9.7 Cotton Ginning

comments on section for 1995 and 1996

Cotton Ginning -- National Emissions Estimate [a]

Footnotes:
[a] Based on crop average for 1991–1995
[b] Emission factors for high-efficiency cyclones (full controls): 2.4 lbs/bale Total PM; 0.82 lbs/bale PM-10
[c] Emission factors for screened drums or cages (conventional controls): 3.1 lbs/bale Total PM; 1.2 lbs/bale PM-10

Region/ State	High-efficiency Cyclones [b] # of Bales	Total PM (lbs)	PM-10 (lbs)	Screened drums or cages [c] # of Bales	Total PM (lbs)	PM-10 (lbs)	State Total # of Bales	Total PM (lbs)	PM-10 (lbs)
CA	2,070,000	4,968,000	1,697,400	805,000	2,495,500	966,000	2,875,000	7,463,500	2,663,400
AZ	597,000	1,432,800	489,540	597,000	1,850,700	716,400	1,194,000	3,283,500	1,205,940
NM	17,200	41,280	14,104	68,800	213,280	82,560	86,000	254,560	96,664
TX	1,359,300	3,262,320	1,114,626	3,171,700	9,832,270	3,806,040	4,531,000	13,094,590	4,920,666
OK	43,600	104,640	35,752	174,400	540,640	209,280	218,000	645,280	245,032
MS	397,200	953,280	325,704	1,588,800	4,925,280	1,906,560	1,986,000	5,878,560	2,232,264
LA	268,200	643,680	219,924	1,072,800	3,325,680	1,287,360	1,341,000	3,969,360	1,507,284
AR	455,400	1,092,960	373,428	1,062,600	3,294,060	1,275,120	1,518,000	4,387,020	1,648,548
MO	99,000	237,600	81,180	396,000	1,227,600	475,200	495,000	1,465,200	556,380
TN	147,600	354,240	121,032	590,400	1,830,240	708,480	738,000	2,184,480	829,512
AL	114,400	274,560	93,808	457,600	1,418,560	549,120	572,000	1,693,120	642,928
FL	17,400	41,760	14,268	69,600	215,760	83,520	87,000	257,520	97,788
GA	340,500	817,200	279,210	794,500	2,462,950	953,400	1,135,000	3,280,150	1,232,610
NC	189,900	455,760	155,718	443,100	1,373,610	531,720	633,000	1,829,370	687,438
SC	61,800	148,320	50,676	247,200	766,320	296,640	309,000	914,640	347,316
VA	12,200	29,280	10,004	48,800	151,280	58,560	61,000	180,560	68,564
TOTAL	6,190,700	14,857,680	5,076,374	11,588,300	35,923,730	13,905,960	17,779,000	50,781,410	18,982,334
		7,429 tons	2,538 tons		17,962 tons	6,953 tons		25,391 tons	9,491 tons

INTEROFFICE MEMORANDUM

MIDWEST RESEARCH INSTITUTE

July 31, 1996

To: AP-42 Section 9.7, Cotton Ginning, Project File

From: Tom Lapp

Subject: National Emission Estimate

The recently published AP-42 Section 9.7, Cotton Ginning, developed emission factors for total particulate (PM) and PM-10 for gins using two types of control devices: (1) high-efficiency cyclones and (2) screened drums or cages. These factors can be used to develop estimates of total emissions from cotton gins on a national basis. Because the emission factors for each control device are different, data were needed on the percentage of cotton baled at gins using each type of control. Mr. Bill Mayfield, USDA National Program Leader-Cotton, was contacted for this information; Mr. Mayfield requested assistance from the National Cotton Council.

For each of 16 states, data were provided for the annual average number of bales ginned (1991-1995 crop years) and the estimated percentage of gins using each type of control device; these data are attached to this memorandum. In the data provided by Mr. Mayfield, "full controls" refers to high-efficiency cyclones and "conventional controls" refers to screened drums or cages. For each state, the total number of bales produced by gins using "full controls" and gins using "conventional controls" was obtained by multiplying with the appropriate percentage factor. The emission factors in the AP-42 section are in terms of pounds of particulate per bale produced. Using the number of bales produced and the appropriate emission factor, an emission estimate of total PM (lb) and total PM-10 (lb) was calculated for each state for each control type. These data are presented in Table 1. On a national basis, estimated total PM emissions and PM-10 emissions from gins using high-efficiency cyclones were 7,429 tons and 2,538 tons, respectively. For gins using screened drums or cages, the estimated national emissions for total PM and PM-10 were 17,962 tons and 6,953 tons, respectively. Overall, the national emissions estimate from all gins was 25,391 tons for total PM and 9,491 tons for PM-10.

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TABLE 1. COTTON GINNING--NATIONAL EMISSIONS ESTIMATE[a]

Region/ State	High-efficiency cyclones[b]			Screened drums or cages[c]			TOTAL		
		Emissions, lb			Emissions, lb			Emissions, lb	
	No. of bales[d]	Total PM	PM-10	No. of bales[d]	Total PM	PM-10	No. of bales[d]	Total PM	PM-10
CA	2,070,000	4,968,000	1,697,400	805,000	2,495,500	966,000	2,875,000	7,463,500	2,663,400
AZ	597,000	1,432,800	489,540	597,000	1,850,700	716,400	1,194,000	3,283,500	1,205,940
NM	17,200	41,280	14,104	68,800	213,280	82,560	86,000	254,560	96,664
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VA	12,200	29,280	10,004	48,800	151,280	58,560	61,000	180,560	68,564
TOTAL	6,190,700	14,857,680	5,076,374	11,588,300	35,923,730	13,905,960	17,779,000	50,781,410	18,982,334
		7,429 (tons)	2,538 (tons)		17,962 (tons)	6,953 (tons)		25,391 (tons)	9,491 (tons)

[a]Based on 1991-1995 crop data.

[b]Emission factors for high-efficiency cyclone (full controls): 2.4 lb/bale Total PM; 0.82 lb/bale PM-10

[c]Emission factors for screened drums or cages (conventional controls): 3.1 lb/bale Total PM; 1.2 lb/bale PM-10

[d]Average annual number of bales ginned (1991-1995).

USDA, CSREES
7777 Walnut Grove Road, Box 5
Memphis, TN 38120

DATE: 7/23/96

FAX COVER SHEET

TO: Brian Shroger

FAX NO. 919-677-0065

FROM: William Mayfield
National Program Leader, Cotton
FAX No. 901/766-7689

MESSAGE: Enclosed are our estimates of the total bales ginned on Fully Controlled and Conventionally Controlled Gins for the last five crops. These estimates represent the opinions of several knowledgeable cotton industry people.

No. of pages sent including cover sheet: 2

If you have trouble receiving this transmission, please contact me at 901/766-7690.

FAX Cover Sheet

National Cotton Council
P.O. Box 12285
Memphis, Tennessee 38182
901/274-9030, F-901/725-0510

To: Bill Mayfield (766-7689)

From: Fred Johnson

Date: July 23, 1996

Subject: Estimated Percent of Crop By Emission Control Method

Pages: 1 (including cover)

Remarks:

State/Region	% Crop Full Controls	% Crop Conventional Controls	Avg. Crop (1991-95)
California	72	28	2,875,000
Arizona	50	50	1,194,000
New Mexico	20	80	86,000
Texas	30	70	4,531,000
Oklahoma	20	80	218,000
Mississippi	20	80	1,986,000
Louisiana	20	80	1,341,000
Arkansas	30	70	1,518,000
Missouri	20	80	495,000
Tennessee	20	80	738,000
Alabama	20	80	572,000
Florida	20	80	87,000
Georgia	30	70	1,135,000
North Carolina	30	70	633,000
South Carolina	20	80	309,000
Virginia	20	80	61,000
U.S.	35	65	17,506,000

EHPA

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April 14, 1997

Ms. Sharon Nizich, MD-14
Emission Factors and Inventory Group
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Subject: EPA Contract No. 68-D3-0035, Work Assignment No. III-102
Emissions Estimation Methodology for Cotton Ginning

Dear Sharon:

AP-42 Section 9.7 presents general information, process description, and total PM and PM-10 emission factors for cotton ginning. Emission factors are given for gins with high-efficiency cyclones on all exhaust streams (i.e., full controls) and for gins with screened drums or cages on the lint cleaners and battery condenser and high-efficiency cyclones on all other exhaust streams (i.e., conventional controls). Additional information obtained from EPA includes data on the percentage of cotton baled at gins using each type of control. These data are estimates developed by the National Cotton Council showing the estimated percent of crop by emission control method by State.

The U.S. Department of Agriculture (USDA) compiles and reports data on the amount of cotton ginned by State, district, and county for each crop year. (A crop year runs from August/September through March.) The USDA has been compiling and reporting these data since 1991, and data are available in hard copy and electronic format and through the Internet. Prior to 1991, the U.S. Department of Commerce, Bureau of the Census reported these data.

We have prepared the following emissions estimation methodology write-up using a modified Trends Procedures document format. Please let me know if you have any comments or questions.

Sincerely,

Sharon L. Kersteter

Attachment
cc: P. Carlson (EHPA-NC)

5537-C Hempstead Way
Springfield, VA 22151
E-mail pechanva@pechan.com

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COTTON GINNING: 07-01

Emissions from cotton ginning fall into the following Tier categories:

Tier 1 Category	Tier 2 Category	Subcategory
Other Industrial Processes	Agricultural, Food, and Kindred Products	Agricultural Industries

The overall source classification code (SCC) for cotton gins is 30200410. SCCs for specific sources within the ginning process are provided in Figure 9.7-1 and Table 9.7-1 in AP-42.[1]

Description of Category

Cotton ginning is the process of cleaning, processing, and packaging the picked cotton into bales to be transported to the textile mill for processing into yarn. Ginning consists of five steps: (a) the unloading system; (2) the seed cotton cleaning system; (3) the overflow system; (4) the ginning and lint handling system; and (5) the battery condenser and baling system. AP-42 Section 9.7 presents a detailed description of each of these steps.

