.024 (0.031-0.053)	0.018 (0.040)	2
No. 3 dryer and cleaner	Total PM	3	A	0.040-0.043 (0.088-0.095)	0.041 (0.091)	2
No. 3 dryer and cleaner	PM-10	3	B	0.011-0.017 (0.025-0.038)	0.014 (0.030)	2
Overflow fan	Total PM	3	A	0.030-0.056 (0.065-0.012)	0.046 (0.10)	2
Overflow fan	PM-10	3	B	0.012-0.019 (0.026-0.041)	0.016 (0.036)	2
Unloading fan and dryers and cleaners	Total PM	2	B	1.2-2.1 (2.6-4.7)	1.6 (3.6)	3
Unloading fan and dryers and cleaners	PM-10	2	B	0.60-1.0 (1.3-2.3)	0.82 (1.8)	3
Overflow fan and master trash fan	Total PM	2	B	0.34-0.56 (0.74-1.2)	0.45 (0.99)	3
Overflow fan and master trash fan	PM-10	2	B	0.020-0.063 (0.045-0.14)	0.042 (0.092)	3
Mote fan	Total PM	2	B	0.026-0.16 (0.056-0.36)	0.095 (0.21)	3
Mote fan	PM-10	2	B	0.0047-0.076 (0.010-0.17)	0.040 (0.089)	3
Mote trash fan	Total PM	2	B	0.037-0.064 (0.082-0.14)	0.051 (0.11)	3
Mote trash fan	PM-10	2	B	0.0015-0.0027 (0.0033-0.0059)	0.0021 (0.0046)	3
Gin stand trash fan	Total PM	2	B	0.098-0.12 (0.22-0.26)	0.11 (0.24)	4
Gin stand trash fan	PM-10	2	B	0.016-0.055 (0.036-0.12)	0.036 (0.079)	4
No. 1 dryer and cleaner	Total PM	2	B	0.089-0.19 (0.20-0.41)	0.14 (0.30)	4
No. 1 dryer and cleaner	PM-10	2	B	0.028-0.070 (0.062-0.15)	0.049 (0.11)	4
No. 2 dryer and cleaner	Total PM	2	B	0.35-0.36 (0.78-0.79)	0.36 (0.79)	4
No. 2 dryer and cleaner	PM-10	2	B	0.065-0.15 (0.14-0.32)	0.11 (0.23)	4
Mote fan	Total PM	2	B	0.043-0.054 (0.095-0.12)	0.049 (0.11)	4

TABLE 4-1. (continued)

Source	Pollutant	No. of test runs	Data rating	Emission factor range, kg/bale (lb/bale)	Average emission factor, kg/bale (lb/bale)	Ref. No.
Mote fan	PM-10	2	B	0.014-0.032 (0.030-0.070)	0.023 (0.050)	4
Mote fan	Total PM	2	B	0.21-0.74 (0.45-1.6)	0.47 (1.0)	5
Mote fan	PM-10	2	B	0.050-0.23 (0.11-0.50)	0.14 (0.30)	5
Lint cleaners	Total PM	2	B	0.91-1.1 (2.0-2.5)	1.0 (2.3)	5
Lint cleaners	PM-10	2	B	0.32-0.52 (0.71-1.2)	0.42 (0.93)	5
Unloading fan	Total PM	2	B	0.095-0.10 (0.21-0.23)	0.10 (0.22)	5
Unloading fan	PM-10	2	B	0.095-0.10 (0.21-0.23)	0.10 (0.22)	5
No. 1 dryer and cleaner	Total PM	2	B	0.15-0.35 (0.32-0.77)	0.25 (0.54)	5
No. 1 dryer and cleaner	PM-10	2	B	0.061-0.13 (0.13-0.29)	0.096 (0.21)	5
Mote fan	Total PM	3	A	0.14-0.16 (0.30-0.35)	0.15 (0.33)	6
Mote fan	PM-10	3	B	0.071-0.084 (0.16-0.19)	0.079 (0.17)	6
Unloading fan	Total PM	3	A	0.10-0.17 (0.23-0.37)	0.14 (0.30)	6
Unloading fan	PM-10	3	B	0.056-0.082 (0.12-0.18)	0.069 (0.15)	6
Lint cleaners	Total PM	3	A	0.11-0.18 (0.24-0.39)	0.13 (0.29)	6
Lint cleaners	PM-10	3	B	0.057-0.10 (0.13-0.22)	0.072 (0.16)	6
Overflow fan	Total PM	3	A	0.019-0.021 (0.041-0.046)	0.020 (0.044)	6
Overflow fan	PM-10	3	B	0.011-0.014 (0.023-0.031)	0.012 (0.027)	6
No. 1 dryer and cleaner	Total PM	3	A	0.076-0.15 (0.17-0.32)	0.11 (0.24)	6
No. 1 dryer and cleaner	PM-10	3	B	0.025-0.079 (0.056-0.17)	0.050 (0.11)	6
Gin stand trash fan	Total PM	3	A	0.091-0.14 (0.20-0.30)	0.11 (0.23)	6
Gin stand trash fan	PM-10	3	B	0.036-0.051 (0.079-0.11)	0.042 (0.093)	6
Battery condenser	Total PM	3	A	0.018-0.059 (0.040-0.13)	0.037 (0.082)	6
Battery condenser	PM-10	3	B	0.0035-0.0072 (0.0077-0.016)	0.0058 (0.013)	6
No. 2 dryer and cleaner	Total PM	3	A	0.044-0.052 (0.096-0.12)	0.047 (0.10)	6
No. 2 dryer and cleaner	PM-10	3	B	0.022-0.025 (0.048-0.055)	0.024 (0.053)	6

TABLE 4-1. (continued)

Source	Pollutant	No. of test runs	Data rating	Emission factor range, kg/bale (lb/bale)	Average emission factor, kg/bale (lb/bale)	Ref. No.
Master trash fan	Total PM	3	A	0.17-0.20 (0.38-0.43)	0.18 (0.40)	7
Master trash fan	PM-10	3	B	0.045-0.059 (0.10-0.13)	0.051 (0.11)	7
Battery condenser	Total PM	3	A	0.016-0.024 (0.035-0.053)	0.019 (0.042)	8
Battery condenser	PM-10	3	B	0.0039-0.011 (0.0085-0.023)	0.0077 (0.017)	8
No. 3 dryer and cleaner	Total PM	3	A	0.032-0.063 (0.072-0.14)	0.045 (0.099)	8
No. 3 dryer and cleaner	PM-10	3	B	0.011-0.022 (0.024-0.050)	0.016 (0.035)	8
Mote fan	Total PM	3	A	0.064-0.086 (0.14-0.19)	0.076 (0.17)	9
Mote fan	PM-10	3	B	0.045-0.052 (0.099-0.11)	0.048 (0.11)	9
Battery condenser	Total PM	3	A	0.013-0.019 (0.029-0.041)	0.016 (0.036)	9
Battery condenser	PM-10	3	B	0.011-0.012 (0.023-0.027)	0.011 (0.025)	9
Overflow fan	Total PM	3	A	0.0032-0.0063 (0.0070-0.014)	0.0050 (0.011)	9
Overflow fan	PM-10	3	B	0.0010-0.0027 (0.0023-0.0059)	0.0020 (0.0045)	9
Lint cleaners	Total PM	3	A	0.051-0.070 (0.11-0.15)	0.057 (0.13)	9
Lint cleaners	PM-10	3	B	0.025-0.032 (0.055-0.071)	0.028 (0.062)	9
No. 1 dryer and cleaner	Total PM	3	A	0.16-0.19 (0.36-0.42)	0.18 (0.39)	9
No. 1 dryer and cleaner	PM-10	3	B	0.036-0.044 (0.079-0.098)	0.040 (0.089)	9
Unloading fan	Total PM	3	A	0.029-0.050 (0.063-0.11)	0.041 (0.090)	9
Unloading fan	PM-10	3	B	0.020-0.028 (0.044-0.062)	0.024 (0.053)	9
No. 2 dryer and cleaner	Total PM	3	A	0.080-0.11 (0.18-0.24)	0.093 (0.21)	9
No. 2 dryer and cleaner	PM-10	3	B	0.0090-0.032 (0.020-0.071)	0.022 (0.048)	9
Unloading fan[b]	Total PM	3	D	0.0074-0.0082 (0.016-0.018)	0.0078 (0.017)	10
No. 1 dryer and cleaner[b]	Total PM	3	D	0.022-0.033 (0.049-0.073)	0.027 (0.059)	10
No. 2 dryer and cleaner[b]	Total PM	3	D	0.016-0.018 (0.035-0.039)	0.017 (0.037)	10
Overflow fan[b]	Total PM	3	D	0.012-0.014 (0.027-0.031)	0.013 (0.029)	10
Mote trash fan[b]	Total PM	3	D	0.019-0.023 (0.041-0.050)	0.020 (0.045)	10

TABLE 4-1. (continued)

Source	Pollutant	No. of test runs	Data rating	Emission factor range, kg/bale (lb/bale)	Average emission factor, kg/bale (lb/bale)	Ref. No.
Main trash fan[b]	Total PM	3	D	0.028-0.037 (0.062-0.082)	0.033 (0.073)	10
Mote fan[b]	Total PM	3	D	0.029-0.034 (0.063-0.075)	0.032 (0.070)	10
Battery condenser with 80-mesh screens[b]	Total PM	3	D	0.0050-0.0074 (0.011-0.016)	0.0059 (0.013)	10
First and second stage lint cleaners with 16D perforated drums[b]	Total PM	3	D	0.13-0.15 (0.28-0.34)	0.14 (0.30)	10
Third stage lint cleaners with 80-mesh screens[b]	Total PM	3	D	0.0072-0.0096 (0.016-0.021)	0.0084 (0.019)	10
Unloading fan	Total PM	2	B	0.093-0.23 (0.21-0.52)	0.16 (0.36)	11
No. 1 dryer and cleaner	Total PM	3	A	0.13-0.21 (0.29-0.45)	0.16 (0.35)	11
No. 2 dryer and cleaner	Total PM	3	A	0.044-0.064 (0.097-0.14)	0.056 (0.12)	11
Master trash fan	Total PM	3	A	0.10-0.12 (0.22-0.27)	0.11 (0.25)	11
First and second stage lint cleaners with screen cages	Total PM	3[c]	D	0.23-0.54 (0.51-1.2)	0.36 (0.80)	11
Mote system	Total PM	3	A	0.053-0.093 (0.12-0.21)	0.070 (0.15)	11
Battery condenser with screen cage	Total PM	3	D	0.044-0.14 (0.10-0.31)	0.098 (0.22)	11
Unloading fan	Total PM	3	A	0.083-0.15 (0.18-0.33)	0.11 (0.25)	11
No. 1 dryer and cleaner	Total PM	3	A	0.14-0.20 (0.30-0.44)	0.18 (0.39)	11
Second stage seed cotton cleaning	Total PM	3	A	0.017-0.021 (0.038-0.047)	0.020 (0.043)	11
No. 2 dryer and cleaner	Total PM	3	A	0.059-0.076 (0.13-0.17)	0.069 (0.15)	11
Master trash fan	Total PM	3	A	0.41-0.66 (0.89-1.4)	0.57 (1.3)	11
Gin stand feeder trash	Total PM	3	A	0.021-0.029 (0.046-0.063)	0.025 (0.055)	11
First and second stage lint cleaners with screen cages	Total PM	3[d]	D	0.49-0.91 (1.1-2.0)	0.70 (1.5)	11
Battery condenser with screen cage	Total PM	3	D	0.028-0.070 (0.062-0.15)	0.047 (0.10)	11
Unloading fan	Total PM	3	B	0.16-0.20 (0.35-0.43)	0.18 (0.40)	12
Nos. 1 and 2 dryers and gin stand trash	Total PM	3	B	0.14-0.17 (0.31-0.37)	0.16 (0.35)	12
Nos. 1 and 2 seed cotton cleaners	Total PM	4[e]	B	0.16-0.64 (0.35-1.4)	0.36 (0.79)	12
Mote system	Total PM	3	B	0.10-0.16 (0.22-0.36)	0.14 (0.30)	12

TABLE 4-1. (continued)

Source	Pollutant	No. of test runs	Data rating	Emission factor range, kg/bale (lb/bale)	Average emission factor, kg/bale (lb/bale)	Ref. No.
Mote cleaner	Total PM	3	D	0.066-0.094 (0.15-0.21)	0.075 (0.17)	12
First and second stage lint cleaners with screen cages	Total PM	3	C	0.54-1.0 (1.2-2.3)	0.73 (1.6)	12
Battery condenser with screen cages	Total PM	3	C	0.16-0.16 (0.35-0.36)	0.16 (0.36)	12
No. 1 dryer and cleaner	Total PM	3	A	0.12-0.15 (0.27-0.33)	0.14 (0.30)	13
No. 1 dryer and cleaner	PM-10	3	B	0.024-0.054 (0.054-0.12)	0.039 (0.088)	13
First and second stage lint cleaners	Total PM	3	A	0.16-0.21 (0.35-0.46)	0.18 (0.39)	13
First and second stage lint cleaners	PM-10	3	B	0.045-0.054 (0.097-0.12)	0.050 (0.011)	13
Lint cleaners	Total PM	3	A	0.029-0.22 (0.064-0.49)	0.14 (0.30)	14
Lint cleaners	PM-10	2	B	0.079-0.12 (0.17-0.26)	0.10 (0.22)	14
Unloading fan	Total PM	3	A	0.13-0.20 (0.29-0.45)	0.16 (0.34)	14
Unloading fan	PM-10	3	B	0.027-0.042 (0.060-0.093)	0.035 (0.078)	14
Master trash fan	Total PM	3	A	0.039-0.046 (0.087-0.10)	0.042 (0.092)	14
Master trash fan	PM-10	3	B	0.0039-0.018 (0.0086-0.040)	0.013 (0.029)	14
Mote trash fan	Total PM	2	B	0.024-0.026 (0.052-0.058)	0.025 (0.055)	14
Mote trash fan	PM-10	2	B	0.0080-0.0085 (0.018-0.019)	0.0083 (0.018)	14
Cyclone robber system	Total PM	3	A	0.072-0.092 (0.16-0.20)	0.083 (0.18)	14
Cyclone robber system	PM-10	3	B	0.015-0.037 (0.032-0.083)	0.024 (0.052)	14
Gin stand feeder trash	Total PM	3	A	0.017-0.019 (0.037-0.042)	0.018 (0.039)	14
Gin stand feeder trash	PM-10	3	B	0.0030-0.0047 (0.0065-0.010)	0.0041 (0.0089)	14
Mote system	Total PM	3	A	0.050-0.059 (0.11-0.13)	0.055 (0.12)	15
Mote system	PM-10	3	D	0.024-0.034 (0.053-0.074)	0.029 (0.064)	15
Battery condenser	Total PM	3	A	0.0055-0.0073 (0.012-0.016)	0.0059 (0.013)	15
Battery condenser	PM-10	3	B	0.0014-0.0055 (0.0030-0.012)	0.0036 (0.0079)	15
First and second stage lint cleaners	Total PM	3	A	0.016-0.068 (0.036-0.15)	0.041 (0.090)	15
First and second stage lint cleaners	PM-10	3	B	0.0068-0.030 (0.015-0.066)	0.020 (0.043)	15

TABLE 4-1. (continued)

Source	Pollutant	No. of test runs	Data rating	Emission factor range, kg/bale (lb/bale)	Average emission factor, kg/bale (lb/bale)	Ref. No.
Unloading fan	Total PM	3	A	0.11-0.16 (0.25-0.37)	0.15 (0.32)	16
Unloading fan	PM-10	3	B	0.038-0.064 (0.084-0.14)	0.052 (0.12)	16
Overflow fan	Total PM	3	A	0.045-0.082 (0.099-0.18)	0.059 (0.13)	16
Overflow fan	PM-10	3	B	0.016-0.019 (0.036-0.042)	0.017 (0.038)	16
Mote system	Total PM	3	A	0.031-0.059 (0.070-0.13)	0.045 (0.099)	16
Mote system	PM-10	3	B	0.011-0.052 (0.024-0.12)	0.027 (0.059)	16
No. 2 dryer and cleaner	Total PM	3	A	0.035-0.073 (0.076-0.16)	0.050 (0.11)	16
No. 2 dryer and cleaner	PM-10	3	B	0.010-0.030 (0.023-0.066)	0.018 (0.040)	16
Battery condenser	Total PM	3	A	0.0073-0.015 (0.016-0.034)	0.011 (0.024)	16
Battery condenser	PM-10	3	B	0.0019-0.0064 (0.0041-0.014)	0.0039 (0.0085)	16

[a] Sources controlled by high-efficiency 1D-3D or 2D-2D cyclones unless noted otherwise.
[b] Gin was processing first-harvest picker-harvested cotton.
[c] Three test runs conducted on each of four lint cages (two first stage and two second stage). Results are summed to determine a total emission factor for first and second stage lint cleaners.
[d] Three test runs conducted on one lint cleaner exhaust, and six test runs conducted on the other.
[e] Four test runs conducted at one exhaust and two valid test runs conducted at another exhaust point. Ninety-four percent of the emissions were measured at the site where four test runs were performed.

TABLE 4-2. EMISSION FACTOR DEVELOPMENT FOR COTTON GINNING

Source	Pollutant	No. of test runs	Data rating	Single test emission factors, kg/bale (lb/bale)	Average emission factor, kg/bale (lb/bale)	Emission factor rating	Ref. No.
Battery condenser	PM-10	3	B	0.0036 (0.0079)	0.0064 (0.014)	D	15
Battery condenser	PM-10	3	B	0.0039 (0.0085)			16
Battery condenser	PM-10	3	B	0.0058 (0.013)			6
Battery condenser	PM-10	3	B	0.0077 (0.017)			8
Battery condenser	PM-10	3	B	0.011 (0.025)			9
Battery condenser	Total PM	3	A	0.0059 (0.013)	0.018 (0.039)	D	15
Battery condenser	Total PM	3	A	0.011 (0.024)			16
Battery condenser	Total PM	3	A	0.016 (0.036)			9
Battery condenser	Total PM	3	A	0.019 (0.042)			8
Battery condenser	Total PM	3	A	0.037 (0.082)			6
Battery condenser with screen cages	Total PM	3	D	0.0059 (0.013)	0.078 (0.17)	E	10
Battery condenser with screen cages	Total PM	3	D	0.047 (0.10)			11
Battery condenser with screen cages	Total PM	3	D	0.098 (0.22)			11
Battery condenser with screen cages	Total PM	3	C	0.16 (0.36)			12
Cyclone robber system	PM-10	3	B	0.024 (0.052)	0.024 (0.052)	D	14
Cyclone robber system	Total PM	3	A	0.083 (0.18)	0.083 (0.18)	D	14
Gin stand feeder trash	PM-10	3	B	0.0041 (0.0089)	0.025 (0.055)	NR	14
Gin stand trash fan	PM-10	3	B	0.018 (0.040)			1
Gin stand trash fan	PM-10	2	B	0.036 (0.079)			4
Gin stand trash fan	PM-10	3	B	0.042 (0.093)			6
Gin stand feeder trash	Total PM	3	A	0.018 (0.039)	0.059 (0.13)	NR	14
Gin stand feeder trash	Total PM	3	A	0.025 (0.055)			11
Gin stand trash fan	Total PM	3	A	0.031 (0.068)			1
Gin stand trash fan	Total PM	3	A	0.11 (0.23)			6
Gin stand trash fan	Total PM	2	B	0.11 (0.24)			4
Lint cleaners	PM-10	3	B	0.020 (0.043)	0.11 (0.24)	D	15
Lint cleaners	PM-10	3	B	0.028 (0.062)			9
Lint cleaners	PM-10	3	B	0.050 (0.011)			13
Lint cleaners	PM-10	3	B	0.072 (0.16)			6
Lint cleaners	PM-10	2	B	0.10 (0.22)			14
Lint cleaners	PM-10	2	B	0.42 (0.93)			5
Lint cleaners	Total PM	3	A	0.041 (0.090)	0.26 (0.58)	D	15
Lint cleaners	Total PM	3	A	0.057 (0.13)			9
Lint cleaners	Total PM	3	A	0.13 (0.29)			6
Lint cleaners	Total PM	3	A	0.14 (0.30)			14
Lint cleaners	Total PM	3	A	0.18 (0.39)			13
Lint cleaners	Total PM	2	B	1.0 (2.3)			5
Lint cleaners with screened drums	Total PM	3	D	0.14 (0.30)	0.49 (1.1)	E	10
Lint cleaners with screen cages	Total PM	3	D	0.36 (0.80)			11
Lint cleaners with screen cages	Total PM	3	D	0.70 (1.5)			11
Lint cleaners with screen cages	Total PM	3	C	0.75 (1.6)			12

TABLE 4-2. (continued)

Source	Pollutant	No. of test runs	Data rating	Single test emission factors, kg/bale (lb/bale)	Average emission factor, kg/bale (lb/bale)	Emission factor rating	Ref. No.
Master trash fan (and gin stand feeder trash fan)	PM-10	3	B	0.017 (0.038)	0.034 (0.074)	D	14
Master trash fan	PM-10	3	B	0.051 (0.11)			7
~~Master trash fan~~	~~Total PM~~	~~3~~	~~D~~	~~0.033 (0.073)~~	0.24 (0.54)	D	~~10~~
Master trash fan (and gin stand feeder trash fan)	Total PM	3	A	0.060 (0.13)			14
Master trash fan (and gin stand feeder trash fan)	Total PM	3	A	0.14 (0.31)			11
Master trash fan	Total PM	3	A	0.18 (0.40)			7
Master trash fan	Total PM	3	A	0.57 (1.3)			11
Mote fan	PM-10	2	B	0.023 (0.050)	0.060 (0.13)	D	4
Mote fan	PM-10	3	B	0.027 (0.059)			16
~~Mote fan~~	~~PM-10~~	~~3~~	~~D~~	~~0.029 (0.064)~~			~~15~~
Mote fan	PM-10	2	B	0.040 (0.089)			3
Mote fan	PM-10	3	B	0.048 (0.11)			9
Mote fan	PM-10	3	B	0.079 (0.17)			6
Mote fan	PM-10	2	B	0.14 (0.30)			5
~~Mote fan~~	~~Total PM~~	~~3~~	~~D~~	~~0.032 (0.070)~~	0.13 (0.28)	D	~~10~~
Mote fan	Total PM	3	A	0.045 (0.099)			16
Mote fan	Total PM	2	B	0.049 (0.11)			4
Mote fan	Total PM	3	A	0.055 (0.12)			15
Mote fan	Total PM	3	A	0.070 (0.15)			11
Mote fan	Total PM	3	A	0.076 (0.17)			9
Mote fan	Total PM	2	B	0.095 (0.21)			3
Mote fan	Total PM	3	B	0.14 (0.30)			12
Mote fan	Total PM	3	A	0.15 (0.33)			6
Mote fan	Total PM	2	B	0.47 (1.0)			5
Mote trash fan	PM-10	2	B	0.0021 (0.0046)	0.0095 (0.021)	D	3
Mote trash fan	PM-10	2	B	0.0083 (0.018)			14
Mote trash fan	PM-10	3	B	0.018 (0.040)			2
~~Mote trash fan~~	~~Total PM~~	~~3~~	~~D~~	~~0.020 (0.045)~~	0.035 (0.077)	D	~~10~~
Mote trash fan	Total PM	2	B	0.025 (0.055)			14
Mote trash fan	Total PM	3	A	0.031 (0.067)			2
Mote trash fan	Total PM	2	B	0.051 (0.11)			3
~~Mote trash fan~~	~~Total PM~~	~~3~~	~~D~~	~~0.075 (0.17)~~			~~12~~
No. 1 dryer and cleaner	PM-10	3	B	0.039 (0.088)	0.055 (0.12)	D	13
No. 1 dryer and cleaner	PM-10	3	B	0.040 (0.089)			9
No. 1 dryer and cleaner	PM-10	2	B	0.049 (0.11)			4
No. 1 dryer and cleaner	PM-10	3	B	0.050 (0.11)			6
No. 1 dryer and cleaner	PM-10	2	B	0.096 (0.21)			5

TABLE 4-2. (continued)

Source	Pollutant	No. of test runs	Data rating	Single test emission factors, kg/bale (lb/bale)	Average emission factor, kg/bale (lb/bale)	Emission factor rating	Ref. No.
~~No. 1 dryer and cleaner~~	~~Total PM~~	~~3~~	~~D~~	~~0.027 (0.059)~~			~~10~~
No. 1 dryer and cleaner	Total PM	3	A	0.11 (0.24)	0.17 (0.36)	D	6
No. 1 dryer and cleaner	Total PM	3	A	0.14 (0.30)			13
No. 1 dryer and cleaner	Total PM	2	B	0.14 (0.30)			4
No. 1 dryer and cleaner	Total PM	3	A	0.16 (0.35)			11
No. 1 dryer and cleaner	Total PM	3	A	0.18 (0.39)			9
No. 1 dryer and cleaner	Total PM	3	A	0.18 (0.39)			11
No. 1 dryer and cleaner	Total PM	2	B	0.25 (0.54)			5
No. 2 dryer and cleaner	PM-10	3	B	0.018 (0.040)	0.043 (0.093)	D	16
No. 2 dryer and cleaner	PM-10	3	B	0.022 (0.048)			9
No. 2 dryer and cleaner	PM-10	3	B	0.024 (0.053)			6
No. 2 dryer and cleaner	PM-10	3	B	0.042 (0.093)			1
No. 2 dryer and cleaner	PM-10	2	B	0.11 (0.23)			4
~~No. 2 dryer and cleaner~~	~~Total PM~~	~~3~~	~~D~~	~~0.017 (0.037)~~			~~10~~
No. 2 dryer and cleaner	Total PM	3	A	0.047 (0.10)	0.11 (0.24)	D	6
No. 2 dryer and cleaner	Total PM	3	A	0.050 (0.11)			16
No. 2 dryer and cleaner	Total PM	3	A	0.056 (0.12)			11
No. 2 dryer and cleaner	Total PM	3	A	0.069 (0.15)			11
No. 2 dryer and cleaner	Total PM	3	A	0.093 (0.21)			9
No. 2 dryer and cleaner	Total PM	3	A	0.10 (0.22)			1
No. 2 dryer and cleaner	Total PM	2	B	0.36 (0.79)			4
No. 3 dryer and cleaner	PM-10	3	B	0.014 (0.030)	0.015 (0.033)	D	2
No. 3 dryer and cleaner	PM-10	3	B	0.016 (0.035)			8
No. 3 dryer and cleaner	Total PM	3	A	0.041 (0.091)	0.043 (0.095)	D	2
No. 3 dryer and cleaner	Total PM	3	A	0.045 (0.099)			8
Nos. 1 and 2 dryers and gin stand trash	Total PM	3	B	0.16 (0.35)	0.16 (0.35)	NR	12
Nos. 1 and 2 seed cotton cleaners	Total PM	4	B	0.36 (0.79)	0.36 (0.79)	NR	12
Overflow fan	PM-10	3	B	0.0020 (0.0045)	0.012 (0.026)	D	9
Overflow fan	PM-10	3	B	0.012 (0.027)			6
Overflow fan	PM-10	3	B	0.016 (0.036)			2
Overflow fan	PM-10	3	B	0.017 (0.038)			16
Overflow fan	Total PM	3	A	0.0050 (0.011)			9
~~Overflow fan~~	~~Total PM~~	~~3~~	~~D~~	~~0.013 (0.029)~~			~~10~~
Overflow fan	Total PM	3	A	0.020 (0.044)	0.033 (0.071)	D	6
Overflow fan	Total PM	3	A	0.046 (0.10)			2
Overflow fan	Total PM	3	A	0.059 (0.13)			16
Overflow fan and master trash fan	PM-10	2	B	0.042 (0.092)	0.042 (0.092)	NR	3
Overflow fan and master trash fan	Total PM	2	B	0.45 (0.99)	0.45 (0.99)	NR	3
Second stage seed cotton cleaning	Total PM	3	A	0.020 (0.043)	0.020 (0.043)	NR	11

TABLE 4-2. (continued)

Source	Pollutant	No. of test runs	Data rating	Single test emission factors, kg/bale (lb/bale)	Average emission factor, kg/bale (lb/bale)	Emission factor rating	Ref. No.
Third stage lint cleaners with 80-mesh screens	Total PM	3	D	0.0084 (0.019)	0.0084 (0.019)	NR	10
Unloading fan	PM-10	3	B	0.024 (0.053)	0.056 (0.12)	D	9
Unloading fan	PM-10	3	B	0.035 (0.078)			14
Unloading fan	PM-10	3	B	0.052 (0.12)			16
Unloading fan	PM-10	3	B	0.069 (0.15)			6
Unloading fan	PM-10	2	B	0.10 (0.22)			5
~~Unloading fan~~	~~Total PM~~	~~3~~	~~D~~	~~0.0078 (0.017)~~	0.13 (0.29)	D	~~10~~
Unloading fan	Total PM	3	A	0.041 (0.090)			9
Unloading fan	Total PM	2	B	0.10 (0.22)			5
Unloading fan	Total PM	3	A	0.11 (0.25)			11
Unloading fan	Total PM	3	A	0.14 (0.30)			6
Unloading fan	Total PM	3	A	0.15 (0.32)			16
Unloading fan	Total PM	3	A	0.16 (0.34)			14
Unloading fan	Total PM	2	B	0.16 (0.36)			11
Unloading fan	Total PM	3	B	0.18 (0.40)			12
Unloading fan and dryers and cleaners	PM-10	2	B	0.82 (1.8)	0.82 (1.8)	NR	3
Unloading fan and dryers and cleaners	Total PM	2	B	1.6 (3.6)	1.6 (3.6)	NR	3

[a] Emission factor units are kg (lb) of pollutant per bale of cotton processed. Sources controlled by high-efficiency 1D-3D or 2D-2D cyclones unless noted otherwise. NR = not rated. Crossed-out data are not included in the average emission factors shown.
[b] Emission factor not rated because emissions are accounted for in other emission factors.

TABLE 4-3. SUMMARY OF CANDIDATE EMISSION FACTORS FOR COTTON GINNING

Source	Pollutant	No. of tests	Emission factor range, kg/bale (lb/bale)	Average emission factor, kg/bale (lb/bale)	Emission factor rating	Ref. No.
Battery condenser	PM-10	5	0.0036-0.011 (0.0079-0.025)	0.0064 (0.014)	D	6,8,9,15,16
Battery condenser	Total PM	5	0.0059-0.037 (0.013-0.082)	0.018 (0.039)	D	6,8,9,15,16
Battery condenser with screen cages	Total PM	4	0.0059-0.016 (0.013-0.36)	0.078 (0.17)	E	10-12
Cyclone robber system	PM-10	1	NA	0.024 (0.052)	D	14
Cyclone robber system	Total PM	1	NA	0.083 (0.18)	D	14
Lint cleaners	PM-10	6	0.020-0.42 (0.043-0.93)	0.11 (0.24)	D	5,6,9,13-15
Lint cleaners	Total PM	6	0.041-1.0 (0.090-2.3)	0.26 (0.58)	D	5,6,9,13-15
Lint cleaners with screened drums or cages	Total PM	4	0.14-0.75 (0.30-1.6)	0.49 (1.1)	E	10-12
Master trash fan	PM-10	2	0.017-0.051 (0.038-0.11)	0.034 (0.074)	D	7,14
Master trash fan	Total PM	4	0.060-0.57 (0.13-1.3)	0.24 (0.54)	D	7,11,14
Mote fan	PM-10	6	0.023-0.14 (0.050-0.30)	0.060 (0.13)	D	3-6,9,16
Mote fan	Total PM	9	0.045-0.47 (0.099-1.0)	0.13 (0.28)	D	3-6,9,11,12,16
Mote trash fan	PM-10	3	0.0021-0.018 (0.0046-0.040)	0.0095 (0.021)	D	2,3,14
Mote trash fan	Total PM	3	0.025-0.051 (0.055-0.11)	0.035 (0.077)	D	2,3,14
No. 1 dryer and cleaner	PM-10	5	0.039-0.096 (0.088-0.21)	0.055 (0.12)	D	4-6,9,13
No. 1 dryer and cleaner	Total PM	7	0.11-0.25 (0.24-0.54)	0.17 (0.36)	D	4-6,9,11,13
No. 2 dryer and cleaner	PM-10	5	0.018-0.11 (0.040-0.23)	0.043 (0.093)	D	1,4,6,9,16
No. 2 dryer and cleaner	Total PM	7	0.047-0.36 (0.10-0.79)	0.11 (0.24)	D	1,4,6,9,11,16
No. 3 dryer and cleaner	PM-10	2	0.014-0.016 (0.030-0.035)	0.015 (0.033)	D	2,8
No. 3 dryer and cleaner	Total PM	2	0.041-0.045 (0.091-0.099)	0.043 (0.095)	D	2,8
Overflow fan	PM-10	4	0.0020-0.017 (0.0045-0.038)	0.012 (0.026)	D	2,6,9,16
Overflow fan	Total PM	4	0.0050-0.059 (0.011-0.13)	0.033 (0.071)	D	2,6,9,16
Unloading fan	PM-10	5	0.024-0.10 (0.053-0.22)	0.056 (0.12)	D	5,6,9,14,16
Unloading fan	Total PM	8	0.041-0.18 (0.090-0.40)	0.13 (0.29)	D	5,6,9,11,12, 14,16
Total No. 1[b]	PM-10	NA	NA	0.37 (0.82)	D	1-9,13-16
Total No. 1[b]	Total PM	NA	NA	1.1 (2.4)	D	1-9,11-16
Total No. 2[c]	PM-10	NA	NA	0.54 (1.2)	E	1-9,13,14,16
Total No. 2[c]	Total PM	NA	NA	1.4 (3.1)	E	1-12,13,14,16

[a] Emission factor units are kg (lb) of pollutant per bale of cotton processed. Sources controlled by high-efficiency 1D-3D or 2D-2D cyclones unless noted otherwise. NA = not applicable.

[b] Total for gins with high-efficiency cyclones on all exhaust streams. Does not include emission factors for the No. 3 dryer and cleaner, cyclone robber system, mote trash fan, lint cleaners with screened drums or cages, and battery condenser with screened drums or cages.

[c] Total for gins with screened drums or cages on the lint cleaners and battery condenser and high-efficiency cyclones on all other exhaust streams. Does not include emission factors for the No. 3 dryer and cleaner, cyclone robber system, mote trash fan, lint cleaners with high-efficiency cyclones, and battery condenser with high-efficiency cyclones. PM-10 emissions from lint cleaners and battery condensers with screened drums or cages are estimated as 50 percent of the total PM emissions from these sources.

The emission factor ratings assigned to the factors for the revised AP-42 section are based on the guidelines presented in Section 3.3 of this report. All of the factors are assigned D or E ratings because the test data represent almost exclusively a single geographic region and may not be representative of facilities nationwide.

Candidate emission factors were developed for total PM and PM-10 emissions from the following sources: unloading fan, No. 1 dryer and cleaner, No. 2 dryer and cleaner, No. 3 dryer and cleaner, overflow fan, lint cleaners, cyclone robber system, mote fan, mote trash fan, battery condenser, master trash fan, and two total gin emission factors. Total No.1 represents total PM or PM-10 emissions from gins with all exhaust streams controlled by high-efficiency cyclones. Total No. 2 represents total PM or PM-10 emissions from gins with screened drums or cages controlling the lint cleaner and battery condenser exhausts and high-efficiency cyclones controlling all other exhaust streams. The No. 3 dryer and cleaner, cyclone robber system, and mote trash fan emission factors are not included in either total because these processes are not used at most cotton gins. However, these factors should be added into the total for a particular gin if these processes are used at that gin.

Data were also available for the gin stand trash fan, Nos. 1 and 2 dryers and gin stand trash fan, Nos. 1 and 2 seed cotton cleaners, overflow and master trash fan, second stage seed cotton cleaning, and unloading fan and dryers and cleaners. However, the emission factors developed with these data are not rated and are not included in the revised AP-42 section because the emissions from these sources are included in the other candidate emission factors. Use of these factors would result in double-counting of emissions from several sources.

4.4 SUMMARY OF CHANGES TO AP-42 SECTION

4.4.1 Section Narrative

The section narrative was reformatted and edited for technical accuracy, and revisions were made to reflect current industry practices. Review comments from industry were incorporated into the narrative.

4.4.2 Emission Factors

The emission factors presented in the previous version of AP-42 are not included in the revised AP-42 section for the reasons discussed in Section 4.2.18 of this report. The emission factors presented in Table 4-3 are presented in Table 9.7-1 in the draft AP-42 section. Due to revised guidelines for rating emission factors, the new emission factors are rated lower than the old factors. However, the new factors are based on more reliable and representative data than the old factors.

REFERENCES FOR SECTION 4

1. *Westfield Gin--PM10 & Total Particulate Testing--Main Trash Stock Piler Cyclone, #2 Incline Cyclone, Gin Feed Trash Cyclone*, BTC Environmental, Inc., Ventura, CA, November 14-15, 1991.

2. *Airways Gin--PM10 & Total Particulate Testing--Motes Trash Cyclone, #3 Incline Cyclone, Overflow Separator Cyclone*, BTC Environmental, Inc., Ventura, CA, November 21-22, 1991.

3. *Source Emission Testing--Mount Whitney Cotton Gin*, BTC Environmental, Inc., Ventura, CA, November 29-30, 1990.

4. *Source Emission Testing--Stratford Growers*, BTC Environmental, Inc., Ventura, CA, November 27-28, 1990.

5. *Source Emission Testing--County Line Gin*, BTC Environmental, Inc., Ventura, CA, December 3-4, 1990.

6. *County Line Gin--PM10 & Total Particulate Testing--Motes, Suction, Lint Cleaner, Overflow, #1 Drying, Gin Stand Trash, Battery Condenser, and #2 Drying Cyclones*, BTC Environmental, Inc., Ventura, CA, December 8-11, 1991.

7. *Westfield Gin--PM10 & Total Particulate Testing--Trash Cyclone*, BTC Environmental, Inc., Ventura, CA, November 12, 1992.

8. *West Valley Cotton Growers--PM10 & Total Particulate Testing--Battery Condenser and #3 Dryer/Cleaner Cyclones*, BTC Environmental, Inc., Ventura, CA, October 28, 1993.

9. *Dos Palos Cooperative--PM10 & Total Particulate Testing--Motes, Suction, Lint Cleaner, Overflow, #1 Drying, Battery Condenser, and #2 Drying Cyclones*, BTC Environmental, Inc., Ventura, CA, November 27-29, 1992.

10. *Halls Gin Company--Particulate Emissions from Cotton Gin Exhausts*, State of Tennessee Department of Health and Environment Division of Air Pollution Control, Nashville, TN, October 25-27, 1988.

11. *Cotton Gin Emission Tests, Marana Gin, Producers Cotton Oil Company, Marana, Arizona*, EPA-330/2-78-008, National Enforcement Investigations Center, Denver, CO, and EPA Region IX, San Francisco, CA, May 1978.

12. *Emission Test Report, Westside Farmers' Cooperative Gin #5, Tranquility, California*, Prepared for U.S. Environmental Protection Agency Division of Stationary Source Enforcement, Washington, D.C., PEDCo Environmental, Inc., Cincinnati, OH, February 1978.

13. *Elbow Enterprises--PM-10 and Total Particulate Testing, Lint Cleaner and Dryer #1 Cyclones*, AIRx Testing, Ventura, CA, November 7-8, 1994.

14. *Stratford Growers, Inc.--PM-10 and Total Particulate Testing, Unloading, Hull Trash, Feeder Trash, Lint Cleaner, Cyclone Robber System, & Motes Trash Cyclones*, AIRx Testing, Ventura, CA, October 26-28, 1994.

15. *Alta Vista Gin--PM-10 and Total Particulate Testing, Battery Condenser, Lint Cleaner, & Motes Trash Cyclones*, AIRx Testing, Ventura, CA, November 3-4, 1994.

16. *Dos Palos Coop Gin--PM-10 and Total Particulate Testing, Unloading, Dryer #2, Overflow, Battery Condenser, & Motes Cyclones*, AIRx Testing, Ventura, CA, October 31 through November 2, 1994.

17. Written communication from Fred Johnson and Phillip J. Wakelyn, National Cotton Council of America, Memphis, TN, to Dallas Safriet, U. S. Environmental Protection Agency, Research Triangle Park, NC, October 31, 1995.

18. Written communication from Roger A. Isom, California Cotton Ginners Association, Fresno, CA, to Dallas Safriet, U. S. Environmental Protection Agency, Research Triangle Park, NC, October 2, 1995.

19. Written communication from Thomas E. Goff, San Joaquin Valley Unified Air Pollution Control District, Bakersfield, CA, to Dallas Safriet, U. S. Environmental Protection Agency, Research Triangle Park, NC, October 26, 1995.

5. PROPOSED AP-42 SECTION 9.7

The proposed AP-42 Section 9.7, Cotton Ginning, is presented on the following pages as it would appear in the document.