Ginning activity occurs from August/September through March, covering parts of two calendar years.[2] Ginning activity occurs in the 16 States where cotton is grown, i.e., Alabama, Arizona, Arkansas, California, Florida, Georgia, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia. The majority of the ginning facilities are located in Arkansas, California, Louisiana, Mississippi, and Texas. The current industry trend is from many small gins to fewer large, high capacity gins.[1]

Activity Indicator

The activity factor for this category is the number of bales of cotton ginned. The U.S. Department of Agriculture (USDA) compiles and reports data on the amount of cotton ginned by State, district, and county for each crop year in its *Cotton Ginnings* reports.[3] (A crop year runs from September through March.) These reports are published once or twice per month during the crop year and give the amount of cotton ginned as running totals.

During months when two reports are generated (generally during the height of ginning activity), the first report of the month provides preliminary estimates (running bales ginned) for cotton ginned up to the beginning of that month by State and U.S. total. The second report of the month provides "final" estimates (running bales ginned) by State, district, county, and U.S. total for the same time period. For example, the 01.16.96 report contained preliminary State and U.S. estimates of cotton ginned prior to January 1, 1996; the 01.25.96 report contained "final" estimates by State, district, county, and U.S. total for cotton ginned prior to January 1, 1996. In calendar year 1996, the *Cotton Ginnings* reports were published on the following dates:

01/16/96	09/11/96	11/12/96
01/25/96	09/27/96	11/26/96
02/08/96	10/11/96	12/12/96
03/25/96	10/25/96	12/23/96
08/12/96		

As shown by these publishing dates, there is little "lag time" in the availability of the ginning data.

It should be noted that the *Cotton Ginnings — Annual Report* also provides total crop year data on a county basis.[4] However, since this information is given for the total crop year rather than for the calendar year, it is not useful for the Trends emissions estimation methodology.

The USDA has been compiling and reporting cotton ginnings data since 1991, and data are available in both hard copy and electronic format. Prior to 1991, the U.S. Department of Commerce, Bureau of the Census, reported these data. In addition, these cotton ginnings data are available on the Internet at the following web site addresses:

Cotton Ginnings

http://www.mannlib.cornell.edu/reports/nassr/field/pcg-bb

(from this site, the user can select the year and then the individual monthly report for viewing or downloading)

Cotton Ginnings - Annual Report

http://www.mannlib.cornell.edu/reports/nassr/field/pcg-bban

(from this site, the user can select the year of interest for viewing or downloading)

Emission Factor

AP-42 presents total PM and PM-10 emission factors (in lbs/bale) for gins with high-efficiency cyclones on all exhaust streams (i.e., full controls) and for gins with screened drums or cages on the lint cleaners and battery condenser and high-efficiency cyclones on all other exhaust streams (i.e., conventional controls). Table 1 shows the AP-42 emission factors. Additional information obtained from EPA includes the estimated percent of cotton baled at gins using each type of control by State. These data were developed by the National Cotton Council and are shown in Table 2.[5]

TABLE 1. COTTON GINNING EMISSION FACTORS[1]

Control Type	Total PM (lb/bale)	PM-10 (lb/bale)
Full controls (high-efficiency cyclone)	2.4	0.82
Conventional controls (screened drums or cages)	3.1	1.2

TABLE 2. ESTIMATED PERCENT OF CROP BY EMISSION CONTROL METHOD (BY STATE AND U.S. AVERAGE)[5]

State	Percent Crop - Full Controls	Percent Crop - Conventional Controls
Alabama	20	80
Arizona	50	50
Arkansas	30	70
California	72	28
Florida	20	80
Georgia	30	70
Louisiana	20	80
Mississippi	20	80
Missouri	20	80
New Mexico	20	80
North Carolina	30	70
Oklahoma	20	80
South Carolina	20	80
Tennessee	20	80
Texas	30	70
Virginia	20	80
U.S. Average*	**35**	**65**

*Average is based on the average crop (average total bales ginned per year) from 1991 to 1995 for these States.

Emissions Estimation Methodology

The general equation for estimating emissions from this category is given below.

$$E = [(P_c * B) * EF_c] + [(P_f * B) * EF_f]$$

Where:
- E = annual county emissions (lbs/year)
- B = number of bales ginned in the county
- P_c = fraction of total bales at gins with conventional controls
- EF_c = emission factor for gins with conventional controls (lbs/bale)
- P_f = fraction of total bales at gins with full controls
- EF_f = emission factor for gins with full controls (lbs/bale)

The number of bales ginned in a county can be obtained from Reference 2. However, since these data are reported as running totals for the growing season (which spans parts of two calendar years), the number of bales ginned for a calendar year will need to be determined using data from two crop years. The amount of cotton ginned from January 1 to the end of the season (March) for calendar year *x* (crop year *x*) and the amount of cotton ginned from the beginning of the season (August/ September) for calendar year *x* (crop year *y*) should be summed to get the calendar year *x* total. To determine the amount ginned from January 1 to the end of the season, subtract the amount ginned by January 1 (in the early January *Cotton Ginnings* report) from the total reported in the March or end of season *Cotton Ginnings* report. To determine the amount ginned from the beginning of the season to January 1, use the total recorded by January 1 in the early January *Cotton Ginnings* report.

It should be noted that for confidentiality purposes, the *Cotton Ginnings* report may not show detailed data for a county, but may include those data in the district, State, or U.S. totals. Data for a gin may be considered confidential if (1) there are fewer than three gins operating in the county, or (2) more than 60 percent of the cotton ginned in the county is ginned at one mill. The standard *Cotton Ginnings* report lists the following four footnotes to its table of running bales ginned:

1/ withheld to avoid disclosing individual gins
2/ withheld to avoid disclosing individual gins, but included in State total
3/ excludes some gins' data to avoid disclosing individual gins, but included in the State total
4/ withheld to avoid disclosing individual gins but included in the U.S. total

The following methodology can be used for estimating the number of bales ginned from those counties with confidential data.

(1) If all counties in the district show confidentiality, but there is a district total, divide district total by the number of counties to get individual county estimates.

(2) If some (but not all) counties in a district show confidentiality and there is a district total, subtract county totals from district total and divide the remainder by the number of counties showing confidentiality to get estimates for the "confidential" counties.

(3) If both county and district totals are considered confidential within a State, divide the State total by the number of counties to get individual county estimates.

(4) If some (but not all) districts show confidentiality, subtract recorded district totals from the State total and divide the remainder by the number of counties showing confidentiality to get estimates for the "confidential" counties.

Although this method of apportioning is time consuming, it is preferable to using the ginning distribution from previous years to determine current estimates of number of bales ginned in confidential counties. The variability of the cotton harvest from year to year, the possibility of past claims of confidentiality, and the industry trend from numerous small gins to fewer, large gins makes distribution based on past activity unreliable. In addition, if the estimates generated by the methodology above does not meet with State approval, the State may submit more accurate data for those counties and the apportioning methodology can be revised.

The example below uses actual 1995 crop year data for Alabama from *Cotton Ginnings*. These data are shown in the Table 3. Italicized numbers were generated from the process listed above.

Example.

Using the data for Alabama from the 03.25.96 *Cotton Ginnings* report:

- District 10 shows data for three counties, confidential data for two counties and a district total.

(1) Subtract District 10 county data from District 10 total.

144,250 - (35,200 + 59,300 + 25,750) = 24,000 bales

(2) Divide the remaining total by two (two counties claimed confidentiality) to estimate amount for each confidential county.

24,000/2 = 12,000 bales per confidential county

This procedure can also be used for District 40.

- Districts 50 and 60 show district totals only (i.e., all counties within these districts claim confidentiality). To estimate individual county totals, divide each district total by the number of counties within that district.

District 50	District 60
122,300/4 = 30,575 bales per county	153,650/6 = 25,608 bales per county

- Districts 20 and 30 claim county and district confidentiality. To estimate county totals,

TABLE 3. COTTON GINNINGS: RUNNING BALES GINNED BY COUNTY, DISTRICT, STATE, AND UNITED STATES[a]

State/County/ District	Running Bales Ginned	State/County/ District	Running Bales Ginned
UNITED STATES	17,498,800		
Alabama		Alabama (Cont'd)	
Colbert 1/	*12,000*	Baldwin 1/	*30,575*
Lauderdale 1/	*12,000*	Escambia 1/	*30,575*
Lawrence	35,200	Mobile 1/	*30,575*
Limestone	59,300	Monroe 1/	*30,575*
Madison	25,750		
		District 50	122,300
District 10	144,250		
		Covington 1/	*25,608*
Blount 1/	*4,538*	Crenshaw 1/	*25,608*
Cherokee 1/	*4,538*	Geneva 1/	*25,608*
		Henry 1/	*25,608*
District 20		Houston 1/	*25,608*
		Russell 1/	*25,608*
Chilton 1/	*4,538*		
Fayette 1/	*4,538*	District 60	153,650
Pickens 1/	*4,538*		
Shelby 1/	*4,538*	AL Total	491,150
Tallapoosa 1/	*4,538*		
Tuscaloosa 1/	*4,538*		
		Arizona	
District 30 2/			
		Mohave 1/	
Autauga 1/	*4,079*		
Dallas 1/	*4,079*	District 20 2/	
Elmore	6,100		
Greene 1/	*4,079*	Maricopa	354,050
Hale 1/	*4,079*	Pinal	266,900
Lowndes 1/	*4,079*		
Macon 1/	*4,079*	District 50	620,950
Marengo 1/	*4,079*		
		La Paz 1/	
District 40	34,650	Yuma	74,100

[a]The data in and format of this table were taken from the 03.25.96 *Cotton Ginnings* report.
1/ Withheld to avoid disclosing individual gins.
2/ Withheld to avoid disclosing individual gins, but included in State total.
3/ Excludes some gins' data to avoid disclosing individual gins, but included in State total.
4/ Withheld to avoid disclosing individual gins, but included in U.S. total.

(1) Subtract available district totals from State total.

491,150 - (144,250 + 34,650 + 122,300 + 153,650) = 36,300 bales

(2) Divide remainder by the number of counties claiming confidentiality in the two remaining districts.

36,300/8 = 4,538 bales per confidential county

Calculation of Emissions

Using the data in Table 3 and other data from *Cotton Ginnings* reports, PM-10 emissions can be calculated for Madison County, Alabama, as shown in the following example.

(1) Determine total running bales ginned in Madison County in 1996

(a) For the period January 1, 1996 until the end of the crop season, subtract the running total as of January 1, 1996 from the 01/25/96 *Cotton Ginnings* report from the final crop season total from the 03/25/96 *Cotton Ginnings* report.