9.7 Cotton Ginning

9.7.1 General[1-8]

Cotton ginning takes place throughout the area of the United States known as the Sunbelt. Four main production regions can be designated:

- Southeast—Virginia, North Carolina, South Carolina, Georgia, Alabama, and Florida
- Mid-South—Missouri, Tennessee, Mississippi, Arkansas, and Louisiana
- Southwest—Texas and Oklahoma
- West—New Mexico, Arizona, and California

The majority of the ginning facilities are located in Texas, Mississippi, Arkansas, California, and Louisiana.

The industry trend is toward fewer gins with higher processing capacity. In 1979, 2,332 active gins in the United States produced 14,161,000 bales of cotton. By the 1994/1995 season, the number of cotton gins in the United States dropped to 1,306, but about 19,122,000 bales were produced. The average volume processed per gin in 1994/1995 was 14,642 bales.

Cotton ginning is seasonal. It begins with the maturing of the cotton crop, which varies by region, and ends when the crop is finished. Each year the cotton ginning season starts in the lower Southwest region in midsummer, continues through the south central and other geographical regions in late summer and early autumn, and ends in the upper Southwest region in late autumn and early winter. Overall, U. S. cotton is ginned between October 1 and December 31, with the bulk of the crop from each geographical region being ginned in 6 to 8 weeks. During the remainder of the year, the gin is idle.

All U. S. cotton in commercial production is now harvested by machines of two types, picking and stripping. Machine-picked cotton accounts normally for 70 to 80 percent of the total cotton harvested, while the rest is machine stripped. Machine picking differs from machine stripping mainly in the method by which the cotton lint and seed are removed from the plant. Machine picking is done by a spindle picker machine that selectively separates the exposed seed cotton from the open capsules, or bolls. In contrast, the mechanical stripper removes the entire capsule, with lint plus bract, leaf, and stem components in the harvested material.

Strippers collect up to six times more leaves, burs, sticks, and trash than the spindle picker machines. This higher ratio of trash to lint requires additional equipment for cleaning and trash extraction. Stripper-harvested cotton may produce 1,000 pounds of trash per 500-pound bale of lint, compared to 150 pounds of trash per 500-pound bale from spindle picking.

The modular system of seed cotton storage and handling has been rapidly adopted. This system stores seed cotton in the field after harvesting until the gin is ready to process it. Modules can also be transported longer distances, allowing gins to increase productivity. In 1994, 78 percent of the U.S. crop was handled in modules.

9.7.2 Process Description[2,5-7]

Figure 9.7-1 is a flow diagram of a typical cotton-ginning process. Each of the five ginning steps and associated equipment is described below.

9.7.2.1 Unloading System -

Module trucks and trailers transport cotton from the field to the gin. A pneumatic system removes the cotton from the trailers, and either a pneumatic system or a module feeder removes the cotton from modules. A combination conveyer and pneumatic system conveys the cotton to a separator and feed control unit. Prior to this first separator point, some gins use a stone and green boll trap for preliminary trash removal. The screen assembly in the separator allows air to escape but collects the cotton and allows it to fall into the feed control unit. The conveying air flows from the separator to a cyclone system, where it is cleaned and discharged to the atmosphere.

9.7.2.2 Seed Cotton Cleaning System -

Cotton is subjected to three basic conditioning processes--drying, cleaning, and extracting--before it is processed for separation of lint and seed. To ensure adequate conditioning, cotton gins typically use two conditioning systems (drying, cleaning, and extracting) in series.

Seed cotton dryers are designed to reduce lint cotton moisture content to 5 to 8 percent to facilitate cleaning and fiber/seed separation. A high-pressure fan conveys seed cotton through the drying system to the first seed cotton cleaner, which loosens the cotton and removes fine particles of foreign matter (e. g., leaf trash, sand, and dirt). In the second cleaner, large pieces (e. g., sticks, stems, and burs) are removed from the cotton by a different process, referred to as "extracting". Different types of extractors may be used, including bur machines, stick machines, stick and bur machines, stick and green leaf extractors, and extractor/feeders. These machines remove burs, sticks, stems, and large leaves, pneumatically conveying them to the trash storage area. The cotton is pneumatically conveyed to the next processing step. Typically, all conveying air is cleaned by a cyclone before being released to the atmosphere.

9.7.2.3 Overflow System -

After cleaning, the cotton enters a screw conveyor distributor, which apportions the cotton to the extractor/feeders at a controlled rate. The extractor/feeders drop the cotton into the gin stands at the recommended processing rates. If the flow of cotton exceeds the limit of the extractor/feeder systems, the excess cotton flows into the overflow hopper. A pneumatic system (overflow separator) then returns this cotton back to the screw conveyor distributor, as required. Typically, the air from this system is routed through a cyclone and cleaned before being exhausted to the atmosphere.

9.7.2.4 Ginning and Lint Handling System -

Cotton enters the gin stand through a "huller front", which performs some cleaning. Saws grasp the locks of cotton and draw them through a widely spaced set of "huller ribs" that strip off hulls and sticks. (New gin stands do not have huller ribs.) The cotton locks are then drawn into the roll box, where fibers are separated from the seeds. After all the fibers are removed, the seeds slide down the face of the ginning ribs and fall to the bottom of the gin stand for subsequent removal to storage. Cotton lint is removed from the saws by a rotating brush, or a blast of air, and is conveyed pneumatically to the lint cleaning system for final cleaning and combing. The lint cotton is removed from the conveying airstream by a condenser that forms the lint into a batt. The lint batt is fed into the first lint cleaner, where saws comb the lint cotton again and remove part of the remaining leaf particles, grass, and motes. Most condensers are covered with fine mesh wire or fine perforated metal, which acts to filter short lint fibers and some dust from the conveying air.

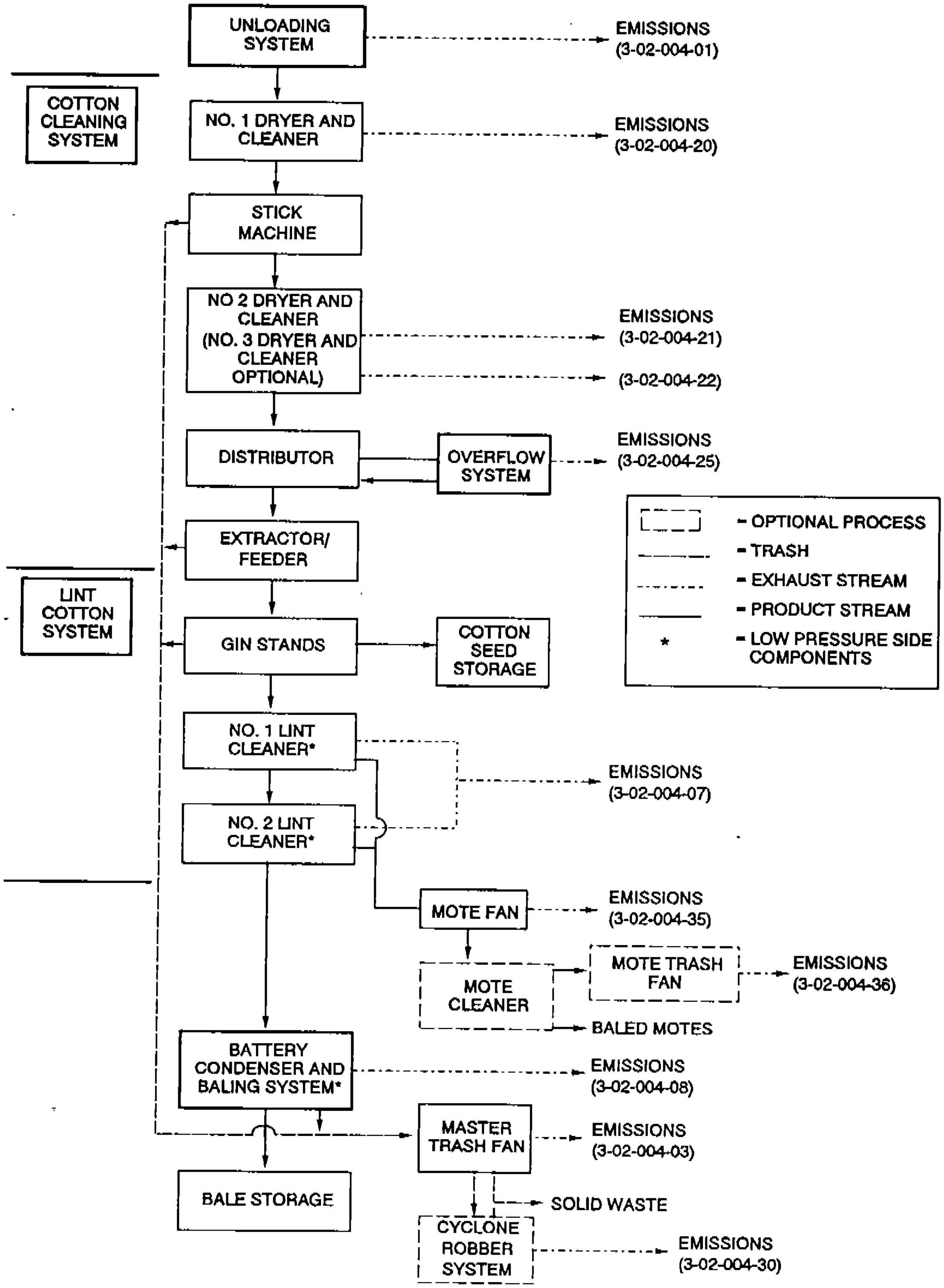

Figure 9.7-1. Flow diagram of cotton ginning process.
(Source Classification Codes in parentheses.)

9.7.2.5 Battery Condenser And Baling System -

Lint cotton is pneumatically transported from the lint cleaning system to a battery condenser, which is a drum covered with fine mesh screen or fine perforated metal that separates the lint cotton from the conveying air. The lint cotton is formed into batts and fed into a baling press, which compresses the cotton into uniform bales.

Most gins use a double-press box for packaging the cotton into bales. The lint drops into one press box and fills it while a bale is being pressed and strapped in the other box. Approximately 480 lb (217 kilograms [kg]) of cotton is pressed into a bale before it is wrapped with a cover and strapped. Modern gins are presently equipped with higher-tonnage bale presses that produce the more compact universal density cotton bales. In 1995, 96 percent of the U.S. crop was pressed into universal density bales at the gins. The finished cotton bale is transported to the textile mill for processing into yarn. Motes are sometimes cleaned and baled also.

9.7.3 Emissions And Controls[1-24]

Particulate matter (PM) is the primary air pollutant emitted from cotton ginning. Available data indicate that about 37 percent of the total PM emitted (following control systems) from cotton ginning is PM less than or equal to 10 microns in aerodynamic diameter (PM-10). The PM is composed of fly lint, dust, fine leaves, and other trash. Figure 9.7-1 shows the typical PM emission points in the ginning process. Particulate matter emissions are typically greater at gins processing stripper-harvested cotton than at gins processing picker-harvested cotton. Also, PM emissions from the first cotton harvest at a given facility are typically lower than emissions from subsequent harvests.

Control devices used to control PM emissions from cotton ginning operations include cyclones, fine screen coverings, and perforated metal drums. Cyclones may be used to control the sources with high pressure exhaust or all of the operations at a gin. Two types of cyclones that are used are 2D-2D and 1D-3D cyclones. Both the body and the cone of a 2D-2D cyclone are twice as long as the cyclone diameter. The body of a 1D-3D cyclone is the same length as the diameter, and the cone length is three times the diameter. In many cases, 1D-3D cyclones display slightly higher PM control efficiencies than 2D-2D cyclones.

Screen coverings and perforated drums may be used to control PM emissions from sources with low-pressure exhaust, including the battery condenser and lint cleaners.

Table 9.7-1 presents PM and PM-10 emission factors for cotton gins controlled primarily by 1D-3D or 2D-2D cyclones. Emission factors for lint cleaners and battery condensers with screened drums or cages are also presented. Emission factors for total gin emissions are shown for two different gin configurations. The emission factors for "Total No.1" represent total PM and PM-10 emissions from gins with all exhaust streams controlled by high-efficiency cyclones. The emission factors for "Total No. 2" represent total PM and PM-10 emissions from gins with screened drums or cages controlling the lint cleaner and battery condenser exhausts and high-efficiency cyclones controlling all other exhaust streams. The emission factors for the No. 3 dryer and cleaner, cyclone robber system, and mote trash fan are not included in either total because these processes are not used at most cotton gins. However, these factors should be added into the total for a particular gin if these processes are used at that gin.

Table 9.7-1. EMISSION FACTORS FOR COTTON GINS CONTROLLED WITH HIGH-EFFICIENCY CYCLONES[a]

Source	Total PM, lb/bale	EMISSION FACTOR RATING	PM-10, lb/bale	EMISSION FACTOR RATING
Unloading fan (SCC 3-02-004-01)	0.29[b]	D	0.12[c]	D
No. 1 dryer and cleaner (SCC 3-02-004-20)	0.36[d]	D	0.12[e]	D
No. 2 dryer and cleaner (SCC 3-02-004-21)	0.24[f]	D	0.093[g]	D
No. 3 dryer and cleaner[h] (SCC 3-02-004-22)	0.095	D	0.033	D
Overflow fan[j] (SCC 3-02-004-25)	0.071	D	0.026	D
Lint cleaners (SCC 3-02-004-07)				
with high-efficiency cyclones[k]	0.58	D	0.24	D
with screened drums or cages[m]	1.1	E	ND	NA
Cyclone robber system[n] (SCC 3-02-004-30)	0.18	D	0.052	D
Mote fan (SCC 3-02-004-35)	0.28[p]	D	0.13[q]	D
Mote trash fan[r] (SCC 3-02-004-36)	0.077	D	0.021	D
Battery condenser (SCC 3-02-004-08)				
with high-efficiency cyclones[s]	0.039	D	0.014	D
with screened drums or cages[m]	0.17	E	ND	NA
Master trash fan (SCC 3-02-004-03)	0.54[t]	D	0.074[u]	D
Cotton gin total No. 1[v] (SCC 3-02-004-10)	2.4	D	0.82	D
Cotton gin total No. 2[w] (SCC 3-02-004-10)	3.1	E	1.2	E

[a] Emission factor units are lb of pollutant per bale of cotton processed. Emissions are controlled by 1D-3D or 2D-2D high-efficiency cyclones unless noted. SCC = source classification code. ND = no data available. To convert from lb/bale to kg/bale, multiply by 0.45.
[b] References 13-15,17,19-20,22,24.
[c] References 13-14,17,22,24.
[d] References 12-14,17,19,21.
[e] References 12-14,17,21.
[f] References 9,12,14,17,19,24.
[g] References 9,12,14,17,24.
[h] References 10,16. Most gins do not include this source, and these emission factors are not included in the total gin emission factors shown. However, these factors should be added into the total for a particular gin if this source is part of that gin.
[j] References 10,14,17,24.
[k] References 13-14,17,21-23. Emission factors are included in Total No. 1, but are not included in Total No. 2.
[m] References 18-20. Emission factors are not included in Total No. 1, but are included in Total No. 2.
[n] Reference 22. Most gins do not include this source, and these emission factors are not included in the total gin emission factors shown. However, these factors should be added into the total for a particular gin if this source is part of that gin.
[p] References 11-14,17,19-20,23-24.
[q] References 11-14,17,24.
[r] References 10-11,22. Many gins do not include this source, and these emission factors are not included in the total gin emission factors shown. However, these factors should be added into the total for a particular gin if these sources are part of that gin.
[s] References 14,16-17,23-24. Emission factors are included in Total No. 1, but are not included in Total No. 2.
[t] References 15,19,22.

Table 9.7-1 (cont.).

[u] References 15,22.
[v] Total for gins with high-efficiency cyclones on all exhaust streams. Does not include emission factors for the No. 3 dryer and cleaner, cyclone robber system, mote trash fan, lint cleaners with screened drums or cages, and battery condenser with screened drums or cages.
[w] Total for gins with screened drums or cages on the lint cleaners and battery condenser and high-efficiency cyclones on all other exhaust streams. Does not include emission factors for the No. 3 dryer and cleaner, cyclone robber system, mote trash fan, lint cleaners with high-efficiency cyclones, and battery condenser with high-efficiency cyclones. PM-10 emissions from lint cleaners and battery condensers with screened drums or cages are estimated as 50 percent of the total PM emissions from these sources.

9.7.4 Summary of Terminology

Bale — A compressed and bound package of cotton lint, typically weighing about 480 lb.

Batt — Matted lint cotton.

Boll — The capsule or pod of the cotton plant.

Bur (or burr) — The rough casing of the boll. Often referred to as hulls after separation from the cotton.

Condenser — A perforated or screened drum device designed to collect lint cotton from the conveying airstream, at times into a batt.

Cotton — General term used variously to refer to the cotton plant (genus *Gossypium*); agricultural crop; harvest product; white fibers (lint) ginned (separated) from the seed; baled produce; and yarn or fabric products. Cotton is classified as upland or extra long staple depending on fiber length.

Cottonseed — The seed of the cotton plant, separated from its fibers. The seeds constitute 40 percent to 55 percent of the seed cotton (depending on the amount of trash) and are processed into oil meal, linters, and hulls, or are fed directly to cattle.

Cyclone — A centrifugal air pollution control device for separating solid particles from an airstream.

Cyclone robber system - A secondary cyclone trash handling system. These systems are not used at most cotton gins.

Cylinder cleaner — A machine with rotating spiked drums that open the locks and clean the cotton by removing dirt and small trash.

Extractor — Equipment for removing large trash pieces (sticks, stems, burs, and leaves). The equipment may include one or more devices, including a stick machine, bur machine, green-leaf machine, and a combination machine.

Extractor-feeder — A device that gives seed cotton a final light extraction/cleaning and then feeds it at a controlled rate to the gin stand.

Fly lint (or lint fly) — Short (less than 50 μm) cotton fibers, usually emitted from condensers and mote fan.

Gin stand — The heart of the ginning plant where gin saws (usually several in parallel) separate the cotton lint from the seeds.

High pressure side — The portion of the process preceding the gin stand (including unloading, drying, extracting, cleaning, and overflow handling systems) in which material is conveyed by a higher pressure air, and exhausts are typically controlled by cyclones.

Lint cleaner — A machine for removing foreign material from lint cotton.

Lint cotton — Cotton fibers from which the trash and seeds have been removed by the gin.

Low pressure side — The portion of the process following the gin stand (including lint cotton cleaning and batt formation process) in which material is conveyed by low pressure air, and exhausts are typically controlled by condensers.

Mote — A small group of short fibers attached to a piece of the seed or to an immature seed. Motes may be cleaned and baled.

Picker harvester — A machine that removes cotton lint and seeds from open bolls with rotating spindles, leaving unopened bolls on the plant. "First pick" cotton is obtained from the initial harvest of the season. It usually contains less trash than "second pick" cotton, obtained later in the harvest season. "Ground cotton" is obtained by picking up between the rows at season's end and has a high trash content.

Seed cotton — Raw cotton, containing lint, seed, and some waste material, as it comes from the field.

Separator — A mechanical device (e.g., wire screen with rotary rake) that separates seed cotton from conveying air.

Stripper harvester — A machine that strips all bolls — opened (mature) and unopened (immature or green) — from the plant; strippers are used on short cotton plants, grown in arid areas of Texas, Oklahoma, and New Mexico. They collect larger amounts of trash (leaves, stems, and sticks) than picker harvesters.

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APPENDIX A

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 1

COTTON 1

WESTFIELD GINNING
11054 West Mount Whitney Avenue
Riverdale, CA 93656
Attn: Mark Borda

PM10 & TOTAL PARTICULATE TESTING
MAIN TRASH STAOCK PILER CYCLONE
*2 INCLINE CYCLONE
GIN FEED TRASH CYCLONE
NOVEMBER 14 & 15, 1991

Prepared By:

BTC ENVIRONMENTAL, INC.
1536 Eastman Avenue
Ventura, CA 93003

Job Number
23024

Laboratory Report Number
291-180

Test Team Leader
Cam Donnahoo

Results Verified By:
Tom Porter
Vice President - Air Test Division

PARTICULATE EMISSION SUMMARY
MAIN TRASH STOCK PILER CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.1165	0.0915	0.1210	*0.1097*
lb/hr	3.96	3.15	4.18	*3.76*
lb/Bale	0.30	0.20	0.28	~~0.26~~
	.317	.217	.299	.278
Particule Size Distribution				
+10µ (%)	63.15	44.43	65.73	*57.77*
+10µ (lb/hr)	2.50	1.40	2.75	*2.22*
+10µ (lb/Bale)	0.19	0.09	0.18	*0.15*
−10µ (%)	36.85	55.57	36.27	*42.90*
−10µ (lb/hr)	1.46	1.75	1.52	*1.58*
−10µ (lb/Bale)	0.11	0.11	0.10	*0.11*

#2 INCLINE CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0527	0.0617	0.0690	*0.0611*
lb/hr	1.43	1.70	1.87	*1.67*
lb/Bale	0.10	0.11	0.12	*0.11*
	.102	.121	.134	.119
Particule Size Distribution				
+10µ (%)	71.54	57.62	48.14	*59.10*
+10µ (lb/hr)	1.02	0.98	0.90	*0.97*
+10µ (lb/Bale)	0.07	0.06	0.06	*0.06*
−10µ (%)	28.46	42.38	51.86	*40.90*
−10µ (lb/hr)	0.41	0.72	0.97	*0.70*
−10µ (lb/Bale)	0.03	0.05	0.06	*0.05*

GIN FEED TRASH CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0202	0.0181	0.0178	*0.0187*
lb/hr	0.54	0.49	0.47	*0.50*
lb/Bale	0.04	0.03	0.03	*0.03*
	.042	.035	.033	.037
Particule Size Distribution				
+10µ (%)	44.53	42.82	33.04	*40.13*
+10µ (lb/hr)	0.24	0.21	0.16	*0.20*
+10µ (lb/Bale)	0.02	0.01	0.01	*0.01*
−10µ (%)	55.47	57.18	66.96	*59.87*
−10µ (lb/hr)	0.30	0.28	0.31	*0.30*
−10µ (lb/Bale)	0.02	0.02	0.02	*0.02*

INTRODUCTION

On November 14 &15, 1991, BTC Environmental performed source emissions tests for PM-10 particulate matter on a Main Trash Stock Piler Cyclone, #2 Incline Cyclone and a Gin Feed Trash Cyclone Cyclone. Sampling was done in triplicate for total particulate and PM-10 particule size distribution. All the cyclones were operating at the following rates:

1) Main Trasch Stock Piler Cyclone - 16.6 bales per hour
2) #2 Incline cyclone - 15 bales per hour
3) Gin Feed Trash Cyclone - 14.7 bales per hour

Avg. rates. Run-by-run provided on pages 115-118.

SAMPLING AND ANALYTICAL PROCEDURES

STACK GAS ANALYSIS: The oxygen and carbon dioxide content of the exhaust gases were assumed to be ambient air. Oxygen = 20.9% and Carbon Dioxide = 0.05%.

STACK GAS VELOCITY: The stack gas velocity was determined using an "S" type pitot tube connected to a magnehelic gauge. The "S" type pitot was used to determine the stack velocity profile for each run. Sampling was conducted from the horizontal port. A traverse was made on the verticle port yielding results that were with ±10% of the horizontal ΔP readings. A total of eight (8) traverse points was utilized.

The stack temperature was determined using a thermocouple and an indicating pyrometer. The proportion of water was determined gravimetrically and the dry molecular weight of the stack gas determined by E.P.A. Method 3, equation 3-2. Stack velocities were calculated using E.P.A. Method 2, equation 2-9; gas volumetric flow rate was determined by equation 2-10.

TOTAL PARTICULATE EMISSIONS: A CARB Method 5 sampling train was utilized to determine the total particulate emission from the cyclones. The sample train consists of a stainless steel nozzle, a heated stainless steel probe, a heated glass fiber filter and cooled impingers. After the weight is obtained from the filter, probe and nozzle rinses; the total solids in the impingers is added to the front-end catch to satisfy Fresno County APCD rules.

PARTICULE SIZE DITRIBUTION: A sample was taken isokinetically from the stack using a GII cascade impactor. The impactor consists of 2 slotted discs, a back up filter and cooled impingers. The first two (2) discs are +10µ and the backup filter and impingers are -10µ. The total weights obtained from each fraction were added together to obtain the total particulate weight. The total weight was used to determine the % of the +10µ and the -10µ fraction. The total weight obtained from the total particulate runs are used to determine the +10µ and the -10µ results reported in lb/hr and lb/bale.

Westfield Ginning Co.

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT
*** FRESNO ZONE ***
COTTON GIN SOURCE TEST - PROCESS WEIGHT FORM

COTTON GIN SOURCE TEST DATA

GINNING PROCESS - #2 Incline

TEST RUN #1			TEST RUN #2			TEST RUN #3		
BALE #	BALE WT	TIME	BALE #	BALE WT	TIME	BALE #	BALE WT	TIME
10609	486	900						
10610	498							
10611	498							
10612	486							
10613	490							
10614	470							
10615	462							
10616	486							
10617	470							
10618	470							
10619	500							
10620	522							
10621	506							
10622	503							
10623	498	10:00						

TOTAL BALES = ~~15~~ 14	TOTAL BALES = ______	TOTAL BALES = ______
TIME = 1 (hrs)	TIME = ______ (hrs)	TIME = ______ (hrs)
BALES/HR = 14	BALES/HR = ______	BALES/HR = ______

AVERAGE PROCESS RATE = ______ (bales/hr)

DISTRICT REPRESENTATIVE: ______________

DATE: __________

#2 MA

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT
* FRESNO ZONE *
COTTON GIN SOURCE TEST - PROCESS WEIGHT FORM

COTTON GIN SOURCE TEST DATA

GINNING PROCESS - #2 Incline

TEST RUN #1			TEST RUN #2			TEST RUN #3		
BALE #	BALE WT	TIME	BALE #	BALE WT	TIME	BALE #	BALE WT	TIME
10630	518	10:12	10653	510	1:19	10		
10631	520		10654	530				
10632	532		10655	522				
10633	514		10656	520				
10634	515		10657	527				
10635	532		10658	542				
10636	530		10659	531				
10637	530		10660	518				
10638	526		10661	520				
10639	526		10662	532				
10640	532		10663	532				
10641	524		10664	532				
10642	538		10665	528				
10643	510		10666	508				
10644	514	11:12	10667	516	2:19			

TOTAL BALES = ~~15~~ 14	TOTAL BALES = ~~15~~ 14	TOTAL BALES = ______
TIME = 1 (hrs)	TIME = 1 (hrs)	TIME = ______ (hrs)
BALES/HR = 14	BALES/HR = 14	BALES/HR = ______

AVERAGE PROCESS RATE = ~~15~~ 14 (bales/hr)

DISTRICT REPRESENTATIVE: ______________

DATE: 11/14

#2 MA.

Westfied Ginning Co.

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT
*** FRESNO ZONE ***
COTTON GIN SOURCE TEST - PROCESS WEIGHT FORM

COTTON GIN SOURCE TEST DATA

GINNING PROCESS - GIN Feed Trash

TEST RUN #1			TEST RUN #2			TEST RUN #3		
BALE #	BALE WT	TIME	BALE #	BALE WT	TIME	BALE #	BALE WT	TIME
10680	526	3:15	10699	533	4:36	10717	500	5:51
10681	518		10700	550		10718	526	
10682	530		10701	530		10719	526	
10683	534		10702	514		10720	522	
10684	530		10703	510		10721	534	
10685	526		10704	518		10722	537	
10686	530		10705	526		10723	511	
10687	516		10706	521		10724	524	
10688	526		10707	530		10725	516	
10689	510		10708	537		26	527	
10690	536		10709	538		10727	521	
10691	536		10710	534		10728	539	
10692	518		10711	510		10729	516	
10693	525	4:15	10712	510		10730	514	
			10713	530	5:36	10731	537	6:51
						10732	531	6:53

TOTAL BALES = ~~14~~ 13	TOTAL BALES = ~~15~~ 14	TOTAL BALES = ~~16~~ 15
TIME = 1 (hrs)	TIME = 1 (hrs)	TIME = 1.05 (hrs)
BALES/HR = ~~14~~ 13	BALES/HR = ~~15~~ 14	BALES/HR = ~~15.2~~ 14.3

AVERAGE PROCESS RATE = 14.7 **(bales/hr)**

DISTRICT REPRESENTATIVE: ______________

DATE: ______________

Main Trash From Gin

Source category:	Cotton	COTTON1	Date:	08/01/95	
Plant name :	Westfield		Location:	Riverdale, CA	
Test date :	Nov 14-15, 1991		Ref. No.:		
Process :		Basis for process rate :		production	

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Number of cyclones	Process rate, bales/hr	Emission factor kg/bale	Emission factor lb/bale
No. 2 incline cyclone	Two 38" 2D-2D cyclones	Total PM	1	1.43	2	15.00	0.0866	0.191
		Total PM	2	1.70	2	15.00	0.103	0.227
		Total PM	3	1.87	2	15.00	0.113	0.249
		AVERAGE					0.101	0.222
		PM-10	1	0.407	2	15.00	0.0246	0.0543
		PM-10	2	0.720	2	15.00	0.0436	0.0961
		PM-10	3	0.970	2	15.00	0.0587	0.129
		AVERAGE					0.0423	0.0932

Gin feed trash cyclone	Two 38" 2D-2D cyclones	Total PM	1	0.54	2	14.00	0.0350	0.0771
		Total PM	2	0.49	2	15.00	0.0297	0.0653
		Total PM	3	0.47	2	15.20	0.0281	0.0618
		AVERAGE					0.0309	0.0681
		PM-10	1	0.30	2	14.00	0.0195	0.0429
		PM-10	2	0.28	2	15.00	0.0169	0.0373
		PM-10	3	0.31	2	15.20	0.0185	0.0408
		AVERAGE					0.0183	0.0403

APPENDIX B

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 2

Cotton 2

AIRWAYS GINS
911 E. Shields Avenue
Fresno, CA 93740
Attn: Jack Hoover

PM10 & TOTAL PARTICULATE TESTING
MOTES TRASH CYCLONE, #3 INCLINE CYCLONE
OVERFLOW SEPARATOR CYCLONE
NOVEMBER 21 & 22, 1991

AIRWAYS GIN

P/O# 1030200101

Prepared By:

BTC ENVIRONMENTAL, INC.
1536 Eastman Avenue
Ventura, CA 93003

Job Number
1045

Laboratory Report Number
291-186

Test Team Leader
Mark Patrick

Results Verified By:
Tom Porter
Vice President - Air Test Division

BTC ENVIRONMENTAL INCORPORATED

CALCULATED EMISSION RESULTS

Client: **Airway Gins**
Site: **Fresno**
Unit: **Mote**

Date: **11/21/91**
Type: ***T std = 60 F***
Run: **1-PM10**

PM10 PARTICULATE

Wt	Total Particulate Weight	0.0477	g
Ct	Total Particulate Emissions	**0.0183**	grain/dscf
CFt	Particulate Flow Rate	**1.67**	lb/hr
	+10µ Particulate	**30.67**	%
	+10µ Particulate	**0.51**	lb/hr
	-10µ Particulate	**69.33**	%
	-10µ Particulate	**1.16**	lb/hr

BTC Environmental, Inc. - 1989

CALCULATED EMISSION RESULTS

Client: **Airway Gins**	Date: **11/21/91**
Site: **Fresno**	Type: ***T std ~ 60 F***
Unit: **Mote**	Run: **2-PM10**

PM10 PARTICULATE

Wt	Total Particulate Weight	0.0383	g
Ct	Total Particulate Emissions	**0.0149**	grain/dscf
CFt	Particulate Flow Rate	**1.33**	lb/hr
	+10µ Particulate	**46.73**	%
	+10µ Particulate	**0.62**	lb/hr
	-10µ Particulate	**53.27**	%
	-10µ Particulate	**0.71**	lb/hr

BTC Environmental, Inc. - 1989

CALCULATED EMISSION RESULTS

Client: **Airway Gins**	Date: **11/21/91**
Site: **Fresno**	Type: ***T std = 60 F***
Unit: **Mote**	Run: **3-PM10**

PM10 PARTICULATE

Wt	Total Particulate Weight	0.0468	g
Ct	Total Particulate Emissions	**0.0170**	grain/dscf
CFt	Particulate Flow Rate	**1.56**	lb/hr
	+10µ Particulate	**47.60**	%
	+10µ Particulate	**0.74**	lb/hr
	-10µ Particulate	**52.40**	%
	-10µ Particulate	**0.82**	lb/hr

BTC Environmental, Inc. - 1989

CALCULATED EMISSION RESULTS

Client: **Airway Gins**
Site: **Fresno**
Unit: **#3 Incline**

Date: **11/22/91**
Type: ***T std = 60 F***
Run: **1-PM10**

PM10 PARTICULATE

Wt	Total Particulate Weight	0.0921	g
Ct	Total Particulate Emissions	**0.0335**	grain/dscf
CFt	Particulate Flow Rate	**1.04**	lb/hr
	+10µ Particulate	**71.90**	%
	+10µ Particulate	**0.75**	lb/hr
	-10µ Particulate	**28.10**	%
	-10µ Particulate	**0.29**	lb/hr

BTC Environmental, Inc. - 1989

CALCULATED EMISSION RESULTS

Client: **Airway Gins**	Date: **11/22/91**
Site: **Fresno**	Type: ***T std = 60 F***
Unit: **#3 Incline**	Run: **2-PM10**

PM10 PARTICULATE

Wt	Total Particulate Weight	0.0809	g
Ct	Total Particulate Emissions	**0.0334**	grain/dscf
CFt	Particulate Flow Rate	**1.04**	lb/hr
	+10μ Particulate	**68.59**	%
	+10μ Particulate	**0.71**	lb/hr
	-10μ Particulate	**31.41**	%
	-10μ Particulate	**0.33**	lb/hr

BTC Environmental, Inc. - 1989

CALCULATED EMISSION RESULTS

Client: **Airway Gins**	Date: **11/22/91**
Site: **Fresno**	Type: ***T std = 60 F***
Unit: **#3 Incline**	Run: **3-PM10**

PM10 PARTICULATE

Wt	Total Particulate Weight	0.0821	g
Ct	Total Particulate Emissions	**0.0349**	grain/dscf
CFt	Particulate Flow Rate	**1.09**	lb/hr
	+10µ Particulate	**59.74**	%
	+10µ Particulate	**0.65**	lb/hr
	-10µ Particulate	**40.26**	%
	-10µ Particulate	**0.44**	lb/hr

BTC Environmental, Inc. - 1989

CALCULATED EMISSION RESULTS

Client: **Airway Gins**	Date: **11/22/91**
Site: **Fresno**	Type: ***T std = 60 F***
Unit: **Overflow**	Run: **1-PM10**

PM10 PARTICULATE

Wt	Total Particulate Weight	0.0638	g
Ct	Total Particulate Emissions	**0.0309**	grain/dscf
CFt	Particulate Flow Rate	**1.32**	lb/hr
	+10µ Particulate	**63.86**	%
	+10µ Particulate	**0.84**	lb/hr
	-10µ Particulate	**36.14**	%
	-10µ Particulate	**0.48**	lb/hr

BTC Environmental, Inc. - 1989

CALCULATED EMISSION RESULTS

Client: **Airway Gins**	Date: **11/22/91**
Site: **Fresno**	Type: ***T std - 60 F***
Unit: **Overflow**	Run: **2-PM10**

PM10 PARTICULATE

Wt	Total Particulate Weight	0.0606	g
Ct	Total Particulate Emissions	**0.0309**	grain/dscf
CFt	Particulate Flow Rate	**1.34**	lb/hr
	+10μ Particulate	**68.06**	%
	+10μ Particulate	**0.91**	lb/hr
	-10μ Particulate	**31.94**	%
	-10μ Particulate	**0.43**	lb/hr

BTC Environmental, Inc. - 1989

CALCULATED EMISSION RESULTS

Client:	**Airway Gins**	Date:	**11/22/91**
Site:	**Fresno**	Type:	***T std = 60 F***
Unit:	**Overflow**	Run:	**3-PM10**

PM10 PARTICULATE

Wt	Total Particulate Weight	0.0362	g
Ct	Total Particulate Emissions	**0.0175**	grain/dscf
CFt	Particulate Flow Rate	**0.75**	lb/hr
	+10μ Particulate	**59.35**	%
	+10μ Particulate	**0.45**	lb/hr
	-10μ Particulate	**40.65**	%
	-10μ Particulate	**0.31**	lb/hr

BTC Environmental, Inc. - 1989

11-21-91

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT
*** FRESNO ZONE ***
COTTON GIN SOURCE TEST - PROCESS WEIGHT FORM

COTTON GIN SOURCE TEST DATA

GINNING PROCESS - mote - #1 Test
Air-Way

TEST RUN #1			TEST RUN #2			TEST RUN #3		
BALE #	BALE WT	TIME	BALE #	BALE WT	TIME	BALE #	BALE WT	TIME
25314	500	12:36 49	25334	497	1:32 48			
25315	498	12:39 27	25335	505	1:35 44			
25316	497		25336	499	1:38 32			
25317	506	12:44 54	25337	508	1:41 25			
25318	514	12:47 12	25338					
25319	516	12:50 31						
25320	506	12:53 20						
25321	510	12:56 10						
25322	517	12:59 03						
25323	505	1:01 42						
25324	509	1:04 30						
25325	510	1:07 20						
25326	510	1:10 10						
25327	510	1:13 03						
25328	509	1:15 55						
25329	503	1:18 49						
25330	498	1:21 33						
25331	489	1:24 20						
25332	509	1:27 08						
25333	504	1:29 59						

TOTAL BALES = 24 23	TOTAL BALES = ______	TOTAL BALES = ______
TIME = 1.1 (hrs) 1.1	TIME = ______ (hrs)	TIME = ______ (hrs)
BALES/HR = 21.8 20.9	BALES/HR = ______	BALES/HR = ______

AVERAGE PROCESS RATE = ______ (bales/hr)

DISTRICT REPRESENTATIVE: ______________

DATE: ______________

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT
*** FRESNO ZONE ***
COTTON GIN SOURCE TEST - PROCESS WEIGHT FORM

COTTON GIN SOURCE TEST DATA

GINNING PROCESS - Air-way Mote - #2 Test

TEST RUN #1			TEST RUN #2			TEST RUN #3		
BALE #	BALE WT	TIME	BALE #	BALE WT	TIME	BALE #	BALE WT	TIME
25342	505	1:55 30	25362	508	2:5102			
25343	512	1:58 24	25363	502	2:5346			
25344	511	2:01 16	25364	505	2:5631			
25345	503	2:0402	25365					
25346	507	2:06 51						
25347	498	2:09 31						
25348	505	2:12 13						
25349	502	2:1453						
25350	512	2:1738						
25351	512	2:2024						
25352	514	2:23 10						
25353	514	2:2554						
25354	518	2:2839						
25355	525	2:3130						
25356	516	2:3418						
25357	513	2:3707						
25358	497	2:3951						
25359	508	2:4240						
25360	504	2:4530						
25361	504	2:4814						

TOTAL BALES = 23 22	TOTAL BALES = ______	TOTAL BALES = ______
TIME = 1.0 (hrs) 1.0	TIME = ______ (hrs)	TIME = ______ (hrs)
BALES/HR = 23 22	BALES/HR = ______	BALES/HR = ______

AVERAGE PROCESS RATE = __________ (bales/hr)

DISTRICT REPRESENTATIVE: ____________________

DATE: ____________

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT
*** FRESNO ZONE ***
COTTON GIN SOURCE TEST - PROCESS WEIGHT FORM

COTTON GIN SOURCE TEST DATA

GINNING PROCESS - Air way mote - #3 Test

TEST RUN #1			TEST RUN #2			TEST RUN #3		
BALE #	BALE WT	TIME	BALE #	BALE WT	TIME	BALE #	BALE WT	TIME
25371	504	3:1539	25391	508	4:1005			
25372	511	3:1813	25392	503	4:1258			
25373	505	3:2050	25393	514	4:1532			
25374	498	3:2322	25394	509	4:1819			
25375	502	3:2603	25395					
25376	508	3:2844						
25377	512	3:3128						
25378	500	3:3412						
25379	494	3:3654						
25380	505	3:3938						
25381	511	3:4223						
25382	508	3:4508						
25383	508	3:4753						
25384	512	3:5043						
25385	502	3:5334						
25386	495	3:5618						
25387	512	3:5904						
25388	509	4:0150						
25389	508	4:0432						
25390	508	4:0720						

TOTAL BALES = 24 23 TIME = 1.05 (hrs) 1.05 BALES/HR = 22.9 21.94	TOTAL BALES = ____ TIME = ____ (hrs) BALES/HR = ____	TOTAL BALES = ____ TIME = ____ (hrs) BALES/HR = ____

AVERAGE PROCESS RATE = _______ (bales/hr)