25,750 bales - 25,700 bales = 50 bales

(b) For the period from the beginning of the 1996 crop year until the end of calendar year 1996, use the running total as of January 1, 1997 from the 01/24/97 *Cotton Ginnings* report. Add this to the total from (a) above to get calendar year 1996 total.

50 bales + 40,500 bales = 40,550 bales ginned in calendar year 1996

(2) Determine the percent of crop ginned by emission control method using Table 2.

(3) Use the emission factors from AP-42 as shown in Table 1, the results of (1) and (2) above, and the general equation to estimate emissions.

$$E = [(P_c * B) * EF_c] + [(P_f * B) * EF_f]$$

Where: P_c = 0.8
P_f = 0.2
B = 40,550 bales
EF_c = 1.2 lb/bale PM-10
EF_f = 0.82 lb/bale PM-10

Emissions = [(0.8 * 40,550 bales) * 1.2 lb/bale] + [(0.2 * 40,550 bales) * 0.82 lb/bale]
= 38,928 lbs + 6,650 lbs
= 45,578 lbs or 23 tons of PM-10

Control Efficiency

Emission factors are controlled emissions factors as indicated above.

References

1. *Compilation of Air Pollutant Emissions Factors and Supplements, Fifth Edition and Supplements, AP-42*, U.S. Environmental Protection Agency, Research Triangle Park, NC. 1997.

2. Telecon. Sharon Kersteter, E.H. Pechan & Associates, Inc., Durham, NC, with Roger Latham, U.S. Department of Agriculture, Cotton Statistics. March 6, 1997.

3. *Cotton Ginnings*, PCG, U.S. Department of Agriculture, National Agricultural Statistics Service, Agricultural Statistics Board, Washington, DC. (13 issues, mailed approximately twice per month during August-March ginning season)

4. *Cotton Ginnings — Annual Report*, PCG-BB, U.S Department of Agriculture, National Agricultural Statistics Service, Washington, DC. Annual publication.

5. Memorandum. Fred Johnson, National Cotton Council, Memphis, TN, to Bill Mayfield, U.S. Department of Agriculture, Memphis, TN, *Estimated Percent of Crop by Emission Control Method*, July 23, 1996.

USDA, CSREES
7777 Walnut Grove Road, Box 5
Memphis, TN 38120

DATE: 7/23/96

FAX COVER SHEET

TO: Brian Shroger

FAX NO. 919-677-0065

FROM: William Mayfield
National Program Leader, Cotton
FAX No. 901/766-7689

MESSAGE: Enclosed are our estimates of the total holes ginned on Fully Controlled and Conventionally Controlled Gins for the last five crops. These estimates represent the opinions of several knowledgeable cotton industry people.

No. of pages sent including cover sheet: 2

If you have trouble receiving this transmission, please contact me at 901/766-7690.

FAX Cover Sheet

National Cotton Council
P.O. Box 12285
Memphis, Tennessee 38182
901/274-9030, F-901/725-0510

To: Bill Mayfield (766-7689)

From: Fred Johnson

Date: July 23, 1996

Subject: Estimated Percent of Crop By Emission Control Method

Pages: 1 (including cover)

Remarks:

AVERAGE TOTAL BALES GINNED PER YEAR

State/Region	% Crop Full Controls	% Crop Conventional Controls	Avg. Crop (1991-95)
California	72	28	2,875,000
Arizona	50	50	1,194,000
New Mexico	20	80	86,000
Texas	30	70	4,531,000
Oklahoma	20	80	218,000
Mississippi	20	80	1,986,000
Louisiana	20	80	1,341,000
Arkansas	30	70	1,518,000
Missouri	20	80	495,000
Tennessee	20	80	738,000
Alabama	20	80	572,000
Florida	20	80	87,000
Georgia	30	70	1,135,000
North Carolina	30	70	633,000
South Carolina	20	80	309,000
Virginia	20	80	61,000
U.S.	35	65	~~17,506,000~~ 17,779,000

Document Control Sheet

Project No.: 4603-01-03 (Subtask No.) ____

Document Name: Cotton Ginning - National Emissions Estimate Table

CBI: ☐ Yes ☐ No

Originator: T. Lapp Ext. 5258

WP COMMENTS:

WP ID No.: cotton tbl 5213

TH1

① Date to WP: 7/24 Due date/time: 7/26

☐ Flexible ☐ Firm ☐ RUSH

WP PROOF ☐ Yes ☐ No

FORMAT	SPACING	OUTPUT			WP INITIALS dlb
☐ EPA	☒ 1	☒ Draft	☐ Scan	☐ Graphics	
☒ MRI	☐ 1.5	☐ Final	___ Text	___ General use	
☐ Note below	☐ 2	☐ Rainbow	___ Figure	___ 35 mm slides	REKEYED ☐
☐ Format only		☐ Copies ____	___ Photo	___ Transparency	BY WP
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Route: Instructions/comments: _____

F1

② Date to WP: 7/25 Due date/time: 7/29

☐ Flexible ☐ Firm ☐ RUSH

WP PROOF ☐ Yes ☐ No

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WJ

③ Date to WP: 7/30 Due date/time: 7/31

☐ Flexible ☒ Firm ☐ RUSH

WP PROOF ☐ Yes ☐ No

FORMAT	SPACING	OUTPUT			WP INITIALS dlb
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☒ MRI	☐ 1.5	☒ Final	___ Text	___ General use	
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Route: Instructions/comments: Memo on SHARE\TOWP -- File name: COTTON.EST

Put memo in correct format - thanks

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Document Control Sheet (continued)

Project No.: _____ (Subtask No.) ____	WP ID No.: _____

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☐ Firm
☐ RUSH

WP PROOF
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☐ Flexible
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WP PROOF
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USDA, CSREES
7777 Walnut Grove Road, Box 5
Memphis, TN 38120

DATE: 7/23/96

FAX COVER SHEET

TO: Brian Shroger

FAX NO. 919-677-0065

FROM: William Mayfield
National Program Leader, Cotton
FAX No. 901/766-7689

MESSAGE: Enclosed are our estimates of the total holes ginned on Fully Controlled and Conventionally Controlled Gins for the last five crops. These estimates represent the opinions of several knowledgeable cotton industry people.

No. of pages sent including cover sheet: 2

If you have trouble receiving this transmission, please contact me at 901/766-7690.

FAX Cover Sheet

National Cotton Council
P.O. Box 12285
Memphis, Tennessee 38182
901/274-9030, F-901/725-0510

To: Bill Mayfield (766-7689)

From: Fred Johnson

Date: July 23, 1996

Subject: Estimated Percent of Crop By Emission Control Method

Pages: 1 (including cover)

Remarks:

AVERAGE TOTAL BALES GINNED PER YEAR

State/Region	% Crop Full Controls	% Crop Conventional Controls	Avg. Crop (1991-95)
California	72	28	2,875,000
Arizona	50	50	1,194,000
New Mexico	20	80	86,000
Texas	30	70	4,531,000
Oklahoma	20	80	218,000
Mississippi	20	80	1,986,000
Louisiana	20	80	1,341,000
Arkansas	30	70	1,518,000
Missouri	20	80	495,000
Tennessee	20	80	738,000
Alabama	20	80	572,000
Florida	20	80	87,000
Georgia	30	70	1,135,000
North Carolina	30	70	633,000
South Carolina	20	80	309,000
Virginia	20	80	61,000
U.S.	35	65	~~17,506,000~~ 17,779,000

EHPA

E.H. Pechan & Associates, Inc.

3500 Westgate Drive, Suite 103 • Durham, NC 27707
919-493-3144 • Fax 919-493-3182 • E-mail pechannc@pechan.com

April 14, 1997

Ms. Sharon Nizich, MD-14
Emission Factors and Inventory Group
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Subject: EPA Contract No. 68-D3-0035, Work Assignment No. III-102
Emissions Estimation Methodology for Cotton Ginning

Dear Sharon:

AP-42 Section 9.7 presents general information, process description, and total PM and PM-10 emission factors for cotton ginning. Emission factors are given for gins with high-efficiency cyclones on all exhaust streams (i.e., full controls) and for gins with screened drums or cages on the lint cleaners and battery condenser and high-efficiency cyclones on all other exhaust streams (i.e., conventional controls). Additional information obtained from EPA includes data on the percentage of cotton baled at gins using each type of control. These data are estimates developed by the National Cotton Council showing the estimated percent of crop by emission control method by State.

The U.S. Department of Agriculture (USDA) compiles and reports data on the amount of cotton ginned by State, district, and county for each crop year. (A crop year runs from August/September through March.) The USDA has been compiling and reporting these data since 1991, and data are available in hard copy and electronic format and through the Internet. Prior to 1991, the U.S. Department of Commerce, Bureau of the Census reported these data.

We have prepared the following emissions estimation methodology write-up using a modified Trends Procedures document format. Please let me know if you have any comments or questions.

Sincerely,

Sharon L. Kersteter

Attachment
cc: P. Carlson (EHPA-NC)

5537-C Hempstead Way
Springfield, VA 22151
E-mail pechanva@pechan.com

2880 Sunrise Blvd., Suite 220
Rancho Cordova, CA 95742
E-mail pechanca@pechan.com

COTTON GINNING: 07-01

Emissions from cotton ginning fall into the following Tier categories:

Tier 1 Category	Tier 2 Category	Subcategory
Other Industrial Processes	Agricultural, Food, and Kindred Products	Agricultural Industries

The overall source classification code (SCC) for cotton gins is 30200410. SCCs for specific sources within the ginning process are provided in Figure 9.7-1 and Table 9.7-1 in AP-42.[1]

Description of Category

Cotton ginning is the process of cleaning, processing, and packaging the picked cotton into bales to be transported to the textile mill for processing into yarn. Ginning consists of five steps: (a) the unloading system; (2) the seed cotton cleaning system; (3) the overflow system; (4) the ginning and lint handling system; and (5) the battery condenser and baling system. AP-42 Section 9.7 presents a detailed description of each of these steps.

Ginning activity occurs from August/September through March, covering parts of two calendar years.[2] Ginning activity occurs in the 16 States where cotton is grown, i.e., Alabama, Arizona, Arkansas, California, Florida, Georgia, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia. The majority of the ginning facilities are located in Arkansas, California, Louisiana, Mississippi, and Texas. The current industry trend is from many small gins to fewer large, high capacity gins.[1]

Activity Indicator

The activity factor for this category is the number of bales of cotton ginned. The U.S. Department of Agriculture (USDA) compiles and reports data on the amount of cotton ginned by State, district, and county for each crop year in its *Cotton Ginnings* reports.[3] (A crop year runs from September through March.) These reports are published once or twice per month during the crop year and give the amount of cotton ginned as running totals.

During months when two reports are generated (generally during the height of ginning activity), the first report of the month provides preliminary estimates (running bales ginned) for cotton ginned up to the beginning of that month by State and U.S. total. The second report of the month provides "final" estimates (running bales ginned) by State, district, county, and U.S. total for the same time period. For example, the 01.16.96 report contained preliminary State and U.S. estimates of cotton ginned prior to January 1, 1996; the 01.25.96 report contained "final" estimates by State, district, county, and U.S. total for cotton ginned prior to January 1, 1996. In calendar year 1996, the *Cotton Ginnings* reports were published on the following dates:

01/16/96	09/11/96	11/12/96
01/25/96	09/27/96	11/26/96
02/08/96	10/11/96	12/12/96
03/25/96	10/25/96	12/23/96
08/12/96		

As shown by these publishing dates, there is little "lag time" in the availability of the ginning data.

It should be noted that the *Cotton Ginnings — Annual Report* also provides total crop year data on a county basis.[4] However, since this information is given for the total crop year rather than for the calendar year, it is not useful for the Trends emissions estimation methodology.

The USDA has been compiling and reporting cotton ginnings data since 1991, and data are available in both hard copy and electronic format. Prior to 1991, the U.S. Department of Commerce, Bureau of the Census, reported these data. In addition, these cotton ginnings data are available on the Internet at the following web site addresses:

Cotton Ginnings

http://www.mannlib.cornell.edu/reports/nassr/field/pcg-bb

(from this site, the user can select the year and then the individual monthly report for viewing or downloading)

Cotton Ginnings - Annual Report

http://www.mannlib.cornell.edu/reports/nassr/field/pcg-bban

(from this site, the user can select the year of interest for viewing or downloading)

Emission Factor

AP-42 presents total PM and PM-10 emission factors (in lbs/bale) for gins with high-efficiency cyclones on all exhaust streams (i.e., full controls) and for gins with screened drums or cages on the lint cleaners and battery condenser and high-efficiency cyclones on all other exhaust streams (i.e., conventional controls). Table 1 shows the AP-42 emission factors. Additional information obtained from EPA includes the estimated percent of cotton baled at gins using each type of control by State. These data were developed by the National Cotton Council and are shown in Table 2.[5]

TABLE 1. COTTON GINNING EMISSION FACTORS[1]

Control Type	Total PM (lb/bale)	PM-10 (lb/bale)
Full controls (high-efficiency cyclone)	2.4	0.82
Conventional controls (screened drums or cages)	3.1	1.2

TABLE 2. ESTIMATED PERCENT OF CROP BY EMISSION CONTROL METHOD (BY STATE AND U.S. AVERAGE)[5]

State	Percent Crop - Full Controls	Percent Crop - Conventional Controls
Alabama	20	80
Arizona	50	50
Arkansas	30	70
California	72	28
Florida	20	80
Georgia	30	70
Louisiana	20	80
Mississippi	20	80
Missouri	20	80
New Mexico	20	80
North Carolina	30	70
Oklahoma	20	80
South Carolina	20	80
Tennessee	20	80
Texas	30	70
Virginia	20	80
U.S. Average[a]	**35**	**65**

[a]Average is based on the average crop (average total bales ginned per year) from 1991 to 1995 for these States.

Emissions Estimation Methodology

The general equation for estimating emissions from this category is given below.

$$E = [(P_c * B) * EF_c] + [(P_f * B) * EF_f]$$

Where: E = annual county emissions (lbs/year)
B = number of bales ginned in the county
P_c = fraction of total bales at gins with conventional controls
EF_c = emission factor for gins with conventional controls (lbs/bale)
P_f = fraction of total bales at gins with full controls
EF_f = emission factor for gins with full controls (lbs/bale)

The number of bales ginned in a county can be obtained from Reference 2. However, since these data are reported as running totals for the growing season (which spans parts of two calendar years), the number of bales ginned for a calendar year will need to be determined using data from two crop years. The amount of cotton ginned from January 1 to the end of the season (March) for calendar year *x* (crop year *x*) and the amount of cotton ginned from the beginning of the season (August/ September) for calendar year *x* (crop year *y*) should be summed to get the calendar year *x* total. To determine the amount ginned from January 1 to the end of the season, subtract the amount ginned by January 1 (in the early January *Cotton Ginnings* report) from the total reported in the March or end of season *Cotton Ginnings* report. To determine the amount ginned from the beginning of the season to January 1, use the total recorded by January 1 in the early January *Cotton Ginnings* report.

It should be noted that for confidentiality purposes, the *Cotton Ginnings* report may not show detailed data for a county, but may include those data in the district, State, or U.S. totals. Data for a gin may be considered confidential if (1) there are fewer than three gins operating in the county, or (2) more than 60 percent of the cotton ginned in the county is ginned at one mill. The standard *Cotton Ginnings* report lists the following four footnotes to its table of running bales ginned:

1/ withheld to avoid disclosing individual gins
2/ withheld to avoid disclosing individual gins, but included in State total
3/ excludes some gins' data to avoid disclosing individual gins, but included in the State total
4/ withheld to avoid disclosing individual gins but included in the U.S. total

The following methodology can be used for estimating the number of bales ginned from those counties with confidential data.

(1) If all counties in the district show confidentiality, but there is a district total, divide district total by the number of counties to get individual county estimates.

(2) If some (but not all) counties in a district show confidentiality and there is a district total, subtract county totals from district total and divide the remainder by the number of counties showing confidentiality to get estimates for the "confidential" counties.

(3) If both county and district totals are considered confidential within a State, divide the State total by the number of counties to get individual county estimates.

(4) If some (but not all) districts show confidentiality, subtract recorded district totals from the State total and divide the remainder by the number of counties showing confidentiality to get estimates for the "confidential" counties.

Although this method of apportioning is time consuming, it is preferable to using the ginning distribution from previous years to determine current estimates of number of bales ginned in confidential counties. The variability of the cotton harvest from year to year, the possibility of past claims of confidentiality, and the industry trend from numerous small gins to fewer, large gins makes distribution based on past activity unreliable. In addition, if the estimates generated by the methodology above does not meet with State approval, the State may submit more accurate data for those counties and the apportioning methodology can be revised.

The example below uses actual 1995 crop year data for Alabama from *Cotton Ginnings*. These data are shown in the Table 3. Italicized numbers were generated from the process listed above.

Example.

Using the data for Alabama from the 03.25.96 *Cotton Ginnings* report:

- District 10 shows data for three counties, confidential data for two counties and a district total.

(1) Subtract District 10 county data from District 10 total.

144,250 - (35,200 + 59,300 + 25,750) = 24,000 bales

(2) Divide the remaining total by two (two counties claimed confidentiality) to estimate amount for each confidential county.

24,000/2 = 12,000 bales per confidential county

This procedure can also be used for District 40.

- Districts 50 and 60 show district totals only (i.e., all counties within these districts claim confidentiality). To estimate individual county totals, divide each district total by the number of counties within that district.

District 50	District 60
122,300/4 = 30,575 bales per county	153,650/6 = 25,608 bales per county

- Districts 20 and 30 claim county and district confidentiality. To estimate county totals,

TABLE 3. COTTON GINNINGS: RUNNING BALES GINNED BY COUNTY, DISTRICT, STATE, AND UNITED STATES[a]

State/County/ District		Running Bales Ginned	State/County/ District		Running Bales Ginned
UNITED STATES		17,498,800			
Alabama			Alabama (Cont'd)		
Colbert	1/	*12,000*	Baldwin	1/	*30,575*
Lauderdale	1/	*12,000*	Escambia	1/	*30,575*
Lawrence		35,200	Mobile	1/	*30,575*
Limestone		59,300	Monroe	1/	*30,575*
Madison		25,750			
			District 50		122,300
District 10		144,250			
			Covington	1/	*25,608*
Blount	1/	*4,538*	Crenshaw	1/	*25,608*
Cherokee	1/	*4,538*	Geneva	1/	*25,608*
			Henry	1/	*25,608*
District 20			Houston	1/	*25,608*
			Russell	1/	*25,608*
Chilton	1/	*4,538*			
Fayette	1/	*4,538*	District 60		153,650
Pickens	1/	*4,538*			
Shelby	1/	*4,538*	AL Total		491,150
Tallapoosa	1/	*4,538*			
Tuscaloosa	1/	*4,538*			
			Arizona		
District 30	2/				
			Mohave	1/	
Autauga	1/	*4,079*			
Dallas	1/	*4,079*	District 20	2/	
Elmore		6,100			
Greene	1/	*4,079*	Maricopa		354,050
Hale	1/	*4,079*	Pinal		266,900
Lowndes	1/	*4,079*			
Macon	1/	*4,079*	District 50		620,950
Marengo	1/	*4,079*			
			La Paz	1/	
District 40		34,650	Yuma		74,100

[a]The data in and format of this table were taken from the 03.25.96 *Cotton Ginnings* report.
1/ Withheld to avoid disclosing individual gins.
2/ Withheld to avoid disclosing individual gins, but included in State total.
3/ Excludes some gins' data to avoid disclosing individual gins, but included in State total.
4/ Withheld to avoid disclosing individual gins, but included in U.S. total.

(1) Subtract available district totals from State total.

491,150 - (144,250 + 34,650 + 122,300 + 153,650) = 36,300 bales

(2) Divide remainder by the number of counties claiming confidentiality in the two remaining districts.

36,300/8 = 4,538 bales per confidential county

Calculation of Emissions

Using the data in Table 3 and other data from *Cotton Ginnings* reports, PM-10 emissions can be calculated for Madison County, Alabama, as shown in the following example.