DISTRICT REPRESENTATIVE: ____________

DATE: ________

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT
* FRESNO ZONE *
COTTON GIN SOURCE TEST - PROCESS WEIGHT FORM

COTTON GIN SOURCE TEST DATA

GINNING PROCESS - #3 Inclined Cleaner - #1 Test
AIR-WAY

TEST RUN #1			TEST RUN #2			TEST RUN #3		
BALE #	BALE WT	TIME	BALE #	BALE WT	TIME	BALE #	BALE WT	TIME
25719	502	$6:59^{29}$	25739	499	$7:52^{22}$			
25720	514	$7:02^{21}$	25740	495	7:55 [illegible]			
25721	515	$7:04^{47}$	25741	506	$7:58^{05}$			
25722	499	$7:07^{37}$	25742	507	$8:00^{53}$			
25723	513	$7:10^{07}$	25743	512	$8:03^{41}$			
25724	521	$7:12^{47}$	25744	507	$8:06^{30}$			
25725	523	$5:15^{20}$	25745		$8:09^{15}$			
25726	502	$7:17^{54}$						
25727	502	$7:20^{20}$						
25728	499	$7:23^{08}$						
25729	507	$7:25^{45}$						
25730	495	$7:28^{28}$						
25731	498	$7:31^{05}$						
25732	492	$7:33^{36}$						
25733	507	$7:36^{15}$						
25734	508	$7:38^{58}$						
25735	500	$7:41^{33}$						
25736	500	$7:44^{18}$						
25737	496	$7:47^{05}$						
25738	492	$7:49^{49}$						

TOTAL BALES = 26 25	TOTAL BALES = ______	TOTAL BALES = ______
TIME = 1.1 (hrs) 1.1	TIME = ______ (hrs)	TIME = ______ (hrs)
BALES/HR = 23.6 22.7	BALES/HR = ______	BALES/HR = ______

AVERAGE PROCESS RATE = ________ (bales/hr)

DISTRICT REPRESENTATIVE: ____________________

DATE: ____________

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT
* FRESNO ZONE *
COTTON GIN SOURCE TEST - PROCESS WEIGHT FORM

COTTON GIN SOURCE TEST DATA

GINNING PROCESS - #3 Inclined cleaner #2 Test
Air-way

TEST RUN #1			TEST RUN #2			TEST RUN #3		
BALE #	BALE WT	TIME	BALE #	BALE WT	TIME	BALE #	BALE WT	TIME
25753	504	8:30 34	25773	499	9:26 21			
25754	514	8:33 26	25774	493	9:28 56			
25755	505	8:36 10	25725	503	9:31 33			
25756	507	8:38 53						
25757	510	8:41 42						
25758	506	8:44 35						
25759	504	8:47 22						
25760	504	8:50 23						
25761	495	8:53 11						
25762	495	8:56 00						
25763	490	8:58 45						
25764	501	9:01 25						
25765	501	9:04 10						
25766	497	9:06 52						
25767	498	9:09 39						
25768	514	9:12 25						
25769	517	9:15 15						
25770	516	9:18 04						
25771	522	9:20 58						
25772	504	9:23 49						

TOTAL BALES = 23 22	TOTAL BALES = ______	TOTAL BALES = ______
TIME = 1.0 (hrs) 1.0	TIME = ______ (hrs)	TIME = ______ (hrs)
BALES/HR = 23 22	BALES/HR = ______	BALES/HR = ______

AVERAGE PROCESS RATE = ________ (bales/hr)

DISTRICT REPRESENTATIVE: ________________

DATE: __________

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT
*** FRESNO ZONE ***
COTTON GIN SOURCE TEST - PROCESS WEIGHT FORM

COTTON GIN SOURCE TEST DATA

GINNING PROCESS - #3 Inclined cleaner #3 Test

TEST RUN #1			TEST RUN #2			TEST RUN #3		
BALE #	BALE WT	TIME	BALE #	BALE WT	TIME	BALE #	BALE WT	TIME
25781	510	9:48 32	25801	519	10:43 35			
25782	510	9:51 15	25802	525	10:46 14			
25783	507	9:54 05	25803	505	10:48 44			
25784	498	9:56 57						
25785	502	9:59 44						
25786	494	10:02 32						
25787	506	10:05 20						
25788	499	10:07 53						
25789	501	10:10 30						
25790	497	10:13 10						
25791	511	10:15 55						
25792	511	10:18 45						
25793	508	10:21 28						
25794	499	10:24 09						
25795	514	10:26 50						
25796	510	10:29 [illegible]						
25797	507	10:32 30						
25798	508	10:35 19						
25799	522	10:38 [illegible]						
25800	516	10:40 53						

TOTAL BALES = 23 22	**TOTAL BALES =** ______	**TOTAL BALES =** ______
TIME = 1.0 **(hrs)** 1.0	**TIME =** ______ **(hrs)**	**TIME =** ______ **(hrs)**
BALES/HR = 23 22	**BALES/HR =** ______	**BALES/HR =** ______

AVERAGE PROCESS RATE = ________ **(bales/hr)**

DISTRICT REPRESENTATIVE: ____________________

DATE: ____________

11-22-95

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

*** FRESNO ZONE ***

COTTON GIN SOURCE TEST - PROCESS WEIGHT FORM

COTTON GIN SOURCE TEST DATA

GINNING PROCESS - over-flow #1 test

TEST RUN #1			TEST RUN #2			TEST RUN #3		
BALE #	BALE WT	TIME	BALE #	BALE WT	TIME	BALE #	BALE WT	TIME
25812	503	11:12 24	25832	[illegible]	12:06 41			
25813	513	11:15 [illegible]	25833	[illegible]	12:09 30			
25814	515	11:17 54	25834	496	12:12 00			
25815	498	11:20 [illegible]						
25816	504	11:23 26						
25817	[illegible]	11:26 15						
25818	500	11:29 03						
25819	495	11:31 33						
25820	[illegible]	11:34 12						
25821	510	11:37 [illegible]						
25822	[illegible]	11:39 59						
25823	[illegible]	11:42 25						
25824	[illegible]	11:45 [illegible]						
25825	[illegible]	11:47 [illegible]						
25826	499	11:50 [illegible]						
25827	512	11:52 00						
25828	511	11:55 [illegible]						
25829	[illegible]	11:58 [illegible]						
25830	496	12:01 [illegible]						
25831	500	12:03 [illegible]						

TEST RUN #1	TEST RUN #2	TEST RUN #3
TOTAL BALES = 23 22	TOTAL BALES = ______	TOTAL BALES = ______
TIME = 1 (hrs) 1	TIME = ______ (hrs)	TIME = ______ (hrs)
BALES/HR = 23 22	BALES/HR = ______	BALES/HR = ______

AVERAGE PROCESS RATE = ________ (bales/hr)

DISTRICT REPRESENTATIVE: ____________________

DATE: ____________

11-22-91

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT
* FRESNO ZONE *
COTTON GIN SOURCE TEST - PROCESS WEIGHT FORM

COTTON GIN SOURCE TEST DATA

GINNING PROCESS - over-flow #2 Test Air-way

TEST RUN #1			TEST RUN #2			TEST RUN #3		
BALE #	BALE WT	TIME	BALE #	BALE WT	TIME	BALE #	BALE WT	TIME
25836	487	12:53 25	25856	508	1:46 25			
25837	507	12:55 [illegible]	25857	575	1:49 19			
25838	[illegible]	12:57 45	25858	5[illegible]	1:51 [illegible]			
25839	[illegible]	1:00 33	25859	5[illegible]	1:59 20			
25840	512	1:03 23	25860	523	1:59 [illegible]	[illegible]		
25841	588	1:06 [illegible]	25861	516	2:01 57			
25842	516	1:08 52						
25843	529	1:11 25						
25844	5[illegible]	1:14 01						
25845	[illegible]	1:16 43						
25846	570	1:19 [illegible]						
25847	[illegible]	1:22 [illegible]						
25848	[illegible]	1:24 [illegible]						
25849	519	1:27 [illegible]						
25850	508	1:30 00						
25851	522	1:32 46						
25852	526	1:35 31						
25853	5[illegible]	1:38 14						
25854	520	1:41 07						
25855	519	1:43 42						

TEST RUN #1	TEST RUN #2	TEST RUN #3
TOTAL BALES = 26 25	TOTAL BALES = ______	TOTAL BALES = ______
TIME = 1.2 (hrs) 1.2	TIME = ______ (hrs)	TIME = ______ (hrs)
BALES/HR = 21.7 20.8	BALES/HR = ______	BALES/HR = ______

AVERAGE PROCESS RATE = ________ (bales/hr)

DISTRICT REPRESENTATIVE: ____________________

DATE: ____________

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT
*** FRESNO ZONE ***
COTTON GIN SOURCE TEST - PROCESS WEIGHT FORM

COTTON GIN SOURCE TEST DATA

GINNING PROCESS - OVER-Flow # 3 Test

TEST RUN #1			TEST RUN #2			TEST RUN #3		
BALE #	BALE WT	TIME	BALE #	BALE WT	TIME	BALE #	BALE WT	TIME
25866	507	$2:17^{32}$	25[illegible]	505	$3:13^{[illegible]}$			
25867	508	$2:20^{[illegible]}$	[illegible]	509	3:1[illegible]			
25868	510	$2:23^{19}$	25886	497	$3:19^{08}$			
25869	510	[illegible]						
25870	496	$2:28^{40}$						
25871	506	$2:31^{22}$						
25872	497	$2:34^{00}$						
25873	497	$2:36^{45}$						
25874	.500	$2:39^{23}$						
25875	499	$2:42^{03}$						
25876	516	$2:47^{00}$	G					
25877	506	$2:49^{33}$						
25878	511	$2:52^{11}$						
25879	509	$2:55^{56}$						
25880	501	$2:57^{5}$						
25881	502	$3:00^{16}$						
25882	498	$3:02^{55}$						
25883	[illegible]	$3:05^{42}$						
25884	507	$3:08^{27}$						
25885	501	$3:11^{05}$						

TOTAL BALES = 23 22	TOTAL BALES = ______	TOTAL BALES = ______
TIME = 1 (hrs) 1	TIME = ______ (hrs)	TIME = ______ (hrs)
BALES/HR = 23 22	BALES/HR = ______	BALES/HR = ______

AVERAGE PROCESS RATE = ________ (bales/hr)

DISTRICT REPRESENTATIVE: ____________________

DATE: ____________

Source category:	Cotton	COTTON2	Date:	02/15/95	
Plant name :	Airways		Location:	Fresno, CA	
Test date :	Nov 21-22, 1991		Ref. No.:		
Process :		Basis for process rate :		production	

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Number of cyclones	Process rate, bales/hr	Emission factor kg/bale	Emission factor lb/bale
Mote trash cyclone	One 20" 1D-3D cyclone	Total PM	1	1.67	1	21.80	0.035	0.076
		Total PM	2	1.33	1	23.00	0.026	0.058
		Total PM	3	1.56	1	22.90	0.031	0.068
		AVERAGE					0.031	0.067
		PM-10	1	1.16	1	21.80	0.024	0.053
		PM-10	2	0.708	1	23.00	0.014	0.031
		PM-10	3	0.817	1	22.90	0.016	0.036
		AVERAGE					0.018	0.040
No. 3 incline cyclone	Two 40" 1D-3D cyclones	Total PM	1	1.04	2	23.60	0.040	0.088
		Total PM	2	1.04	2	23.00	0.041	0.090
		Total PM	3	1.09	2	23.00	0.043	0.095
		AVERAGE					0.041	0.091
		PM-10	1	0.292	2	23.60	0.011	0.025
		PM-10	2	0.327	2	23.00	0.013	0.028
		PM-10	3	0.438	2	23.00	0.017	0.038
		AVERAGE					0.014	0.030
Overflow separator cyclone	Two 40" 1D-3D cyclones	Total PM	1	1.32	2	23.00	0.052	0.11
		Total PM	2	1.34	2	21.70	0.056	0.12
		Total PM	3	0.748	2	23.00	0.030	0.065
		AVERAGE					0.046	0.10
		PM-10	1	0.477	2	23.00	0.019	0.041
		PM-10	2	0.428	2	21.70	0.018	0.039
		PM-10	3	0.304	2	23.00	0.012	0.026
		AVERAGE					0.016	0.036

APPENDIX C

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 3

Cotton 3

ECKLEY ENGINEERING
255 North Fulton Street
Fresno, Ca. 9301
Attn: Bob Eckley

SOURCE EMISSION TESTING
MOUNT WHITNEY COTTON GIN

Total Particulate
PM-10 Particulate
NOVEMBER 29 & 30, 1990

Prepared By:

BTC ENVIRONMENTAL, INC.
1536 Eastman Avenue
Ventura, CA 93003

Job Number
5019

Laboratory Report Number
290-188

Test Team Leader
Cameron Doonahoo

Results Verified By:
Tom Porter - Director Air Test Division

BTC ENVIRONMENTAL INCORPORATED

INTRODUCTION

On November 29 & 30, 1990, BTC Environmental performed source emission tests for PM-10 particulate matter and total particulate matter on various cyclones located at the Mount Whitney cotton gin. The gin is located on Mount Whitney Road near Five Pionts. The cylcones were designated as #1, #2, #3 and #4. A candy cane exhaust duct was attached to the cyclone outlet and routed to ground level producing a uniform flow in a vertical position.

The testing was conducted while the plant was operating at normal conditions and production rates.

SAMPLING AND ANALYTICAL PROCEDURES

STACK GAS ANALYSIS: The stack gas were assumed to be ambient air. The O2 value was 20.9% and the CO2 value was 0.05%.

STACK GAS VELOCITY: The stack gas velocity was determined using an "S" type pitot tube connected to an inclined draft gauge or a magnehelic gauge.

The stack temperature was determined using a thermocouple and an indicating pyrometer. The proportion of water was determined gravimetrically and the dry molecular weight of the stack gas determined by E.P.A. Method 3, equation 3-2. Stack velocities were calculated using E.P.A. Method 2, equation 2-9; gas volumetric flow rate was determined by equation 2-10.

PARTICULATE EMISSIONS: Particulates were collected using a Lace Model 31 stack sampler system that conforms to E.P.A. requirements for particulate sampling. The system consists of a heated probe, heated filter, and cooled impingers (see E.P.A. Method 5). After the weight of the particulates on the filter and in the probe is determined, the total dissolved solids in the the impingers is determined and added to the particulate weight in order to comply with APCD regulations. Blanks for the DI water and acetone were analyzed and substracted from the total particulate weight.

PM-10 PARTICULATE EMISSIONS: Sampling was done isokinetically from each stack at the same time that the total particulate sampling was being done. The sampling was done by using a GII cascade impactor. The impactor consists of a nozzle, two (2) stages with slotted filters, a final stage containing a backup filter, heated probe and cooled impingers containing DI water. The nozzle and the two (2) stages represent the +10μ fraction. The final stage, heated probe and the impingers represent the -10μ fraction.

The weight from each fraction including the filter weights and the rinses are added together to obtain a total weight. The total weight is divided into the weight obtained from each fraction to obtain the percentage for each fraction. The lb/hr values obtained from the total particulate runs were utilized to obtain the lb/hr for the +10μ and the -10μ fractions.

EMISSION SUMMARY

#1 CYCLONE west plenum suction/drying

CONSTITUENT	RUN #1	RUN #2	AVERAGE
Total Particulate			
gr/DSCF	0.0896	0.1646	*0.1271*
lbs/hr	2.59	4.73	*3.66*
PM-10 Particulate			
+10μ(%)	47.8	51.1	*49.5*
-10μ(%)	52.2	48.9	*50.6*
+10μ(lbs/hr)	1.24	2.42	*1.83*
-10μ(lbs/hr)	1.35	2.31	*1.83*

EMISSION SUMMARY

#2 CYCLONE East Plant

CONSTITUENT	RUN #1	RUN #2	AVERAGE
Total Particulate			
gr/DSCF	0.0710	0.1187	*0.0949*
lbs/hr	2.66	4.44	*3.55*
PM-10 Particulate			
+10μ(%)	93.9	88.8	*91.4*
-10μ(%)	6.1	11.2	*8.7*
+10μ(lbs/hr)	2.50	3.94	*3.22*
-10μ(lbs/hr)	0.16	0.50	*0.33*

EMISSION SUMMARY

#3 CYCLONE (MOTES) 19/61

CONSTITUENT	RUN #1	RUN #2	AVERAGE
Total Particulate			
gr/DSCF	0.0045	0.0283	*0.0164*
lbs/hr	0.33	2.12	*1.23*
PM-10 Particulate			
+10μ(%)	81.7	54.0	*67.9*
-10μ(%)	18.3	46.0	*32.2*
+10μ(lbs/hr)	0.27	1.14	*0.71*
-10μ(lbs/hr)	0.06	0.98	*0.52*

EMISSION SUMMARY

#4 CYCLONE MOTES/CONDENSER 85

CONSTITUENT	RUN #1	RUN #2	AVERAGE
Total Particulate			
gr/DSCF	0.0464	0.0268	*0.0366*
lbs/hr	2.16	1.25	*1.71*
PM-10 Particulate			
+10μ(%)	95.8	95.8	*95.8*
-10μ(%)	4.2	4.2	*4.2*
+10μ(lbs/hr)	2.07	1.20	*1.63*
-10μ(lbs/hr)	0.09	0.05	*0.07*

Received from SJVUAPCD
JAN 16, 1995

MOUNT WHITNEY GIN: PRE-MODIFICATION EMISSIONS

EMISSIONS POINT	REFERENCE	TEST DATE	TESTED G/DSCF	TESTED LB/HR	CYCLONE COLLECTORS [NUMBER & SIZE("Ø)]	BALES/HOUR	SYSTEM (POUNDS/HOUR)	SYSTEM (POUNDS/BALE)
WEST PLENUM [Unloading & Dryers & Inclined Cleaners]	Mt. Whitney	11/90	0.1000*	2.88	15/38	15.2	43.2	2.84
EAST PLENUM [Overflow Separator & Trash from West Plenum Cyclones]	Mt. Whitney	11/90	0.0949	3.55	4/38	14.3	14.2	0.99
MOTES (Mote Condenser)	Mt. Whitney	11/90	0.0164	1.23	2/72	11.7	2.46	0.21
MOTES CNSR	Mt. Whitney	11/90	0.0366	1.71	1/72	15.3	1.71	0.12
LC&BC BSKT	Calc Sheet	-	-	-	-	-	-	1.15
MOTE CLNR	Mt. Whitney	11/90	0.0366	0.64	1/28	15.3	0.64	0.04

Calculated pounds per bale before 1991 modifications = 5.4

*Allowable under Rule 404

Source category:	Cotton	COTTON3	Date: 02/15/95
Plant name :	Mount Whitney		Location: Five Points, CA
Test date :	Nov 29-30, 1990		Ref. No.:
Process :	Cotton ginning		Basis for process rate:

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Number of cyclones	Process rate, bales/hr	Emission factor kg/bale	Emission factor lb/bale
West plenum (Unloading, dryers, and inclined cleaners)	Fifteen 38" 2D-2D cyclones	Total PM	1	2.59	15	15.2	1.2	2.6
		Total PM	2	4.73	15	15.2	2.1	4.7
		AVERAGE					1.6	3.6
		PM-10	1	1.35	15	15.2	0.60	1.3
		PM-10	2	2.31	15	15.2	1.0	2.3
		AVERAGE					0.82	1.8
East plenum (Overflow separator and main trash)	Four 38" 2D-2D cyclones	Total PM	1	2.66	4	14.3	0.34	0.74
		Total PM	2	4.44	4	14.3	0.56	1.2
		AVERAGE					0.45	0.99
		PM-10	1	0.16	4	14.3	0.020	0.045
		PM-10	2	0.50	4	14.3	0.063	0.14
		AVERAGE					0.042	0.092
Motes	Two 72" 2D-2D cyclones	Total PM	1	0.33	2	11.7	0.026	0.056
		Total PM	2	2.12	2	11.7	0.16	0.36
		AVERAGE					0.095	0.21
		PM-10	1	0.06	2	11.7	0.0047	0.010
		PM-10	2	0.98	2	11.7	0.076	0.17
		AVERAGE					0.040	0.089
Motes condenser	One 72" 2D-2D cyclone	Total PM	1	2.16	1	15.3	0.064	0.14
		Total PM	2	1.25	1	15.3	0.037	0.082
		AVERAGE					0.051	0.11
		PM-10	1	0.09	1	15.3	0.0027	0.0059
		PM-10	2	0.05	1	15.3	0.0015	0.0033
		AVERAGE					0.0021	0.0046

APPENDIX D

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 4

COTTON 4

ECKLEY ENGINEERING
255 North Fulton Street
Fresno, Ca. 9301
Attn: Bob Eckley

SOURCE EMISSION TESTING
STRATFORD GROWERS
Total Particulate
PM-10 Particulate
November 27 & 26, 1990

Prepared By:

BTC ENVIRONMENTAL, INC.
1536 Eastman Avenue
Ventura, CA 93003

Job Number
5019

Laboratory Report Number
290-188

Test Team Leader
Cameron Doonahoo

Results Verified By:
Tom Porter - Director Air Test Division

BTC ENVIRONMENTAL INCORPORATED

INTRODUCTION

On November 27 & 28, 1990, BTC Environmental performed source emission tests for PM-10 particulate matter and total particulate matter on various cyclones located at the Stratford Growers cotton gin. The gin is located at 19813 Madison Avenue in Stratfor, California. The cylcones were designated as Motes, #A Trash Fan, #1 Trash Fan and #2 TrashFan. A candy cane exhaust duct was attached to the cyclone outlet and routed to ground level producing a uniform flow in a vertical position.

The testing was conducted while the plant was operating at normal conditions and production rates.

SAMPLING AND ANALYTICAL PROCEDURES

STACK GAS ANALYSIS: The stack gas were assumed to be ambient air. The O2 value was 20.9% and the CO2 value was 0.05%.

STACK GAS VELOCITY: The stack gas velocity was determined using an "S" type pitot tube connected to an inclined draft gauge or a magnehelic gauge.

The stack temperature was determined using a thermocouple and an indicating pyrometer. The proportion of water was determined gravimetrically and the dry molecular weight of the stack gas determined by E.P.A. Method 3, equation 3-2. Stack velocities were calculated using E.P.A. Method 2, equation 2-9; gas volumetric flow rate was determined by equation 2-10.

PARTICULATE EMISSIONS: Particulates were collected using a Lace Model 31 stack sampler system that conforms to E.P.A. requirements for particulate sampling. The system consists of a heated probe, heated filter, and cooled impingers (see E.P.A. Method 5). After the weight of the particulates on the filter and in the probe is determined, the total dissolved solids in the the impingers is determined and added to the particulate weight in order to comply with APCD regulations. Blanks for the DI water and acetone were analyzed and substracted from the total particulate weight.

PM-10 PARTICULATE EMISSIONS: Sampling was done isokinetically from each stack at the same time that the total particulate sampling was being done. The sampling was done by using a GII cascade impactor. The impactor consists of a nozzle, two (2) stages with slotted filters, a final stage containing a backup filter, heated probe and cooled impingers containing DI water. The nozzle and the two (2) stages represent the +10µ fraction. The final stage, heated probe and the impingers represent the -10µ fraction.

The weight from each fraction including the filter weights and the rinses are added together to obtain a total weight. The total weight is divided into the weight obtained from each fraction to obtain the percentage for each fraction. The lb/hr values obtained from the total particulate runs were utilized to obtain the lb/hr for the +10µ and the -10µ fractions.

EMISSION SUMMARY

#A TRASH FAN CYCLONE

CONSTITUENT	RUN #1	RUN #2	AVERAGE
Total Particulate			
gr/DSCF	0.0320	0.0393	*0.0357*
lbs/hr	1.37	1.67	*1.52*
PM-10 Particulate			
+10μ(%)	83.2	53.9	*68.6*
-10μ(%)	16.8	46.1	*31.5*
+10μ(lbs/hr)	1.14	0.90	*1.02*
-10μ(lbs/hr)	0.23	0.77	*0.50*

65 Trash

EMISSION SUMMARY

#1 TRASH FAN CYCLONE

CONSTITUENT	RUN #1	RUN #2	AVERAGE
Total Particulate			
gr/DSCF	0.0144	0.0307	*0.0226*
lbs/hr	0.64	1.34	*0.99*
PM-10 Particulate			
+10μ(%)	68.8	62.6	*65.7*
-10μ(%)	31.2	37.4	*34.3*
+10μ(lbs/hr)	0.44	0.84	*0.64*
-10μ(lbs/hr)	0.20	0.50	*0.35*

= #1 Drying

Very Clean Cotton

EMISSION SUMMARY

#2 TRASH FAN CYCLONE

CONSTITUENT	RUN #1	RUN #2	AVERAGE
Total Particulate			
gr/DSCF	0.0916	0.0933	*0.0925*
lbs/hr	4.17	4.25	*4.21*
PM-10 Particulate			
+10μ(%)	59.0	81.9	*70.5*
-10μ(%)	41.0	18.1	*29.6*
+10μ(lbs/hr)	[illegible]	3.48	*2.97*
-10μ(lbs/hr)	[illegible]	0.77	*[illegible]*

#2 Drying

BTC ENVIRONMENTAL INCORPORATED

EMISSION SUMMARY

MOTE FAN CYCLONE

CONSTITUENT	RUN #1	RUN #2	AVERAGE
Total Particulate			
gr/DSCF	0.0088	0.0070	*0.0079*
lbs/hr	0.24	0.19	*0.22*
PM-10 Particulate			
+10μ(%)	39.8	70.7	*55.3*
-10μ(%)	60.2	29.3	*44.8*
+10μ(lbs/hr)	0.10	0.13	*0.11*
-10μ(lbs/hr)	0.14	0.06	*0.10*

STRATFORD GROWERS, INC.: PRE-MODIFICATION EMISSIONS

EMISSIONS POINT	REFERENCE	TEST DATE	TESTED G/DSCF	TESTED LB/HR	CYCLONE COLLECTORS [NUMBER & SIZE(")]	BALES/HOUR	SYSTEM [POUNDS/HOUR]	SYSTEM [POUNDS/B
SUCTION	County Line & CARB	12/90	-	-	3/38	-	-	0.25	
#1 DRYING	Stratford	11/90	0.0226	0.99	4/36	13.0	3.96	0.55	0.30
#2 DRYING	Stratford	11/90	0.0925	4.21	4/36	21.4	16.64	0.79	
OVERFLOW	M(#2 Drying) above	11/90	-	-	2/34	-	-	0.20	
MOTES	Stratford	11/90	0.0079	1.32	6/30	12.0	1.32	0.14	0.11
MOTE CLNG	Motes (above)	11/90	0.0079	-	2/24	-	-	0.14	
LC&BC BSKT	EE Lint Sys.	-	-	-	-	-	-	1.15	
TRASH	Stratford	11/90	0.0357	1.52	2/38	12.7	3.04	0.30	0.24
FEEDER DUST & MC TRASH	J G Boswell	-	-	-	2/36	-	-	0.53	

Calculated pounds per bale before 1991 modifications = 4.1

Original submittal by Eckley Engineering

Source category:	Cotton	COTTON4	Date: 02/15/95
Plant name :	Stratford Growers		Location: Stratford, CA
Test date :	Nov 27-26, 1990		Ref. No.:
Process :	Cotton ginning	Basis for process rate:	Production

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Number of cyclones	Process rate, bales/hr	Emission factor kg/bale	Emission factor lb/bale
Trash fan (Gin stand)	Two 38" 2D-2D cyclones	Total PM	1	1.37	2	12.7	0.098	0.22
		Total PM	2	1.67	2	12.7	0.12	0.26
		AVERAGE					0.11	0.24
		PM-10	1	0.230	2	12.7	0.016	0.036
		PM-10	2	0.770	2	12.7	0.055	0.12
		AVERAGE					0.036	0.079
No. 1 drying (dryers and inclined cleaners)	Four 36" 2D-2D cyclones	Total PM	1	0.640	4	13.0	0.089	0.20
		Total PM	2	1.34	4	13.0	0.19	0.41
		AVERAGE					0.14	0.30
		PM-10	1	0.20	4	13.0	0.028	0.062
		PM-10	2	0.50	4	13.0	0.070	0.15
		AVERAGE					0.049	0.11
No. 2 drying (dryers and inclined cleaners)	Four 36" 2D-2D cyclones	Total PM	1	4.17	4	21.4	0.35	0.78
		Total PM	2	4.25	4	21.4	0.36	0.79
		AVERAGE					0.36	0.79
		PM-10	1	1.71	4	21.4	0.15	0.32
		PM-10	2	0.769	4	21.4	0.065	0.14
		AVERAGE					0.11	0.23
Mote fan	Six 30" 2D-2D cyclones	Total PM	1	0.240	6	12.0	0.054	0.12
		Total PM	2	0.190	6	12.0	0.043	0.095
		AVERAGE					0.049	0.11
		PM-10	1	0.14	6	12.0	0.032	0.070
		PM-10	2	0.06	6	12.0	0.014	0.030
		AVERAGE					0.023	0.050

APPENDIX E

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 5

RECEIVED
MAY 28 1991
Environmental Health

Cottons

ECKLEY ENGINEERING
255 North Fulton Street
Fresno, Ca. 9301
Attn: Bob Eckley

SOURCE EMISSION TESTING
~~HANFORD GROWERS~~
Total Particulate
PM-10 Particulate
December 3 & 4, 1990
County Line Gin

Prepared By:

BTC ENVIRONMENTAL, INC.
1536 Eastman Avenue
Ventura, CA 93003

Job Number
5019

Laboratory Report Number
290-188

Test Team Leader
Cameron Doonahco

Results Verified By:
Tom Porter - Director Air Test Division

BTC ENVIRONMENTAL INCORPORATED

INTRODUCTION

On December 3 & 4, 1990, BTC Environmental performed source emission tests for PM-10 particulate matter and total particulate matter on various cyclones located at the Hanford Growers cotton gin. The gin is located at 12095 2nd Avenue in Hanford, California. The cylcones were designated as #1 Dryer, Mote, Lint Trap and Suction. A candy cane exhaust duct was attached to the cyclone outlet and routed to ground level producing a uniform flow in a vertical position.

The testing was conducted while the plant was operating at normal conditions and production rates.

SAMPLING AND ANALYTICAL PROCEDURES

STACK GAS ANALYSIS: The stack gas were assumed to be ambient air. The O2 value was 20.9% and the CO2 value was 0.05%.

STACK GAS VELOCITY: The stack gas velocity was determined using an "S" type pitot tube connected to an inclined draft gauge or a magnehelic gauge.

The stack temperature was determined using a thermocouple and an indicating pyrometer. The proportion of water was determined gravimetrically and the dry molecular weight of the stack gas determined by E.P.A. Method 3, equation 3-2. Stack velocities were calculated using E.P.A. Method 2, equation 2-9; gas volumetric flow rate was determined by equation 2-10.

PARTICULATE EMISSIONS: Particulates were collected using a Lace Model 31 stack sampler system that conforms to E.P.A. requirements for particulate sampling. The system consists of a heated probe, heated filter, and cooled impingers (see E.P.A. Method 5). After the weight of the particulates on the filter and in the probe is determined, the total dissolved solids in the the impingers is determined and added to the particulate weight in order to comply with APCD regulations. Blanks for the DI water and acetone were analyzed and substracted from the total particulate weight.

PM-10 PARTICULATE EMISSIONS: Sampling was done isokinetically from each stack at the same time that the total particulate sampling was being done. The sampling was done by using a GII cascade impactor. The impactor consists of a nozzle, two (2) stages with slotted filters, a final stage containing a backup filter, heated probe and cooled impingers containing DI water. The nozzle and the two (2) stages represent the +10µ fraction. The final stage, heated probe and the impingers represent the -10µ fraction.

The weight from each fraction including the filter weights and the rinses are added together to obtain a total weight. The total weight is divided into the weight obtained from each fraction to obtain the percentage for each fraction. The lb/hr values obtained from the total particulate runs were utilized to obtain the lb/hr for the +10µ and the -10µ fractions.

Pre-Mod
~~Post~~ Test

EMISSION SUMMARY

#1 DRYER CYCLONE

CONSTITUENT	RUN #1	RUN #2	AVERAGE
Total Particulate			
gr/DSCF	0.0343	0.0849	0.0596
lbs/hr	0.98	2.36	1.67
PM-10 Particulate			
+10μ(%)	57.9	62.7	60.3
-10μ(%)	42.1	37.3	39.7
+10μ(lbs/hr)	0.57	1.48	1.02
-10μ(lbs/hr)	0.41	0.88	0.65

Pre Mod. ~~Post~~ Test

EMISSION SUMMARY

SUCTION CYCLONE

CONSTITUENT	RUN #1	RUN #2	AVERAGE
Total Particulate			
gr/DSCF	0.0338	0.0417	*0.0378*
lbs/hr	1.15	1.26	*1.21*
PM-10 Particulate			
+10μ(%)	0.3	0.7	*0.5*
-10μ(%)	99.7	99.3	*99.5*
+10μ(lbs/hr)	0.00	0.01	*0.01*
-10μ(lbs/hr)	1.15	1.25	*1.20*

Premod
~~Post~~ Test

EMISSION SUMMARY

LINT TRAP CYCLONE

CONSTITUENT	RUN #1	RUN #2	AVERAGE
Total Particulate			
gr/DSCF	0.0534	0.0667	0.0601
lbs/hr	2.32	2.92	2.62
PM-10 Particulate			
+10µ(%)	64.7	54.3	59.5
-10µ(%)	35.3	45.7	40.5
+10µ(lbs/hr)	1.50	1.59	1.54
-10µ(lbs/hr)	0.82	1.33	1.08

Pre-mod
~~Post~~-Test

EMISSION SUMMARY

MOTE CYCLONE

CONSTITUENT	RUN #1	RUN #2	AVERAGE
Total Particulate			
gr/DSCF	0.0458	0.1653	0.1056
lbs/hr	1.91	6.80	4.36
PM-10 Particulate			
+10μ(%)	75.7	69.5	72.6
-10μ(%)	24.3	30.5	27.4
+10μ(lbs/hr)	1.45	4.73	3.09
-10μ(lbs/hr)	0.46	2.07	1.27

ECKLEY ENGINEERING

205 North Fulton * Fresno * California * 93701

Phone (209) 233-1317 FAX 209.233.5756

SJVUAPCD/Kings
330 Campus Drive
Hanford, California 93230

RE: County Line Gin, Inc.
Authority to Construct and Emissions Reduction Credit
Supplement to May 28, 1991, Application #
Corrections to Pre-Modification (12/04/90) Source Testing

The attached sheets document errors in the calculation of the pounds per bale pre-modification figures.

One error was caused by multiplying the emissions per cyclone by four cyclones, instead of the correct factor of six, in the #2 Drying System.

The second error was caused by the source testing laboratory's erroneously labeling a 28" diameter candy cane as measuring only 19" in diameter. BTC has provided the attached corrected pages to be incorporated into the original (12/04/90) report to replace the defective pages.

The corrected figures are incorporated into the computation of the 5.81 pounds/bale TSP, as shown on the attached spread sheet.

REGISTERED PROFESSIONAL ENGINEER
ROBERT CLARK ECKLEY
13217
STATE OF CALIFORNIA

COUNTY LINE GIN: PRE-MODIFICATION EMISSIONS

EMISSIONS POINT	REFERENCE	TEST DATE	TESTED G/DSCF	TESTED LB/HR	CYCLONE COLLECTORS (NUMBER & SIZE(" #))	BALES/HOUR	SYSTEM (POUNDS/HOUR)	SYSTEM (POUNDS/BALE)	
SUCTION	County Line	12/90	0.0378	1.21	4/34	21.9	4.84	0.22	
#1 DRYING	County Line	12/90	0.0596	1.68	6/38	18.4	10.08	0.55	
#2 DRYING	Stratford	12/90	0.0925	4.21	6/38	21.4	25.26 ~~16.84~~	1.18 ~~0.79~~	Multiplied: 4 rather tha.
MOTES	County Line	12/90	0.1000*	8.96 ~~4.13~~ based on allowable not actual	2/60	18.2	17.92 ~~8.26~~	0.98 ~~0.45~~	Lab error see enclos pages
LINT CLEANER	County Line	12/90	0.0601	1.68, wrong. 2.63	16/38	18.5	26.88	1.45	
OVERFLOW	%(#2 Drying)	12/90	-	-	1/40	-	-	0.20	
G.S. TRASH	Stratford	11/90	0.0357	1.52	2/38	12.7	3.80 adj.	0.30	
BC SCRNBSKT	AP-42	-	-	-	-	-	-	0.19	
MOTE CLEANER	%(Motes)	12/90	-	-	1/43	-	-	0.74 ~~0.33~~	See 'Motes' Note above

Calculated pounds per bale before 1991 modifications = ~~3.5~~ 5.81

*Allowable under Rule 404

A ÷ 50% PM_{10} $\longrightarrow$ 2.905 lb. PM_{10} / bale

Filename: DEC90GIN.WQ1

DATA ARE A RE-CALCULATION OF REPORT RESULTS PER A MEMO FROM ECKLEY ENGINEERING STATING THAT THE DUCT SIZE OF 19" USED IN THE CALCULATION WAS INCORRECT. THE ACTUAL SIZE WAS 28". THEREFORE, FLOW RATES WERE MULTIPLIED BY (28/19) ^ 2.

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported		
			Run 1	Run 2	Average
1	Stack temperature	Deg F	60.4	74.3	
MOTES	Pressure	in. HG	30.21	30.21	
CYCLONE	Moisture	%	0.9	0.7	
	Oxygen	%	20.9	20.9	
	Volumetric flow, actual	acfm	10555	10691	
	Volumetric flow, standard*	dscfm	10553	10432	
	Isokinetic variation	%	95.4	95.1	
Circle: Production or feed rate Capacity:		bales/hr	9.1	9.1	
	Pollutant concentrations:				
	Total PM	G/dscf	0.0458	0.1653	
	PM-10	% of PM	24.3%	30.5%	
	Pollutant mass flux rates:				
	Total PM	lb/hr	4.14	14.8	9.46
	PM-10	lb/hr	1.01	4.5	2.76
	Emission factors (ENGLISH UNITS):				AVERAGE
	Total PM	lb/bale	0.455	1.62	1.04
	PM-10	lb/bale	0.111	0.495	0.303

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

Source category: Cotton COTTON5 Date: 02/15/95
Plant name : County Line Gin Location: Hanford, CA
Test date : Dec 3-4, 1990 Ref. No.:
Process :
Basis for process rate :

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Number of cyclones	Process rate, bales/hr	Emission factor kg/bale	Emission factor lb/bale
Motes	2 60" 2D-2D cyclones	Total PM	1	4.14	2	18.20	0.21	0.45
		Total PM	2	14.80	2	18.20	0.74	1.6
		AVERAGE					0.47	1.0
		PM-10	1	1.010	2	18.20	0.050	0.11
		PM-10	2	4.51	2	18.20	0.23	0.50
		AVERAGE					0.14	0.30
Lint trap	Sixteen 38" 2D-2D cyclones	Total PM	1	2.32	16	18.50	0.91	2.0
		Total PM	2	2.92	16	18.50	1.1	2.5
		AVERAGE					1.0	2.3
		PM-10	1	0.819	16	18.50	0.32	0.71
		PM-10	2	1.33	16	18.50	0.52	1.2
		AVERAGE					0.42	0.93
Suction cyclone	Four 34" 2D-2D cyclones	Total PM	1	1.15	4	21.90	0.095	0.21
		Total PM	2	1.26	4	21.90	0.10	0.23
		AVERAGE					0.10	0.22
		PM-10	1	1.15	4	21.90	0.095	0.21
		PM-10	2	1.25	4	21.90	0.10	0.23
		AVERAGE					0.10	0.22
No. 1 dryer cyclone	Six 38" 2D-2D cyclones	Total PM	1	0.98	6	18.40	0.15	0.32
		Total PM	2	2.36	6	18.40	0.35	0.77
		AVERAGE					0.25	0.54
		PM-10	1	0.413	6	18.40	0.061	0.13
		PM-10	2	0.880	6	18.40	0.13	0.29
		AVERAGE					0.096	0.21

APPENDIX F

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 6

COUNTY LINE GIN, INC.
12095 2nd Avenue
Hanford, CA 93230
Attn: Mark Boyes

PM10 & TOTAL PARTICULATE TESTING MOTES, SUCTION, LINT CLEANER, OVERFLOW, #1 DRYING, GIN STAND TRASH, BATTERY CONDENSER AND #2 DRYING CYLONES

December 8 - 11, 1991

(805) 654-1657

654-1095

Prepared By:

BTC ENVIRONMENTAL, INC.
1536 Eastman Avenue
Ventura, CA 93003

Job Number
3067

Laboratory Report Number
291-204

Test Team Leader
Tom Porter

Results Verified By:
Tom Porter
Vice President - Air Test Division

Bob Eckley: @ (202) 233-1217

BTC ENVIRONMENTAL INCORPORATED

INTRODUCTION

On December 8 - 11, 1991, BTC Environmental performed source emissions tests for PM-10 particulate matter on a Motes Cyclone, Suction Cyclone, Lint Cleaner Cyclone, Overflow Cleaner, #1 Drying Cyclone, Gin Stand Trash Cyclone, Battery Condenser Cyclone and the #2 Drying Cyclone. The cyclones are located at 12095 2nd Avenue, Hanford, California. Sampling was done in triplicate for total particulate and PM-10 particule size distribution. Production rates, in bales per hour, was teken by Robert Eckley with Eckley Engineering.