(1) Determine total running bales ginned in Madison County in 1996

(a) For the period January 1, 1996 until the end of the crop season, subtract the running total as of January 1, 1996 from the 01/25/96 *Cotton Ginnings* report from the final crop season total from the 03/25/96 *Cotton Ginnings* report.

25,750 bales - 25,700 bales = 50 bales

(b) For the period from the beginning of the 1996 crop year until the end of calendar year 1996, use the running total as of January 1, 1997 from the 01/24/97 *Cotton Ginnings* report. Add this to the total from (a) above to get calendar year 1996 total.

50 bales + 40,500 bales = 40,550 bales ginned in calendar year 1996

(2) Determine the percent of crop ginned by emission control method using Table 2.

(3) Use the emission factors from AP-42 as shown in Table 1, the results of (1) and (2) above, and the general equation to estimate emissions.

$$E = [(P_c * B) * EF_c] + [(P_f * B) * EF_f]$$

Where: P_c = 0.8
P_f = 0.2
B = 40,550 bales
EF_c = 1.2 lb/bale PM-10
EF_f = 0.82 lb/bale PM-10

Emissions = [(0.8 * 40,550 bales) * 1.2 lb/bale] + [(0.2 * 40,550 bales) * 0.82 lb/bale]
= 38,928 lbs + 6,650 lbs
= 45,578 lbs or 23 tons of PM-10

Control Efficiency

Emission factors are controlled emissions factors as indicated above.

References

1. *Compilation of Air Pollutant Emissions Factors and Supplements, Fifth Edition and Supplements, AP-42*, U.S. Environmental Protection Agency, Research Triangle Park, NC. 1997.

2. Telecon. Sharon Kersteter, E.H. Pechan & Associates, Inc., Durham, NC, with Roger Latham, U.S. Department of Agriculture, Cotton Statistics. March 6, 1997.

3. *Cotton Ginnings*, PCG, U.S. Department of Agriculture, National Agricultural Statistics Service, Agricultural Statistics Board, Washington, DC. (13 issues, mailed approximately twice per month during August-March ginning season)

4. *Cotton Ginnings — Annual Report*, PCG-BB, U.S Department of Agriculture, National Agricultural Statistics Service, Washington, DC. Annual publication.

5. Memorandum. Fred Johnson, National Cotton Council, Memphis, TN, to Bill Mayfield, U.S. Department of Agriculture, Memphis, TN, *Estimated Percent of Crop by Emission Control Method*, July 23, 1996.

CALIFORNIA COTTON GINNERS ASSOCIATION

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Fresno, CA 93727
Telephone: 209 / 252-0684
Fax: 209 / 252-0551

October 2, 1995

Mr. Dallas Safriet
Environmental Engineer
Emission Factor Inventory Group (MD-14)
U.S. ENVIRONMENTAL PROTECTION AGENCY
Research Triangle Park, NC 27711

Re: **Proposed Revisions to AP-42: Section 9.7 Cotton Ginning**

Dear Mr. Safriet,

On behalf of the 110 cotton gins in California, I would like to express our thanks for the opportunity to comment on the proposed revisions to AP-42, Section 9.7: Cotton Ginning. As you know from previous discussions on this issue, our industry has some serious concerns on any revisions to AP-42. History has shown that AP-42 has been used as a regulatory tool for setting emissions standards, as opposed to an emission factor reference document, which is the actual intent of AP-42. On that premise, we have completed our review of the proposed revisions and would like to offer the following comments.

First and foremost, the majority of the actual source tests referenced in the document were conducted in California. In each of the references, it was indicated that the cotton ginned at each of the gins was stripper harvested. This is an absolute falsehood. **All cotton ginned in California is spindle picked (picker harvested).** Any reference to this must be changed throughout the document, including the emission factor tables.

Secondly, we would like to comment on "Reference 10", which is the Halls Gin in Halls, Tennessee. It is stated on page 4-8 that the testing was conducted using a Radar High Volume sampler. This is a totally unacceptable method for determining PM10 emissions from a cotton gin. It does not provide for isokinetic sampling as is required by EPA as set forth in EPA Method 5 for total particulate (PM) and EPA method 201A for PM10. Furthermore, it was mentioned that the testing report did not discuss cyclonic flow. All testing performed on cotton gins in California utilized a "straightening vane" to eliminate the cyclonic flow. Any testing performed without the use of the straightening vane is invalid and must be rejected. All of the emissions testing performed on cotton gins in California were performed using a California Air Resources Board (CARB) certified source test contractor and using EPA and CARB approved source test methods and equipment. Considering this, and the fact that even the gins tested in California that utilized "1D-3D" cyclones on all emission points, none of the gins were able to achieve the emissions indicated by the Halls Gin source test. Based on this evidence, it is obvious that the

emissions from Halls Gin in Tennessee are questionable, since they were estimated using unapproved source tests methods. Therefore, we would recommend that the data from the Halls Gin not be utilized, as it does not reflect true and accurate emissions from cotton gins.

Upon review of the California source test data, it should be noted that this reflects only a portion of the tests that have been conducted. There have been considerably more emissions tests performed in California, and these tests should be reviewed and incorporated as possible. Most of these tests occurred within the San Joaquin Valley Unified A.P.C.D.

As we stated in the beginning of this letter, our experience demonstrates that AP-42 has been used to set emissions standards, with which industry must comply. Therefore, it is extremely critical that AP-42 put forth credible and accurate data that truly represents emissions from cotton gins. We hope that you take our comments into consideration when finalizing this document. Again, we would like to thank you for the opportunity to comment on these proposed revisions, and feel free to contact me should you have any questions regarding our comments.

Sincerely,

Roger A. Isom

Roger A. Isom
Director of Technical Services

c: Fred Johnson, NATIONAL COTTON GINNERS ASSOCIATION
Earl P. Williams, CALIFORNIA COTTON GINNERS ASSOCIATION
CCGA Environmental Committee

National Cotton Council OF AMERICA

Box 12285 • Memphis, TN 38182-0285
(901) 274-9030 • FAX (901) 725-0510

PRODUCERS • GINNERS • WAREHOUSEMEN • MERCHANTS • CRUSHERS • COOPERATIVES • MANUFACTURERS

October 31, 1995

Mr. Dallas Safriet
Environmental Engineer
Emission Factor and Inventory Group
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Dear Mr. Safriet:

The National Cotton Council (NCC) and National Cotton Ginners Association (NCGA) appreciates the opportunity to submit comments to the proposed revisions for Section 9.7: Cotton Ginning, AP-42, Compilation of Air Pollutant Emission Factors. NCC is the central organization of the cotton industry, representing producers, ginners, warehouses, crushers, merchants, textile mills, and cooperatives. NCGA is the umbrella organization for eight state and regional ginner organizations, representing all ginners in 17 states.

The attached comments were developed by industry's technical advisors after a thorough review of the draft proposed revisions:

> Pages 2-1 through 2-3, and 2-5 through 2-11 (**William Mayfield**, Program Leader, Cotton Ginning and Mechanization, USDA Extension Service, Memphis, Tennessee)
>
> Figures 2-1 and 9.7-2 (**Roy Baker**, Research Leader, USDA-ARS Cropping Systems Research Laboratory, Lubbock, Texas)
>
> Section 9.7 (**Ed Hughs**, Research Leader, USDA-ARS Southwest Cotton Ginning Laboratory, Mesilla Park, New Mexico)

Other Comments on the Proposed Draft

Proposed changes made by Mayfield on the industry's description should be incorporated into the narrative in 9.7-1 through 9.7.6. Likewise, Baker's corrections to the flow diagrams should be included in Figures 9.7-1 and 9.7-2.

In Section 3, General Data Review and Analysis Procedures, we would point out that in the screening process, earlier emission tests were omitted from the current draft without proper justification. We feel that the data collected in 1977-78 from California and

Arizona is still applicable to current cotton gin emission factors. (Attached photographs are being submitted for your information.) Therefore, those data along with earlier data from the Parnell and Baker study, as well as data from four additional California gins, are included as references in Hughs' proposed emission factor tables. The additional emission data was included with the combined stripper and picker harvesting data in establishing average emission factors for all cotton regardless of harvesting method.

In Section 4, Review of Specific Data Sets, references 1 through 9 erroneously state that those facilities process stripper-harvested cotton. Therefore, Tables 4-1 and 4-3, Summary of Data for Ginning of Stripper Harvested Cotton, are misapplied. Reference 10 (Halls Gin, Halls, TN) of that section should note that these tests were conducted on early season, clean cotton and cannot be a representative average for a whole season's emissions. It should also be noted that data for the Halls Gin were not collected using Method 5 sampling.

Test data as discussed by Hughs support the following conclusions:

1. There is no reason to distinquish between emissions from ginning stripper-harvested and spindle picked cotton if the gin has high efficiency cyclones. The only emission data from stripper-harvested cotton is in Parnell and Baker's study (Hughs' reference 14).

2. A distinction between 1D3D and 2D2D cyclones under normal operating conditions is not justified because there is such a small difference in the overall efficiencies.

3. A distinction is justified for emissions from gins with high efficiency cyclones but with different collection devices for lint cleaner exhausts (-- cyclones vs. screens or lint baskets -- see Tables 4-1, 4-2, 4-3, and 4-4). Separate emission factors should be established for gins employing lint cleaner screens or baskets and those using high efficiency cyclones for their lint cleaners.

Draft Tables 9.7-1, 9.7-2, and 9.7-3, correctly includes both PM and PM10, which is an important distinction in light of EPA's recent guidance (Oct. 16, 1995) to states determining that PM10 will be the regulated pollutant under Title V of the Clean Air Act Amendments.

Summary

In summary, there should not be distinctions made between stripper and picker harvested cotton or between 1D3D and 2D2D cyclones; emission data for gins processing all cotton, regardless of harvesting method and type of high efficiency cyclones employed,

should be combined in calculating average emission factors; and the only distinctions in AP-42 for gin emissions should be for lint cleaner controls (cyclones vs. screens or lint baskets) and for total particulate (TSP) vs. PM10. In addition, we urge that EPA include all of the emission data referenced in Hughs' comments. In our view, the emission factors offered by Hughs take into account all relevant data and establish conservative, credible default numbers for use by both the ginning industry and state regulatory agencies.

Thank you again for allowing us to comment on your process to establish AP-42 emission factors for cotton gins.