SAMPLING AND ANALYTICAL PROCEDURES

STACK GAS ANALYSIS: The oxygen and carbon dioxide content of the exhaust gases were assumed to be ambient air. Oxygen = 20.9% and Carbon Dioxide = 0.05%.

STACK GAS VELOCITY: The stack gas velocity was determined using an "S" type pitot tube connected to a magnehelic gauge. The "S" type pitot was used to determine the stack velocity profile for each run. Sampling was conducted from two (2) vertical ports. A total of twelve (12) traverse points was utilized at each port for a total of 24 sample points.

The stack temperature was determined using a thermocouple and an indicating pyrometer. The proportion of water was determined gravimetrically and the dry molecular weight of the stack gas determined by E.P.A. Method 3, equation 3-2. Stack velocities were calculated using E.P.A. Method 2, equation 2-9; gas volumetric flow rate was determined by equation 2-10.

TOTAL PARTICULATE EMISSIONS: A CARB Method 5 sampling train was utilized to determine the total particulate emission from the cyclones. The sample train consisted of a stainless steel nozzle, a heated stainless steel probe, a heated glass fiber filter and cooled impingers. After the weight is obtained from the filter, probe and nozzle rinses; the total solids in the impingers is added to the front-end catch to satisfy Tulare County APCD rules.

PARTICULE SIZE DITRIBUTION: A sample was taken isokinetically from the stack using a GII cascade impactor. A modified CARB Method 501 was utilized. The impactor consisted of two (2) slotted discs, a back up filter and cooled impingers. The first two (2) discs are +10μ and the backup filter and impingers are -10μ. The total weights obtained from each fraction were added together to obtain the total particulate weight. The total weight was used to determine the % of the +10μ and the -10μ fraction. The total weight obtained from the total particulate runs are used to determine the +10μ and the -10μ results reported in lb/hr.

Post-Mod

PARTICULATE EMISSION SUMMARY

MOTES CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0594	0.0598	0.0518	*0.0570*
lb/hr	2.97	3.04	2.58	*2.86*
Particule Size Distribution				
+10µ (%)	45.92	48.86	47.75	*47.51*
+10µ (lb/hr)	1.36	1.49	1.23	*1.36*
-10µ (%)	54.08	51.14	52.25	*52.49*
-10µ (lb/hr)	1.61	1.55	1.35	*1.50*

SUCTION CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0494	0.0638	0.0796	*0.0643*
lb/hr	2.69	3.62	4.33	*3.55*
Particule Size Distribution				
+10µ (%)	46.60	49.96	51.36	*49.31*
+10µ (lb/hr)	1.25	1.81	2.22	*1.76*
-10µ (%)	53.40	50.05	48.64	*50.70*
-10µ (lb/hr)	1.44	1.81	2.11	*1.78*

LINT CLEANER CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0191	0.0312	0.0190	*0.0231*
lb/hr	1.01	1.60	1.03	*1.21*
Particule Size Distribution				
+10µ (%)	48.80	42.98	47.25	*46.34*
+10µ (lb/hr)	0.49	0.69	0.49	*0.56*
-10µ (%)	51.20	57.02	52.77	*53.66*
-10µ (lb/hr)	0.52	0.91	0.54	*0.66*

Post-Mod

PARTICULATE EMISSION SUMMARY (Cont)

OVERFLOW CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0333	0.0365	0.0367	*0.0355*
lb/hr	1.26	1.41	1.41	*1.36*
Particule Size Distribution				
+10µ (%)	35.79	30.86	49.34	*38.66*
+10µ (lb/hr)	0.45	0.44	0.70	*0.53*
-10µ (%)	64.21	69.14	50.66	*61.34*
-10µ (lb/hr)	0.81	0.97	0.71	*0.83*

#1 DRYING CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0506	0.0901	0.0679	*0.0695*
lb/hr	1.41	2.74	2.00	*2.05*
Particule Size Distribution				
+10µ (%)	66.44	46.49	57.17	*56.70*
+10µ (lb/hr)	0.94	1.27	1.14	*1.12*
-10µ (%)	33.56	53.51	42.83	*43.30*
-10µ (lb/hr)	0.47	1.47	0.86	*0.93*

GIN STAND TRASH CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.1134	0.0764	0.0767	*0.0888*
lb/hr	4.62	3.13	3.10	*3.62*
Particule Size Distribution				
+10µ (%)	62.53	56.18	60.30	*59.67*
+10µ (lb/hr)	2.89	1.76	1.87	*2.17*
-10µ (%)	37.47	43.82	39.70	*40.33*
-10µ (lb/hr)	1.73	1.37	1.23	*1.44*

Post-Mod.

PARTICULATE EMISSION SUMMARY (Cont)

BATTERY CONDENSER CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0058	0.0112	0.0189	*0.0120*
lb/hr	0.32	0.61	1.04	*0.66*
Particule Size Distribution				
+10µ (%)	60.30	79.97	94.08	*78.12*
+10µ (lb/hr)	0.19	0.49	0.98	*0.55*
-10µ (%)	39.70	20.03	5.92	*21.88*
-10µ (lb/hr)	0.13	0.12	0.06	*0.10*

#2 DRYING CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0262	0.0287	0.0325	*0.0291*
lb/hr	0.79	0.82	0.95	*0.85*
Particule Size Distribution				
+10µ (%)	43.25	51.26	52.04	*48.85*
+10µ (lb/hr)	0.34	0.42	0.49	*0.42*
-10µ (%)	56.75	48.74	47.96	*51.15*
-10µ (lb/hr)	0.45	0.40	0.46	*0.43*

County Line
12/91 AFTER MODS

System	No of Cyclones	Std. bales/test hr	TSP lb/test hr	TSP lb/bale	PM10 lb/hr	PM10 lb/bale		
Suction	3	35.2	3.66	0.302	1.78	0.152		
#1 Drying	4	33.9	2.05	0.242	0.93	0.110		
#2 Drying	4	33.0	0.86	0.103	0.43	0.052		
Motes	4	34.7	2.86	0.330	1.50	0.173		
LC	8	33.2	1.21	0.292	0.66	0.159		
OF	1	31.0	1.36	0.044	0.83	0.027		
Gin Stand Trash	2	31.1	3.62	0.233	1.44	0.093		
BC	4	32.2	0.66	0.082	0.10	0.012		
(Est.) Mote Cleaner (3/4 Motes gr. loading)	2	34.7	-	0.070	-	0.037		
				Σ=1.70		Σ=0.815		

Source category:	Cotton	COTTON6	Date:	11/11/94
Plant name :	County Line Gin		Location:	Hanford, CA
Test date :	Dec 8-11, 1991		Ref. No.:	
Process :			Basis for process rate :	production

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Number of cyclones	Process rate, bales/hr	Emission factor kg/bale	Emission factor lb/bale
Motes cyclone	4-44" 1D-3D cyclones	filt. PM	1	2.97	4	34.70	0.155	0.342
		filt. PM	2	3.04	4	34.70	0.159	0.350
		filt. PM	3	2.58	4	34.70	0.135	0.297
		AVERAGE					0.150	0.330
		PM-10	1	1.61	4	34.70	0.0843	0.186
		PM-10	2	1.55	4	34.70	0.0811	0.179
		PM-10	3	1.35	4	34.70	0.0707	0.156
		AVERAGE					0.0787	0.173
Suction cyclone	3-46" 1D-3D cyclones	filt. PM	1	2.69	3	35.20	0.104	0.229
		filt. PM	2	3.62	3	35.20	0.140	0.309
		filt. PM	3	4.33	3	35.20	0.168	0.369
		AVERAGE					0.137	0.302
		PM-10	1	1.44	3	35.20	0.0557	0.123
		PM-10	2	1.81	3	35.20	0.0700	0.154
		PM-10	3	2.11	3	35.20	0.0816	0.180
		AVERAGE					0.0691	0.152
Lint cleaner cyclone	8-48" 1D-3D cyclones	filt. PM	1	1.01	8	33.20	0.110	0.243
		filt. PM	2	1.60	8	33.20	0.175	0.386
		filt. PM	3	1.03	8	33.20	0.113	0.248
		AVERAGE					0.133	0.292
		PM-10	1	0.517	8	33.20	0.0566	0.125
		PM-10	2	0.912	8	33.20	0.0998	0.220
		PM-10	3	0.544	8	33.20	0.0595	0.131
		AVERAGE					0.0719	0.158
Overflow cyclone	1-40" 1D-3D cyclone	filt. PM	1	1.26	1	31.00	0.0185	0.0406
		filt. PM	2	1.41	1	31.00	0.0206	0.0455
		filt. PM	3	1.41	1	31.00	0.0206	0.0455
		AVERAGE					0.0199	0.0439
		PM-10	1	0.809	1	31.00	0.0118	0.0261
		PM-10	2	0.975	1	31.00	0.0143	0.0314
		PM-10	3	0.714	1	31.00	0.0105	0.0230
		AVERAGE					0.0122	0.0269

Source category:	Cotton	COTTON6	Date: 11/11/94
Plant name :	County Line Gin		Location: Hanford, CA
Test date :	Dec 8-11, 1991		Ref. No.:
Process :		Basis for process rate :	production

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Number of cyclones	Process rate, bales/hr	Emission factor kg/bale	Emission factor lb/bale
No. 1 drying cyclone	4-41" 1D-3D cyclones	filt. PM	1	1.41	4	33.90	0.0755	0.166
		filt. PM	2	2.74	4	33.90	0.147	0.323
		filt. PM	3	2.00	4	33.90	0.107	0.236
		AVERAGE					0.110	0.242
		PM-10	1	0.473	4	33.90	0.0253	0.0558
		PM-10	2	1.47	4	33.90	0.0785	0.173
		PM-10	3	0.857	4	33.90	0.0459	0.101
		AVERAGE					0.0499	0.110
Gin stand trash cyclone Includes 'impact cleaner trash, mote trash, gin stand/feed trash	2-38" 1D-3D cyclones	filt. PM	1	4.62	2	31.10	0.135	0.297
		filt. PM	2	3.13	2	31.10	0.0914	0.201
		filt. PM	3	3.10	2	31.10	0.0905	0.199
		AVERAGE					0.106	0.233
		PM-10	1	1.73	2	31.10	0.0505	0.111
		PM-10	2	1.37	2	31.10	0.0400	0.0881
		PM-10	3	1.23	2	31.10	0.0359	0.0791
		AVERAGE					0.0421	0.0928
Battery condenser cyclone	4-49" 1D-3D cyclones	filt. PM	1	0.320	4	32.20	0.0180	0.0398
		filt. PM	2	0.610	4	32.20	0.0344	0.0758
		filt. PM	3	1.04	4	32.20	0.0587	0.129
		AVERAGE					0.0370	0.0816
		PM-10	1	0.127	4	32.20	0.00716	0.0158
		PM-10	2	0.122	4	32.20	0.00689	0.0152
		PM-10	3	0.0616	4	32.20	0.00347	0.00765
		AVERAGE					0.00584	0.0129
No. 2 drying cyclone	4-40" 1D-3D cyclones	filt. PM	1	0.790	4	33.00	0.0435	0.0958
		filt. PM	2	0.820	4	33.00	0.0451	0.0994
		filt. PM	3	0.950	4	33.00	0.0523	0.115
		AVERAGE					0.0470	0.103
		PM-10	1	0.448	4	33.00	0.0247	0.0543
		PM-10	2	0.400	4	33.00	0.0220	0.0484
		PM-10	3	0.456	4	33.00	0.0251	0.0552
		AVERAGE					0.0239	0.0527

2 additional cyclones control emissions from mote cleaning operations
1-36" 1D-3D cyclone
and
1-44" 1D-3D cyclone

APPENDIX G

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 7

WESTFIELD GIN
11054 West Mount Whitney Ave.
Riverdale, CA 93656

PM10 & TOTAL PARTICULATE TESTING
TRASH CYCLONE

November 12, 1992

Prepared By:

BTC ENVIRONMENTAL, INC.
1536 Eastman Avenue
Ventura, CA 93003

Job Number
23024

Laboratory Report Number
292-161

Test Team Leader
Cam Donnahoo

Results Verified By:
Tom Porter
Vice President - Air Test Division

INTRODUCTION

On November 12, 1992, BTC Environmental performed source emissions tests for PM-10 particulate matter on the Trash Cyclone. The cyclone is located at the Westfield Gin, 11054 West Mount Whitney Ave., Riverdale, California. Sampling was done in triplicate for total particulate and PM-10 particule size distribution. Production rates, in bales per hour, was taken by Westfield personnel. 866-5671

SAMPLING AND ANALYTICAL PROCEDURES

STACK GAS ANALYSIS: The oxygen and carbon dioxide content of the exhaust gases were assumed to be ambient air. Oxygen = 20.9% and Carbon Dioxide = 0.05%.

STACK GAS VELOCITY: The stack gas velocity was determined using an "S" type pitot tube connected to a magnehelic gauge. The "S" type pitot was used to determine the stack velocity profile for each run. Sampling was conducted from one (1) horizontal port. A total of eight (8) traverse points was utilized. The sample duct was in an horizontal configuration thus only one (1) sample port was accessible

The stack temperature was determined using a thermocouple and an indicating pyrometer. The proportion of water was determined gravimetrically and the dry molecular weight of the stack gas determined by E.P.A. Method 3, equation 3-2. Stack velocities were calculated using E.P.A. Method 2, equation 2-9; gas volumetric flow rate was determined by equation 2-10.

TOTAL PARTICULATE EMISSIONS: A CARB Method 5 sampling train was utilized to determine the total particulate emission from the cyclones. The sample train consisted of a stainless steel nozzle, a heated stainless steel probe, a heated glass fiber filter and cooled impingers. After the weight is obtained from the filter, probe and nozzle rinses; the total solids in the impingers is added to the front-end catch to satisfy APCD rules.

PARTICULE SIZE DITRIBUTION: A sample was taken isokinetically from the stack using a Gil cascade impactor. A modified CARB Method 501 was utilized. The impactor consisted of two (2) slotted discs, a back up filter and cooled impingers. The first two (2) discs are +10μ and the backup filter and impingers are -10μ. The total weights obtained from each fraction were added together to obtain the total particulate weight. The total weight was used to determine the % of the +10μ and the -10μ fraction. The total weight obtained from the total particulate runs are used to determine the +10μ and the -10μ results reported in grains/dscf, lb/hr and lb/bale.

PARTICULATE EMISSION SUMMARY

TRASH CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0745	0.0773	0.0826	*0.0781*
lb/hr	2.49	2.65	2.86	*2.67*
lb/bale	0.19	0.19	0.21	*0.20*
Particule Size Distribution				
+10μ (%)	70.96	66.47	76.92	*71.45*
+10μ (lb/hr)	1.77	1.76	2.20	*1.91*
+10μ (lb/bale)	0.13	0.13	0.16	*0.14*
−10μ (%)	29.04	33.53	23.08	*28.55*
−10μ (lb/hr)	0.72	0.89	0.66	*0.76*
−10μ (lb/bale)	0.06	0.06	0.05	*0.06*
Bales/hr	13.2	13.8	13.2	

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg R	534.1	540.5	549.3	
Trash	Moisture	%	0.7	0.4	0.8	
stockpiler	Oxygen	%	20.9	20.9	20.9	
cyclone	Volumetric flow, actual	acfm	3988	4128	4260	
	Volumetric flow, standard	dscfm	3909	4007	4041	
	Isokinetic variation	%	90.2	90.3	90.2	
Circle: Production or feed rate Capacity:		bales/hr	13.2	13.8	13.2	
	Pollutant concentrations:					
	Total PM	g/dscf	0.0752	0.0773	0.0826	
	Filterable PM	% of total	98.88%	93.69%	99.66%	
	Condensible PM	% of total	1.12%	6.31%	0.34%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	2.52	2.65	2.86	
	Filterable PM	lb/hr	2.49	2.49	2.85	
	Condensible PM	lb/hr	0.0282	0.168	0.00986	
	Emission factors:					
	Total PM	lb/bale	0.19	0.19	0.22	0.20
	Filterable PM	lb/bale	0.19	0.18	0.22	0.20
	Condensible PM	lb/bale	0.0021	0.012	0.00075	0.0050

Condensible PM considered negligible--only report total PM

Multiply single cyclone emission factors by 2 to determine factors for the source

Source is controlled by two 1D-3D cyclones		Run 1	Run 2	Run 3	Average
Total PM emission factor	lb/bale	0.38	0.38	0.43	0.40

Test ID	Parameter	Units	Values reported Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg R	534.1	540.5	547.9	
Trash	Moisture	%	0.7	0.4	0.8	
cyclone	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	4071	4014	4168	
	Volumetric flow, standard	dscfm	3989	3895	3962	
	Isokinetic variation	%	100.2	100	101.4	
Circle: Production or feed rate Capacity:		bales/hr	13.2	13.8	13.2	
	Pollutant concentrations:					
	PM-10	% of PM	29.04%	33.53%	23.08%	
	Pollutant mass flux rates:					
	PM-10	lb/hr	0.73	0.89	0.66	
	Emission factors:					
	PM-10	lb/bale	0.055	0.065	0.050	0.057

Multiply single cyclone emission factors by 2 to determine factors for the source

Source is controlled by two 1D-3D cyclones		Run 1	Run 2	Run 3	Average
PM-10 emission factor	lb/bale	0.11	0.13	0.10	0.11

APPENDIX H

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 8

WEST VALLEY COTTON GROWERS
10030 West Mount Whitney Ave.
Riverdale, CA 93656
Attn: Tom Pires

PM10 & TOTAL PARTICULATE TESTING
BATTERY CONDENSER &
#3 DRYER/CLEANER CYCLONES

OCTOBER 28, 1993

Prepared By:

BTC ENVIRONMENTAL, INC.
1536 Eastman Avenue
Ventura, CA 93003

Job Number
23029

Laboratory Report Number
293-133

Test Team Leader
David Whitcomb

Results Verified By:
Tom Porter
Vice President - Air Test Division

November 24, 1993

BTC ENVIRONMENTAL INCORPORATED

INTRODUCTION

On October 28, 1993, BTC Environmental performed source emissions tests for Total and PM-10 particulate matter on a Condenser Battery and a #3 Dryer/Cleaner Cyclone. The cyclones are located at West Valley Cooton Growers Gin, 10030 West Mount Whitney Ave., Riverdale, California. Sampling was done in triplicate for total particulate and PM-10 particule size distribution. Production rates, in bales per hour, were taken by West Valley Cotton Growers personnel. No problems were encountered during the sampling. The exhaust stacks were candy canes attached to the top of the cyclones and continued in a vertical position. The testing was conducted with two (2) ports. The Battery Condenser duct is 36 inches in diameter and the ports ports were located 18 inches upstream and 75 inches downstream from the nearest disturbance. The #3 Dryer/Cleaner duct is 17 inches in diameter and the ports ports were located 18 inches upstream and 180 inches downstream from the nearest disturbance.

SAMPLING AND ANALYTICAL PROCEDURES

STACK GAS ANALYSIS: The oxygen and carbon dioxide content of the exhaust gases were assumed to be ambient air. Oxygen = 20.9% and Carbon Dioxide = 0.05%.

STACK GAS VELOCITY: The stack gas velocity was determined using an "S" type pitot tube connected to a magnehelic gauge. The "S" type pitot was used to determine the stack velocity profile for each run. A total of 24 (12 points per port) traverse points were utilized on each duct.

The stack temperature was determined using a thermocouple and an indicating pyrometer. The proportion of water was determined gravimetrically and the dry molecular weight of the stack gas determined by E.P.A. Method 3, equation 3-2. Stack velocities were calculated using E.P.A. Method 2, equation 2-9; gas volumetric flow rate was determined by equation 2-10.

TOTAL PARTICULATE EMISSIONS: A CARB Method 5 sampling train was utilized to determine the total particulate emission from the cyclones. The sample train consisted of a stainless steel nozzle, a heated stainless steel probe, a heated glass fiber filter and cooled impingers. After the weight is obtained from the filter, probe and nozzle rinses; the total solids in the impingers is added to the front-end catch to satisfy SJVUAPCD rules.

PARTICULE SIZE DISTRIBUTION: A sample was taken isokinetically from the stack using a GII cascade impactor. A modified CARB Method 501 was utilized. The impactor consisted of two (2) slotted discs, a back up filter and cooled impingers. The first two (2) discs are +10μ and the backup filter, probe and impingers are -10μ. The total weights obtained from each fraction were added together to obtain the total particulate weight. The total weight was used to determine the % of the +10μ and the -10μ fraction. The total weight obtained from the total particulate runs are used to determine the +10μ and the -10μ results reported in grains/dscf, lb/hr and lb/bale.

PARTICULATE EMISSION SUMMARY

BATTERY CONDENSER CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0152	0.0131	0.0131	*0.0138*
lb/hr	0.84	0.81	0.78	*0.81*
lb/bale	0.05	0.04	0.03	*0.04*
Particule Size Distribution				
+10µ (%)	56.13	49.51	75.68	*60.44*
+10µ (lb/hr)	0.47	0.40	0.59	*0.49*
+10µ (lb/bale)	0.03	0.02	0.03	*0.03*
−10µ (%)	43.87	50.49	24.32	*39.56*
−10µ (lb/hr)	0.37	0.41	0.19	*0.32*
−10µ (lb/bale)	0.02	0.02	0.01	*0.02*
Average Bales/hr	16.0	20.9	22.3	*19.7*

#3 DRYER/CLEANER CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0441	0.0346	0.0307	*0.0365*
lb/hr	0.74	0.60	0.53	*0.62*
lb/bale	0.03	0.02	0.02	*0.03*
Particule Size Distribution				
+10µ (%)	63.77	71.86	58.81	*64.81*
+10µ (lb/hr)	0.47	0.43	0.31	*0.40*
+10µ (lb/bale)	0.02	0.02	0.01	*0.02*
−10µ (%)	36.23	28.14	41.19	*35.19*
−10µ (lb/hr)	0.27	0.17	0.22	[illegible]
−10µ (lb/bale)	0.01	0.01	0.01	[illegible]
Average Bales/hr	23.2	24.3	22.7	*23.4*

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg R	530.1	541.6	550.4	
Battery condenser cyclone	Moisture	%	1	1	0.6	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	6710	7579	7460	
	Volumetric flow, standard	dscfm	6474	7163	6937	
	Isokinetic variation	%	100.2	98.1	97.3	
Circle: Production or feed rate Capacity:		bales/hr	16	20.9	22.3	
Battery condenser controlled by a single 80" 1D-3D cyclone	Pollutant concentrations:					
	Total PM	g/dscf	0.0152	0.0131	0.0131	
	Filterable PM	% of total	99.01%	93.42%	93.96%	
	Condensible PM	% of total	0.99%	6.58%	6.04%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.843	0.804	0.779	
	Filterable PM	lb/hr	0.835	0.751	0.732	
	Condensible PM	lb/hr	0.00831	0.0529	0.0471	
	Emission factors:					
	Total PM	lb/bale	0.0527	0.0385	0.0349	0.0420
	Filterable PM	lb/bale	0.0522	0.0360	0.0328	0.0403
	Condensible PM	lb/bale	0.000519	0.00253	0.00211	0.00172

Use total PM data only--condensible PM considered negligible

Test ID	Parameter	Units	Values reported Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg R	528.3	539.3	549.4	
Battery condenser cyclone	Moisture	%	1.491	1.12	1.35	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	6257	7817	7500	
	Volumetric flow, standard	dscfm	6030	7408	6935	
	Isokinetic variation	%	80.2	85.1	85.1	
Circle: Production or feed rate Capacity:		bales/hr	16	20.9	22.3	
Battery condenser controlled by a single 80" 1D-3D cyclone	Pollutant concentrations:					
	PM-10	% of PM	43.87%	50.49%	24.32%	
	Pollutant mass flux rates:					
	PM-10	lb/hr	0.37	0.41	0.19	
	Emission factors:					
	PM-10	lb/bale	0.0231	0.0194	0.0085	0.0170

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
3	Stack temperature	Deg R	556.7	559.5	553.6	
#3 Dryer/ cleaner cyclone	Moisture	%	1	0.8	0.7	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	2156	2233	2200	
	Volumetric flow, standard	dscfm	1965	2030	2022	
	Isokinetic variation	%	97.9	97.7	90.5	
Circle: Production or feed rate Capacity:		bales/hr	23.2	24.3	22.7	
Controlled by three 38" 1D-3D cyclones	Pollutant concentrations:					
	Total PM	g/dscf	0.0441	0.0346	0.0307	
	Filterable PM	% of total	81.24%	98.26%	94.24%	
	Condensible PM	% of total	18.76%	1.74%	5.76%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.743	0.602	0.532	
	Filterable PM	lb/hr	0.603	0.592	0.501	
	Condensible PM	lb/hr	0.13932	0.0105	0.0306	
	Emission factors:					
	Total PM	lb/bale	0.0464	0.0288	0.0239	0.0330
	Filterable PM	lb/bale	0.0377	0.0283	0.0225	0.0295
	Condensible PM	lb/bale	0.008707	0.00050	0.00137	0.00353

Multiply single cyclone emission factors by three to determine total process emissions

3 cyclone	Emission factors:					
	Total PM	lb/bale	0.14	0.086	0.072	0.099

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
4	Stack temperature	Deg R	556.6	556.8	554	
#3 Dryer/ cleaner cyclone	Moisture	%	0.776	1.717	1.05	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	2151	2194	2168	
	Volumetric flow, standard	dscfm	1966	1985	1984	
	Isokinetic variation	%	83	83.6	84	
Circle: Production or feed rate Capacity:		bales/hr	23.2	24.3	22.7	
Controlled by three 38" 1D-3D cyclones	Pollutant concentrations:					
	PM-10	% of PM	36.23%	28.14%	41.19%	
	Pollutant mass flux rates:					
	PM-10	lb/hr	0.27	0.17	0.22	
	Emission factors:					
	PM-10	lb/bale	0.0168	0.0081	0.0098	0.0116

Multiply single cyclone emission factors by three to determine total process emissions

3 cyclone	Emission factors:					
	PM-10	lb/bale	0.050	0.024	0.029	0.035

APPENDIX I

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 9

DOS PALOS COOPERATIVE

7870 W. Hutchins Road
Dos Palos, CA

PM10 & TOTAL PARTICULATE TESTING MOTES, SUCTION, LINT CLEANER, OVERFLOW, #1 DRYING, BATTERY CONDENSER AND #2 DRYING CYLONES

November 27 - 29, 1992

Prepared By:

BTC ENVIRONMENTAL, INC.
1536 Eastman Avenue
Ventura, CA 93003

Job Number
5019

Laboratory Report Number
292-157

Test Team Leader
Cam Donnahoo

Results Verified By:
Tom Porter
Vice President - Air Test Division

for Banking emissions

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INTRODUCTION

On November 27 - 29, 1992, BTC Environmental performed source emissions tests for PM-10 particulate matter on a Motes Cyclone, Suction Cyclone, Lint Cleaner Cyclone, Overflow Cleaner, #1 Drying Cyclone, Battery Condenser Cyclone and the #2 Drying Cyclone. The cyclones are located at the Dos Palos Cooperative #2 Gin, 7870 West Hutchins Road, Dos Palos, California. Sampling was done in triplicate for total particulate and PM-10 particule size distribution. Production rates, in bales per hour, was taken by Robert Eckley with Eckley Engineering. *

SAMPLING AND ANALYTICAL PROCEDURES

STACK GAS ANALYSIS: The oxygen and carbon dioxide content of the exhaust gases were assumed to be ambient air. Oxygen = 20.9% and Carbon Dioxide = 0.05%.

STACK GAS VELOCITY: The stack gas velocity was determined using an "S" type pitot tube connected to a magnehelic gauge. The "S" type pitot was used to determine the stack velocity profile for each run. Sampling was conducted from two (2) horizontal ports. A total of twelve (8) traverse points was utilized at each port for a total of 16 sample points.

The stack temperature was determined using a thermocouple and an indicating pyrometer. The proportion of water was determined gravimetrically and the dry molecular weight of the stack gas determined by E.P.A. Method 3, equation 3-2. Stack velocities were calculated using E.P.A. Method 2, equation 2-9; gas volumetric flow rate was determined by equation 2-10.

TOTAL PARTICULATE EMISSIONS: A CARB Method 5 sampling train was utilized to determine the total particulate emission from the cyclones. The sample train consisted of a stainless steel nozzle, a heated stainless steel probe, a heated glass fiber filter and cooled impingers. After the weight is obtained from the filter, probe and nozzle rinses; the total solids in the impingers is added to the front-end catch to satisfy APCD rules.

PARTICULE SIZE DITRIBUTION: A sample was taken isokinetically from the stack using a GII cascade impactor. A modified CARB Method 501 was utilized. The impactor consisted of two (2) slotted discs, a back up filter and cooled impingers. The first two (2) discs are +10µ and the backup filter and impingers are -10µ. The total weights obtained from each fraction were added together to obtain the total particulate weight. The total weight was used to determine the % of the +10µ and the -10µ fraction. The total weight obtained from the total particulate runs are used to determine the +10µ and the -10µ results reported in lb/hr.

PARTICULATE EMISSION SUMMARY

MOTES CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0156	0.0126	0.0174	*0.0152*
lb/hr	0.96	0.79	1.06	*0.94*
Particule Size Distribution				
+10µ (%)	33.78	29.22	44.84	*35.95*
+10µ (lb/hr)	0.32	0.23	0.48	*0.34*
−10µ (%)	66.22	70.78	55.16	*64.05*
−10µ (lb/hr)	0.64	0.56	0.58	*0.59*

BATTERY CONDENSER CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0054	0.0049	0.0038	*0.0047*
lb/hr	0.26	0.24	0.18	*0.23*
Particule Size Distribution				
+10µ (%)	43.40	33.73	7.42	*28.18*
+10µ (lb/hr)	0.11	0.08	0.01	*0.07*
−10µ (%)	56.60	66.27	92.58	*71.82*
−10µ (lb/hr)	0.15	0.16	0.17	*0.16*

OVERFLOW CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0046	0.0091	0.0082	*0.0073*
lb/hr	0.17	0.33	0.30	*0.27*
Particule Size Distribution				
+10µ (%)	67.47	57.50	57.96	*60.98*
+10µ (lb/hr)	0.11	0.19	0.17	*0.16*
−10µ (%)	32.53	42.50	42.04	*39.02*
−10µ (lb/hr)	0.06	0.14	0.13	*0.11*

PARTICULATE EMISSION SUMMARY (Cont)

LINT CLEANER CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0115	0.0087	0.0084	***0.0095***
lb/hr	0.63	0.46	0.46	***0.52***
Particule Size Distribution				
+10µ (%)	53.66	51.60	46.43	***50.56***
+10µ (lb/hr)	0.34	0.24	0.21	***0.26***
-10µ (%)	46.34	48.40	53.57	***49.44***
-10µ (lb/hr)	0.29	0.22	0.25	***0.25***

#1 DRYING CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0841	0.0927	0.0780	***0.0849***
lb/hr	4.71	5.15	4.38	***4.75***
Particule Size Distribution				
+10µ (%)	79.75	76.98	74.70	***77.14***
+10µ (lb/hr)	3.76	3.96	3.27	***3.66***
-10µ (%)	20.25	23.02	25.30	***22.86***
-10µ (lb/hr)	0.95	1.19	1.11	***1.08***

SUCTION CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0120	0.0201	0.0194	***0.0172***
lb/hr	0.52	0.91	0.79	***0.74***
Particule Size Distribution				
+10µ (%)	30.74	43.60	44.11	***39.48***
+10µ (lb/hr)	0.16	0.40	0.35	***0.30***
-10µ (%)	69.26	56.40	55.89	***60.52***
-10µ (lb/hr)	0.36	0.51	0.44	***0.44***

PARTICULATE EMISSION SUMMARY (Cont)

#2 DRYER CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0366	0.0426	0.0320	*0.0371*
lb/hr	2.43	2.92	2.13	*2.49*
Particule Size Distribution				
+10µ (%)	73.17	70.31	88.64	*77.37*
+10µ (lb/hr)	1.78	2.05	1.89	*1.91*
−10µ (%)	26.85	29.69	11.36	*22.63*
−10µ (lb/hr)	0.65	0.87	0.24	*0.59*

	Cyclone No & Ø	$\bar{X}$ gr/dscf	TSP per cyclone lb/hr	per cyclone lb/hr	% PM_{10}	per cyclone lb/hr PM_{10}	per cyclone lb/hr PM_{10}	STD bales/hr	STD lb TSP/bale	STD lb PM_{10}/bale
Suction	3 ~ 46	0.0123	0.74	2.22	60.52	0.44	1.32	24.6	0.0902	0.0536
#1 Dry	2 ~ 50	0.0944	4.75	9.50	22.86	1.08	2.16	24.3	0.3909	0.0889
#2 Dry	2 ~ 50	0.0371	2.49	4.98	23.69	0.59	1.18	24.3	0.2049	0.0486
Overflow	1 ~ 36	0.0073	0.27	0.27	39.02	0.11	0.11	23.8	0.0113	0.0048
Motes	4 ~ 42	0.0162	0.94	3.76	64.05	0.59	2.36	22.4	0.1679	0.1054
LC	6 ~ 48	0.0096	0.52	3.12	49.44	0.26	1.50	24.5	0.1273	0.0612
BC	4 ~ 48	0.0047	0.23	0.92	71.82	0.16	0.64	26.4	0.0362	0.0242
Trash not meas. use motes $\times 0.51 \cdot (\frac{30}{42})^2$ avg. bales/hr 24.0	1 ~ 30	0.0162	0.48	0.48	64.06	0.30	0.30	24.0	0.0200	0.0125
								Σ	1.05 TSP	0.4003 PM_{10}

0.4003 lb/bale PM_{10}

From motes bales work sht — 0.002

0.402 lb/bale PM_{10}

PM_{10} is 38% of TSP

$\boxed{PM_{10} = 0.40 \text{ lb/bale}}$

Wendy Eckley
12/20/92

Dos Palos Cooperative Gin
Source Test Calcs

Eckley Engineering
265 N Fulton
Fresno CA 93721-1614
Phone (209) 233-1217
FAX 209-233-5756

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To Brian Shrager | From Kai Chan
Co. | Co. SJVUAPCD
Dept. | Phone # (209) 545-7000
Fax # (919) 677-0065 | Fax #

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Process rates adjusted. Emission factors represent entire process, not just emissions from the cyclone tested.

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	81	85.3	86.1	
MOTES	Pressure	in. HG	30.05	30.05	30.05	
CYCLONES	Moisture	%	0.9	0.9	0.9	
4-42"	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	7530	7673	7535	
	Volumetric flow, standard*	dscfm	7204	7283	7141	
	Isokinetic variation	%	99.4	102	103.4	
Circle: Production or feed rate Capacity:		bales/hr	5.6	5.6	5.6	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0156	0.0126	0.0174	
	PM-10	% of total	66.22%	70.78%	55.16%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.963	0.787	1.07	0.938
	PM-10	lb/hr	0.638	0.557	0.587	0.594
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.172	0.140	0.190	0.168
	PM-10	lb/bale	0.114	0.0994	0.105	0.106
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.0780	0.0637	0.0863	0.0760
	PM-10	kg/bale	0.0517	0.0451	0.0476	0.0481

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

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D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg F	90.4	87.8	87.3	
BATTERY	Pressure	in. HG	29.93	29.93	29.91	
CONDENSE	Moisture	%	2.8	1.5	3.4	
CYCLONE	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	6109	6080	6101	
	Volumetric flow, standard*	dscfm	5612	5687	5598	
	Isokinetic variation	%	104.9	102.7	108.2	
Circle: Production or feed rate Capacity:		bales/hr	6.35	6.35	6.35	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0054	0.0049	0.0038	
	PM-10	% OF TOTAL	56.60%	66.27%	92.58%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.260	0.239	0.182	0.227
	PM-10	lb/hr	0.147	0.158	0.169	0.158
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.0409	0.0376	0.0287	0.0357
	PM-10	lb/bale	0.0232	0.0249	0.0266	0.0249
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/bale	0.0186	0.0171	0.0130	0.0162
	PM-10	kg/bale	0.0105	0.0113	0.0121	0.0113

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

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D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported Run 1	Run 2	Run 3	Run 4
3	Stack temperature	Deg F	70.4	72.8	77.9	
OVERFLOW	Pressure	in. HG	30.05	30.05	30	
CYCLONE	Moisture	%	1	0.9	0.8	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	4355	4327	4369	
	Volumetric flow, standard*	dscfm	4245	4203	4201	
	Isokinetic variation	%	103.4	103.3	106.6	
Circle: Production or feed rate Capacity:		bales/hr	23.8	23.8	23.8	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0046	0.0091	0.0082	
	PM-10	% OF TOTAL	32.53%	42.50%	42.04%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.167	0.328	0.295	0.264
	PM-10	lb/hr	0.054	0.139	0.124	0.106
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.00703	0.0138	0.0124	0.0111
	PM-10	lb/bale	0.00229	0.00585	0.00522	0.00445
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.00319	0.00625	0.00563	0.00502
	PM-10	kg/bale	0.00104	0.00266	0.00237	0.00202

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

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D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
4	Stack temperature	Deg F	84.6	84.4	84.8	
LINT	Pressure	in. HG	30	30	30	
CLEANER	Moisture	%	0.8	0.7	0.8	
CYCLONE	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	6687	6501	6756	
	Volumetric flow, standard*	dscfm	6351	6183	6414	
	Isokinetic variation	%	102.4	99.9	102.7	
Circle: Production or feed rate Capacity:		bales/hr	4.08	4.08	4.08	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0115	0.0087	0.0084	
	PM-10	% OF TOTAL	46.34%	48.40%	53.57%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.626	0.461	0.462	0.516
	PM-10	lb/hr	0.290	0.223	0.247	0.254
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.153	0.113	0.113	0.126
	PM-10	lb/bale	0.0710	0.0546	0.0606	0.0621
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.0695	0.0512	0.0513	0.0574
	PM-10	kg/bale	0.0322	0.0248	0.0275	0.0282

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

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D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
5	Stack temperature	Deg F	134.9	130.4	126.2	
#1 DRYING CYCLONE	Pressure	in. HG	29.97	29.9	29.97	
	Moisture	%	2.3	2.2	2.4	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	7643	7536	7545	
	Volumetric flow, standard*	dscfm	6538	6487	6543	
	Isokinetic variation	%	109.3	106	108.5	
Circle: Production or feed rate Capacity:		bales/hr	12.15	12.15	12.15	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0841	0.0927	0.0780	
	PM-10	% OF TOTAL	20.25%	23.02%	25.30%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	4.71	5.15	4.37	4.75
	PM-10	lb/hr	0.954	1.19	1.11	1.08
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.388	0.424	0.360	0.391
	PM-10	lb/bale	0.0785	0.0977	0.0911	0.0891
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.176	0.192	0.163	0.177
	PM-10	kg/bale	0.0356	0.0443	0.0413	0.0404

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

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D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
6	Stack temperature	Deg F	66.8	67	70	
SUCTION	Pressure	in. HG	29.87	29.87	29.87	
CYCLONE	Moisture	%	0.5	1	0.8	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	5143	5401	4882	
	Volumetric flow, standard*	dscfm	5043	5267	4744	
	Isokinetic variation	%	104.9	92.9	106.2	
Circle: Production or feed rate Capacity:		bales/hr	8.20	8.20	8.20	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0120	0.0201	0.0194	
	PM-10	% OF TOTAL	69.26%	56.40%	55.89%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.519	0.907	0.789	0.738
	PM-10	lb/hr	0.359	0.512	0.441	0.437
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.0633	0.111	0.0962	0.0900
	PM-10	lb/bale	0.0438	0.0624	0.0538	0.0533
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.0287	0.0502	0.0436	0.0408
	PM-10	kg/bale	0.0199	0.0283	0.0244	0.0242

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

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D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
7	Stack temperature	Deg F	114.8	120.1	120.1	
#2 DRYING CYCLONE	Pressure	in. HG	29.92	29.92	29.92	
	Moisture	%	1.5	2.2	1.2	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	8682	9108	8777	
	Volumetric flow, standard*	dscfm	7736	7985	7773	
	Isokinetic variation	%	99.5	93.1	100.1	
Circle: Production or feed rate Capacity:		bales/hr	12.15	12.15	12.15	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0366	0.0426	0.0320	
	PM-10	% OF TOTAL	26.85%	29.69%	11.36%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	2.43	2.92	2.13	2.49
	PM-10	lb/hr	0.652	0.866	0.242	0.587
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.200	0.240	0.175	0.205
	PM-10	lb/bale	0.0536	0.0712	0.0199	0.0483
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.0906	0.109	0.0796	0.0930
	PM-10	kg/bale	0.0243	0.0323	0.00904	0.0219

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

APPENDIX J

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 10

STATE OF TENNESSEE

DEPARTMENT OF HEALTH AND ENVIRONMENT

DIVISION OF AIR POLLUTION CONTROL

Halls Gin Company
Industrial Road
P.O. Box 158
Halls, Tennessee 38040

Reference Number: 49-00074

Particulate Emissions from Cotton Gin Exhausts

October 25-27, 1988

Submitted by: Carl Koontz
Carl Koontz
Compliance Monitoring Program

Eric R. Flowers
Eric Flowers
Air Resources Management Program

Forwarded by: Harold E. Hodges
Harold E. Hodges, P.E.
Technical Secretary
Tennessee Air Pollution Control Board

COMMENTS CONCERNING THE TESTING OF CYCLONE 8B

At the conclusion of the third sample run for Cyclone 8B an accident occurred which destroyed the filter for that sample run and contaminated the probe wash.