Sincerely,

Phillip Wakelyn

Phillip J. Wakelyn, PhD
Manager of Environmental Safety and Health
National Cotton Council of America

Fred Johnson

Fred Johnson
Executive Vice President
National Cotton Ginners Association

INTEROFFICE MEMORANDUM

MIDWEST RESEARCH INSTITUTE

July 31, 1996

To: AP-42 Section 9.7, Cotton Ginning, Project File

From: Tom Lapp

Subject: National Emission Estimate

The recently published AP-42 Section 9.7, Cotton Ginning, developed emission factors for total particulate (PM) and PM-10 for gins using two types of control devices: (1) high-efficiency cyclones and (2) screened drums or cages. These factors can be used to develop estimates of total emissions from cotton gins on a national basis. Because the emission factors for each control device are different, data were needed on the percentage of cotton baled at gins using each type of control. Mr. Bill Mayfield, USDA National Program Leader-Cotton, was contacted for this information; Mr. Mayfield requested assistance from the National Cotton Council.

For each of 16 states, data were provided for the annual average number of bales ginned (1991-1995 crop years) and the estimated percentage of gins using each type of control device; these data are attached to this memorandum. In the data provided by Mr. Mayfield, "full controls" refers to high-efficiency cyclones and "conventional controls" refers to screened drums or cages. For each state, the total number of bales produced by gins using "full controls" and gins using "conventional controls" was obtained by multiplying with the appropriate percentage factor. The emission factors in the AP-42 section are in terms of pounds of particulate per bale produced. Using the number of bales produced and the appropriate emission factor, an emission estimate of total PM (lb) and total PM-10 (lb) was calculated for each state for each control type. These data are presented in Table 1. On a national basis, estimated total PM emissions and PM-10 emissions from gins using high-efficiency cyclones were 7,429 tons and 2,538 tons, respectively. For gins using screened drums or cages, the estimated national emissions for total PM and PM-10 were 17,962 tons and 6,953 tons, respectively. Overall, the national emissions estimate from all gins was 25,391 tons for total PM and 9,491 tons for PM-10.

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TABLE 1. COTTON GINNING--NATIONAL EMISSIONS ESTIMATE[a]

Region/ State	High-efficiency cyclones[b]			Screened drums or cages[c]			TOTAL		
		Emissions, lb			Emissions, lb			Emissions, lb	
	No. of bales[d]	Total PM	PM-10	No. of bales[d]	Total PM	PM-10	No. of bales[d]	Total PM	PM-10
CA	2,070,000	4,968,000	1,697,400	805,000	2,495,500	966,000	2,875,000	7,463,500	2,663,400
AZ	597,000	1,432,800	489,540	597,000	1,850,700	716,400	1,194,000	3,283,500	1,205,940
NM	17,200	41,280	14,104	68,800	213,280	82,560	86,000	254,560	96,664
TX	1,359,300	3,262,320	1,114,626	3,171,700	9,832,270	3,806,040	4,531,000	13,094,590	4,920,666
OK	43,600	104,640	35,752	174,400	540,640	209,280	218,000	645,280	245,032
MS	397,200	953,280	325,704	1,588,800	4,925,280	1,906,560	1,986,000	5,878,560	2,232,264
LA	268,200	643,680	219,924	1,072,800	3,325,680	1,287,360	1,341,000	3,969,360	1,507,284
AR	455,400	1,092,960	373,428	1,062,600	3,294,060	1,275,120	1,518,000	4,387,020	1,648,548
MO	99,000	237,600	81,180	396,000	1,227,600	475,200	495,000	1,465,200	556,380
TN	147,600	354,240	121,032	590,400	1,830,240	708,480	738,000	2,184,480	829,512
AL	114,400	274,560	93,808	457,600	1,418,560	549,120	572,000	1,693,120	642,928
FL	17,400	41,760	14,268	69,600	215,760	83,520	87,000	257,520	97,788
GA	340,500	817,200	279,210	794,500	2,462,950	953,400	1,135,000	3,280,150	1,232,610
NC	189,900	455,760	155,718	443,100	1,373,610	531,720	633,000	1,829,370	687,438
SC	61,800	148,320	50,676	247,200	766,320	296,640	309,000	914,640	347,316
VA	12,200	29,280	10,004	48,800	151,280	58,560	61,000	180,560	68,564
TOTAL	6,190,700	14,857,680 7,429 (tons)	5,076,374 2,538 (tons)	11,588,300	35,923,730 17,962 (tons)	13,905,960 6,953 (tons)	17,779,000	50,781,410 25,391 (tons)	18,982,334 9,491 (tons)

[a]Based on 1991-1995 crop data.

[b]Emission factors for high-efficiency cyclone (full controls): 2.4 lb/bale Total PM; 0.82 lb/bale PM-10

[c]Emission factors for screened drums or cages (conventional controls): 3.1 lb/bale Total PM; 1.2 lb/bale PM-10

[d]Average annual number of bales ginned (1991-1995).

USDA, CSREES
7777 Walnut Grove Road, Box 5
Memphis, TN 38120

DATE: 7/23/96

FAX COVER SHEET

TO: Brian Shroger

FAX NO. 919-677-0065

FROM: William Mayfield
National Program Leader, Cotton
FAX No. 901/766-7689

MESSAGE: Enclosed are our estimates of the total holes ginned on Fully Controlled and Conventionally Controlled Gins for the last five crops. These estimates represent the opinions of several knowledgeable cotton industry people.

No. of pages sent including cover sheet: 2

If you have trouble receiving this transmission, please contact me at 901/766-7690.

FAX Cover Sheet

National Cotton Council
P.O. Box 12285
Memphis, Tennessee 38182
901/274-9030, F-901/725-0510

To: Bill Mayfield (766-7689)

From: Fred Johnson

Date: July 23, 1996

Subject: Estimated Percent of Crop By Emission Control Method

Pages: 1 (including cover)

Remarks:

AVERAGE TOTAL BALES GINNED PER YEAR

State/Region	% Crop Full Controls	% Crop Conventional Controls	Avg. Crop (1991-95)
California	72	28	2,875,000
Arizona	50	50	1,194,000
New Mexico	20	80	86,000
Texas	30	70	4,531,000
Oklahoma	20	80	218,000
Mississippi	20	80	1,986,000
Louisiana	20	80	1,341,000
Arkansas	30	70	1,518,000
Missouri	20	80	495,000
Tennessee	20	80	738,000
Alabama	20	80	572,000
Florida	20	80	87,000
Georgia	30	70	1,135,000
North Carolina	30	70	633,000
South Carolina	20	80	309,000
Virginia	20	80	61,000
U.S.	35	65	~~17,506,000~~ 17,779,000

National Cotton Council
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PRODUCERS • GINNERS • WAREHOUSEMEN • MERCHANTS • CRUSHERS • COOPERATIVES • MANUFACTURERS

October 3, 1995

Mr. Dallas Safreit
U.S. Environmental Protection Agency
Emission Factor and Inventory Group (MD-14)
Research Triangle Group, NC 27711

Dear Dallas:

This is to confirm your phone message on October 3, 1995 that we have additional time to provide cotton industry comments of the draft version of Section 9.7, Cotton Ginning, AP-42, Compilation of Air Pollution Emission Factors. As always we appreciate the opportunity to provide comments on this important document, and look forward to working with you on the document.

Yours sincerely,

Phillip J. Wakelyn, Ph.D.
Manager, Environmental Health and Safety

cc: Fred Johnson

National Cotton Council OF AMERICA

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PRODUCERS • GINNERS • WAREHOUSEMEN • MERCHANTS • CRUSHERS • COOPERATIVES • MANUFACTURERS

May 23, 1996

Mr. Dallas Safriet
Environmental Engineer
Emission Factor and Inventory Group
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Dear Mr. Safriet:

The National Cotton Council (NCC) and National Cotton Ginners Association (NCGA) appreciate the opportunity to respond to the April 1996 draft final report of "Emission Factor Documentation for AP-42, Section 9.7, Cotton Ginning". NCC is the central organization of the cotton industry, representing producers, ginners, warehouses, crushers, merchants, textile mills, and cooperatives. NCGA is the umbrella organization for eight state and regional ginner associations, representing all ginners in 17 states.

Several cotton industry technical advisors conducted a thorough review of the draft final report. Their comments, summarized below, deal with specific errors in the draft and offer general opinions of the emission data.

Specific Comments

Page 2-1: "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**, compared with 7,096 bales during the 1989/1990 season."

Page 2-2: "Two types of machines are used: pickers and strippers. Machine-picked cotton normally accounts for **70-80** percent of the total cotton harvested, while machine stripped normally accounts for **20-30** percent of the total cotton harvested."

"In **1994**, **78** percent of the U.S. crop was handled in modules."

Page 2-5: "**Typically**, all conveying air is cleaned by a cyclone before being released into the atmosphere."

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May 30, 1996

Mr. Dallas Safriet
Environmental Engineer
Emission Factor and Inventory Group
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Re: AP-42, Gin Emissions

Dear Dallas:

I understand why you want to keep the section on p. 2-7 in the write up "Cotton fields may be treated..." If you do keep this section in you should make the following additions/modifications:

> "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 ~~emissions of any~~ residues of such chemicals *on the external particulate emissions from a cotton gin.* ~~during the ginning process~~. *However the little information available indicates that residues of agricultural chemicals on gin emissions are either nondetectable or below levels of concern."*

Bill Mayfield will send you information on moduling and a copy of the Ginner's Handbook. I look forward to working with you further on this and seeing the final product.

Yours sincerely,

Phillip J. Wakelyn, Ph.D.
Manager, Environmental Health and Safety

cc: Fred Johnson

In the way of general comments, we would make the following observations:

- Almost all data is from one cotton production area, with different soils and production practices from other areas.
- All emission data, other than earlier EPA tests, are piecemeal, taken from single exhausts and not the entire facility.
- Emission data was taken from one cyclone of two or more in a set.

We offer these general comments to point out the inherent difficulty in obtaining good data that is representative of the entire industry. In spite of the limitations in the available data, we still believe the draft's emission factors are good default numbers which are acceptable for use by industry and the regulatory community.