During the compilation of this report a comparison was made between the results obtained from the testing of Cyclone 8A with the filter weight gains from the first two sample runs for Cyclone 8B.

As the data obtained for Cyclone 8B is compatible with the results obtained for Cyclone 8A and since both Cyclones 8A and 8B are part of a doublet, it was determined that the sampling results obtained for Cyclone 8A would be prorated for Cyclone 8B. The SUMMARY OF RESULTS and DATA SUMMATION portions of this report reflect this decision.

EF/F1089012

I. Gin Description

Halls Gin Company is a newly constructed cotton gin which produced its first bale of cotton early in October 1988. Mr. Tom Hammond and Mr. Miller Pounds selected gin machinery and equipment for the new gin and are in charge of gin management. Mr. Bob Marshall of Covington, Tennessee was responsible for designing the gin, selecting and installing air pollution control devices, and managing the mechanical operation during the first season. Halls Gin has a capacity to handle 7 1/2 bales per hour for each of the three gin stands for a total capacity of 22 1/2 bales per hour. The location of the gin is in the Halls Industrial Park in Lauderdale County, just northwest of Halls and about 10 miles south of Dyersburg.

II. Process Description

A. Layout and Flow Diagram

Figure 1 depicts the layout of Halls Gin Company showing operations and equipment. Figure 2 is a flow diagram of how the cotton is ginned, tracing basic steps which include unloading of raw cotton, drying, cleaning, related processing, and baling of the cotton (the final product). The flow pattern of handling trash, byproducts, and emissions to the atmosphere is also depicted. Figure 3 is a diagram of the emission points at the gin.

B. Composition of Cotton

Cotton processed at Halls Gin Company is picker harvested cotton. This is a taller plant than the western "stripper-harvested" variety. A spindle picker harvests the cotton by removing cotton from the bur with rotating spindles, leaving unopened bolls on the plant and collecting fewer amounts of leaves, burs, and trash than stripper cotton.

Spindle picked cotton has the following approximate composition for a typical 1500 pound load.

Component	Weight (lbs)	Weight Percent (%)
Seed	800	53.3
Lint Cotton (bale)	495	33.0
Trash	158	10.5
Moisture	25	1.7
Motes	22	1.5
Total	1500	100.0

As can be seen from the above analysis, a 495 pound bale of lint cotton is recovered from 1500 pounds of spindle picked cotton. The above composition may vary especially due to actual trash content and moisture content. Besides lint cotton there are two other basic byproducts. Seed is sold as a separate product. Motes, which are basically immature seeds, are cleaned, baled, and sold for use as upholstery stuffing.

C. Process Operations

The purpose of a cotton gin is to separate cotton fibers (lint) from the cotton seed and to remove the trash from the lint. This is an essential function before cotton will be acceptable for use in the textile industry.

At Halls Gin Company this is accomplished in the following sequential manner.

1. Weighing and Unloading Stations

Trailers are previously weighed or weighed at the scale house without a load. The loaded trailer (gross weight) is then recorded and the difference in weight (tare weight) represents the weight of cotton. The loaded trailers are ticketed and brought into a two lane bay area inside the gin building. Here one trailer at a time is unloaded by means of a manually operated telescoping suction pipe (suck pipe). The number of bales of cotton per trailer load is typically between 6-14 and the time to unload a trailer varies normally between 25 to 58 minutes depending on operator ability, load size, and mechanical problems in the gin. Modules of cotton which have a protective covering are also unloaded in the bay area. Raw cotton is exhausted through the suction pipe to a 72 inch dual separator and feed control unit. The screen in the separator removes seed cotton from the conveying air allowing the cotton to fall into the feed control unit. Air and trash from the separator are exhausted to a quad cyclone unit consisting of Cyclones 1A, 1B, 1C, and 1D. The feed control unit functions to prevent choking in the seed cotton cleaners, evenly distributes cotton to the dryers and cleaners, and helps minimize time loss between bales.

2. Seed Cotton Cleaning System

A split tower dryer (primary drying system) unit receives seed cotton (cotton with seed intact) from the feed control unit. These 52 inch Murray dryers are heated by natural gas. Ideally, cotton is dried between 6.5 to 8.0% moisture. At Halls Gin the moisture content is typically 7 to 7.5%.

From the primary dryers, cotton is sent to two parallel systems of 72 inch inclined cleaners and stick and green leaf machines. Inclined Cleaner 1A and Stick Machine 1A are in parallel with Inclined Cleaner 1B and Stick Machine 1B. The inclined seed cotton cleaners open up the cotton and break up large clumps of cotton and then remove fine particle trash consisting of sand, dirt, and miscellaneous trash. From the inclined cleaners the seed cotton is further cleaned by an extractor or stick and green leaf machine. Centrifugal force from high-speed saw cylinders spin off large trash including sticks, stems, and burs from seed cotton. Fiber is retained on the saw. Air and trash from Inclined Cleaner 1B and Stick Machine 1B and from Inclined Cleaner 1A and Stick Machine 1A are exhausted to dual Cyclones 2A and 2B and Cyclones 3A and 3B, respectively.

Seed cotton is further dried in a secondary tower dryer system (52 inch Murray dryers) before routing to two parallel sets of inclined and impact cleaners. Cotton from the 1A system is sent to Inclined Cleaner 2A and Impact Cleaner 2A while 1B cotton is sent to Inclined Cleaner 2B and Impact Cleaner 2B. The 72 inch impact cleaners release the seed cotton to a 14 inch conveyor distributor. Seed cotton is then evenly distributed among three extractor-feeders routing seed cotton to each of three gin stands. Dual Cyclones 4A and 4B and dual Cyclones 5A and 5B handle air and trash from Inclined Cleaners 2B and 2A respectively.

3. Overflow System

When the flow of seed cotton from the conveyor distributor exceeds that able to be received from the gin stands, excess cotton is bypassed to an overflow hopper system. Seed cotton from the overflow hopper is pneumatically conveyed to a 50 inch separator returning seed cotton to the conveyor distributor. Cotton is then fed by extractor-feeders to the gin stands as needed.

Air and trash from the overflow separator, impact cleaners, extractor-feeders, and gin trash are routed to large dual Cyclones 6A and 6B.

4. Lint Cotton Handling System

The conveyor distributor apportions cotton to each of three parallel Continental 141 gin stands by means of three extractor-feeders. Each gin stand has a capacity of 7 1/2 bales per hour. The gin stand is the heart of the gin and utilizes the original basic ginning principle invented by Eli Whitney, the spiked tooth gin. Saw teeth pass between gin ribs. Fibers are pulled from the seed rather than cut since the leading edge of the saw teeth is parallel to the rib.

Cotton enters each gin stand system through a huller front where secondary cleaning occurs. The saws hold and draw out the cotton through widely spaced huller ribs causing hulls and sticks to fall out of the machine. Cotton locks are then drawn to the bottom of a roller box from the huller ribs.

The ginning process separating the lint and seed occurs in the roll box. After seeds are cleaned (fibers removed), they slide down the gin ribs and fall into a 6 inch seed line. Seeds are pneumatically conveyed from a vacuum box to a seed storage house. Lint cotton (seed cotton no longer exists at this stage) from the saw is removed by brushes known as doffing.

From here lint cotton is conveyed to a condenser screen drum that forms a lint batt. The batt is then fed to the first set of saw lint cleaners. Saws transport cotton over grid bars and combined with centrifugal force remove immature seeds with short immature fibers (motes) and comb the lint removing leaf particles, grass, and other foreign matter. Cleaned lint is taken off the saw by a rotating brush which also provides air to convey the lint to the second stage lint cleaner. Continental Sixteen D (16D) 66 inch 4C units are used at Halls Gin on the first and second stage lint cleaners. Lint is further cleaned by a third stage lint cleaner. Gin Stands 1 and 3 have 66 inch Continental units with Moss condensers as third stage lint cleaners. Gin Stand 2 is a Constellation unit. Eighty (80) mesh wire cloth cover all three Moss condenser drums. The 16D perforated drums have .045 inch diameter holes.

The first and second stage lint cleaners from the three gin stands vent lint fly and fine dust to three separate low pressure 26 inch diameter goose-necked exhaust vents. Similarly, the three Moss condensers vent emissions to three separate 42 inch diameter vents.

5. Mote System

Motes from all three stages of lint cleaning from each gin stand are pneumatically conveyed from three lines to three separate mote cyclones identified as Cyclones 9, 10, and 11. A common hopper serves these three cyclones. A single line from the hopper transports motes to the mote cleaner. A hopper under the cleaner collects trash from the motes, roughly 50% of the material, and returns it to Cyclones 7A and 7B at the main cyclone bank. Cleaned motes are then compressed in the mote press and baled as a product ready for shipping.

6. Battery Condenser and Bale System

Lint after being cleaned from the three stages of lint cleaners is blown through a trunk-line to a 54 inch Moss battery condenser. The condenser drum is covered with 80 mesh screen to minimize emissions. A single 42 inch diameter goose-necked vent serves this low pressure exhaust. The slow turning screened drum forms a lint batt which is routed between doffing rollers to a lint slide. The slide feeds the lint batt to a baling press, packing the lint cotton in a bale ready for shipment. Bales during the days of observation ranged in weight between 448 and 514 pounds.

7. Waste Disposal System

The main cyclone bank (cyclone sets 1 through 7) discharge trash and heavy material from the base trough of the cyclones to a trash fan. This fan blows the waste to dual Cyclones 8A and 8B above a waste disposal pile. Waste from these two cyclones is emptied to a screw conveyor which discharges the material to a waste pile about 15 feet above the ground. Two spray nozzles direct water to the cotton trash as it is augered on top of the pile. This further reduces emissions to the atmosphere.

III. Process Weight Rate and Field Notes

The following weights of raw cotton were recorded during the periods of emission testing.

Date of Testing	Time	Total Weight (lbs)	Elapsed Time (hrs)	Process Weight Rate (lbs/hr)	Bales/Hour @ 1500 lbs. per Bale
10/25/88	9:46 AM - 1:47 PM	93,060	4 1/60	23,168	15.45
10/26/88	8:46 AM - 5:15 PM	212,640	8 29/60	25,066	16.71
10/27/88	7:46 AM - 3:24 PM	189,590	7 38/60	24,837	16.56

The average process weight rate during the three days of testing calculated to be 24,357 lbs/hr or 16.24 bales per hour.

The above values were determined by utilizing weight tickets for each trailer load and timing the beginning and end of the loading as close as possible to the actual stack emission testing periods.

A random check of bale press times was made. The following times were measured at the bale press station.

Time to Form One Bale (minutes and seconds)	Bales Per Hour
3:50	15.65
2:50	21.18
3:22	17.82
3:30	17.14

This averages to be 17.94 bales per hour and is reasonably close to long range weight measurement over the three day period.

During actual operation it is not uncommon to observe periods of delay at the suction pipe due to mechanical problems in the gin machinery. In some cases, the suction pipe operator could not continue the unloading of the trailer. These delays were normally a few minutes.

CALCULATION OF ACTUAL EMISSIONS

HALLS GIN COMPANY (49-00074)

Source Identification Battery Condenser Vent

Test Date Oct. 27, 1988

Q = actual airflow in ft^3/min* 3,000

T_d = dry bulb temperature at exhaust point 80°F

T_w = wet bulb temperature at exhaust point 70°F

M = percent moisture in exhaust gases 2.5%

P_{bar} = barometric pressure 29.67

$$Q_{std} = (Q)\left(1 - \frac{M}{100}\right)$$

2,925

Q_{std} in dry standard ft^3/min

* Based on fan data obtained from the designer and builder of the gin. The fan data is at ambient temperature, which is approximately 70° F. Barometric pressures measured during the testing were within one percent of 29.92 in. of Hg. Therefore, the given flows are considered to be at standard conditions.

Company Halls Gin Co. Test Date Oct. 27, 1988

Cyclone I.D. Battery Condenser Vent

Run #	1	2	3	Ave.
M_s = percent moisture in exit gases (weighted averages of percent moistures obtained in inlet ducts)	2.5	2.5	2.5	
$QS_{std} = \frac{(SV)(17.71)(P_{bar})(1-\frac{Ms}{100})}{(T_o + 460)}$ (QSstd = total volume sampled at standard conditions ft^3)	338.7	338.7	338.7	
C_s (gr/dscf) $= \frac{(15.43)(TP)}{(QS_{std})}$ (Cs = particulate concentration)	0.0107	0.0073	0.0076	0.0085
$PMR_{lb/hr} = (C_s)(TQ_{std})(0.00857)$ TQ_{std} = (total air into cyclone) (PMR = mass emission rate)	0.27 0.268	0.183	0.191	0.21

(Note 1)

The rate of air flow through the orifice is precalculated for all pressure drops across the orifice using the various nozzles for an orifice temperature of 60°F. This figure is then converted to the actual air flow at the orifice temperature by the equation:

$$SR = \frac{(SR60)(T_o = 460)}{520}$$

Where: SR60 = sampling rate through orifice at 60°F
To = average temperature of orifice (°F)

JS/ah/APCHd1

Source category: Cotton
Plant name : Halls Gin
Test date : Oct. 25-27, 1988
Process :

COTTON10

Date: 11/30/94
Location: Halls, TN
Ref. No.:

Source	Pollutant	Run No.	Emission rate, lb/hr	Process rate, bales/hr	Emission factor kg/bale	Emission factor lb/bale
TOTAL EMISSION FACTORS BY PROCESS						
SUCTION CYCLONES	filt. PM	1			0.00768	0.0169
	filt. PM	2			0.00824	0.0181
	filt. PM	3			0.00739	0.0163
			AVERAGE		0.00777	0.0171
INCLINED CLEANER 1 CYCLONES	filt. PM	1			0.0222	0.0489
	filt. PM	2			0.0245	0.0539
	filt. PM	3			0.0331	0.0730
			AVERAGE		0.0266	0.0586
INCLINED CLEANER 2 CYCLONES	filt. PM	1			0.0163	0.0359
	filt. PM	2			0.0176	0.0387
	filt. PM	3			0.0158	0.0348
			AVERAGE		0.0166	0.0365
OVERFLOW CYCLONES	filt. PM	1			0.0120	0.0265
	filt. PM	2			0.0141	0.0310
	filt. PM	3			0.0136	0.0299
			AVERAGE		0.0132	0.0291
MOTE TRASH CYCLONES	filt. PM	1			0.0195	0.0431
	filt. PM	2			0.0227	0.0499
	filt. PM	3			0.0186	0.0410
			AVERAGE		0.0203	0.0447
COTTON WASTE DISPOSAL CYCLONES	filt. PM	1			0.0337	0.0743
	filt. PM	2			0.0283	0.0624
	filt. PM	3			0.0372	0.0819
			AVERAGE		0.0331	0.0729
MOTE PRESS CYCLONES	filt. PM	1			0.0322	0.0708
	filt. PM	2			0.0286	0.0630
	filt. PM	3			0.0342	0.0754
			AVERAGE		0.0317	0.0697
BATTERY CONDENSER VENT w/80 MESH SCREEN	filt. PM	1			0.00735	0.0162
	filt. PM	2			0.00502	0.0111
	filt. PM	3			0.00524	0.0115
			AVERAGE		0.00587	0.0129
LINT CLEANER FIRST AND SECOND STAGES w/16D PERFORATED DRUMS	filt. PM	1			0.125	0.275
	filt. PM	2			0.131	0.288
	filt. PM	3			0.154	0.340
			AVERAGE		0.137	0.301
LINT CLEANER THIRD STAGE w/80 MESH SCREEN	filt. PM	1			0.00718	0.0158
	filt. PM	2			0.00842	0.0185
	filt. PM	3			0.00963	0.0212
			AVERAGE		0.00841	0.0185

Source category:	Cotton	COTTON10	Date:	11/30/94
Plant name :	Halls Gin		Location:	Halls, TN
Test date :	Oct. 25-27, 1988		Ref. No.:	
Process :				

Source	Pollutant	Run No.	Emission rate, lb/hr	Process rate, bales/hr	Emission factor kg/bale	Emission factor lb/bale
Suction cyclone 1A	filt. PM	1	0.0575	15.45	0.00169	0.00372
	filt. PM	2	0.0719	15.45	0.00211	0.00465
	filt. PM	3	0.0599	15.45	0.00176	0.00388
	AVERAGE				0.00185	0.00408
Suction cyclone 1B	filt. PM	1	0.0815	15.45	0.00239	0.00528
	filt. PM	2	0.0719	15.45	0.00211	0.00465
	filt. PM	3	0.0623	15.45	0.00183	0.00403
	AVERAGE				0.00211	0.00465
Suction cyclone 1C	filt. PM	1	0.0551	15.45	0.00162	0.00357
	filt. PM	2	0.0647	15.45	0.00190	0.00419
	filt. PM	3	0.0719	15.45	0.00211	0.00465
	AVERAGE				0.00188	0.00414
Suction cyclone 1D	filt. PM	1	0.0671	15.45	0.00197	0.00434
	filt. PM	2	0.0719	15.45	0.00211	0.00465
	filt. PM	3	0.0575	15.45	0.00169	0.00372
	AVERAGE				0.00192	0.00424
1B Inclined cleaner cyclone 2A	filt. PM	1	0.199	16.71	0.00541	0.0119
	filt. PM	2	0.290	16.71	0.00788	0.0174
	filt. PM	3	0.405	16.71	0.0110	0.0242
	AVERAGE				0.00810	0.0178
1B Inclined cleaner cyclone 2B	filt. PM	1	0.290	16.71	0.00788	0.0174
	filt. PM	2	0.294	16.71	0.00799	0.0176
	filt. PM	3	0.279	16.71	0.00758	0.0167
	AVERAGE				0.00782	0.0172
1A Inclined cleaner cyclone 3A	filt. PM	1	0.152	15.45	0.00447	0.00984
	filt. PM	2	0.137	15.45	0.00403	0.00887
	filt. PM	3	0.191	15.45	0.00561	0.0124
	AVERAGE				0.00470	0.0104
1A Inclined cleaner cyclone 3B	filt. PM	1	0.152	15.45	0.00447	0.00984
	filt. PM	2	0.156	15.45	0.00458	0.0101
	filt. PM	3	0.304	15.45	0.00893	0.0197
	AVERAGE				0.00599	0.0132
2B Inclined cleaner cyclone 4A	filt. PM	1	0.0988	16.71	0.00268	0.00591
	filt. PM	2	0.117	16.71	0.00318	0.00700
	filt. PM	3	0.115	16.71	0.00312	0.00688
	AVERAGE				0.00300	0.00660
2B Inclined cleaner cyclone 4B	filt. PM	1	0.099	16.71	0.00268	0.00591
	filt. PM	2	0.140	16.71	0.00380	0.00838
	filt. PM	3	0.124	16.71	0.00337	0.00742
	AVERAGE				0.00329	0.00724

Source category: Cotton
Plant name : Halls Gin
Test date : Oct. 25-27, 1988
Process :

COTTON10

Date: 11/30/94
Location: Halls, TN
Ref. No.:

Source	Pollutant	Run No.	Emission rate, lb/hr	Process rate, bales/hr	Emission factor kg/bale	Emission factor lb/bale
2A Inclined cleaner cyclone 5A	filt. PM	1	0.206	16.71	0.00560	0.0123
	filt. PM	2	0.184	16.71	0.00500	0.0110
	filt. PM	3	0.114	16.71	0.00310	0.00682
	AVERAGE				0.00456	0.0101
2A Inclined cleaner cyclone 5B	filt. PM	1	0.197	16.71	0.00535	0.0118
	filt. PM	2	0.206	16.71	0.00560	0.0123
	filt. PM	3	0.228	16.71	0.00619	0.0136
	AVERAGE				0.00571	0.0126
Overflow cyclone 6A	filt. PM	1	0.179	16.71	0.00486	0.0107
	filt. PM	2	0.196	16.71	0.00533	0.0117
	filt. PM	3	0.152	16.71	0.00413	0.00910
	AVERAGE				0.00477	0.0105
Overflow cyclone 6B	filt. PM	1	0.263	16.71	0.00715	0.0157
	filt. PM	2	0.322	16.71	0.00875	0.0193
	filt. PM	3	0.348	16.71	0.00945	0.0208
	AVERAGE				0.00845	0.0186
Mote trash cyclone 7A	filt. PM	1	0.325	16.71	0.00883	0.0194
	filt. PM	2	0.403	16.71	0.0109	0.0241
	filt. PM	3	0.369	16.71	0.0100	0.0221
	AVERAGE				0.00993	0.0219
Mote trash cyclone 7B	filt. PM	1	0.391	16.56	0.0107	0.0236
	filt. PM	2	0.427	16.56	0.0117	0.0258
	filt. PM	3	0.314	16.56	0.00861	0.0190
	AVERAGE				0.0103	0.0228
Cotton waste disposal cyclone 8A	filt. PM	1	0.650	16.56	0.0178	0.0393
	filt. PM	2	0.620	16.56	0.0170	0.0374
	filt. PM	3	0.761	16.56	0.0209	0.0460
	AVERAGE				0.0186	0.0409
Cotton waste disposal cyclone 8B	filt. PM	1	0.581	16.56	0.0159	0.0351
	filt. PM	2	0.414	16.56	0.0114	0.0250
	filt. PM***	3	0.596	16.56	0.0163	0.0360
	AVERAGE				0.0145	0.0320

RUN 3 WAS VOID. EMISSIONS ESTIMATED USING RATIO OF RUN 3 (8A CYCLONE) TO AVG. OF RUNS 1 AND 2 (8A CYCL.) MULT. BY AVG. OF RUNS 1 AND 2 (8B CYCL.).

Source category:	Cotton	COTTON10	Date:	11/30/94
Plant name :	Halls Gin		Location:	Halls, TN
Test date :	Oct. 25-27, 1988		Ref. No.:	
Process :				

Source	Pollutant	Run No.	Emission rate, lb/hr	Process rate, bales/hr	Emission factor kg/bale	Emission factor lb/bale
Mote press cyclone 9	filt. PM	1	0.408	16.56	0.0112	0.0246
	filt. PM	2	0.464	16.56	0.0127	0.0280
	filt. PM	3	0.587	16.56	0.0161	0.0354
	AVERAGE				0.0133	0.0294
Mote press cyclone 10	filt. PM	1	0.337	16.56	0.00924	0.0204
	filt. PM	2	0.180	16.56	0.00493	0.0109
	filt. PM	3	0.210	16.56	0.00576	0.0127
	AVERAGE				0.00664	0.0146
Mote press cyclone 11	filt. PM	1	0.428	16.56	0.0117	0.0258
	filt. PM	2	0.400	16.56	0.0110	0.0242
	filt. PM	3	0.451	16.56	0.0124	0.0272
	AVERAGE				0.0117	0.0257
Battery condenser vent	filt. PM	1	0.268	16.56	0.00735	0.0162
	filt. PM	2	0.183	16.56	0.00502	0.0111
	filt. PM	3	0.191	16.56	0.00524	0.0115
	AVERAGE				0.00587	0.0129
Gin stand 1B (Moss)	filt. PM	1	0.122	16.56	0.00334	0.00737
	filt. PM	2	0.139	16.56	0.00381	0.00839
	filt. PM	3	0.153	16.56	0.00419	0.00924
	AVERAGE				0.00378	0.00833
Gin stand 1A (16D)	filt. PM	1	1.81	16.56	0.0496	0.109
	filt. PM	2	1.68	16.56	0.0461	0.101
	filt. PM	3	2.27	16.56	0.0622	0.137
	AVERAGE				0.0526	0.116
Gin stand 2B (Moss)	filt. PM	1	0.0971	16.71	0.00264	0.00581
	filt. PM	2	0.113	16.71	0.00307	0.00676
	filt. PM	3	0.131	16.71	0.00356	0.00784
	AVERAGE				0.00309	0.00680
Gin stand 2A (16D)	filt. PM	1	1.80	16.71	0.0489	0.108
	filt. PM	2	2.12	16.71	0.0576	0.127
	filt. PM	3	2.23	16.71	0.0606	0.133
	AVERAGE				0.0557	0.123
Gin stand 3B (Moss)	filt. PM	1	0.0441	16.71	0.00120	0.00264
	filt. PM	2	0.0565	16.71	0.00154	0.00338
	filt. PM	3	0.0689	16.71	0.00187	0.00412
	AVERAGE				0.00154	0.00338
Gin stand 3A (16D)	filt. PM	1	0.964	16.71	0.0262	0.0577
	filt. PM	2	1.00	16.71	0.0272	0.0598
	filt. PM	3	1.16	16.71	0.0315	0.0694
	AVERAGE				0.0283	0.0623

APPENDIX K

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 11

Environmental Protection Agency
Office of Enforcement
EPA 330/2-78-008

EPA - Region IX
CONFIDENTIAL MATERIAL

The Report may contain
proprietary information,
and shall be considered
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further notice.

COTTON GIN EMISSION TESTS
MARANA GIN
PRODUCERS COTTON OIL COMPANY

Marana, Arizona

[November 2 - 19, 1977]

EPA - Region IX
CONFIDENTIAL MATERIAL

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proprietary information,
and shall be considered
CONFIDENTIAL until
further notice.

May 1978

National Enforcement Investigations Center - Denver
and
Region IX - San Francisco

III. PROCESS DESCRIPTION

Both short- and long-staple gins process seed cotton in a similar manner. Pneumatic or air conveying is the principal means of moving cotton within each gin. Approximately 725 kg (1,600 lb)* of seed cotton is required to produce a bale of lint cotton (227 kg or 500 lb). The weight difference (498 kg or 1,100 lb) is the weight of trash and cottonseed removed during processing.

Seed cotton is usually delivered to a gin in a wagon, and unloaded. This seed cotton is alternately dried and cleaned twice before being ginned. Lint cotton, cottonseed and trash are separated during ginning, after which the lint cotton is cleaned again before being baled.

The condition of the seed cotton, a function of the picking procedures, affects process operations and emissions. Cotton is generally picked twice from the defoliated stalks which accounts for 90 to 95% of the cotton ginned. Picked cotton contains some trash (stalks, leaves and dirt). Subsequent to the second pick, a vacuum sweeper is used to pick up cotton including trash that has fallen to the ground (ground-cotton). Second-pick cotton, which has slightly more trash than first-pick but much less than ground cotton, was reportedly ginned during the November 2-19 survey.

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* At the Marana Gin it was computed to take 662 kg (1,460 lb) of seed cotton to produce a bale of lint cotton.

The seed cotton moisture content also affects the process operations and emissions. The moisture content is a function of the mode of harvesting (i.e., picked or ground cotton) and the time of harvesting (i.e., morning or afternoon, and before or after a rain). A 6 to 8% moisture content is considered ideal for processing; less than 6% results in cotton being removed with the trash, increasing the loading to the cyclones. Conversely, only a small amount of trash will be removed when the moisture content is greater than 8%, resulting in a poor grade of bale cotton. Detailed process information for both Marana gins follows.

The seed cotton is off-loaded from a wagon with a vacuum system and collected in a separator [Figures 2 and 3]. The cotton then enters a natural-gas-fired reel drier. The reel drier is a horizontal rotary drier that also removes some trash as the cotton passes through the unit.

This cotton is air-conveyed to a 7-cylinder inclined cleaner (the long-staple gin has a 5-cylinder inclined cleaner). The cleaner consists of 7 (5) spiked drum cylinders which carry and "scrub" the seed cotton to remove fine particles such as leaves, dirt and sand.

Next, a bur extractor removes heavy trash and burs from the cotton with a revolving saw cylinder. The teeth of the saw hold the seed cotton and subject it to a carding and cleaning action as the cotton is spread across the surface of the cylinder.

The cotton is then fed into a 24-shelf natural-gas-fired tower drier. The cotton, while falling from shelf to shelf, is dried by a concurrent stream of warm gases. The cotton moisture content at the exit is normally between 6 and 8%. This dry cotton is air-conveyed to second-stage inclined cleaners (the short-staple gin has two cleaners in parallel, the long-staple gin has one). These inclined cleaners are identical to the one previously described.

Then, the cotton is distributed to five extractor feeders in parallel (the long-staple gin has ten) where additional burs, stems, whole leaves and other trash are removed. The cotton is fed at a constant rate to five 80-saw-gin stands (10 roller gins in the long-staple gin). Excess cotton is returned to the second stage cleaners.

The saw-gin stands use saws and air blasts to separate seeds and trash from the cotton; the roller gins use revolving cylinders to separate the seeds and trash from the lint. The resulting lint cotton is air-conveyed to two lint cleaners operated in parallel (two sets of two lint cleaners are used in the long-staple gin). The lint cleaners remove fine particles, motes, dust and sticks. The clean lint cotton is air-conveyed to the condenser where it is formed into a smooth endless mat and fed into the baler. The bales are wrapped in burlap, tied with metal bands and stored.

The motes and lint cotton removed with the trash from the lint cleaners and condenser are recovered in the mote cyclone. The motes are then cleaned in an inclined cleaner, and baled. Motes are not recovered in the long-staple gin.*

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* The long-staple cotton reportedly contains only 1 to 2% motes while short-staple contains 10 to 12%.

Table 4

PROCESS DATA SUMMARY
PRODUCERS COTTON OIL COMPANY
Marana, Arizona

	Process Weight					Allowed Emissions	
Date	lb/day[a]	kg/day[a]	ton/hr	m. ton/hr	bal/hr	lb/hr	kg/hr
Short-staple cotton gin							
11/5	225,130	102,118	5.00	4.54	6.35		
11/6	243,860	110,613	5.52	5.01	7.56		
11/7	289,690	131,401	6.44	5.84	6.83		
11/8[b]	61,920	13,651	-	-	-		
11/9	316,380	143,507	7.03	6.38	9.63		
11/10	297,525	134,955	6.61	6.00	9.05		
11/11	307,410	139,439	6.83	6.20	7.36		
11/12	283,720	128,693	6.30	5.72	8.63		
11/13	296,770	134,613	6.53	5.92	8.95		
Average	-	-	6.28	5.70		11.2	5.1
Long-Staple Cotton gin							
11/12[c]	31,210	14,157	1.39	1.26			
11/13	48,420	21,963	2.15	1.95			
11/14	117,930	53,492	2.62	2.38			
11/15	109,710	49,763	2.44	2.21			
11/16	100,180	45,441	2.23	2.02			
11/17[d]	-	-	2.70	2.45			
11/18[d]	-	-	2.26	2.05			
11/19[d]	-	-	2.76	2.51			
Average	-	-	2.32	2.10		6.02	2.7

a Process day is 22.5 hrs, gin shuts down for two 45-minute lunches per day.
b No sampling occurred on this day. Data not included in averages.
c Process day - 8 to 10 hours.
d Gin process Summary not available. Process weight calculated from time period required to unload wagons.

Table 5

EMISSION DATA SUMMARY
SHORT-STAPLE GIN
PRODUCERS COTTON OIL COMPANY
Marana, Arizona

Station No.	Average Concentration[a] gr/cf	Average Concentration[a] mg/m^3	Average Mass Emissions[b] lb/hr	Average Mass Emissions[b] kg/hr
Cyclones				
2204 #1 inclined cleaner + drier	0.044	100	3.33 .39	1.51
2205 bur extractor	0.011	25.7	0.38 .044	0.17
2207 #2 cleaner, gin std	0.024	54.6	1.35 .17	0.61
2208 gin std feeder + mote cleaner	0.015	33.8	0.50 .056	0.23
2209 unload sep	0.048	110	2.14 .25	0.97
2211 trash conveyor	0.19	437	8.25 .96	3.74
Subtotal	-	-	16.0	7.23
Lint Cages				
2201	0.039	89.1	4.32 .50	1.96
2202	0.010	23.0	0.88 .102	0.40
2203	0.051	118	8.31 .97	3.77
Subtotal	-	-	13.5	6.13
Total	-	-	29.5 3.43	13.4
Emission Limitation			11.2	5.1

a At standard conditions.
b Adjusted for blockage effects.

Table 6

EMISSION DATA SUMMARY
LONG-STAPLE GIN
PRODUCERS COTTON OIL COMPANY
Marana, Arizona

3.4 bales/hr

Station No.	Average Concentration[a] gr/scf	mg/m³	Average Mass Emissions[b] lb/hr	kg/hr
Cyclones				
2306	0.0083	18.8	0.51	0.23
2307	0.0094	21.0	0.40	0.18
2308	0.064	146	1.17	0.53
2309	0.043	98.8	1.16	0.53
2310	0.017	38.9	0.82	0.37
Subtotal	-	-	4.06 1.19	1.84
Lint Cages				
2301	0.033	76.4	1.15	0.52
2302	0.015	35.4	0.55	0.25
2303	0.016	35.7	0.34	0.15
2304	0.027	61.7	0.66	0.30
2305	0.017	38.8	0.74	0.34
Subtotal	-	-	3.44 1.01	1.56
Total	-	-	7.50 2.21	3.40
Emission Limitation			6.02	2.7

a At standard conditions.
b Adjusted for blockage effects.

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTTON11.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	95	95	96	
LINT CAGE	Pressure	in. HG	29.92	29.92	29.92	
	Moisture	%	1	1	1	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm				
	Volumetric flow, standard*	dscfm	13000	13000	13000	
	Isokinetic variation	%				
Circle: Production or feed rate Capacity:		bales/hr	6.85	6.85	6.85	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0360	0.0460	0.0340	
	Pollutant mass flux rates:					
	Total PM	lb/hr	3.99	5.14	3.84	4.32
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.58	0.75	0.56	0.63
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.264	0.340	0.254	0.286

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11A.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg F	75	82	89	
BATTERY	Pressure	in. HG	29.92	29.92	29.92	
CONDENS	Moisture	%	1	1	1	
W/SCREEN	Oxygen	%	20.9	20.9	20.9	
CAGE	Volumetric flow, actual	acfm				
	Volumetric flow, standard*	dscfm	10300	10300	10300	
	Isokinetic variation	%				
Circle: Production or feed rate Capacity:		bales/hr	8.6	8.6	8.6	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0060	0.0091	0.0150	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.530	0.803	1.32	0.886
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.062	0.093	0.15	0.103
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.028	0.042	0.070	0.047

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11B.WQ1

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported						
			Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	
3	Stack temperature	Deg F	69	73	73	69	79	79	
LINT	Pressure	in. HG	29.92	29.92	29.92	29.92	29.92	29.92	
CAGE	Moisture	%	1	1	1	1	1	1	
	Oxygen	%	20.9	20.9	20.9	20.9	20.9	20.9	
	Volumetric flow, actual	acfm							
	Volumetric flow, standard*	dscfm	19000	19000	19000	19000	19000	19000	
	Isokinetic variation	%							
Circle: Production or feed rate Capacity:		bales/hr	8.82	8.82	8.82	9.63	9.63	9.63	
	Pollutant concentrations:								
	Total PM	G/dscf	0.0470	0.0440	0.0680	0.06	0.058	0.031	
	Pollutant mass flux rates:								
	Total PM	lb/hr	7.560	7.200	11.00	9.67	9.46	4.98	8.312
	Emission factors (ENGLISH UNITS):								AVERAGE
	Total PM	lb/bale	0.86	0.82	1.25	1.00	0.98	0.52	0.90
	Emission factors (METRIC UNITS):								AVERAGE
	Total PM	kg/bale	0.389	0.370	0.566	0.455	0.446	0.235	0.410

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11C.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
4	Stack temperature	Deg F	158	159	153	
NO. 1 INCLINED CLEANER AND DRYER	Pressure	in. HG	28.12	28.1	28.12	
	Moisture	%	0.4	0.7	1	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	11405	11523	11510	
	Volumetric flow, standard*	dscfm	9121	9166	9224	
	Isokinetic variation	%	94.3	94.4	98.1	
Circle: Production or feed rate Capacity:		bales/hr	8.63	8.63	8.95	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0480	0.0330	0.0500	
	Pollutant mass flux rates:					
	Total PM	lb/hr	3.81	2.62	3.92	3.45
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.441	0.304	0.438	0.394
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.200	0.138	0.199	0.179

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11D.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
5	Stack temperature	Deg F	109	111	95	
SECOND	Pressure	in. HG	28.12	28.12	28.15	
STAGE	Moisture	%	1.1	0.7	0.7	
SEED	Oxygen	%	20.9	20.9	20.9	
COTTON	Volumetric flow, actual	acfm	4447	4970	5049	
CLEANING	Volumetric flow, standard*	dscfm	3836	4289	4487	
	Isokinetic variation	%	106.3	105.1	105	
Circle: Production or feed rate Capacity:		bales/hr	9.36	9.36	8.63	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0130	0.0120	0.0086	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.44	0.42	0.33	0.40
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.0470	0.0449	0.0383	0.0434
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.0213	0.0204	0.0174	0.0197

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11E.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 2	Run 3	Run 4	Run 4
6	Stack temperature	Deg F	112	104	115	
NO. 2 DRYER AND CLEANER	Pressure	in. HG	28.13	28.17	28.18	
	Moisture	%	0.4	0.9	0.8	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	8541	8110	8410	
	Volumetric flow, standard*	dscfm	7383	7084	7216	
	Isokinetic variation	%	99.6	102.3	98.6	
Circle: Production or feed rate Capacity:		bales/hr	9.05	9.36	9.36	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0230	0.0260	0.0200	
	Pollutant mass flux rates:					
	Total PM	lb/hr	1.43	1.56	1.21	1.40
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.158	0.167	0.129	0.151
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.0717	0.0756	0.0586	0.0686

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11F.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 3	Run 4	Run 5	Run 4
7	Stack temperature	Deg F	92	90	80	
GIN STAND FEEDER TRASH	Pressure	in. HG	28.12	28.11	28.15	
	Moisture	%	0.5	0.7	0.6	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	4748	4526	4683	
	Volumetric flow, standard*	dscfm	4247	4053	4282	
	Isokinetic variation	%	99.4	99.9	100.2	
Circle: Production or feed rate Capacity:		bales/hr	9.63	9.63	9.05	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0150	0.0140	0.0160	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.550	0.440	0.57	0.520
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.0571	0.0457	0.0630	0.0553
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.026	0.021	0.029	0.025

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11G.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
8	Stack temperature	Deg F	83	87	85	
UNLOADING FAN	Pressure	in. HG	27.87	27.84	27.84	
	Moisture	%	0.6	0.4	0.9	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	5964	5912	5912	
	Volumetric flow, standard*	dscfm	5370	5289	5282	
	Isokinetic variation	%	107.3	101.7	104.9	
Circle: Production or feed rate Capacity:		bales/hr	8.82	8.82	8.82	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0350	0.0640	0.0450	
	Pollutant mass flux rates:					
	Total PM	lb/hr	1.61	2.90	2.04	2.18
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.183	0.329	0.231	0.248
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.083	0.149	0.105	0.112

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11H.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 2	Run 3	Run 4	Run 4
9	Stack temperature	Deg F	96	101	99	
MASTER TRASH FAN	Pressure	in. HG	27.99	27.99	27.89	
	Moisture	%	0.9	0.6	0.8	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	5794	6043	6043	
	Volumetric flow, standard*	dscfm	5101	5289	5278	
	Isokinetic variation	%	108.4	108	106	
Circle: Production or feed rate Capacity:		bales/hr	6.85	6.85	6.85	
	Pollutant concentrations:					
	Total PM	G/dscf	0.14	0.21	0.22	
	Pollutant mass flux rates:					
	Total PM	lb/hr	6.12	9.52	9.95	8.53
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.894	1.39	1.45	1.25
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.405	0.630	0.659	0.565

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11I.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 3	Run 4	Run 5	Run 4
10	Stack temperature	Deg F	61	90	90	
LINT CAGE (LONG STAPLE)	Pressure	in. HG				
	Moisture	%	1	1	1	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm				
	Volumetric flow, standard*	dscfm	4000	4000	4000	
	Isokinetic variation	%				
Circle: Production or feed rate Capacity:		bales/hr	3.4	3.4	3.4	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0330	0.0310	0.0360	
	Pollutant mass flux rates:					
	Total PM	lb/hr	1.14	1.05	1.25	1.15
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.34	0.31	0.37	0.34
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.152	0.140	0.167	0.153

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11J.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 3	Run 4	Run 5	Run 4
11	Stack temperature	Deg F	68	77	93	
LINT CAGE (LONG STAPLE)	Pressure	in. HG				
	Moisture	%	1	1	1	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm				
	Volumetric flow, standard*	dscfm	4150	4150	4150	
	Isokinetic variation	%				
Circle: Production or feed rate Capacity:		bales/hr	3.4	3.4	3.4	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0107	0.0150	0.0210	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.37	0.52	0.76	0.55
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.11	0.15	0.22	0.16
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.049	0.069	0.101	0.073

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11K.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 3	Run 4	Run 5	Run 4
12	Stack temperature	Deg F	93	90	67	
LINT CAGE (LONG STAPLE)	Pressure	in. HG				
	Moisture	%	1	1	1	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm				
	Volumetric flow, standard*	dscfm	2540	2540	2540	
	Isokinetic variation	%				
Circle: Production or feed rate Capacity:		bales/hr	3.4	3.4	3.4	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0130	0.0270	0.0072	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.27	0.59	0.16	0.34
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.079	0.17	0.047	0.100
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.036	0.079	0.021	0.045

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11L.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 3	Run 4	Run 5	Run 4
13	Stack temperature	Deg F	73	86	90	
LINT	Pressure	in. HG				
CAGE	Moisture	%	1	1	1	
(LONG	Oxygen	%	20.9	20.9	20.9	
STAPLE)	Volumetric flow, actual	acfm				
	Volumetric flow, standard*	dscfm	2880	2880	2880	
	Isokinetic variation	%				
Circle: Production or feed rate Capacity:		bales/hr	3.4	3.4	3.4	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0054	0.0170	0.0580	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.13	0.42	1.44	0.66
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.038	0.12	0.42	0.20
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.017	0.056	0.192	0.088

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MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 3	Run 4	Run 5	Run 4
14	Stack temperature	Deg F	90	68	78	
BATTERY	Pressure	in. HG				
CONDENSER	Moisture	%	1	1	1	
W/SCREEN	Oxygen	%	20.9	20.9	20.9	
CAGE	Volumetric flow, actual	acfm				
(LONG	Volumetric flow, standard*	dscfm	5060	5060	5060	
STAPLE)	Isokinetic variation	%				
Circle: Production or feed rate Capacity:		bales/hr	3.4	3.4	3.4	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0190	0.0075	0.0240	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.83	0.33	1.05	0.74
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.24	0.10	0.31	0.22
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.111	0.044	0.140	0.098

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MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 3	Run 4	Run 5	Run 4
15	Stack temperature	Deg F	87	98	105	
MOTE SYSTEM	Pressure	in. HG	28.05	28.05	28.02	
	Moisture	%	0.5	0.5	0.5	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	8280	8672	8659	
	Volumetric flow, standard*	dscfm	7455	7654	7540	
	Isokinetic variation	%	96.8	97.2	98.1	
Circle: Production or feed rate Capacity:		bales/hr	3.4	3.4	3.4	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0078	0.0110	0.0061	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.48	0.70	0.40	0.53
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.14	0.21	0.12	0.15
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.064	0.093	0.053	0.070

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11O.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 3	Run 4	Run 5	Run 4
16	Stack temperature	Deg F	121	142	148	
NO. 2 DRYER AND CLEANER	Pressure	in. HG	28.05	28.05	28.04	
	Moisture	%	0.6	1	1	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	6370	6488	6684	
	Volumetric flow, standard*	dscfm	5395	5281	5385	
	Isokinetic variation	%	102.6	98.9	97	
Circle: Production or feed rate Capacity:		bales/hr	3.4	3.4	3.4	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0072	0.0110	0.0099	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.33	0.48	0.44	0.42
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.10	0.14	0.13	0.12
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.044	0.064	0.059	0.056

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11P.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 3	Run 4	Run 5	Run 4
17	Stack temperature	Deg F	98	96	84	
UNLOADING	Pressure	in. HG	27.9	27.88	27.85	
	Moisture	%	0.7	0.7	1	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	2302	2577	2472	
	Volumetric flow, standard*	dscfm	2017	2264	2211	
	Isokinetic variation	%	89.3	90.9	90.6	
Circle: Production or feed rate Capacity:		bales/hr	3.4	3.4	3.4	
	Pollutant concentrations:		RUN 1 VOID			
	Total PM	G/dscf		0.0890	0.0380	
	Pollutant mass flux rates:					
	Total PM	lb/hr		1.76	0.70	1.23
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale		0.52	0.21	0.36
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale		0.23	0.093	0.16

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11Q.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 2	Run 3	Run 4	
18	Stack temperature	Deg F	180	187	187	
NO. 1 DRYER AND CLEANER	Pressure	in. HG	27.99	27.94	27.93	
	Moisture	%	1.5	1.4	1.4	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	4186	4369	4447	
	Volumetric flow, standard*	dscfm	3182	3283	3340	
	Isokinetic variation	%	109	105.2	102	
Circle: Production or feed rate Capacity:		bales/hr	3.4	3.4	3.4	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0560	0.0390	0.0340	
	Pollutant mass flux rates:					
	Total PM	lb/hr	1.54	1.10	0.97	1.20
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.45	0.32	0.29	0.35
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.21	0.15	0.13	0.16

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON11R.WQ1

MARANA GIN, MARANA, ARIZONA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 3	Run 4	Run 5	Run 4
19	Stack temperature	Deg F	190	189	186	
MASTER TRASH FAN	Pressure	in. HG	27.94	27.9	27.88	
	Moisture	%	1.4	1.4	1.5	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	7953	8201	7390	
	Volumetric flow, standard*	dscfm	5948	6135	5544	
	Isokinetic variation	%	102	96.4	107.2	
Circle: Production or feed rate Capacity:		bales/hr	3.4	3.4	3.4	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0150	0.0170	0.0190	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.750	0.880	0.920	0.850
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.22	0.26	0.27	0.25
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.100	0.117	0.123	0.113

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

APPENDIX L

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 12

12

PEDCo ENVIRONMENTAL
11499 CHESTER ROAD
CINCINNATI, OHIO 45246
(513) 782-4700

EMISSION TEST REPORT

WESTSIDE FARMERS'

COOPERATIVE GIN #5

TRANQUILITY, CALIFORNIA

EPA - Region IX
CONFIDENTIAL MATERIAL
The Report may contain proprietary information, and shall be considered CONFIDENTIAL until further notice.