Summary

In summary, several corrections are necessary in the industry description section and emission points diagram of the draft. In addition, a close examination of the emission data shows a majority was collected piecemeal and from one distinct production area, which is always a potential concern with numbers that will have application nationwide.

Nevertheless, the emission factors should be good default numbers that industry and regulators can use in considering the particulate emissions from cotton gins.

Thank you again for the opportunity to comment on this latest draft. We apologize for the short delay in submitting our observations, but we felt the draft deserved a thorough review. It will be very useful for you to finalize this AP-42 document as soon as possible.

Sincerely,

P/ Wakelyn

Phillip J. Wakelyn, PhD
Manager of Environmental Safety and Health
National Cotton Council of America

Fred Johnson

Fred Johnson
Executive Vice President
National Cotton Ginners Association

Page 2-6: "**Typically**, the air from this system is routed through a cyclone and cleaned before being exhausted to the atmosphere."

Page 2-7: **Typically**, the air from each step in the process goes through a control device before being vented to the atmosphere."

Delete: "Cotton fields may be treated with any of several agricultural chemicals, including fertilizers, pesticides, and harvesting aids (such as defoliants and desiccants). Little information is available on emissions of any residues of such chemicals during the ginning process."

Page 2-8: Delete: "Wet scrubbers have been sued with little success as primary control. The efficiency of particulate removal is lower than cyclones and the scrubber creates a water and sludge disposal problem. However, wet scrubbers have been proven as a secondary control device with cyclones. Testing indicated a wet scrubber can remove 73.5 percent of the particulate exhausted by a cyclone, which captured an average of 90.8 percent of gin emissions. Particulate removal for the combined system averaged 97.6 percent."

Page 2-10 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."

Page 9.7-6 See attached diagram.

Explanations and General Comments

The proposed deletion on page 2.7 was also offered in our earlier comments. We feel that this information is not pertinent, because there is little information available but what is available indicates there is nothing of concern in gin external emissions. This document should deal only with particulate emissions unless there are other appropriate data available.

We propose the deletion on page 2.8 because we are not aware of any current gin application of this technology. Therefore, it is unnecessary to mention every piece of control technology, either not employed or unsuccessful.

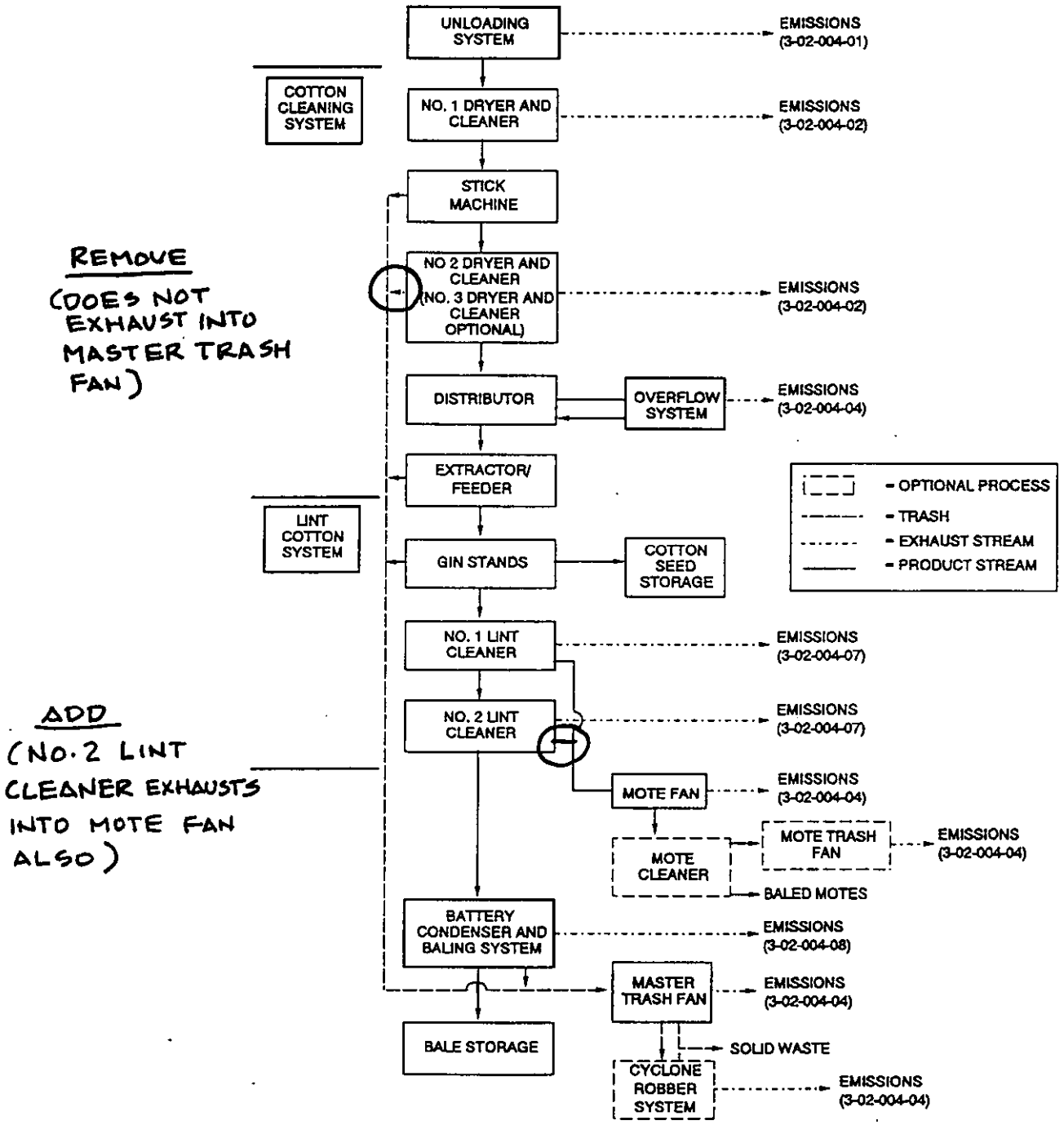

Figure 9.7-2. Emissions from a typical ginning operation.
(Source Classification Codes in parentheses.)

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January 8, 1997

Mr. Tim Smith
Office of Air Quality Planning & Standards
U.S. Environmental Protection Agency
Mail Drop 2
Research Triangle Park, North Carolina 27711

RE: Requested Comments on the Potential to Emit Rulemaking

Dear Tim:

The National Cotton Council (NCC) and National Cotton Ginners Association (NCGA) appreciate the opportunity to submit comments and suggested guidance for the EPA Potential to Emit (PTE) Rulemaking. NCC and NCGA are pleased that EPA conducted the two "Small Business SBREFA Outreach Meetings for the Potential to Emit Rulemaking" and that you are requesting these comments. NCC also appreciates being an invited advisor member of the "Potential to Emit Small Entity Advisors Panel" for these meetings. This is a very important issue for small seasonal agricultural businesses like cotton gins which operate in 17 different states and at least an additional 10 or more separate air districts in some of the states, all having different requirements (Table 1). NCC is the central organization of the cotton industry, representing producers, ginners, warehouses, crushers, merchants, textile mills, and cooperatives. NCGA is the umbrella organization for eight state and regional organizations, representing all ginners in 17 states.

NCC and NCGA are pleased that EPA is committed to providing technical guidance on types of inherent physical and operational design features that are acceptable in determining potential to emit for individual small source categories through a "generic standard" to be published as an "interim final standard" but also request that EPA publish a guidance for cotton gins similar to the one for "grain handling facilities" and "batch chemical production operations". The cotton gin guidance could be a model guidance for types of emitting sources in which emissions occur only during a given season because of material limitations (e.g., seasonal agriculture). Specifically, we appreciate EPA's recognition that cotton ginning is a seasonal agricultural activity and therefore, a seasonal emission source.

We submitted comments and talked to EPA, starting in February 1995, to receive PTE guidance for cotton gins. Some of our earlier comments (April 25, 1996) to EPA's revised draft guidance for cotton gins, "Calculating Potential to Emit for Sources that only Operate on a Seasonal Basis", commended EPA for allowing states flexibility in defining the cotton harvesting and ginning seasons. We also pointed out that this guidance would be more useful if it presents a maximum capacity with an upper-limit estimate "threshold", determined by using material throughput (bales/year) and AP-42 emission factors (see Table 2), like the November 1995 EPA guidance for grain handling facilities. EPA also used this approach for the MACT standard for "Wood Furniture Manufacturing Operations" (60 FR 62929; December 7, 1995). Without a PTE guidance for cotton gins, states are establishing dissimilar upper thresholds, some of which are unrealistically low and yet apply to all facilities in a state. For gins, like grain handling facilities, annual throughput and AP-42 emission factors are the important parameters for determining annual emissions and whether a source is major or minor under Title V. The number of days of operation tells very little about annual emission levels.

Cotton gins have more constraints than country grain elevators, in that they too are closely restricted in their operation due to a limited geographic area from which a finite amount of the perishable raw material (seed cotton) can be grown and harvested. Likewise, the principal determinant of which cotton ginning facility will be used by growers to process their cotton is the proximity of that gin to the harvested area. However, unlike a grain elevator, a cotton gin is more restricted in how far and how much seed cotton can be transported. A cotton gin will service the same general geographic area from year to year. And, like grain elevators, year-round operation is practically unachievable at cotton gins. The amount of cotton harvested on any one year may vary to a certain extent, but a reasonable threshold/upper bound can be established for determining whether a source is major or minor.

Therefore, NCC and NCGA recommend that EPA issue a separate guidance for determining PTE for cotton gins, as well as include cotton gins (seasonal agricultural operations) in the "generic interim final standard" to be issued by June 1997. For cotton gins the material throughput upper bound major source threshold should be a seasonal production limit (bales/year) based on AP-42 emission factors (with a safety factor) and the types of controls on a gin (see Table 3). The major source threshold should be determined by using the 95% upper limit confidence value for AP-42 gin emissions (see Table 3). The 95% confidence limits were calculated from the AP-42 emission factors for gins (see Appendix 1) by S.E. Hughs, research leader of the USDA Southwestern Ginning Laboratory, who made some of the measurements and assisted Dallas Safriet, EPA, and the EPA contractor (MRI) in developing the Cotton Ginning section (9.7) in AP-42.