Prepared by

PEDCo Environmental, Inc.
11499 Chester Road
Cincinnati, Ohio 45246

Contract No. 68-01-4147
Task No. 47
PN 3370-2-D

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Division of Stationary Source Enforcement
Washington, D.C. 20460

John R. Busik, Project Officer
Daniel C. Yee, Task Manager

February 1978


CHESTER TOWERS

BRANCH OFFICES

Crown Center
Kansas City, Mo.

Professional Village
Chapel Hill, N.C.

Table 1. PROCESS OPERATIONS AND EMISSION POINT DESCRIPTION

Process operation no.	Process description	Emission point discharge no.	Type of control equipment
1	Unloading separator	D	Cyclones
2	#1 Tower dryer with cleaning cylinder	C	Cyclones
3	#1 Incline cleaner	B	Cyclones
4	Stick machine	C	Cyclones
5	Super volume cotton conditioner	C	Cyclones
6	#2 Incline cleaner	E	Cyclones
7	4-Gin stands with feeders	C	Cyclones
8	4-Super jet lint cleaners	C	Cyclones
9	4-#1 Saw type lint cleaner with condensers on top	H	Lint screen basket
10	4-#2 Saw type lint cleaners with condensers on top	G&I	Lint screen baskets
11	Battery condenser	J	Lint screen basket
12	Bale press	N/A	N/A
13	Automatic sampler	N/A	N/A
14	Mote cleaner	F	Cyclone
15	#1-Heater (3 million Btu/hr)	-	None
16	#2-Heater (3 million Btu/hr)	-	None

NOTE: Site A receives uncleaned motes from Lint Screen Baskets.

These are acfh!

Table 2. SUMMARY OF PARTICULATE EMISSION RESULTS

Site No.	Total concentration gr/dscf[a]	Allowable concentration gr/dscf[b]	Allowable concentration dscfh	Filterable particulate lb/h	Total particulate lb/h
A	0.043	0.1	644,000	3.78	3.82
B	0.106	0.1	859,000	10.72	10.97
C	0.047	0.1	721,000	4.34	4.38
D	0.102	0.1	351,000	4.99	5.07
E	0.010	0.1	346,000	0.36	0.49
F	0.087	0.1	144,000	1.71	1.78
G	0.031	0.1	824,000	3.35	3.63
H	0.088	0.1	1,100,000	11.86	12.99
I	0.041	0.1	771,000	4.03	4.41
J	0.023	0.1	1,500,000	3.64	4.61

a) Grains per dry standard cubic foot (sum of impinger and filterable concentrations). Each value is the average of all test runs conducted at the site.

b) Allowable particulate matter concentration based on Fresno County Air Pollution Control District Rules and Regulations - revised May 18, 1976 - Rule 404 Particulate Matter Concentration.

c) Flow rate in dry standard cubic feet per hour - 68°F and 29.92 in Hg.

3.0 DESCRIPTION OF PROCESS

The Westside Cooperative Gin #5 process flow diagram and sampling locations are presented in Figure 1. Corresponding process flow machine descriptions, sampling location, and type of control equipment was summarized in Table 1.

The gin was in operation seven days a week, 24 hours per day with scheduled one hour shutdowns every six hours for maintenance purposes. An average ginning rate of 13 bales of cotton per hour was maintained during the testing period. Each ginned bale of cotton requires approximately 1600 pounds of seed cotton to produce a 500 pound bale. The 1600 pounds per bale times the ginning rate of 13 bale per hour corresponds to a input weight rate of 20,800 pounds per hour.

Particulate emissions from sites A through D are controlled by a series of high-efficiency cyclone dust collectors. Emissions from sites E and F are controlled by single cyclone dust collectors. Emissions are normally vented directly into the atmosphere from the top of each cyclone. However, in order to facilitate sampling at these sites, sheet metal stack extensions were installed as shown in Figure 2.

Raw cotton entering the gin during the testing period was first-picked which, due to the length of the harvest season, had been stored in the fields for an average of 10 days according to plant personnel. This, in conjunction with an unusually dry harvest season, may have had an effect on the final particulate emission results in comparison to past years operations.

Table 3. SUMMARY OF FLUE GAS CONDITIONS

Site	Run No.	Date (1977)	Sampling train type	Flow rate[a], acfh	Flow rate[b], dscfh	Stack temp., °F	Moisture content %
A	A-1	11/18	Aerotherm	657,959	643,609	78	0.16
	A-2	11/18	Method 5	613,082	596,184	79	0.66
	A-1&2	11/18	Run average	635,521	619,897	78.5	0.41
	A-3	11/18	Aerotherm	659,052	639,526	82	0.0
	A-4	11/18	Method 5	644,986	625,985	82	0.20
	A-3&4	11/18	Run average	652,015	632,756	82	0.10
	A-5	11/18	Aerotherm	664,729	645,451	82	0.0
	A-6	11/18	Method 5	622,227	603,566	82	0.07
	A-5&6	11/18	Run average	643,478	624,509	82	0.035
A	Uncleaned motes		Site average	643,673	625,721	81	0.18
B	B-1	11/15	Method 5	815,356	710,391	140	1.13
	B-2	11/17	Aerotherm	881,808	745,153	150	2.72
	B-3	11/17	Method 5	827,333	695,453	150	3.27
	B-2&3	11/17	Run average	854,571	720,303	150	3.00
	B-4	11/17	Method 5	846,933	714,146	145	3.75
	B-5	11/17	Aerotherm	886,217	747,757	144	3.74
	B-4&5	11/17	Run average	866,575	730,952	144.5	3.745
	B-6	11/17	Method 5	845,864	723,225	137	3.59
	B-7	11/17	Aerotherm	864,066	744,138	138	2.68
	B-6&7	11/17	Run average	854,965	733,682	137.5	3.14
B	#1&2 Inclined cleaners		Site average	858,704	728,312	144	3.30

Table 3(Continued). SUMMARY OF FLUE GAS CONDITIONS

Site	Run No.	Date (1977)	Sampling train type	Flow rate[a], acfh	Flow rate[b], dscfh	Stack temp., °F	Moisture content %
C	C-1	11/15	Method 5	739,791	638,716	125	4.51
	C-2	11/16	Method 5	695,539	629,297	119	1.42
	C-3	11/16	Aerotherm	683,557	628,603	116	0.42
	C-2&3	11/16	Run average	689,548	628,950	117.5	0.92
	C-4	11/16	Method 5	763,904	699,015	114	1.23
	C-5	11/16	Aerotherm	741,105	685,929	114	0.12
	C-4&5	11/16	Run average	752,505	692,472	114	0.675
	C-6	11/22	Aerotherm	792,196	741,121	104	0.79
C	Unloading and dryer		Site average	721,027	660,711	115.8	0.80
D	D-1	11/19	Aerotherm	364,050	364,192	67	0.0
	D-2	11/19	Method 5	325,247	327,989	62	0.0
	D-1&2	11/19	Run average	344,649	346,091	64.5	0.0
	D-3	11/19	Aerotherm	383,068	378,348	73	0.0
	D-4	11/19	Method 5	366,861	361,181	70	0.83
	D-3&4	11/19	Run average	374,965	369,765	71.5	0.415
	D-5	11/19	Aerotherm	346,899	344,629	70	0.0
	D-6	11/19	Method 5	317,726	305,229	71	0.30
	D-5&6	11/19	Run average	332,313	324,929	70.5	0.15
D	Unloading separator		Site average	350,642	346,928	68.8	0.19

Table 3 (Continued). SUMMARY OF FLUE GAS CONDITIONS

Site	Run No.	Date (1977)	Sampling train type	Flow rate[a], acfh	Flow rate[b], dscfh	Stack temp., °F	Moisture content %
E	E-1	11/20	Aerotherm	343,815	348,803	62	0.0
	E-2	11/20	Method 5	311,714	317,715	57	0.59
	E-1&2	11/20	Run average	327,764	333,259	58	0.295
	E-3	11/20	Aerotherm	348,847	344,426	76	0.42
	E-4	11/20	Method 5	363,613	359,666	75	0.37
	E-3&4	11/20	Run average	356,230	352,046	75.5	0.40
	E-5	11/20	Aerotherm	357,148	356,028	73	0.0
	E-6	11/20	Method 5	361,736	358,235	72	0.72
	E-5&6	11/20	Run average	359,442	357,132	72.5	0.36
E	Condenser and basket catch		Site average	345,647	345,507	68.7	0.35
F	F-1	11/21	Aerotherm	131,188	131,280	69	0.10
	F-2	11/21	Method 5	199,913	198,614	65	1.45
	F-1&2	11/21	Run average	165,551	164,947	67	0.775
	F-3	11/21	Aerotherm	102,968	102,330	73	0.04
	F-4	11/21	Method 5	143,716	141,270	71	1.37
	F-3&4	11/21	Run average	123,342	121,800	72	0.71
	F-5	11/21	Aerotherm	134,142	133,434	72	0.03
	F-6	11/21	Method 5	149,240	144,183	74	2.59
	F-5&6	11/21	Run average	141,691	138,809	73	1.31
F	Mote cleaner		Site average	143,528	141,852	70.7	0.93

Table 3(Continued). SUMMARY OF FLUE GAS CONDITIONS

Site	Run No.	Date (1977)	Sampling train type	Flow rate[a], acfh	Flow rate[b], dscfh	Stack temp., °F	Moisture content %
G	G-1	11/20	Method 5*	785,676	793,698	63	0.48
	G-2	11/20	Method 5*	816,909	803,151	78	0.33
	G-3	11/20	Method 5*	868,410	850,595	80	0.03
G	#2 Lint cleaner		Site average	823,665	815,815	73.7	0.28
H	H-1	11/22	Method 5*	1,183,366	1,149,698	81	1.03
	H-2	11/22	Method 5*	1,057,932	1,014,448	82	2.11
	H-3	11/22	Method 5*	1,052,716	1,004,418	81	2.87
H	#1 Lint cleaner		Site average	1,098,005	1,056,188	81.3	2.00
I	I-1	11/21	Method 5*	805,633	788,224	75	1.41
	I-2	11/21	Method 5*	693,836	682,357	77	0.30
	I-3	11/21	Method 5*	813,167	790,041	76	2.01
I	#2 Lint cleaner		Site average	770,879	753,541	76	1.24
J	J-1	11/22	Method 5*	1,475,709	1,442,395	75	1.65
	J-2	11/22	Method 5*	1,603,057	1,534,392	82	1.96
	J-3	11/22	Method 5*	1,405,817	1,336,862	90	1.28
J	Battery condenser		Site average	1,494,861	1,437,883	82.3	1.63

* Standard Method 5 sampling train with Hastings-Teledyne Mass flow meter.

a Flow rate at stack conditions (actual cubic feet per hour).

b Flow rate at standard donsitions, 68°F and 29.92 in. Hg. in dry standard cubic feet per hour.

Table 4. SUMMARY OF PARTICULATE EMISSIONS

Site	Run No.	Sampling train type	Total concentration, gr/dscf[a]	Emission rate (lb/hr)		
				Condensible	Filterable	Total
A	A-1	Aerotherm	0.027	0.05	2.47	2.52
	A-2	Method 5	0.034	0.07	2.84	2.91
	A-1&2	Run average	0.0305	0.06	2.66	2.72
	A-3	Aerotherm	0.052	0.04	4.68	4.72
	A-4	Method 5	0.052	0.03	4.65	4.68
	A-3&4	Run average	0.052	0.035	4.665	4.70
	A-5	Aerotherm	0.044	0.01	4.08	4.09
	A-6	Method 5	0.046	0.02	3.93	3.95
	A-5&6	Run average	0.045	0.015	4.01	4.02
A	Uncleaned motes	Site average	0.043	0.037	3.78	3.82
B	B-1[c]	Method 5	0.052	0.33	5.00	5.33
	B-2	Aerotherm	0.041	0.18	4.17	4.35
	B-3	Method 5	0.040	0.34	3.60	3.94
	B-2&3	Run average	0.0405	0.26	3.89	4.15
	B-4	Method 5	0.125	0.26	12.52	12.78
	B-5	Aerotherm	0.118	0.18	12.38	12.56
	B-4&5	Run average	0.122	0.22	12.45	12.67
	B-6	Method 5	0.159	0.38	16.06	16.44
	B-7	Aerotherm	0.148	0.16	15.57	15.73
	B-6&7	Run average	0.154	0.27	15.82	16.09
B	#1 & #2 inclined cleaners	Site average	0.106	0.25	10.72	10.97

Table 4(Continued). SUMMARY OF PARTICULATE EMISSIONS

Site	Run No.	Sampling train type	Total concentration, gr/dscf[a]	Emission rate (lb/hr)		
				Condensible	Filterable	Total
C	C-1[c]	Method 5	0.049	1.24	3.26	4.50
	C-2	Method 5	0.053	0.02	4.74	4.76
	C-3	Aerotherm[b]	0.046	0.06	4.03	4.09
	C-2&3	Run average	0.0495	0.04	4.39	4.43
	C-4	Method 5	0.040	0.06	3.93	3.99
	C-5	Aerotherm[b]	0.048	0.03	4.64	4.67
	C-4&5	Run average	0.044	0.045	4.29	4.33
	C-6[c]	Aerotherm	0.093	0.13	9.77	9.90
C	Unloading & dryer	Site average	0.047	0.0425	4.34	4.38
D	D-1	Aerotherm	0.117	0.06	6.02	6.08
	D-2	Method 5	0.119	0.09	5.50	5.59
	D-1&2	Run average	0.118	0.075	5.76	5.84
	D-3	Aerotherm	0.107	0.05	5.75	5.80
	D-4	Method 5	0.097	0.15	4.87	5.02
	D-3&4	Run average	0.102	0.10	5.31	5.41
	D-5	Aerotherm[b]	0.069	0.02	3.38	3.40
	D-6	Method 5	0.103	0.06	4.44	4.50
	D-5&6	Run average	0.086	0.04	3.91	3.95
D	Unloading	Site average	0.102	0.072	4.99	5.07

Table 4 (Continued). SUMMARY OF PARTICULATE EMISSIONS

Site	Run No.	Sampling train type	Total concentration, gr/dscf[a]	Emission rate (lb/hr)		
				Condensible	Filterable	Total
E	E-1	Aerotherm	0.007	0.05	0.32	0.37
	E-2	Method 5[b]	0.012	0.09	0.48	0.57
	E-1&2	Run average	0.0095	0.07	0.40	0.47
	E-3	Aerotherm	0.009	0.12	0.32	0.44
	E-4	Method 5	0.015	0.24	0.52	0.76
	E-3&4	Run average	0.012	0.18	0.42	0.60
	E-5	Aerotherm	0.005	0.05	0.23	0.28
	E-6	Method 5	0.010	0.20	0.33	0.53
	E-5&6	Run average	0.0075	0.125	0.28	0.405
E	Basket & condenser catch	Site average	0.0097	0.123	0.36	0.49
F	F-1	Aerotherm[b]	0.082	0.05	1.50	1.55
	F-2	Method 5[b]	0.095	0.15	2.54	2.69
	F-1&2	Run average	0.089	0.10	2.02	2.12
	F-3	Aerotherm[b]	0.079	0.02	1.13	1.15
	F-4	Method 5[b]	0.094	0.08	1.82	1.90
	F-3&4	Run average	0.087	0.05	1.48	1.53
	F-5	Aerotherm[b]	0.075	0.03	1.41	1.44
	F-6	Method 5[b]	0.093	0.08	1.84	1.92
	F-5&6	Run average	0.084	0.055	1.63	1.68
F	Mote cleaner	Site average	0.087	0.068	1.71	1.78

Table 4 (Continued). SUMMARY OF PARTICULATE EMISSIONS

Site	Run No.	Sampling train type	Total concentration, gr/dscf[a]	Emission rate (lb/hr)		
				Condensible	Filterable	Total
G	G-1	Method 5	0.027	0.29	2.77	3.06
	G-2	Method 5	0.028	0.19	3.01	3.20
	G-3	Method 5	0.038	0.37	4.28	4.65
G	#2 lint cleaner	Site average	0.031	0.28	3.35	3.63
H	H-1	Method 5	0.063	1.13	9.15	10.28
	H-2	Method 5	0.062	1.10	7.83	8.93
	H-3	Method 5	0.138	1.16	18.61	19.77
H	#1 lint cleaner	Site average	0.088	1.13	11.86	12.99
I	I-1	Method 5	0.052	0.70	5.13	5.83
	I-2	Method 5	0.042	0.17	3.96	4.13
	I-3	Method 5	0.029	0.26	3.01	3.27
I	#2 lint cleaner	Site average	0.041	0.38	4.03	4.41
J	J-1	Method 5	0.023	1.08	3.58	4.66
	J-2	Method 5	0.021	1.30	3.19	4.49
	J-3	Method 5	0.024	0.53	4.14	4.67
J	Battery condenser	Site average	0.023	0.97	3.64	4.61

[a] Grains per dry standard cubic foot (sum of condensible and filterable concentrations).
[b] Does not meet Federal requirements for isokinetic sampling variation.
[c] Un-paired sampling trains not included in site average.
NOTE: Averages are of paired trains only.

Table 5. NONISOKINETIC TESTS RESULTS COMPARISON

Run No.	I,[a] %	pmr_c,[b] lbs/hr	pmr_a,[c] lbs/hr
C-3	182.2	4.03	7.34
C-5	263.1	4.67	12.26
E-2	82.3	0.48	0.40
F-1	111.8	1.55	1.73
F-2	62.5	2.69	1.68
F-3	116.6	1.15	1.34
F-4	66.1	1.90	1.26
F-5	110.2	1.44	1.59
F-6	66	1.92	1.25

[a] Percent isokinetic.

[b] Pollutant mass rate-concentration method.

[c] Pollutant mass rate-ratio of area method.

COTTON12.WQ1

SECTION 4, REFERENCE 12, WESTSIDE FARMERS COOP GIN, NOV. 15-22, 1977

SITE	PROCESS	RUN	G/DSCF	DSCFH	CALC. LB/HR	BALES/H	CALC. LB/BALE
A	MOTE SYSTEM	1	0.034	596184	2.90	13	0.22
		2	0.052	625985	4.65	13	0.36
		3	0.046	603566	3.97	13	0.31
AVERAGE			0.044	608578	3.84	13	0.30
B	NOS. 1 & 2 SEED COTTON CLEANERS	1	0.052	710391	5.28	13	0.41
		2	0.04	695453	3.97	13	0.31
		3	0.125	714146	12.75	13	0.98
		4	0.159	723225	16.43	13	1.26
AVERAGE			0.108	710941	11.05	13	0.74
C	NOS. 1 & 2 DRYERS & GIN STAND TRASH	1	0.049	638716	4.47	13	0.34
		2	0.053	629297	4.76	13	0.37
		3	0.04	699015	3.99	13	0.31
AVERAGE			0.04733	655676	4.41	13	0.34
D	UNLOADING	1	0.119	327989	5.58	13	0.43
		2	0.097	361181	5.00	13	0.38
		3	0.103	305229	4.49	13	0.35
AVERAGE			0.10633	331466	5.02	13	0.39
E	NO. 2 CLEANER	RUN 1 VOID					
		2	0.015	359666	0.77	13	0.059
		3	0.01	358235	0.51	13	0.039
AVERAGE			0.0125	358951	0.64	13	0.049
F	MOTE CLEANER D-RATED--ALL RUNS FAILED ISOKINETIC REQUIREMENT	1	0.095	198614	2.70	13	0.21
		2	0.094	141270	1.90	13	0.15
		3	0.093	144183	1.92	13	0.15
AVERAGE		D-RATED DATA--ALL RUNS ABOUT 66% ISOKINETICS					0.17
G	NO. 2 LINT CLEANER	1	0.027	793698	3.06	13	0.24
		2	0.028	803151	3.21	13	0.25
		3	0.038	850595	4.62	13	0.36
AVERAGE			0.031	815815	3.63	13	0.28
H	NO. 1 LINT CLEANER	1	0.063	1149698	10.35	13	0.80
		2	0.062	1014448	8.99	13	0.69
		3	0.138	1004418	19.80	13	1.52
AVERAGE			0.08767	1056188	13.04	13	1.00
I	NO. 2 LINT CLEANER	1	0.052	788224	5.86	13	0.45
		2	0.042	682357	4.09	13	0.31
		3	0.029	790041	3.27	13	0.25
AVERAGE			0.041	753541	4.41	13	0.34
SUM OF NO. 1 AND NO. 2 LINT CLEANERS							1.6
J	BATTERY CONDENSER	1	0.023	1442395	4.74	13	0.36
		2	0.021	1534392	4.60	13	0.35
		3	0.024	1336862	4.58	13	0.35
AVERAGE			0.02267	1437883	4.64	13	0.36

CONTACT REPORT--MRI Project No.

From: Brian Shrager, Environmental Engineering Department

Date of Contact: April 12, 1996

Contacted by: Telephone

Company/Agency: USDA-ARS Southwest Cotton Ginning Laboratory Mesilla Park, New Mexico

Telephone Number: (505) 526-6381

Person(s) Contacted/Title(s)

Ed Hughs, Research Leader

CONTACT SUMMARY: Mr. Hughs was contacted to clarify emission data presented in a cotton ginning test report (Reference 12 in the AP-42 background report). The following were the main points of clarification.

- Site A should be labeled as the mote system, not the master trash fan.
- Sites B, C, and E should be grouped together and labeled as the No. 1 and 2 Dryer and Cleaner and Gin Stand Trash. There is also a small PM contribution from the lint cleaners, but this should not be significant.

- To calculate an emission factor for the lint cleaners, the emission factors from tests on Sites G, H, and I should be added together. This lint cleaner emission factor is 1.6 lb/bale, not 0.35 lb/bale as shown in the comments received from the National Cotton Council on October 31, 1995.
- In many of the test reports, there is a source called gin stand trash fan or gin stand feeder trash. This source is the same as the master trash fan or is part of the master trash system.
- Two of the reports (References 13 and 14 in the comments received from the National Cotton Council on October 31, 1995) were not used because of a lack of documentation and the use of a non-standard test method.

We also discussed procedures for combining data. In particular, I told Mr. Hughs that we do not use C- and D-rated data if A- and B-rated data are available, whereas the Cotton Council emission factors used all data regardless of rating.

APPENDIX M

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 13

INTRODUCTION

On November 7 & 8, 1994, AIRx Testing performed source emission tests for Total and PM-10 particulate matter on the Lint Cleaner and Dryer #1 Cyclones. The cyclones are located at Elbow Enterprises, 12021 Avenue 328, Visalia, California. Sampling was done in triplicate for total particulate and PM-10 particule size distribution. Production rates, in bales per hour, were taken by Elbow personnel. No problems were incountered during the sampling. The exhaust stacks were candy canes attached to the top of the cyclones and continued in a vertical position. The testing was conducted with two (2) ports. The Lint Cleaner Cyclone duct was 30 inches in diameter and the ports were located 72 inches upstream and 240 inches downstream from the nearest disturbance. A total of 12 sample points were taken (6 per port). The Dryer #1 cyclone was 26 inches in diameter and the ports were located 50 inches upstream and 240 inches downstream from the nearest disturbance. A total of 12 sample points were taken (6 per port).

SAMPLING AND ANALYTICAL PROCEDURES

STACK GAS ANALYSIS: The oxygen and carbon dioxide content of the exhaust gases were assumed to be ambient air. Oxygen = 20.9% and Carbon Dioxide = 0.05%.

STACK GAS VELOCITY: The stack gas velocity was determined using an "S" type pitot tube connected to a magnehelic gauge. The "S" type pitot was used to determine the stack velocity profile for each run. A total of 12 (6 points per port) traverse points were utilized on each duct.

The stack temperature was determined using a thermocouple and an indicating pyrometer. The proportion of water was determined gravimetrically and the dry molecular weight of the stack gas determined by E.P.A. Method 3. Stack velocities and gas volumetric flow rate were calculated using E.P.A. Method 2.

TOTAL PARTICULATE EMISSIONS: A CARB Method 5 sampling train was utilized to determine the total particulate emission from the cyclones. The sample train consisted of a stainless steel nozzle, a heated stainless steel probe, a heated glass fiber filter and cooled impingers. After the weight is obtained from the filter, probe and nozzle rinses; the total solids in the impingers is added to the front-end catch to satisfy SJVUAPCD rules.

PARTICULE SIZE DISTRIBUTION: A sample was taken isokinetically from the stack using a GII cascade impactor. A modified CARB Method 501 was utilized. The impactor consisted of two (2) slotted discs, a back up filter and cooled impingers. The noxxle, preseparator cyclone and the first two (2) discs are +10µ and the backup filter, probe and impingers are -10µ. The total weights obtained from each fraction were added together to obtain the total particulate weight. The total weight was used to determine the % of the +10µ and the -10µ fraction. The total weight obtained from the total particulate runs are used to determine the +10µ and the -10µ results reported in grains/dscf, lb/hr and lb/bale.

PARTICULATE EMISSION SUMMARY

DRYER #1 CYCLONE (1 of 3)

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0893	0.0817	0.0720	0.0810
lb/hr	3.95	3.60	3.42	3.66
lb/bale	0.10	0.09	0.11	0.10
Particule Size Distribution				
+10μ (%)	69.8	79.9	62.1	70.6
+10μ (lb/hr)	2.76	2.87	2.12	2.58 ?
+10μ (lb/bale)	0.07	0.07	0.07	<0.01
-10μ (%)	30.2	20.1	37.9	29.4
-10μ (lb/hr)	1.19	0.72	1.30	1.07 OK
-10μ (lb/bale)	0.03 OK	0.02 OK	0.04 OK	0.03
Average Bales/hr	41.0	40.5	31.2	37.6

LINT CLEANER CYCLONE (1 of 12)

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0155	0.0172	0.0145	0.0157
lb/hr	1.32	1.47	1.25	1.35
lb/bale	0.03	0.04	0.03	0.03
Particule Size Distribution				
+10μ (%)	71.6	73.1	72.3	72.3
+10μ (lb/hr)	0.94	1.07	0.90	0.97
+10μ (lb/bale)	0.02	0.03	0.02	0.02
-10μ (%)	28.4	26.9	27.7	27.7
-10μ (lb/hr)	0.37	0.39	0.35	0.37
-10μ (lb/bale)	0.01 OK	0.01 OK	0.01 OK	0.01 OK
Average Bales/hr	42.7	38.2	42.6	41.2

FIELD DATA SUMMARY
TOTAL PARTICULATE
DRYER #1 CYCLONE

	Run#1	Run#2	Run#3
Vlc - Volume of water collected, ml	9.4	0.0	0.0
Vm - Gas volume, meter cond., dcf	37.572	37.920	42.917
Y - Meter calibration factor	0.972	0.972	0.972
Pbar - Barometric pressure, in. Hg	29.65	29.65	29.65
Pg - Stack static pressure, in. H20	-0.15	-0.15	-0.15
ΔH - Avg. meter press. diff., in. H20	1.381	1.321	1.585
Tm - Absolute meter temperature, °R	531.6	539.8	540.7
Vm(std) - Standard sample gas vol., dscf	35.5340	35.3126	39.9273
Bws - Water vapor part in gas stream	1.2	0.0	0.0
CO2 - Dry concentration, volume %	0.1	0.1	0.1
O2 - Dry concentration, volume %	20.9	20.9	20.9
Md - Mol wt. stack gas, dry, g/gmole	28.844	28.844	28.844
Ms - Mol wt. stack gas, wet, g/gmole	28.712	28.844	28.844
Cp - Pitot tube coef., dimensionless	0.833	0.833	0.833
Δp - Avg. of sq. roots of each Δp	0.449	0.444	0.481
Ts - Absolute stack Temp. °R	572.3	574.3	580.7
A - Area of stack, square feet	3.69	3.69	3.69
Qstd - Volumetric flow rate, dscfm	5159	5140	5541
An - Area of nozzel, square feet	0.0004276	0.0004276	0.0004276
ø - Sampling time, minutes	60	60	60
I - Isokinetic variation, percent	99.0	98.7	103.5

FIELD DATA SUMMARY
PM10 PARTICULATE
DRYER #1 CYCLONE

	Run #1	Run #2	Run #3
Vlc - Volume of water collected, ml	--	--	--
Vm - Gas volume, meter cond., dcf	33.204	33.482	33.765
Y - Meter calibration factor	0.972	0.972	0.972
Pbar - Barometric pressure, in. Hg	29.65	29.65	29.65
Pg - Stack static pressure, in. H2O	-0.15	-0.15	-0.15
ΔH - Avg. meter press. diff., in. H2O	1.000	1.000	1.000
Tm - Absolute meter temperature, °R	523.5	538.9	539.5
Vm(std) - Standard sample gas vol., dscf	31.8578	31.2080	31.4353
Bws - Water vapor part in gas stream	1.2	0.0	0.0
CO_2 - Dry concentration, volume %	0.1	0.1	0.1
[illegible] 70 O_2 - Dry concentration, volume %	20.9	20.9	20.9
Md - Mol wt. stack gas, dry, g/gmole	28.844	28.844	28.844
Ms - Mol wt. stack gas, wet, g/gmole	28.712	28.844	28.844
Cp - Pitot tube coef., dimensionless	0.833	0.833	0.833
Δp - Avg. of sq. roots of each Δp	0.458	0.434	0.444
Ts - Absolute stack Temp. °R	601.3	581.2	585.0
A - Area of stack, square feet	3.69	3.69	3.69
Qstd - Volumetric flow rate, dscfm	5128	4995	5092
An - Area of nozzel, square feet	0.0004276	0.0004276	0.0004276
ø - Sampling time, minutes	60	60	60
I - Isokinetic variation, percent	89.3	89.8	88.7

AIR TESTING

FIELD DATA SUMMARY
TOTAL PARTICULATE
LINT CLEANER CYCLONE

M5

	Run#1	Run#2	Run#3
Vlc - Volume of water collected, ml	6.5	6.4	0.9
Vm - Gas volume, meter cond., dcf	31.571	32.444	32.031
Y - Meter calibration factor	1.028	1.028	1.028
Pbar - Barometric pressure, in. Hg	29.72	29.72	29.72
Pg - Stack static pressure, in. H20	-0.05	-0.05	-0.05
ΔH - Avg. meter press. diff., in. H20	1.434	1.488	1.499
Tm - Absolute meter temperature, °R	536.9	545.4	548.2
Vm(std) - Standard sample gas vol., dscf	31.3361	31.7075	31.1452
Bws - Water vapor part in gas stream	1.0	0.9	0.1
C02 - Dry concentration, volume %	0.1	0.1	0.1
02 - Dry concentration, volume %	20.9	20.9	20.9
Md - Mol wt. stack gas, dry, g/gmole	28.844	28.844	28.844
Ms - Mol wt. stack gas, wet, g/gmole	28.740	28.743	28.829
Cp - Pitot tube coef., dimensionless	0.833	0.833	0.833
Δp - Avg. of sq. roots of each Δp	0.623	0.631	0.633
Ts - Absolute stack Temp. °R	531.8	541.1	542.6
A - Area of stack, square feet	4.91	4.91	4.91
Qstd - Volumetric flow rate, dscfm	9913	9960	10041
An - Area of nozzel, square feet	0.0002737	0.0002737	0.0002737
ø - Sampling time, minutes	60	60	60
I - Isokinetic variation, percent	94.5	95.2	92.7

FIELD DATA SUMMARY
PM10 PARTICULATE
LINT CLEANER CYCLONE
M 501

	Run#1	Run#2	Run#3
Vlc - Volume of water collected, ml	-- 6.5	-- 6.4	-- 0.9
Vm - Gas volume, meter cond., dcf	35.123	35.521	34.628
Y - Meter calibration factor	0.972	0.972	0.972
Pbar - Barometric pressure, in. Hg	29.72	29.72	29.72
Pg - Stack static pressure, in. H20	-0.05	-0.05	-0.05
ΔH - Avg. meter press. diff., in. H20	1.000	1.000	1.000
Tm - Absolute meter temperature, °R	527.5	563.4	535.4
Vm(std) - Standard sample gas vol., dscf	33.5249	31.7433	32.5611
Bws - Water vapor part in gas stream	1.0 ?	0.9 ?	0.1 ?
C02 - Dry concentration, volume %	0.1	0.1	0.1
02 - Dry concentration, volume %	20.9	20.9	20.9
Md - Mol wt. stack gas, dry, g/gmole	28.844	28.844	28.844
Ms - Mol wt. stack gas, wet, g/gmole	28.740	28.743	28.829
Cp - Pitot tube coef., dimensionless	0.833	0.833	0.833
Δp - Avg. of sq. roots of each Δp	0.586	0.620	0.631
Ts - Absolute stack Temp. °R	531.8	541.1	544.1
A - Area of stack, square feet	4.91	4.91	4.91
Qstd - Volumetric flow rate, dscfm	9332	9782	9997
An - Area of nozzel, square feet	0.0002592	0.0025920	0.0002592
ø - Sampling time, minutes	60	60	60
I - Isokinetic variation, percent	113.4	102.4	102.8

SECTION 4
REF 13

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ELBOW ENTERPRISES - NOV. 7-8, 1994
VISALIA, CA

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	112.3	114.3	120.7	
DRYER #1	Pressure	in. HG	29.64	29.64	29.64	
CYCLONE	Moisture	%	1.2	0	0	
(1 of 3)	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	5802	5730	6247	
	Volumetric flow, standard*	dscfm	5160	5140	5542	
	Isokinetic variation	%	98.98	98.74	103.54	
Circle: Production or feed rate Capacity:		bales/hr	41	40.5	31.2	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0893	0.0817	0.0720	
	PM-10	% OF TOTAL	30.20%	20.10%	37.90%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	3.95	3.60	3.42	3.656
	PM-10	lb/hr	1.19	0.723	1.30	1.07
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.0963	0.0889	0.110	0.0983
	PM-10	lb/bale	0.0291	0.0179	0.0415	0.0295
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/bale	0.0437	0.0403	0.0497	0.0446
	PM-10	kg/bale	0.0132	0.0081	0.0188	0.0134

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (3)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
DRYER #1	Total PM	lb/bale	0.289	0.267	0.329	0.295
	PM-10	lb/bale	0.0873	0.0536	0.125	0.0885

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D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	71.8	81.1	82.6	
LINT	Pressure	in. HG	29.72	29.72	29.72	
CLEANER	Moisture	%	0.956	0.93	0.134	
CYCLONE	Oxygen	%	20.9	20.9	20.9	
(1 of 12)	Volumetric flow, actual	acfm	10305	10533	10564	
	Volumetric flow, standard*	dscfm	9913	9961	10043	
	Isokinetic variation	%	94.5	95.2	92.7	
Circle: Production or feed rate Capacity:		bales/hr	42.7	38.2	42.6	
	Pollutant concentrations:					
	Total PM	G/dscf	0.0155	0.0172	0.0145	
	PM-10	% OF TOTAL	28.40%	26.90%	27.70%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	1.32	1.47	1.25	1.345
	PM-10	lb/hr	0.374	0.395	0.346	0.372
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.0308	0.0384	0.0293	0.0329
	PM-10	lb/bale	0.00876	0.0103	0.00812	0.00907
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/bale	0.0140	0.0174	0.0133	0.0149
	PM-10	kg/bale	0.0040	0.0047	0.0037	0.0041

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (12)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
LINT	Total PM	lb/bale	0.370	0.461	0.352	0.394
CLEANER	PM-10	lb/bale	0.105	0.124	0.0974	0.109

APPENDIX N

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 14

AP-42 Section 9.7
Reference 22
Report Sect. 4
Reference 14

STRATFORD GROWERS, INC.
19813 Madison
Stratford, CA 93266

Attn: Joe Vierra

RECEIVED
JAN 03 1994
San Joaquin Valley Unified
Air Pollution Control District

PM10 & TOTAL PARTICULATE TESTING UNLOADING, HULL TRASH, FEEDER TRASH, LINT CLEANER, CYCLONE ROBBER SYSTEM & MOTES TRASH CYCLONES

OCTOBER 26 - 28, 1994

Prepared By:

AIRx TESTING
2175 Goodyear Avenue Unit #105
Ventura, CA 93003

Job Number
19083

Laboratory Report Number
294-136

Test Team Leader
Cam Donnahoo

Results Verified By:
Tom Porter
Partner

See Memo dated 1/12/95 for corrected test results

December 19, 1994

AIRx TESTING

SAN JOAQUIN VALLEY UNIFIED
AIR POLLUTION CONTROL DISTRICT

MEMORANDUM

DATE: January 12, 1995
TO: File
SUBJECT: Review of Source Tests for Stratford Growers
October 26-28, 1994
ATC #C-1191-3-1
Stratford, CA.

AIRx Testing performed source emissions tests for Total and PM-10 particulate matter on the Unloading, Hull Trash, Feeder Trash, Lint Cleaner, Cyclone Robber System, and Motes Trash Cyclones. The testing was performed to determine emission rates (lbs/hr) and emission factors (lbs/bale).

The data and calculations were reviewed to ensure accuracy. Two revisions of the data and summary sheets have been submitted by AIRx due to a spread-sheet calculation error of lbs/hr and numerous transposition errors of laboratory data to the *Data & Calculation* sheets.

CONCLUSION AND RECOMMENDATIONS

Stack emissions source tests have been completed in accordance with the above subject ATC. The ginning rate specified in condition #4 of the above subject ATC should be 720 bales/day, not 750 bales/day. Stratford Growers will submit an application for emission reduction credits based on these source test results. Convert ATC to PTO upon completion of review by Permit Services.

Gabor Lazar
AQI

CC: Dave Warner, SJVUAPCD
Roger Isom, CCGA

CALIFORNIA COTTON GINNERS ASSOCIATION

1900 N. Gateway Blvd. - Suite 156
Fresno Airport Center
Fresno, California 93727
Telephone 209 / 252-0684
Fax 209 / 252 - 0551

RECEIVED
JAN 03 1994
San Joaquin Valley Unified
Air Pollution Control District

December 28, 1994

Mr. Gabe Lazar
SAN JOAQUIN VALLEY UNIFIED A.P.C.D.
Central Region
1999 Tuolumne, Suite 200
Fresno, CA 93721

Re: Source Test Results - Stratford Growers Gin
ATC# C-1191-3-1

Dear Gabe,

Enclosed is a copy of the source test results for Stratford Growers Gin. These tests were conducted October 26 through October 28, 1994 at the Stratford Growers Gin located at 19813 Madison Ave. Stratford, California. We have just received the results and are reviewing them ourselves. Once you have completed your review, please forward to Dave Warner, as these results will be used in an application for emission reduction credits.

These results should satisfy any and all requirements of Authority to Construct No. C-1191-3-1. We would also ask that you ftoward these results to Mr. Chuck Hanna, Air Quality Inspector, so that a permit to operate may be issued. If you have any questions, please feel free to contact me at (209)252-0684 or Mr. Joe Vierra at (209)947-3072.

Sincerely,

Roger A. Isom

Roger A. Isom
Director of Technical Services

c: Joe Vierra, STRATFORD GROWERS
Dave Warner, SJVUAPCD - Central Region
Donavon Heslep, DBI

San Joaquin Valley
Unified Air Pollution Control District

SUMMARY OF SOURCE TEST RESULTS

Equipment: Cotton GIN Rating: 720 BPD-Max

Control Device: Cyclones

Facility: Stratford Growers Permit No.: C1191-37

Location: Stratford, CA Test Date: 26-28 Oct 94

Process Throughput/Fuel Usage Rate: *See attached Sheets

Source Test Company: AIRx TESTING

Pollutant	Outlet Conc. (ppmv, gr/scf, etc.)	Emission Factor (lb/MMBTU, lb/bale, etc.)	Mass Flow Rate (lb/hr, etc.)	Permitted Emission Levels (lb/hr, etc.)
Units				
VOC				
NOx				
SOx				
CO				
PM_{10}	*			763.2 lb/day 1.06 lb/bale
Other (ETO, Chromium, etc.)				

PM-10 EMISSION SUMMARY BY TOTAL # OF CYCLONES							
UNITS	UNLOADING (3)	HULL TRASH (1)	LINT CLEANER (6)	MOTES TRASH (1)	CYCLONE ROBBER (2)	FEEDER TRASH (1)	TOTALS
lbs/hour	1.32	0.63	1.92	0.4	0.98	.17	5.42
lbs/bale	0.06	0.03	.12	.02	0.06	0.01	0.3

STRATFORD GROWERS

	Proposed		Tested**		New Proposed
	PM	PM10*	PM	PM10	PM10
Unloading	0.302	0.151	0.330	0.060	0.060
#1 Incline Cleaner	0.267	0.134			0.134
#2 Incline Cleaner	0.267	0.134			0.134
Hull Trash	0.233	0.117	0.110	0.030	0.030
Overflow	0.049	0.025			0.025
Feeder Trash	0.273	0.137	0.040	0.010	0.010
Motes	0.173	0.087			0.087
Lint Cleaner	0.127	0.064	0.240	0.120	0.120
Battery Condenser	0.060	0.030			0.030
Cyclone Robber System	0.172	0.086	0.180	0.060	0.060
Motes Cleaner	0.132	0.066	0.060	0.020	0.020
Motes Trash	0.070	0.035		0.3	0.035
TOTALS =	2.125	1.0625			0.745

NOTE: * = Assume PM10 = 50%PM
** = Source Test performed 10/94

PARTICULATE EMISSION SUMMARY

UNLOADING CYCLONE X3

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0371	0.0485	0.0746	*0.0534*
lb/hr	1.35	1.78	2.81	*1.98*
lb/bale	0.08	0.10	0.15	*0.11*
Particule Size Distribution				
+10µ (%)	72.5	79.5	79.4	*77.1*
+10µ (lb/hr)	0.98	1.41	2.23	*1.54*
+10µ (lb/bale)	0.06	0.08	0.12	*0.09*
−10µ (%)	27.5	20.5	20.6	*22.9*
−10µ (lb/hr)	0.37	0.36	0.58	*0.44* ×3 = 1.32
−10µ (lb/bale)	0.02	0.02	0.03	*0.02* ×3 = 0.06
Average Bales/hr	17.62	18.29	18.70	*18.20*

HULL TRASH CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0382	0.0331	0.0307	*0.0340*
lb/hr	2.07	1.86	2.50	*2.14*
lb/bale	0.10	0.09	0.13	*0.11*
Particule Size Distribution				
+10µ (%)	60.1	54.8	90.3	*68.4*
+10µ (lb/hr)	1.24	1.02	2.25	*1.50*
+10µ (lb/bale)	0.06	0.05	0.12	*0.08*
−10µ (%)	39.9	45.2	9.7	*31.6*
−10µ (lb/hr)	0.82	0.84	0.24	*0.63*
−10µ (lb/bale)	0.04	0.04	0.01	*0.03*
Average Bales/hr	20.54	21.49	19.34	*20.46*

PARTICULATE EMISSION SUMMARY

LINT CLEANER CYCLONE X6

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0025	0.0129	0.0207	*0.0120*
lb/hr	0.19	1.02	0.71	*0.64*
lb/bale	0.01	0.06	0.04	*0.04*
Particule Size Distribution				
+10µ (%)	61.0	49.9	45.8	*52.2*
+10µ (lb/hr)	0.11	0.51	0.32	*0.31*
+10µ (lb/bale)	0.01	0.03	0.02	*0.02*
−10µ (%)	39.0	50.1	54.2	*47.8*
−10µ (lb/hr)	0.07	0.51	0.38	*0.32* x6 = 1.92
−10µ (lb/bale)	<0.01	0.03	0.02	*0.02* x6 = .12
Average Bales/hr	18.63	18.23	19.66	*18.84*

MOTES TRASH CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0813	0.0519	0.0513	*0.0615*
lb/hr	1.55	1.01	1.01	*1.19*
lb/bale	0.07	0.05	0.06	*0.06*
Particule Size Distribution				
+10µ (%)	66.2	66.0	67.4	*66.5*
+10µ (lb/hr)	1.03	0.67	0.68	*0.79*
+10µ (lb/bale)	0.05	0.03	0.04	*0.04*
−10µ (%)	33.8	34.0	32.6	*33.5*
−10µ (lb/hr)	0.52	0.34	0.33	*0.40*
−10µ (lb/bale)	0.02	0.02	0.02	*0.02*
Average Bales/hr	22.08	19.49	17.64	*19.74*

0.71 lb/hr
for Run 3,
is wrong!
lb/hr = 1.60

PARTICULATE EMISSION SUMMARY

CYCLONE ROBBER SYSTEM X2

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0321	0.0302	0.0355	*0.0326*
lb/hr	1.66	1.62	1.99	*1.76*
lb/bale	0.09	0.08	0.10	*0.09*
Particule Size Distribution				
+10µ (%)	56.0	79.5	79.6	*71.7*
+10µ (lb/hr)	0.93	1.29	1.59	*1.27*
+10µ (lb/bale)	0.05	0.06	0.08	*0.06*
−10µ (%)	44.0	20.5	20.4	*28.3*
−10µ (lb/hr)	0.73	0.33	0.41	*0.49* x2 = .98
−10µ (lb/bale)	0.04	0.02	0.02	*0.03* x2 = .06
Average Bales/hr	18.58	20.43	19.70	*19.57*

FEEDER TRASH CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0153	0.0159	0.0187	*0.0166*
lb/hr	0.73	0.76	0.87	*0.79*
lb/bale	0.04	0.04	0.04	*0.04*
Particule Size Distribution				
+10µ (%)	74.7	71.9	84.5	*77.0*
+10µ (lb/hr)	0.54	0.55	0.73	*0.61*
+10µ (lb/bale)	0.03	0.03	0.04	*0.03*
−10µ (%)	25.3	28.1	15.5	*23.0*
−10µ (lb/hr)	0.18	0.21	0.13	*0.17*
−10µ (lb/bale)	0.01	0.01	0.01	*0.01*
Average Bales/hr	18.47	20.55	20.61	*19.88*

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTTON14.WQ1

STRATFORD GROWERS - OCT. 26-28, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	89.5	73.2	81.8	
LINT CLEANER CYCLONE (1 OF 6)	Pressure	in. HG	29.89	29.94	29.94	
	Moisture	%	0.95	0.772	0.187	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	9224	9596	9410	
	Volumetric flow, standard*	dscfm	8637	9292	9021	
	Isokinetic variation	%	96.8	99.7	96.6	
Circle: Production or feed rate Capacity:		bales/hr	18.63	18.23	19.66	
	Pollutant concentrations:					
	Total PM--reported	g	0.0055	0.0309	0.0207	
	Total PM--actual**	g	0.0059	0.0318	0.0207	
	Total PM--reported	G/dscf	0.0025	0.0129	0.0207	
	Total PM--actual	G/dscf	0.00268	0.01328	0.0207	
	PM-10	% OF TOTAL	void	50.1%	54.2%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.20	1.06	1.60	0.952
	PM-10	lb/hr		0.530	0.87	0.70
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.0107	0.0580	0.081	0.0500
	PM-10	lb/bale		0.0291	0.0441	0.0366

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

**Actual grams does not include negative reported impinger catches in the calculation of total PM catch.

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (6)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
LINT CLEANER	Total PM	lb/bale	0.064	0.35	0.49	0.30
	PM-10	lb/bale		0.17	0.26	0.22
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/bale	0.029	0.16	0.22	0.14
	PM-10	kg/bale		0.079	0.12	0.10

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON14A.WQ1

STRATFORD GROWERS - OCT. 26-28, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg F	97.4	98.2	94.2	
UNLOADING	Pressure	in. HG	29.93	29.93	29.93	
CYCLONE	Moisture	%	0.362	0.225	0.164	
(1 OF 3)	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow; actual	acfm	4545	4603	4688	
	Volumetric flow, standard*	dscfm	4226	4280	4393	
	Isokinetic variation	%	97.5	97.4	95	
Circle: Production or feed rate Capacity:		bales/hr	17.62	18.29	18.7	
	Pollutant concentrations:					
	Total PM--reported	g	0.1078	0.1424	0.2294	
	Total PM--actual**	g	0.1374	0.1424	0.2294	
	Total PM--reported	G/dscf	0.0371	0.0485	0.0746	
	Total PM--actual	G/dscf	0.0473	0.0485	0.0746	
	PM-10	% OF TOTAL	27.5%	20.5%	20.6%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	1.71	1.78	2.81	2.100
	PM-10	lb/hr	0.471	0.365	0.58	0.47
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.0972	0.0973	0.150	0.1149
	PM-10	lb/bale	0.0267	0.0199	0.0309	0.0259

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

**Actual grams does not include negative reported impinger catches in the calculation of total PM catch.

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (3)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
UNLOADING	Total PM	lb/bale	0.29	0.29	0.45	0.34
	PM-10	lb/bale	0.080	0.060	0.093	0.078
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.13	0.13	0.20	0.16
	PM-10	kg/bale	0.036	0.027	0.042	0.035

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON14B.WQ1

STRATFORD GROWERS - OCT. 26-28, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
3	Stack temperature	Deg F	90.6	95.4	101.2	
MASTER	Pressure	in. HG	29.93	29.93	29.93	
TRASH	Moisture	%	1.528	0.207	0.803	
CYCLONE	Oxygen	%	20.9	20.9	20.9	
(1 OF 1)	Volumetric flow, actual	acfm	6779	7015	7115	
	Volumetric flow, standard*	dscfm	6307	6556	6542	
	Isokinetic variation	%	99.6	94.8	95.9	
Circle: Production or feed rate Capacity:		bales/hr	20.54	21.49	19.34	
	Pollutant concentrations:					
	Total PM--reported	g	0.0898	0.0770	0.1045	
	Total PM--actual**	g	0.0898	0.0770	0.1045	
	Total PM--reported	G/dscf	0.0382	0.0331	0.0307	
	Total PM--actual	G/dscf	0.0382	0.0331	0.0307	
	PM-10	% OF TOTAL	39.9%	45.2%	9.7%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	2.06	1.86	1.72	1.88
	PM-10	lb/hr	0.824	0.841	0.17	0.61
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.10	0.087	0.089	0.092
	PM-10	lb/bale	0.040	0.039	0.0086	0.029

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

**Actual grams does not include negative reported impinger catches in the calculation of total PM catch.

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (1)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
MASTER	Total PM	lb/bale	0.10	0.087	0.089	0.092
TRASH	PM-10	lb/bale	0.040	0.039	0.0086	0.029
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.046	0.039	0.040	0.042
	PM-10	kg/bale	0.018	0.018	0.0039	0.013

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STRATFORD GROWERS - OCT. 26-28, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
4	Stack temperature	Deg F	87.4	88.8	90.7	
MOTES	Pressure	in. HG	29.96	29.95	29.95	
TRASH	Moisture	%	0.438	0.411	0.372	
CYCLONE	Oxygen	%	20.9	20.9	20.9	
(1 OF 1)	Volumetric flow, actual	acfm	2345	2407	2452	
	Volumetric flow, standard*	dscfm	2221	2274	2309	
	Isokinetic variation	%	87.5	93.9	92.9	
Circle: Production or feed rate Capacity:		bales/hr	22.08	19.49	17.64	
	Pollutant concentrations:					
	Total PM--reported	g	0.1785	0.1251	0.1242	
	Total PM--actual**	g	0.1785	0.1251	0.1242	
	Total PM--reported	G/dscf	0.0813	0.0519	0.0513	
	Total PM--actual	G/dscf	0.0813	0.0519	0.0513	
	PM-10	% OF TOTAL	33.8%	34.0%	32.6%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	1.55	1.01	1.02	1.19
	PM-10	lb/hr	0.523	0.344	0.331	0.399
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.070	0.052	0.058	0.060
	PM-10	lb/bale	0.024	0.018	0.019	0.020

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

**Actual grams does not include negative reported impinger catches in the calculation of total PM catch.

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (1)

Source	Emission factors (ENGLISH UNITS):		run 1 void--87% isokinetic			AVERAGE
MOTES	Total PM	lb/bale		0.052	0.058	0.055
TRASH	PM-10	lb/bale		0.018	0.019	0.018
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale		0.024	0.026	0.025
	PM-10	kg/bale		0.0080	0.0085	0.0083

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON14D.WQ1

STRATFORD GROWERS - OCT. 26-28, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
5	Stack temperature	Deg F	100.2	100	96.6	
CYCLONE	Pressure	in. HG	29.94	29.94	29.94	
ROBBER	Moisture	%	0.729	0.011	0.213	
SYSTEM	Oxygen	%	20.9	20.9	20.9	
(1 OF 2)	Volumetric flow, actual	acfm	6530	6733	7014	
	Volumetric flow, standard*	dscfm	6021	6256	6543	
	Isokinetic variation	%	93.7	93.2	91	
Circle: Production or feed rate Capacity:		bales/hr	18.58	20.43	19.7	
	Pollutant concentrations:					
	Total PM--reported	g	0.0817	0.0793	0.0954	
	Total PM--actual**	g	0.0860	0.0793	0.0954	
	Total PM--reported	G/dscf	0.0321	0.0302	0.0355	
	Total PM--actual	G/dscf	0.0338	0.0302	0.0355	
	PM-10	% OF TOTAL	44.0%	20.5%	20.4%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	1.74	1.62	1.99	1.78
	PM-10	lb/hr	0.767	0.332	0.406	0.502
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.094	0.079	0.10	0.091
	PM-10	lb/bale	0.041	0.016	0.021	0.026

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

**Actual grams does not include negative reported impinger catches in the calculation of total PM catch.

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (2)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
CYCLONE	Total PM	lb/bale	0.19	0.16	0.20	0.18
ROBBER	PM-10	lb/bale	0.083	0.032	0.041	0.052
SYSTEM	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.085	0.072	0.092	0.083
	PM-10	kg/bale	0.037	0.015	0.019	0.024

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON14E.WQ1

STRATFORD GROWERS - OCT. 26-28, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
6	Stack temperature	Deg F	74.1	78.9	84.4	
FEEDER	Pressure	in. HG	29.89	29.89	29.89	
TRASH	Moisture	%	0.686	0.499	0.245	
CYCLONE	Oxygen	%	20.9	20.9	20.9	
(1 OF 1)	Volumetric flow, actual	acfm	5717	5800	5682	
	Volumetric flow, standard*	dscfm	5522	5563	5409	
	Isokinetic variation	%	94.7	93.7	92.3	
Circle: Production or feed rate Capacity:		bales/hr	18.47	20.55	20.61	
	Pollutant concentrations:					
	Total PM--reported	g	0.0435	0.0450	0.0478	
	Total PM--actual**	g	0.0435	0.0450	0.0478	
	Total PM--reported	G/dscf	0.0153	0.0159	0.0187	
	Total PM--actual	G/dscf	0.0153	0.0159	0.0187	
	PM-10	% OF TOTAL	25.3%	28.1%	15.5%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.72	0.76	0.87	0.78
	PM-10	lb/hr	0.183	0.213	0.134	0.177
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.039	0.037	0.042	0.039
	PM-10	lb/bale	0.0099	0.010	0.0065	0.0089

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

**Actual grams does not include negative reported impinger catches in the calculation of total PM catch.

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (1)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
~~CYCLONE~~	Total PM	lb/bale	0.039	0.037	0.042	0.039
~~ROBBER~~	PM-10	lb/bale	0.0099	0.010	0.0065	0.0089
~~SYSTEM~~	Emission factors (METRIC UNITS):					AVERAGE
GIN STAND	Total PM	kg/bale	0.018	0.017	0.019	0.018
FEEDER TRASH	PM-10	kg/bale	0.0045	0.0047	0.0030	0.0041

APPENDIX O

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 15

AP-42 Section 9.7
Reference 23
Report Sect. 4
Reference 15

ALTA VISTA GIN
5854 South San Diego Street
Mendota, CA 93640

Attn: Lloyd Hendrickson

RECEIVED
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APCD—SOUTHERN REGION

PM10 & TOTAL PARTICULATE TESTING BATTERY CONDENSER, LINT CLEANER & MOTES TRASH CYCLONES

NOVEMBER 3 & 4, 1994

Prepared By:

AIRx TESTING
2175 Goodyear Avenue Unit #105
Ventura, CA 93003

Job Number
1060

Laboratory Report Number
294-140

Test Team Leader
Cam Donnahoo

Results Verified By:
Tom Porter
Partner

December 29, 1994

AIRx TESTING

PARTICULATE EMISSION SUMMARY

BATTERY CONDENSER CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0020	0.0019	0.0026	*0.0022*
lb/hr	0.12	0.13	0.18	*0.14*
lb/bale	0.01	0.01	0.01	*0.01*
Particule Size Distribution				
+10µ (%)	30.5	74.4	24.9	*43.3*
+10µ (lb/hr)	0.04	0.10	0.04	*0.06*
+10µ (lb/bale)	<0.01	<0.01	<0.01	*<0.01*
-10µ (%)	69.5	25.6	75.1	*56.7*
-10µ (lb/hr)	0.08	0.03	0.13	*0.08* ×2 = .16
-10µ (lb/bale)	<0.01	<0.01	<0.01	*<0.01* ×2 = < .02
Average Bales/hr	23.3	22.3	23.6	*23.1*

MOTES CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0304	0.0267	0.0262	*0.0278*
lb/hr	1.00	0.87	0.81	*0.89*
lb/bale	0.04	0.04	0.03	*0.04*
Particule Size Distribution				
+10µ (%)	51.7	34.2	50.8	*45.6*
+10µ (lb/hr)	0.52	0.30	0.41	*0.41*
+10µ (lb/bale)	0.02	0.01	0.02	*0.02*
-10µ (%)	48.3	65.8	49.2	*54.4*
-10µ (lb/hr)	0.48	0.57	0.40	*0.48* ×3 = 1.44
-10µ (lb/bale)	0.02	0.02	0.02	*0.02* ×3 = .06
Average Bales/hr	22.4	23.6	23.2	*23.1*

PARTICULATE EMISSION SUMMARY

LINT CLEANER CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0080	0.0098	0.0041	*0.0073*
lb/hr	0.27	0.33	0.13	*0.24*
lb/bale	0.02	0.01	0.01	*0.01*
Particule Size Distribution				
+10μ (%)	55.5	44.6	57.4	*52.5*
+10μ (lb/hr)	0.15	0.15	0.08	*0.13*
+10μ (lb/bale)	0.01	0.01	<0.01	*<0.01*
-10μ (%)	44.5	55.4	42.6	*47.5*
-10μ (lb/hr)	0.12	0.18	0.06	*0.12* × 6 = .72
-10μ (lb/bale)	0.01	0.01	<0.01	*0.01* × 6 = .06
Average Bales/hr	11.6	23.6	25.5	*20.2*

AIR X TESTING

INTRODUCTION

On November 3 & 4, 1994, AIRx Testing performed source emission tests for Total and PM-10 particulate matter on the Battery Condenser, Lint Cleaner and Motes Trash Cyclones. The cyclones are located at Alta Vista Gin, 5854 South San Diego Street, Mendota, California. Sampling was done in triplicate for total particulate and PM-10 particule size distribution. Production rates, in bales per hour, were taken by Alta Vista personnel. No problems were incountered during the sampling. The exhaust stacks were candy canes attached to the top of the cyclones and continued in a vertical position. The testing was conducted with two (2) ports. The Lint Cleaner Cyclone duct was 30 inches in diameter and the ports were located 72 inches upstream and 240 inches downstream from the nearest disturbance. A total of 12 sample points were taken (6 per port). The Motes cyclone was 26 inches in diameter and the ports were located 50 inches upstream and 240 inches downstream from the nearest disturbance. The Battery Condenser cyclone was 35 inches in diameter and the ports were located 72 inches upstream and 240 inches downstream from the nearest disturbance. A total of 12 sample points were taken (6 per port).

SAMPLING AND ANALYTICAL PROCEDURES

STACK GAS ANALYSIS: The oxygen and carbon dioxide content of the exhaust gases were assumed to be ambient air. Oxygen = 20.9% and Carbon Dioxide = 0.05%.

STACK GAS VELOCITY: The stack gas velocity was determined using an "S" type pitot tube connected to a magnehelic gauge. The "S" type pitot was used to determine the stack velocity profile for each run. A total of 12 (6 points per port) traverse points were utilized on each duct.

The stack temperature was determined using a thermocouple and an indicating pyrometer. The proportion of water was determined gravimetrically and the dry molecular weight of the stack gas determined by E.P.A. Method 3. Stack velocities and gas volumetric flow rate were calculated using E.P.A. Method 2.

TOTAL PARTICULATE EMISSIONS: A CARB Method 5 sampling train was utilized to determine the total particulate emission from the cyclones. The sample train consisted of a stainless steel nozzle, a heated stainless steel probe, a heated glass fiber filter and cooled impingers. After the weight is obtained from the filter, probe and nozzle rinses; the total solids in the impingers is added to the front-end catch to satisfy SJVUAPCD rules.

PARTICULE SIZE DISTRIBUTION: A sample was taken isokinetically from the stack using a GII cascade impactor. A modified CARB Method 501 was utilized. The impactor consisted of two (2) slotted discs, a back up filter and cooled impingers. The noxxle, preseparator cyclone and the first two (2) discs are +10µ and the backup filter, probe and impingers are -10µ. The total weights obtained from each fraction were added together to obtain the total particulate weight. The total weight was used to determine the % of the +10µ and the -10µ fraction. The total weight obtained from the total particulate runs are used to determine the +10µ and the -10µ results reported in grains/dscf, lb/hr and lb/bale.

FIELD DATA SUMMARY
TOTAL PARTICULATE
BATTERY CONDENSER CYCLONE

	Run#1	Run#2	Run#3
Vlc - Volume of water collected, ml	0.0 ✓	0.8 ✓	0.6 ✓
Vm - Gas volume, meter cond., dcf	38.786	40.670	43.719
Y - Meter calibration factor	0.957	0.957	0.957
Pbar - Barometric pressure, in. Hg	29.65	29.65	29.65
Pg - Stack static pressure, in. H20	-0.02	-0.02	-0.02
ΔH - Avg. meter press. diff., in. H20	1.377	1.482	1.560
Tm - Absolute meter temperature, °R	552.1	554.9	557.5
Vm(std) - Standard sample gas vol., dscf	34.7712 ✓	36.2834 ✓	38.8275
Bws - Water vapor part in gas stream	0.0 ✓	0.1 ✓	0.1
CO2 - Dry concentration, volume %	0.1	0.1	0.1
02 - Dry concentration, volume %	20.9	20.9	20.9
Md - Mol wt. stack gas, dry, g/gmole	28.844 ✓	28.844 ✓	28.844
Ms - Mol wt. stack gas, wet, g/gmole	28.844 ✓	28.833 ✓	28.836
Cp - Pitot tube coef., dimensionless	0.833	0.833	0.833
Δp - Avg. of sq. roots of each Δp	0.333	0.367	0.369
Ts - Absolute stack Temp. °R	536.5	534.7	530.3
A - Area of stack, square feet	6.68	6.68	6.68
Qstd - Volumetric flow rate, dscfm	7225 ✓	7976 ✓	8054
An - Area of nozzel, square feet	0.0005275	0.0005275	0.0005275
ø - Sampling time, minutes	60	60	60
I - Isokinetic variation, percent	101.6 ✓	96.0 ✓	101.8

AIR$_X$ TESTING

FIELD DATA SUMMARY
PM10 PARTICULATE
BATTERY CONDENSER CYCLONE

	Run#1	Run#2	Run#3
Vlc - Volume of water collected, ml	--	--	--
Vm - Gas volume, meter cond., dcf	31.825	35.095	32.829
Y - Meter calibration factor	0.972	0.972	0.972
Pbar - Barometric pressure, in. Hg	29.65	29.65	29.65
Pg - Stack static pressure, in. H20	-0.02	-0.02	-0.02
ΔH - Avg. meter press. diff., in. H20	1.000	1.000	1.000
Tm - Absolute meter temperature, °R	539.9	544.4	547.1
Vm(std) - Standard sample gas vol., dscf	29.6063	32.3785	30.1402
Bws - Water vapor part in gas stream	0.0	0.1	0.1
CO2 - Dry concentration, volume %	0.1	0.1	0.1
O2 - Dry concentration, volume %	20.9	20.9	20.9
Md - Mol wt. stack gas, dry, g/gmole	28.844	28.844	28.844
Ms - Mol wt. stack gas, wet, g/gmole	28.844	28.833	28.836
Cp - Pitot tube coef., dimensionless	0.833	0.833	0.833
Δp - Avg. of sq. roots of each Δp	0.317	0.333	0.367
Ts - Absolute stack Temp. °R	536.5	534.7	531.8
A - Area of stack, square feet	6.68	6.68	6.68
Qstd - Volumetric flow rate, dscfm	6874	7231	8000
An - Area of nozzel, square feet	0.0004276	0.0004276	0.0004276
ø - Sampling time, minutes	60	60	60
I - Isokinetic variation, percent	112.2	116.6	98.1

AIR$_X$ TESTING

FIELD DATA SUMMARY
TOTAL PARTICULATE
MOTES CYCLONE

	Run#1	Run#2	Run#3
Vlc - Volume of water collected, ml	7.7	2.3	0.0
Vm - Gas volume, meter cond., dcf	45.738	44.419	44.183
Y - Meter calibration factor	0.957	0.957	0.957
Pbar - Barometric pressure, in. Hg	29.82	29.85	29.85
Pg - Stack static pressure, in. H20	-0.02	-0.02	-0.02
ΔH - Avg. meter press. diff., in. H20	1.979	1.979	1.700
Tm - Absolute meter temperature, °R	537.3	540.4	548.3
Vm(std) - Standard sample gas vol., dscf	42.4359	41.0180	40.1804
Bws - Water vapor part in gas stream	0.8	0.3	0.0
CO2 - Dry concentration, volume %	0.1	0.1	0.1
O2 - Dry concentration, volume %	20.9	20.9	20.9
Md - Mol wt. stack gas, dry, g/gmole	28.844	28.844	28.844
Ms - Mol wt. stack gas, wet, g/gmole	28.753	28.816	28.844
Cp - Pitot tube coef., dimensionless	0.833	0.833	0.833
Δp - Avg. of sq. roots of each Δp	0.313	0.313	0.297
Ts - Absolute stack Temp. °R	509.9	522.8	527.9
A - Area of stack, square feet	3.69	3.69	3.69
Qstd - Volumetric flow rate, dscfm	3835	3807	3599
An - Area of nozzel, square feet	0.0007467	0.0006492	0.0006492
ø - Sampling time, minutes	60	60	60
I - Isokinetic variation, percent	91.1	102.0	105.7

AIR$_X$ TESTING

FIELD DATA SUMMARY
PM10 PARTICULATE
MOTES CYCLONE

	Run# 1	Run# 2	Run# 3
Vlc - Volume of water collected, ml	--	--	--
Vm - Gas volume, meter cond., dcf	31.950	35.000	32.961
Y - Meter calibration factor	0.972	0.972	0.972
Pbar - Barometric pressure, in. Hg	29.82	29.82	29.82
Pg - Stack static pressure, in. H20	-0.02	-0.02	-0.02
ΔH - Avg. meter press. diff., in. H20	1.000	1.000	1.000
Tm - Absolute meter temperature, °R	519.4	535.0	540.7
Vm(std) - Standard sample gas vol., dscf	31.0724	33.0445	30.7957
Bws - Water vapor part in gas stream	0.8	0.3	0.0
CO2 - Dry concentration, volume %	0.1	0.1	0.1
O2 - Dry concentration, volume %	20.9	20.9	20.9
Md - Mol wt. stack gas, dry, g/gmole	28.844	28.844	28.844
Ms - Mol wt. stack gas, wet, g/gmole	28.753	28.816	28.844
Cp - Pitot tube coef., dimensionless	0.833	0.833	0.833
Δp - Avg. of sq. roots of each Δp	0.266	0.313	0.313
Ts - Absolute stack Temp. °R	509.9	523.2	527.9
A - Area of stack, square feet	3.69	3.69	3.69
Qstd - Volumetric flow rate, dscfm	3261	3804	3795
An - Area of nozzel, square feet	0.0007670	0.0004276	0.0004276
ø - Sampling time, minutes	60	60	60
I - Isokinetic variation, percent	76.3	124.8	116.6

AIR TESTING

FIELD DATA SUMMARY
TOTAL PARTICULATE
LINT CLEANER CYCLONE

	Run#1	Run#2	Run#3
Vlc - Volume of water collected, ml	0.2	0.0	0.2
Vm - Gas volume, meter cond., dcf	45.350	44.649	45.224
Y - Meter calibration factor	0.957	0.957	0.957
Pbar - Barometric pressure, in. Hg	29.65	29.65	29.65
Pg - Stack static pressure, in. H20	-0.02	-0.02	-0.02
ΔH - Avg. meter press. diff., in. H20	1.854	1.986	1.832
Tm - Absolute meter temperature, °R	520.1	547.3	552.3
Vm(std) - Standard sample gas vol., dscf	43.2047	40.4355	40.5731
Bws - Water vapor part in gas stream	<0.1	0.0	<0.1
C02 - Dry concentration, volume %	0.1	0.1	0.1
02 - Dry concentration, volume %	20.9	20.9	20.9
Md - Mol wt. stack gas, dry, g/gmole	28.844	28.844	28.844
Ms - Mol wt. stack gas, wet, g/gmole	28.842	28.844	28.842
Cp - Pitot tube coef., dimensionless	0.833	0.833	0.833
Δp - Avg. of sq. roots of each Δp	0.241	0.245	0.236
Ts - Absolute stack Temp. °R	521.8	534.2	537.7
A - Area of stack, square feet	4.91	4.91	4.91
Qstd - Volumetric flow rate, dscfm	3898	3913	3768
An - Area of nozzel, square feet	0.0009621	0.0009168	0.0009168
ø - Sampling time, minutes	60	60	60
I - Isokinetic variation, percent	94.2	92.2	96.1

AIR TESTING

PM10 PARTICULATE

~~LINT CLEANER CYCLONE~~

	Run#1	Run#2	Run#3
Vlc - Volume of water collected, ml	--	--	--
Vm - Gas volume, meter cond., dcf	34.296	32.863	34.049
Y - Meter calibration factor	0.972	0.972	0.972
Pbar - Barometric pressure, in. Hg	29.65	29.65	29.65
Pg - Stack static pressure, in. H20	-0.02	-0.02	-0.02
ΔH - Avg. meter press. diff., in. H20	1.000	1.000	1.000
Tm - Absolute meter temperature, °R	521.0	540.0	540.7
Vm(std) - Standard sample gas vol., dscf	33.0608	30.5696	31.4712
Bws - Water vapor part in gas stream	<0.1	0.0	<0.1
C02 - Dry concentration, volume %	0.1	0.1	0.1
02 - Dry concentration, volume %	20.9	20.9	20.9
Md - Mol wt. stack gas, dry, g/gmole	28.844	28.844	28.844
Ms - Mol wt. stack gas, wet, g/gmole	28.842	28.844	28.842
Cp - Pitot tube coef., dimensionless	0.833	0.833	0.833
Δp - Avg. of sq. roots of each Δp	0.229	0.241	0.245
Ts - Absolute stack Temp. °R	521.5	534.2	537.1
A - Area of stack, square feet	4.91	4.91	4.91
Qstd - Volumetric flow rate, dscfm	3707	3853	3902
An - Area of nozzel, square feet	0.0007670	0.0007670	0.0007670
ø - Sampling time, minutes	60	60	60
I - Isokinetic variation, percent	95.1	84.6	86.0

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client : Alta Vista
Site : Mendota
Unit : Battery Condenser
Run : 1

Date : 11/3/94
Job #: 1060
Lab #: 292-140

BLANKS

Acetone
Gross: 4.1584 gms. Tare: 4.1558 gms. Volume: 200 ml Residue: 0.0026 gms.

DI Water
Gross: 4.0301 gms. Tare: 4.0290 gms. Volume: 200 ml Residue: 0.0011 gms.

WEIGHTS & VOLUMES

Filter Gross: 0.5838 gms. Tare: 0.5813 gms. Net: **0.0025** gms.

Probe Rinse -
Acetone: 60 ml * 1E-05 gms./ml = Net: **-0.0008** gms.
DI Water: 65 ml * 6E-06 gms./ml = Net: **-0.0004** gms.
Gross: 79.1404 gms. Tare: 79.1364 gms. Net: **0.0040** gms.

Impinger Catch -
DI Water: 250 ml * 6E-06 gms./ml = Net: **-0.0014** gms.
Total: 250 ml Aliquot: 250 ml
Gross: 77.3430 gms. Tare: 77.3426 gms. Net: **-0.0010** gms. ← 0 for calc. purposes

Total Particulate Weight = ~~0.0044~~ 0.0053 gms.

Blanks same as Stratford

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client :	Alta Vista	Date :	11/3/94
Site :	Mendota	Job #:	1060
Unit :	Battery Condenser	Lab #:	292-140
Run :	3		

BLANKS

Acetone

Volume: 200 ml

Gross: 4.1584 gms. Tare: 4.1558 gms. Residue: 0.0026 gms.

DI Water

Volume: 200 ml

Gross: 4.0301 gms. Tare: 4.0290 gms. Residue: 0.0011 gms.

WEIGHTS & VOLUMES

Filter Gross: 0.5819 gms. Tare: 0.5799 gms. Net: **0.0020** gms.

Probe Rinse -

Acetone: 75 ml * 1E-05 gms./ml = Net: **-0.0010** gms.

DI Water: 75 ml * 6E-06 gms./ml = Net: **-0.0004** gms.

Gross: 76.3064 gms. Tare: 76.3002 gms. Net: **0.0062** gms.

Impinger Catch -

DI Water: 300 ml * 6E-06 gms./ml = Net: **-0.0017** gms.

Total: 300 ml Aliquot: 300 ml

Gross: 80.0136 gms. Tare: 80.0123 gms. Net: **-0.0003** gms. ← 0 for calc. purposes

Total Particulate Weight = 0.006~~5~~8 gms.

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client :	Alta Vista	Date :	11/4/94
Site :	Mendota	Job #:	1060
Unit :	Motes	Lab #:	292-140
Run :	2		

BLANKS

			Volume	Residue
Acetone	Gross: 4.1584 gms.	Tare: 4.1558 gms.	Volume: 200 ml	Residue: 0.0026 gms.
DI Water	Gross: 4.0301 gms.	Tare: 4.0290 gms.	Volume: 200 ml	Residue: 0.0011 gms.

WEIGHTS & VOLUMES

Filter Gross: 0.6270 gms. Tare: 0.5821 gms. Net: **0.0449** gms.

Probe Rinse -

Acetone: 75 ml * 1E-05 gms./ml = Net: **-0.0010** gms.

DI Water: 75 ml * 6E-06 gms./ml = Net: **-0.0004** gms.

Gross: 4.0854 gms. Tare: 4.0570 gms. Net: **0.0284** gms.

Impinger Catch -

DI Water: 275 ml * 6E-06 gms./ml = Net: **-0.0015** gms.

Total: 275 ml Aliquot: 275 ml

Gross: 3.9592 gms. Tare: 3.9586 gms. Net: **-0.0009** gms. 0 for calc. purposes

Total Particulate Weight = 0.071~~0~~9 gms.

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client :	Alta Vista	Date :	11/4/94
Site :	Mendota	Job #:	1060
Unit :	Motes	Lab #:	292-140
Run :	3		

BLANKS

	Gross	Tare	Volume	Residue
Acetone	4.1584 gms.	4.1558 gms.	200 ml	0.0026 gms.
DI Water	4.0301 gms.	4.0290 gms.	200 ml	0.0011 gms.

WEIGHTS & VOLUMES

Filter Gross: 0.6186 gms. Tare: 0.5799 gms. Net: **0.0387** gms.

Probe Rinse -
Acetone: 60 ml * 1E-05 gms./ml = Net: **-0.0008** gms.

DI Water: 65 ml * 6E-06 gms./ml = Net: **-0.0004** gms.

Gross: 4.0534 gms. Tare: 4.0207 gms. Net: **0.0327** gms.

Impinger Catch -
DI Water: 300 ml * 6E-06 gms./ml = Net: **-0.0017** gms.

Total: 300 ml Aliquot: 300 ml

Gross: 4.0262 gms. Tare: 4.0266 gms. Net: **-0.0021** gms. ← 0 for calc. purposes

Total Particulate Weight = ~~0.0682~~ 0.0702 gms.

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client :	Alta Vista	Date :	11/3/94
Site :	Mendota	Job #:	1060
Unit :	Lint Cleaner	Lab #:	292-140
Run :	2		

BLANKS

Acetone

				Volume:	200 ml
Gross:	4.1584 gms.	Tare:	4.1558 gms.	Residue:	0.0026 gms.

DI Water

				Volume:	200 ml
Gross:	4.0301 gms.	Tare:	4.0290 gms.	Residue:	0.0011 gms.

WEIGHTS & VOLUMES

Filter Gross: 0.5996 gms. Tare: 0.5860 gms. Net: **0.0136** gms.

Probe Rinse -

Acetone: 60 ml * 1E-05 gms./ml = Net: **-0.0008** gms.

DI Water: 65 ml * 6E-06 gms./ml = Net: **-0.0004** gms.

Gross: 79.3450 gms. Tare: 79.3306 gms. Net: **0.0144** gms.

Impinger Catch -

DI Water: 275 ml * 6E-06 gms./ml = Net: **-0.0015** gms.

Total: 275 ml Aliquot: 275 ml

Gross: 80.0055 gms. Tare: 80.0050 gms. Net: **-0.0010** gms. 0 for calc. purposes

Total Particulate Weight = 0.02~~5~~68 gms.

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client :	Alta Vista	Date :	11/3/94
Site :	Mendota	Job #:	1060
Unit :	Lint Cleaner	Lab #:	292-140
Run :	3		

BLANKS

Acetone — Volume: 200 ml
Gross: 4.1584 gms. Tare: 4.1558 gms. Residue: 0.0026 gms.

DI Water — Volume: 200 ml
Gross: 4.0301 gms. Tare: 4.0290 gms. Residue: 0.0011 gms.

WEIGHTS & VOLUMES

Filter Gross: 0.5932 gms. Tare: 0.5864 gms. Net: **0.0068** gms.

Probe Rinse --
Acetone: 75 ml * 1E-05 gms./ml = Net: **-0.0010** gms.

DI Water: 75 ml * 6E-06 gms./ml = Net: **-0.0004** gms.

Gross: 77.3499 gms. Tare: 77.3431 gms. Net: **0.0068** gms.

Impinger Catch -
DI Water: 300 ml * 6E-06 gms./ml = Net: **-0.0017** gms.

Total: 300 ml Aliquot: 300 ml

Gross: 80.4292 gms. Tare: 80.4291 gms. Net: **-0.0016** gms. ← 0 for calc. purposes

Total Particulate Weight = ~~0.0107~~ 0.0122 gms.

SECTION 4
REF 15

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTTON15.WQ1

ALTA VISTA GIN - NOV. 3 & 4, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	76.5	74.7	70.3	
BATTERY	Pressure	in. HG	29.65	29.65	29.65	
CONDENSE	Moisture	%	0	0.102	0.072	
CYCLONE	Oxygen	%	20.9	20.9	20.9	
(1 OF 2)	Volumetric flow, actual	acfm	7522	8285	8295	
	Volumetric flow, standard*	dscfm	7225	7976	8054	
	Isokinetic variation	%	101.59	96.02	101.77	
Circle: Production or feed rate Capacity:		bales/hr	23.3	22.3	23.6	
	Pollutant concentrations:					
	Total PM--reported	g	0.0044	0.0045	0.0065	
	Total PM--actual**	g	0.0053	0.0045	0.0068	
	Total PM--reported	G/dscf	0.0020	0.0019	0.0026	
	Total PM--actual	G/dscf	0.0024	0.0019	0.0027	
	PM-10	% OF TOTAL	69.5%	25.6%	75.1%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.15	0.13	0.19	0.16
	PM-10	lb/hr	0.10	0.033	0.14	0.093
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.0064	0.0058	0.0080	0.0067
	PM-10	lb/bale	0.0045	0.0015	0.0060	0.0040
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/bale	0.0029	0.0026	0.0036	0.0031
	PM-10	kg/bale	0.0020	0.0007	0.0027	0.0018

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT
**Actual grams does not include negative impinger catches in the calculation of the total PM catch.

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (2)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
BATTERY	Total PM	lb/bale	0.013	0.012	0.016	0.013
CONDENSE	PM-10	lb/bale	0.0089	0.0030	0.012	0.0079

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON15A.WQ1

ALTA VISTA GIN - NOV. 3 & 4, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg F	49.9	62.8	67.9	
MOTES	Pressure	in. HG	29.82	29.85	29.85	
CYCLONE	Moisture	%	0.837	0.26	0	
(1 OF 3)	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	3805	3847	3662	
	Volumetric flow, standard*	dscfm	3835	3808	3599	
	Isokinetic variation	%	91.07	101.99	105.69	
Circle: Production or feed rate Capacity:		bales/hr	22.4	23.6	23.2	
	Pollutant concentrations:					
	Total PM--reported	g	0.0836	0.0710	0.0682	
	Total PM--actual**	g	0.0836	0.0719	0.0702	
	Total PM--reported	G/dscf	0.0304	0.0267	0.0262	
	Total PM--actual	G/dscf	0.0304	0.0270	0.0270	
	PM-10	% OF TOTAL	48.3%	65.8%	49.2%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	1.00	0.88	0.83	0.905
	PM-10	lb/hr	0.483	0.581	0.41	0.491
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.045	0.037	0.036	0.039
	PM-10	lb/bale	0.022	0.025	0.018	0.021
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/bale	0.020	0.017	0.016	0.018
	PM-10	kg/bale	0.0098	0.011	0.0080	0.0096

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

**Actual grams does not include negative impinger catches in the calculation of the total PM catch.

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (3)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
MOTES	Total PM	lb/bale	0.13	0.11	0.11	0.12
SYSTEM	PM-10	lb/bale	0.0646	0.0738	0.0529	0.0638

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON15B.WQ1

ALTA VISTA GIN - NOV. 3 & 4, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
3	Stack temperature	Deg F	61.8	74.2	77.7	
LINT	Pressure	in. HG	29.65	29.65	29.65	
CLEANER	Moisture	%	0.022	0	0.023	
CYCLONE	Oxygen	%	20.9	20.9	20.9	
(1 OF 6)	Volumetric flow, actual	acfm	3948	4057	3933	
	Volumetric flow, standard*	dscfm	3898	3914	3768	
	Isokinetic variation	%	94.25	92.21	96.08	
Circle: Production or feed rate Capacity:		bales/hr	11.6	23.6	25.5	
	Pollutant concentrations:					
	Total PM--reported	g	0.0225	0.0258	0.0107	
	Total PM--actual**	g	0.0240	0.0268	0.0122	
	Total PM--reported	G/dscf	0.0080	0.0098	0.0041	
	Total PM--actual	G/dscf	0.0085	0.0102	0.0047	
	PM-10	% OF TOTAL	44.5%	55.4%	42.6%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.285	0.341	0.151	0.259
	PM-10	lb/hr	0.127	0.189	0.0643	0.127
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.025	0.014	0.0059	0.015
	PM-10	lb/bale	0.011	0.0080	0.0025	0.0072
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/bale	0.011	0.0066	0.0027	0.0068
	PM-10	kg/bale	0.0050	0.0036	0.0011	0.0032

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

**Actual grams does not include negative impinger catches in the calculation of the total PM catch.

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (6)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
LINT	Total PM	lb/bale	0.15	0.087	0.036	0.090
CLEANER	PM-10	lb/bale	0.066	0.048	0.015	0.043

APPENDIX P

EMISSION FACTOR CALCULATIONS AND REPORT EXCERPTS FROM REFERENCE 16

AP-42 Section 9.7
Reference 24
Report Sect. 4
Reference 16

DOS PALOS COOP GIN
7870 West Hutchins
Dos Palos, CA 93620

Attn: Bill Wilson

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San Joaquin Valley Unified Air Pollution Control District

PM10 & TOTAL PARTICULATE TESTING UNLOADING, DRYER #2, OVERFLOW, BATTERY CONDENSER & MOTES CYCLONES

OCTOBER 31 - NOVEMBER 2, 1994

Prepared By:

AIRx TESTING
2175 Goodyear Avenue Unit #105
Ventura, CA 93003

Job Number
4033

Laboratory Report Number
294-139

Test Team Leader
Cam Donnahoo

Results Verified By:
Tom Porter
Partner

December 23, 1994

AIRx TESTING

AIR_X TESTING

January 4, 1995

Dos Palos COOP Gin
7870 W. Hutchins
Dos Palos, CA 93620

ATTN: Bill Wilson

RE: Addendum to Cyclone Source Emission Testing - Report No. 294-139

An error was found in our spread sheet for calculating the lb/hr. Please find enclosed the revised data and summary sheets with the new values. I hope that this has not caused you any inconvenience or delays.

If you have any questions or comments regarding the above comments, please contact the undersigned at (805) 644-1099.

Respectfully submitted,
AIRx Testing

Tom Porter
Partner

cc: California Cotton Ginners Association
Attn: Roger Isom

SJVUAPCD
Attn: John Cadrett

RECEIVED
JAN 09 1995
SAN JOAQUIN VALLEY
UNIFIED A.P.C.D.
NO. REGION

AIR_X TESTING • 2175 GOODYEAR AVE., SUITE 105 • VENTURA, CA 93003
PHONE: 805/644-1099 • FAX: 805/644-2672

PARTICULATE EMISSION SUMMARY

UNLOADING CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0598	0.0910	0.0734	*0.0747*
lb/hr	2.52	3.93	3.08	*3.18*
lb/bale	0.06	0.09	0.09	*0.08*
Particule Size Distribution				
+10μ (%)	66.4	58.4	67.3	*64.0*
+10μ (lb/hr)	1.67	2.29	2.07	*2.01*
+10μ (lb/bale)	0.04	<0.01	0.06	*0.03*
-10μ (%)	33.6	41.6	32.7	*36.0*
-10μ (lb/hr)	0.85	1.63	1.01	*1.16*
-10μ (lb/bale)	0.02	<0.01	0.03	*0.02*
Average Bales/hr	40.3	45.2	33.8	*39.8*

OVERFLOW CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0338	0.0481	0.0697	*0.0505*
lb/hr	1.65	2.28	3.18	*2.37*
lb/bale	0.05	0.05	0.09	*0.06*
Particule Size Distribution				
+10μ (%)	57.6	66.2	80.1	*68.0*
+10μ (lb/hr)	0.95	1.51	2.54	*1.67*
+10μ (lb/bale)	0.03	0.04	0.07	*0.05*
-10μ (%)	42.4	33.8	19.9	*32.0*
-10μ (lb/hr)	0.70	0.77	0.63	*0.70*
-10μ (lb/bale)	0.02	0.02	0.02	*0.02*
Average Bales/hr	33.3	43.0	35.0	*37.1*

PARTICULATE EMISSION SUMMARY

MOTES CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0113	0.0170	0.0122	*0.0135*
lb/hr	0.74	1.09	0.78	*0.87*
lb/bale	0.02	0.02	0.03	*0.02*
Particule Size Distribution				
+10µ (%)	65.2	64.1	11.2	*46.8*
+10µ (lb/hr)	0.48	0.70	0.09	*0.42*
+10µ (lb/bale)	0.01	0.02	<0.01	*0.01*
-10µ (%)	34.8	35.9	88.8	*53.2*
-10µ (lb/hr)	0.26	0.39	0.69	*0.45*
-10µ (lb/bale)	<0.01	<0.01	0.03	*0.01*
Average Bales/hr	42.9	46.8	24.2	*38.0*

DRYER #2 CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0283	0.0240	0.0221	*0.0248*
lb/hr	1.00	0.86	0.77	*0.88*
lb/bale	0.04	0.02	0.02	*0.03*
Particule Size Distribution				
+10µ (%)	57.6	75.9	60.0	*64.5*
+10µ (lb/hr)	0.57	0.66	0.46	*0.56*
+10µ (lb/bale)	0.02	0.02	0.01	*0.02*
-10µ (%)	42.4	24.1	40.0	*35.5*
-10µ (lb/hr)	0.42	0.21	0.31	*0.31*
-10µ (lb/bale)	0.02	<0.01	<0.01	*0.01*
Average Bales/hr	26.5	38.4	41.6	*35.5*

PARTICULATE EMISSION SUMMARY

BATTERY CONDENSER CYCLONE

	Run #1	Run #2	Run #3	Average
Total Particulate				
gr/DSCF	0.0073	0.0027	0.0039	*0.0046*
lb/hr	0.36	0.13	0.21	*0.23*
lb/bale	<0.01	<0.01	<0.01	*<0.01*
Particule Size Distribution				
+10µ (%)	88.0	9.0	66.6	*54.5*
+10µ (lb/hr)	0.32	0.01	0.14	*0.16*
+10µ (lb/bale)	<0.01	<0.01	<0.01	*<0.01*
-10µ (%)	12.0	91.0	33.4	*45.5*
-10µ (lb/hr)	0.04	0.12	0.07	*0.08*
-10µ (lb/bale)	<0.01	<0.01	<0.01	*<0.01*
Average Bales/hr	45.4	45.0	44.6	*45.0*

INTRODUCTION

On October 31- November 2, 1994, AIRx Testing performed source emissions tests for Total and PM-10 particulate matter on the Unloading, Dryer #2, Overflow, Battery Condenser and Motes Cyclones. The cyclones are located at the Dos Palos Gin, 7870 West Huchins, Dos Palos, California. Sampling was done in triplicate for total particulate and PM-10 particule size distribution. Production rates, in bales per hour, were taken by Dos Palos personnel. No problems were incountered during the sampling. The exhaust stacks were candy canes attached to the top of the cyclones and continued in a vertical position. The testing was conducted with two (2) ports. The Battery Condenser Cyclone duct was 30 inches in diameter and the ports were located 64 inches upstream and 240 inches downstream from the nearest disturbance. A total of 12 sample points were taken (6 per port). All the other cyclones were 26 inches in diameter and the ports were located 62 inches upstream and 240 inches downstream from the nearest disturbance. A total of 12 sample points were taken (6 per port).

SAMPLING AND ANALYTICAL PROCEDURES

STACK GAS ANALYSIS: The oxygen and carbon dioxide content of the exhaust gases were assumed to be ambient air. Oxygen = 20.9% and Carbon Dioxide = 0.05%.

STACK GAS VELOCITY: The stack gas velocity was determined using an "S" type pitot tube connected to a magnehelic gauge. The "S" type pitot was used to determine the stack velocity profile for each run. A total of 12 (6 points per port) traverse points were utilized on each duct.

The stack temperature was determined using a thermocouple and an indicating pyrometer. The proportion of water was determined gravimetrically and the dry molecular weight of the stack gas determined by E.P.A. Method 3. Stack velocities and gas volumetric flow rate were calculated using E.P.A. Method 2.

TOTAL PARTICULATE EMISSIONS: A CARB Method 5 sampling train was utilized to determine the total particulate emission from the cyclones. The sample train consisted of a stainless steel nozzle, a heated stainless steel probe, a heated glass fiber filter and cooled impingers. After the weight is obtained from the filter, probe and nozzle rinses; the total solids in the impingers is added to the front-end catch to satisfy SJVUAPCD rules.

PARTICULE SIZE DISTRIBUTION: A sample was taken isokinetically from the stack using a GII cascade impactor. A modified CARB Method 501 was utilized. The impactor consisted of two (2) slotted discs, a back up filter and cooled impingers. The noxxle, preseparator cyclone and the first two (2) discs are +10µ and the backup filter, probe and impingers are -10µ. The total weights obtained from each fraction were added together to obtain the total particulate weight. The total weight was used to determine the % of the +10µ and the -10µ fraction. The total weight obtained from the total particulate runs are used to determine the +10µ and the -10µ results reported in grains/dscf, lb/hr and lb/bale.

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client : Dos Palos
Site : Dos Palos
Unit : Unloading
Run : 3

Date : 10/31/94
Job #: 4033
Lab #: 292-139

BLANKS

Acetone

Gross: 4.1584 gms. Tare: 4.1558 gms. Volume: 200 ml Residue: 0.0026 gms.

DI Water

Gross: 4.0301 gms. Tare: 4.0290 gms. Volume: 200 ml Residue: 0.0011 gms.

WEIGHTS & VOLUMES

Filter Gross: 0.4650 gms. Tare: 0.3933 gms. Net: **0.0717** gms.

Probe Rinse -

Acetone: 85 ml * 1E-05 gms./ml = Net: **-0.0011** gms.

DI Water: 90 ml * 6E-06 gms./ml = Net: **-0.0005** gms.

Gross: 79.2496 gms. Tare: 79.1358 gms. Net: **0.1138** gms.

Impinger Catch -

DI Water: 340 ml * 6E-06 gms./ml = Net: **-0.0019** gms.

Total: 340 ml Aliquot: 340 ml

Gross: 79.3316 gms. Tare: 79.3310 gms. Net: **-0.0013** gms. ← 0 for calc. purposes

Total Particulate Weight = 0.18~~26~~39 gms.

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client : Dos Palos
Site : Dos Palos
Unit : Unloading
Run : 2

Date : 10/31/94
Job #: 4033
Lab #: 292-139

BLANKS

Acetone			Volume: 200 ml
	Gross: 4.1584 gms.	Tare: 4.1558 gms.	Residue: 0.0026 gms.
DI Water			Volume: 200 ml
	Gross: 4.0301 gms.	Tare: 4.0290 gms.	Residue: 0.0011 gms.

WEIGHTS & VOLUMES

Filter	Gross: 0.5169 gms.	Tare: 0.3959 gms.		Net: **0.1210** gms.
Probe Rinse -				
Acetone:	110 ml *	1E-05 gms./ml	=	Net: **-0.0014** gms.
DI Water:	115 ml *	6E-06 gms./ml	=	Net: **-0.0006** gms.
	Gross: 80.5382 gms.	Tare: 80.4294 gms.		Net: **0.1088** gms.
Impinger Catch -				
DI Water:	300 ml *	6E-06 gms./ml	=	Net: **-0.0017** gms.
	Total: 300 ml	Aliquot: 300 ml		
	Gross: 79.5625 gms.	Tare: 79.5611 gms.		Net: **-0.0002** gms. ← 0 for calc. purposes

Total Particulate Weight = 0.227~~5~~ 7 gms.

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client : Dos Palos
Site : Dos Palos
Unit : Overflow
Run : 1

Date : 10/31/94
Job #: 4033
Lab #: 292-139

BLANKS

Acetone
Gross: 4.1584 gms. Tare: 4.1558 gms. Volume: 200 ml Residue: 0.0026 gms.

DI Water
Gross: 4.0301 gms. Tare: 4.0290 gms. Volume: 200 ml Residue: 0.0011 gms.

WEIGHTS & VOLUMES

Filter Gross: 0.4300 gms. Tare: 0.3968 gms. Net: **0.0332** gms.

Probe Rinse -
Acetone: 75 ml * 1E-05 gms./ml = Net: **-0.0010** gms.

DI Water: 75 ml * 6E-06 gms./ml = Net: **-0.0004** gms.

Gross: 77.4001 gms. Tare: 77.3430 gms. Net: **0.0571** gms.

Impinger Catch -
DI Water: 250 ml * 6E-06 gms./ml = Net: **-0.0014** gms.

Total: 250 ml Aliquot: 250 ml

Gross: 80.2856 gms. Tare: 80.2843 gms. Net: **-0.0001** gms. ← 0 for calc. purposes

Total Particulate Weight = 0.088~~8~~9 gms.

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client :	Dos Palos	Date :	10/31/94
Site :	Dos Palos	Job #:	4033
Unit :	Overflow	Lab #:	292-139
Run :	3		

BLANKS

Acetone							Volume:	200	ml
	Gross:	4.1584	gms.	Tare:	4.1558	gms.	Residue:	0.0026	gms.
DI Water							Volume:	200	ml
	Gross:	4.0301	gms.	Tare:	4.0290	gms.	Residue:	0.0011	gms.

WEIGHTS & VOLUMES

Filter	Gross:	0.6462	gms.	Tare:	0.5826	gms.		Net:	**0.0636**	gms.
Probe Rinse -										
	Acetone:	110	ml *	1E-05	gms./ml		=	Net:	**-0.0014**	gms.
	DI Water:	115	ml *	6E-06	gms./ml		=	Net:	**-0.0006**	gms.
	Gross:	4.1398	gms.	Tare:	4.0304	gms.		Net:	**0.1094**	gms.
Impinger Catch -										
	DI Water:	275	ml *	6E-06	gms./ml		=	Net:	**-0.0015**	gms.
	Total:	275	ml	Aliquot:	300	ml				
	Gross:	3.9185	gms.	Tare:	3.9184	gms.		Net:	**-0.0014**	gms. ← ∅ for calc. purposes

Total Particulate Weight = ~~0.1695~~ 0.171 **gms.**

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client : Dos Palos
Site : Dos Palos
Unit : Motes
Run : 1

Date : 11/1/94
Job #: 4033
Lab #: 292-139

BLANKS

Acetone	Gross: 4.1584 gms.	Tare: 4.1558 gms.	Volume: 200 ml	Residue: 0.0026 gms.
DI Water	Gross: 4.0301 gms.	Tare: 4.0290 gms.	Volume: 200 ml	Residue: 0.0011 gms.

WEIGHTS & VOLUMES

Filter Gross: 0.5923 gms. Tare: 0.5835 gms. Net: **0.0088** gms.

Probe Rinse -

Acetone: 75 ml * 1E-05 gms./ml = Net: **-0.0010** gms.

DI Water: 75 ml * 6E-06 gms./ml = Net: **-0.0004** gms.

Gross: 4.1434 gms. Tare: 4.1225 gms. Net: **0.0209** gms.

Impinger Catch -

DI Water: 400 ml * 6E-06 gms./ml = Net: **-0.0022** gms.

Total: 400 ml Aliquot: 400 ml

Gross: 4.2096 gms. Tare: 4.2078 gms. Net: **-0.0004** gms. ← Ø for calc. purposes

Total Particulate Weight = 0.02~~79~~83 gms.

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client :	Dos Palos	Date :	11/1/94
Site :	Dos Palos	Job #:	4033
Unit :	Motes	Lab #:	292-139
Run :	2		

BLANKS

Acetone			Volume:	200 ml
	Gross: 4.1584 gms.	Tare: 4.1558 gms.	Residue:	0.0026 gms.
DI Water			Volume:	200 ml
	Gross: 4.0301 gms.	Tare: 4.0290 gms.	Residue:	0.0011 gms.

WEIGHTS & VOLUMES

Filter	Gross: 0.6040 gms.	Tare: 0.5808 gms.		Net: **0.0232** gms.
Probe Rinse -				
Acetone:	75 ml *	1E-05 gms./ml	=	Net: **-0.0010** gms.
DI Water:	75 ml *	6E-06 gms./ml	=	Net: **-0.0004** gms.
	Gross: 4.0679 gms.	Tare: 4.0429 gms.		Net: **0.0250** gms.
Impinger Catch -				
DI Water:	300 ml *	6E-06 gms./ml	=	Net: **-0.0017** gms.
	Total: 300 ml	Aliquot: 300 ml		
	Gross: 4.1902 gms.	Tare: 4.1896 gms.		Net: **-0.0011** gms. ∅ for calc. purposes

Total Particulate Weight = 0.04~~50~~69 gms.

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client :	Dos Palos	Date :	11/1/94
Site :	Dos Palos	Job #:	4033
Unit :	Motes	Lab #:	292-139
Run :	3		

BLANKS

Acetone					Volume:	200 ml
	Gross:	4.1584 gms.	Tare:	4.1558 gms.	Residue:	0.0026 gms.
DI Water					Volume:	200 ml
	Gross:	4.0301 gms.	Tare:	4.0290 gms.	Residue:	0.0011 gms.

WEIGHTS & VOLUMES

Filter	Gross: 0.6008 gms.	Tare: 0.5846 gms.		Net:	**0.0162** gms.
Probe Rinse -					
Acetone:	85 ml *	1E-05 gms./ml	=	Net:	**-0.0011** gms.
DI Water:	90 ml *	6E-06 gms./ml	=	Net:	**-0.0005** gms.
	Gross: 3.8744 gms.	Tare: 3.8571 gms.		Net:	**0.0173** gms.
Impinger Catch -					
DI Water:	270 ml *	6E-06 gms./ml	=	Net:	**-0.0015** gms.
	Total: 270 ml	Aliquot: 270 ml			
	Gross: 4.1191 gms.	Tare: 4.1184 gms.		Net:	**-0.0008** gms. ∅ for calc. purposes

Total Particulate Weight = 0.0311 gms.

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client :	Dos Palos	Date :	11/1/94
Site :	Dos Palos	Job #:	4033
Unit :	Dryer #2	Lab #:	292-139
Run :	1		

BLANKS

Acetone						Volume:	200	ml
	Gross:	4.1584 gms.	Tare:	4.1558 gms.		Residue:	0.0026	gms.
DI Water						Volume:	200	ml
	Gross:	4.0301 gms.	Tare:	4.0290 gms.		Residue:	0.0011	gms.

WEIGHTS & VOLUMES

Filter	Gross: 0.5973 gms.	Tare: 0.5865 gms.		Net:	**0.0108**	gms.
Probe Rinse -						
Acetone:	100 ml *	1E-05 gms./ml	=	Net:	**-0.0013**	gms.
DI Water:	100 ml *	6E-06 gms./ml	=	Net:	**-0.0006**	gms.
	Gross: 4.0657 gms.	Tare: 4.0122 gms.		Net:	**0.0535**	gms.
Impinger Catch -						
DI Water:	300 ml *	6E-06 gms./ml	=	Net:	**-0.0017**	gms.
	Total: 300 ml	Aliquot: 300 ml				
	Gross: 4.2100 gms.	Tare: 4.2106 gms.		Net:	**-0.0023**	gms.

0 for calc. purposes

Total Particulate Weight = 0.06~~02~~24 gms.

118

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client : Dos Palos
Site : Dos Palos
Unit : Dryer #2
Run : 2

Date : 11/1/94
Job #: 4033
Lab #: 292-139

BLANKS

Acetone			Volume: 200 ml
	Gross: 4.1584 gms.	Tare: 4.1558 gms.	Residue: 0.0026 gms.
DI Water			Volume: 200 ml
	Gross: 4.0301 gms.	Tare: 4.0290 gms.	Residue: 0.0011 gms.

WEIGHTS & VOLUMES

Filter	Gross: 0.5960 gms.	Tare: 0.5859 gms.		Net: **0.0101** gms.
Probe Rinse -				
Acetone:	75 ml *	1E-05 gms./ml	=	Net: **-0.0010** gms.
DI Water:	75 ml *	6E-06 gms./ml	=	Net: **-0.0004** gms.
	Gross: 4.1522 gms.	Tare: 4.1066 gms.		Net: **0.0456** gms.
Impinger Catch -				
DI Water:	300 ml *	6E-06 gms./ml	=	Net: **-0.0017** gms.
	Total: 300 ml	Aliquot: 300 ml		
	Gross: 3.9544 gms.	Tare: 3.9550 gms.		Net: **-0.0023** gms. ← 0 for calc. purposes

Total Particulate Weight = **0.05~~21~~43** gms.

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client :	Dos Palos	Date :	11/1/94
Site :	Dos Palos	Job #:	4033
Unit :	Dryer #2	Lab #:	292-139
Run :	3		

BLANKS

Acetone			Volume:	200 ml
	Gross: 4.1584 gms.	Tare: 4.1558 gms.	Residue:	0.0026 gms.
DI Water			Volume:	200 ml
	Gross: 4.0301 gms.	Tare: 4.0290 gms.	Residue:	0.0011 gms.

WEIGHTS & VOLUMES

Filter	Gross: 0.5950 gms.	Tare: 0.5815 gms.		Net: **0.0135** gms.
Probe Rinse -				
Acetone:	85 ml *	1E-05 gms./ml	=	Net: **-0.0011** gms.
DI Water:	90 ml *	6E-06 gms./ml	=	Net: **-0.0005** gms.
	Gross: 4.1486 gms.	Tare: 4.1092 gms.		Net: **0.0394** gms.
Impinger Catch -				
DI Water:	325 ml *	6E-06 gms./ml	=	Net: **-0.0018** gms.
	Total: 325 ml	Aliquot: 325 ml		
	Gross: 4.0128 gms.	Tare: 4.0126 gms.		Net: **-0.0016** gms. ← 0 for calc. purposes

Total Particulate Weight = **0.0~~497~~513 gms.**

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client :	Dos Palos	Date :	11/2/94
Site :	Dos Palos	Job #:	4033
Unit :	Battery Condenser	Lab #:	292-139
Run :	1		

BLANKS

Acetone — Volume: 200 ml

Gross: 4.1584 gms. Tare: 4.1558 gms. Residue: 0.0026 gms.

DI Water — Volume: 200 ml

Gross: 4.0301 gms. Tare: 4.0290 gms. Residue: 0.0011 gms.

WEIGHTS & VOLUMES

Filter Gross: 0.5842 gms. Tare: 0.5803 gms. Net: **0.0039** gms.

Probe Rinse -

Acetone: 80 ml * 1E-05 gms./ml = Net: **-0.0010** gms.

DI Water: 80 ml * 6E-06 gms./ml = Net: **-0.0004** gms.

Gross: 3.9310 gms. Tare: 3.9176 gms. Net: **0.0134** gms.

Impinger Catch -

DI Water: 350 ml * 6E-06 gms./ml = Net: **-0.0019** gms.

Total: 350 ml Aliquot: 350 ml

Gross: 4.0702 gms. Tare: 4.0692 gms. Net: **-0.0009** gms. 0 for calc. purposes

Total Particulate Weight = 0.01~~49~~ 59 gms.

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client :	Dos Palos	Date :	11/2/94
Site :	Dos Palos	Job #:	4033
Unit :	Battery Condenser	Lab #:	292-139
Run :	2		

BLANKS

Acetone					Volume:	200 ml
	Gross:	4.1584 gms.	Tare:	4.1558 gms.	Residue:	0.0026 gms.
DI Water					Volume:	200 ml
	Gross:	4.0301 gms.	Tare:	4.0290 gms.	Residue:	0.0011 gms.

WEIGHTS & VOLUMES

Filter	Gross: 0.5821 gms.		Tare: 0.5798 gms.		Net:	**0.0023** gms.
Probe Rinse -						
	Acetone: 75 ml *	1E-05 gms./ml		=	Net:	**-0.0010** gms.
	DI Water: 75 ml *	6E-06 gms./ml		=	Net:	**-0.0004** gms.
	Gross: 3.8670 gms.		Tare: 3.8600 gms.		Net:	**0.0070** gms.
Impinger Catch -						
	DI Water: 275 ml *	6E-06 gms./ml		=	Net:	**-0.0015** gms.
	Total: 275 ml		Aliquot: 275 ml			
	Gross: 3.9633 gms.		Tare: 3.9636 gms.		Net:	**-0.0018** gms.

0 for calc. purposes

Total Particulate Weight = ~~0.0061~~ 0.0079 gms.

PARTICULATE WEIGHTS : DATA & CALCULATIONS

Client : Dos Palos
Site : Dos Palos
Unit : Battery Condenser
Run : 3

Date : 11/2/94
Job #: 4033
Lab #: 292-139

BLANKS

Acetone

Gross: 4.1584 gms. Tare: 4.1558 gms. Volume: 200 ml Residue: 0.0026 gms.

DI Water

Gross: 4.0301 gms. Tare: 4.0290 gms. Volume: 200 ml Residue: 0.0011 gms.

WEIGHTS & VOLUMES

Filter Gross: 0.5904 gms. Tare: 0.5807 gms. Net: **0.0097** gms.

Probe Rinse -

Acetone: 75 ml * 1E-05 gms./ml = Net: **-0.0010** gms.

DI Water: 75 ml * 6E-06 gms./ml = Net: **-0.0004** gms.

Gross: 3.8308 gms. Tare: 3.8292 gms. Net: **0.0016** gms.

Impinger Catch -

DI Water: 300 ml * 6E-06 gms./ml = Net: **-0.0017** gms.

Total: 300 ml Aliquot: 300 ml

Gross: 4.0456 gms. Tare: 4.0452 gms. Net: **-0.0013** gms. ← 0 for calc. purposes

Total Particulate Weight = 0.0099 ~~**0.0087**~~ **gms.**

SECTION 4
REFERENCE 16

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTTON16.WQ1

DOS PALOS COOP GIN--OCT. 31-NOV. 2, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	73	81.4	86.4	
UNLOADIN	Pressure	in. HG	30.05	30.05	30.05	
CYCLONE	Moisture	%	0.851	0.216	1.598	
(1 OF 4)	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	5059	5232	5202	
	Volumetric flow, standard*	dscfm	4915	5036	4893	
	Isokinetic variation	%	91.25	91.62	93.77	
Circle: Production or feed rate Capacity:		bales/hr	40.3	45.2	33.8	
	Pollutant concentrations:					
	Total PM--reported	g	0.1493	0.2775	0.1826	
	Total PM--actual**	g	0.1493	0.2777	0.1839	
	Total PM--reported	G/dscf	0.0598	0.0910	0.0734	
	Total PM--actual	G/dscf	0.0598	0.0911	0.0739	
	PM-10	% of total	33.60%	41.60%	32.70%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	2.52	3.93	3.10	3.18
	PM-10	lb/hr	0.846	1.64	1.01	1.17
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.063	0.087	0.092	0.080
	PM-10	lb/bale	0.021	0.036	0.030	0.029
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.028	0.039	0.042	0.036
	PM-10	kg/bale	0.010	0.016	0.014	0.013

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT
**Actual grams does not include negative impinger catches in the calculation of the total PM catch

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (4)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
UNLOADIN	Total PM	lb/bale	0.25	0.35	0.37	0.32
SYSTEM	PM-10	lb/bale	0.084	0.14	0.12	0.12

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON16A.WQ1

DOS PALOS COOP GIN--OCT. 31-NOV. 2, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg F	96.1	96	93.8	
OVERFLOW	Pressure	in. HG	30.05	30.05	30.05	
CYCLONE	Moisture	%	0.069	0.132	0.025	
(1 OF 2)	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	6053	5888	5638	
	Volumetric flow, standard*	dscfm	5681	5523	5316	
	Isokinetic variation	%	92.39	91.01	91.39	
Circle: Production or feed rate Capacity:		bales/hr	33.3	43	35	
	Pollutant concentrations:					
	Total PM--reported	g	0.0888	0.1211	0.1695	
	Total PM--actual**	g	0.0889	0.1211	0.1710	
	Total PM--reported	G/dscf	0.0338	0.0481	0.0697	
	Total PM--actual	G/dscf	0.0338	0.0481	0.0703	
	PM-10	% of total	42.40%	33.80%	19.90%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	1.65	2.28	3.20	2.38
	PM-10	lb/hr	0.70	0.77	0.64	0.70
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.049	0.053	0.092	0.065
	PM-10	lb/bale	0.021	0.018	0.018	0.019
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.022	0.024	0.042	0.029
	PM-10	kg/bale	0.010	0.0081	0.0083	0.0086

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

**Actual grams does not include negative impinger catches in the calculation of the total PM catch

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (2)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
OVERFLOW	Total PM	lb/bale	0.099	0.11	0.18	0.13
SYSTEM	PM-10	lb/bale	0.042	0.036	0.036	0.038

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON16B.WQ1

DOS PALOS COOP GIN--OCT. 31-NOV. 2, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
3	Stack temperature	Deg F	63.3	74.5	81.7	
MOTES	Pressure	in. HG	28.83	28.83	28.83	
CYCLONE	Moisture	%	0.377	0.078	0	
(1 OF 4)	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	8033	8019	8072	
	Volumetric flow, standard*	dscfm	7663	7511	7466	
	Isokinetic variation	%	93.39	103.98	99.13	
Circle: Production or feed rate Capacity:		bales/hr	42.9	46.8	24.2	
	Pollutant concentrations:					
	Total PM--reported	g	0.0279	0.0458	0.0311	
	Total PM--actual**	g	0.0283	0.0469	0.0319	
	Total PM--reported	G/dscf	0.0113	0.0170	0.0122	
	Total PM--actual	G/dscf	0.0115	0.0174	0.0125	
	PM-10	% of total	34.80%	35.90%	88.80%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.75	1.12	0.80	0.89
	PM-10	lb/hr	0.26	0.40	0.71	0.46
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.018	0.024	0.033	0.025
	PM-10	lb/bale	0.0061	0.0086	0.029	0.015
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.0080	0.011	0.015	0.011
	PM-10	kg/bale	0.0028	0.0039	0.0133	0.0067

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

**Actual grams does not include negative impinger catches in the calculation of the total PM catch

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (4)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
MOTES	Total PM	lb/bale	0.070	0.096	0.13	0.099
SYSTEM	PM-10	lb/bale	0.024	0.034	0.12	0.059

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON16C.WQ1

DOS PALOS COOP GIN--OCT. 31-NOV. 2, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
4	Stack temperature	Deg F	116.5	114.4	119.3	
#2 DRYER	Pressure	in. HG	28.84	28.84	28.84	
CYCLONE	Moisture	%	0.883	0.484	0.838	
(1 OF 4)	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	4775	4837	4741	
	Volumetric flow, standard*	dscfm	4115	4200	4068	
	Isokinetic variation	%	95.51	95.24	101.92	
Circle: Production or feed rate Capacity:		bales/hr	26.5	38.4	41.6	
	Pollutant concentrations:					
	Total PM--reported	g	0.0602	0.0521	0.0497	
	Total PM--actual**	g	0.0624	0.0543	0.0513	
	Total PM--reported	G/dscf	0.0283	0.0240	0.0221	
	Total PM--actual	G/dscf	0.0293	0.0250	0.0228	
	PM-10	% of total	42.40%	24.10%	40.00%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	1.03	0.90	0.80	0.91
	PM-10	lb/hr	0.44	0.22	0.32	0.32
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.039	0.023	0.019	0.027
	PM-10	lb/bale	0.017	0.0057	0.0076	0.0100
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.018	0.011	0.0087	0.012
	PM-10	kg/bale	0.0075	0.0026	0.0035	0.0045

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

**Actual grams does not include negative impinger catches in the calculation of the total PM catch

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (4)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
#2 DRYER	Total PM	lb/bale	0.16	0.094	0.076	0.11
	PM-10	lb/bale	0.066	0.023	0.031	0.040

Filename: F:\PRIVATE\BRI\AP42\COTTON\COTON16D.WQ1

DOS PALOS COOP GIN--OCT. 31-NOV. 2, 1994

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported Run 1	Run 2	Run 3	Run 4
5	Stack temperature	Deg F	67.4	69.6	72.3	
BATTERY	Pressure	in. HG	28	28	28	
CONDENSE	Moisture	%	0.454	0	0.014	
CYCLONE	Oxygen	%	20.9	20.9	20.9	
(1 OF 4)	Volumetric flow, actual	acfm	6305	6399	6735	
	Volumetric flow, standard*	dscfm	5791	5880	6156	
	Isokinetic variation	%	94.04	103.33	95.42	
Circle: Production or feed rate Capacity:		bales/hr	45.4	45	44.6	
	Pollutant concentrations:					
	Total PM--reported	g	0.0149	0.0061	0.0087	
	Total PM--actual**	g	0.0159	0.0079	0.0099	
	Total PM--reported	G/dscf	0.0073	0.0027	0.0039	
	Total PM--actual	G/dscf	0.0078	0.0035	0.0044	
	PM-10	% of total	12.00%	91.00%	33.40%	
	Pollutant mass flux rates:					
	Total PM	lb/hr	0.39	0.18	0.23	0.27
	PM-10	lb/hr	0.046	0.160	0.078	0.095
	Emission factors (ENGLISH UNITS):					AVERAGE
	Total PM	lb/bale	0.0085	0.0039	0.0053	0.0059
	PM-10	lb/bale	0.0010	0.0036	0.0018	0.0021
	Emission factors (METRIC UNITS):					AVERAGE
	Total PM	kg/bale	0.0039	0.0018	0.0024	0.0027
	PM-10	kg/bale	0.00046	0.0016	0.00080	0.00096

*DSCFM BASED ON A STANDARD TEMPERATURE OF 60 DEGREES FAHRENHEIT

**Actual grams does not include negative impinger catches in the calculation of the total PM catch

TO OBTAIN TOTAL PROCESS EMISSION FACTORS, MULTIPLY THE CALCULATED EMISSION FACTORS BY THE TOTAL NUMBER OF PROCESS CYCLONES (4)

Source	Emission factors (ENGLISH UNITS):					AVERAGE
BATTERY	Total PM	lb/bale	0.034	0.016	0.021	0.024
CONDENSE	PM-10	lb/bale	0.0041	0.014	0.0070	0.0085