As can be seen in Table 3, for gins with screens on the low pressure exhausts and high efficiency cyclones on all other exhausts, a threshold of 100,000 bales would have 95% confidence that the yearly emissions would be below 100 tons of PM-10. The resulting bale/year major source thresholds, determined by using the conservative 95% upper confidence limit and either the more conservative PM-10 as 50% or PM-10 as measured by AP-42, show that the vast majority of cotton gins are minor sources of PM-10. Permits and operating conditions for those facilities exceeding the threshold could be handled on a case-by-case basis by states.

In summary, NCC and NCGA commend EPA for their commitment to developing technical PTE guidance for states addressing small seasonal agricultural sources, such as cotton gins. We feel strongly that states need additional guidance for establishing consistent and reasonable threshold limits for determination of major sources under Title V and need them immediately. This can be accomplished through a separate and specific guidance for cotton gins, using a PTE determination calculated with AP-42 emission factors to determine major source annual throughput thresholds in bales/year. Application of a reasonable safety factor, using the 95% upper confidence limit, provides confidence for the regulatory community that ginning facilities with a certain annual material throughput (in bales/year) will not exceed major source thresholds. Prompt action by EPA in providing states with gin-specific technical guidance will help them determine those facilities which are clearly minor sources so that their limited resources can be devoted to Title V permitting of the obvious major sources. Please contact us at 202/745-7805 (PJW) or 901/274-9030 (FJ) if there are questions or additional information is needed.

Sincerely,

Phil Wakelyn

Phillip J. Wakelyn, PhD.
Manager, Environmental Safety & Health
National Cotton Council of America

Fred Johnson

Fred Johnson
Executive Vice President
National Cotton Ginners Association

Table 1. Cotton Growing States and Air Districts; *1994/95 Cotton Gins and Gin Average Volumes

State/ Air Districts	No. of Gins	Avg. Vol.
AL Jefferson	58	11,862
AR	111	15,919
AZ Pinal-Gila Maricopa Pima	67	12,269
CA Imperial Colusa Tehama Glenn San Joaquin Unified Mohave Desert Butte	108	26,120
FL	**	**
GA	66	22,742
KS	1	**
LA	75	20,173
MS	156	13,353
MO	39	14,231
NM	19	3,579
NC Forsyth Mecklenberg Western	49	16,449
OK	56	4,143
SC	42	8,810
TN Knox Hamilton Shelby Davidson	50	17,260
TX	404	11,995
VA	**	**

* USDA-ERS

** Not reported by USDA-ERS

Table 2.

AP-42 Emission Factor for Gins

NEW*:
With high-efficiency cyclones on all exhausts: TSP: 1.09 kg/bale (2.4 lb/bale) PM10: 0.37 kg/bale (0.82 lb/bale)
With screens on the lint cleaner and battery condenser drums and high-efficiency cyclones on all other exhausts: TSP: 1.41 kg/bale (3.1 lb/bale) PM10: 0.54 kg/bale (1.2 lb/bale)

* U.S. EPA. 1996. Emission Factor Documentation for AP-42, Section 9.7, Cotton Ginning, Final Draft Report (EPA Contract No. 68-D2-0159; MRI Project No. 4603-01), April 1996. Finalized by EPA, July 9, 1996, and put on EPA Bulletin Board.

Pg 6

Table 3.

CYCLONES ON ALL EXHAUSTS:

		Emission Factor	Major Source Threshold (Bales/Year)		
		(lbs/bale)	100 tons*	95 tons†	70 tons‡
95% Upper Confidence Limit	50% PM10	1.32	151,515	143,939	106,060
	AP-42 PM10 (34.2%)	0.902	221,729	210,642	155,210
	AP-42 (PM10)	0.82	243,902		

SCREEN CAGES OR SCREENS ON LINT EXHAUSTS:

		Emission Factor	Major Source Threshold (Bales/Year)		
		lbs/bale	100 tons*	95 tons†	70 tons‡
95% Upper Confidence Limit	50% PM10	1.996	100,000	95,000	70,000
	AP-42 PM10 (38.7%)	1.545	129,450	122,977	90,615
	AP-42 (PM10)	1.2	167,000		

***95% confidence that the emissions would be below 100 tons**

† 95% confidence that the emissions would be 5% below the 100 ton limit

‡ 95% confidence that the emissions would be below the major source limit (70 tons) in a non-attainment area

Appendix 1.

Data in both Table 1 and Table 2 were drawn from Table 4-2, Emission Factor Development for Cotton Ginning,which is part of Emission Factor Development for AP-42, Cotton Ginning, EPA Contract No. 68-D2-0159, MRI Project No. 4603-01. These data from each table were analyzed by SAS' PROC MEANS procedure to determine the 95%, upper and lower confidence limits on the sum of the observation points for each simulated gin. This procedure is applicable because the individual data points used were the same data points that were used by EPA to formulate the emission factors that are listed in Table 9.7-1 of AP-42. The data had to be put in this type of format so that statistical procedures could be used to estimate the variance of a gin plant's total emissions for each emission control condition. Once an estimate of the total emission's variance was established, confidence limits could then be set.

Table 1. Simulated Gins with Cyclones On All Exhausts

Name	Obs. Point	Gin #1	Gin #2	Gin #3	Gin #4	Gin #5
unloading fan	1	0.40	0.36	0.34	0.32	0.30
#1 drying	2	0.39	0.39	0.35	0.30	0.30
#2 drying	3	0.22	0.21	0.16	0.12	0.11
master trash	4	0.13	0.31	0.40	1.80 /.30	0.99
overflow fan	5	0.011	0.029	0.044	0.10	0.13
LC w/ cyclone	6	0.09	0.13	0.29	0.30	0.39
mote system	7	0.15	0.17	0.21	0.30	0.33
batt. cond. w/ cyclone	8	0.18	0.024	0.036	0.042	0.082

Table 2. Simulated Gins with Screens on Lint Cleaners and Cyclones On All Other Exhausts

Name	Obs. Point	Gin #1	Gin #2	Gin #3	Gin #4
unloading fan	1	0.40	0.36	0.34	0.32
#1 drying	2	0.39	0.39	0.35	0.30
#2 drying	3	0.22	0.21	0.15	0.12
master trash	4	0.13	0.31	0.40	1.30 /.30
overflow fan	5	0.011	0.029	0.044	0.10
mote system	6	0.15	0.17	0.21	0.30
lint system w/ screens	7	0.30	0.80	1.50	1.00

Appendix 1 (Continued).

FOR CYCLONES ON ALL EXHAUSTS:

No. of Gins	Std. Error of Mean	Lower Confidence Limit	Mean	Upper Confidence Limit
5	0.26328	1.51432	2.0756	2.63688

upper limit (95% confidence limit)

2.63688 (TSP) @ 50% PM10 ≈ 1.32 lbs/bale
using the 100 ton limit ≈ **151,515 bales/year**

2.63688 (TSP) @ AP-42 PM10 (34.2%) ≈ 0.902 lbs/bale
using the 100 ton limit ≈ **221, 729 bales/year**

FOR SCREEN CAGES OR SCREENS ON LINT EXHAUSTS:

No. of Gins	Std. Error of Mean	Lower Confidence Limit	Mean	Upper Confidence Limit
4	0.53997	1.45025	2.721	3.99175

upper limit (95% confidence limit)

3.99175 (TSP) @ 50% PM10 ≈ 1.996 lbs/bale
using the 100 ton limit ≈ **100,000 bales/yr**

3.99175 (TSP) @ AP-42 PM10 (38.7%) ≈ 1.545 lbs/bale
using the 100 ton limit ≈ **129,450 bales/yr**

National Cotton Council OF AMERICA

1521 New Hampshire Avenue, NW • Washington, DC 20036
(202) 745-7805 • FAX (202) 483-4040

PRODUCERS • GINNERS • WAREHOUSEMEN • MERCHANTS • CRUSHERS • COOPERATIVES • MANUFACTURERS

23 May, 1997

Mr. Dallas Safriet
Emission Factor and Inventory Group
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Re: *AP-42 Appendix B.1, Cotton Ginning*

Dear Dallas:

Enclosed are the corrections to Appendix B.1 cotton ginning and a copy of a paper, accepted for publication in *Trans. ASAE*, that has the best and most recent information on the % of PM-2.5 in gin emissions. I hope you will be able to correct and update this section and possibly add it to "Emission Factor, Documentation for AP-42 Sec. 9.7, Cotton Ginning".

Also enclosed is a letter sent to Tim Smith regarding PTE for cotton gins. Thresholds for gins to be below 100 tons/yr. of PM-10 with 95% confidence are discussed and recommended. It would be very useful to get a guidance for cotton gins, for determining annual emissions and whether a source is major or minor under Title V, similar to the one for grain handling facilities, based on annual throughput and AP-42 emission factors. States could use this to develop consistent General Permits for gins in their state. Tim Smith is looking to you to say the 95% confidence approach is all right. Any help is appreciated.

Sincerely,

Phil

Phillip J. Wakelyn, Ph.D.
Senior Scientist, Environmental Health and Safety

cc: Fred Johnson
Ed Hughs

United States Department of Agriculture
Agricultural Research Service
Southern Plains Area
Southwestern Cotton Ginning Research Laboratory
P.O. Box 578, 300 East College Dr.
Mesilla Park, NM 88047

May 19, 1997

SUBJECT: Appendix B of AP-42, Cotton Ginning

TO: Phil Wakelyn, Senior Scientist
Environmental-Safety Technology
National Cotton Council
1521 New Hampshire Ave., NW
Washington, D.C. 20036

FROM: Ed Hughs, Research Leader EH

What is Appendix B.1 of the new AP-42 used to be Section 6.3 Cotton Ginning, Appendix C.1 of the previous edition. I had been asked to review C.1-34 through 37 by Fred Johnson in 1992. The emission factors for lint cleaner air exhaust (C.1-36, 37) I found at that time were too high by a factor of 10. I submitted the correction, but evidently it was never made. The lint cleaner exhaust emission factor shown on B.1-34, 35 has the same errors as did C.1-36, 37. I am senior author on the technical reference for this factor. I have made and am enclosing the appropriate edits to B.1-34, 35 for your information.

I am also enclosing a draft copy of "Physical Characteristics of Cyclone Particulate Emissions," of which you are co-author. This paper will shortly be published in the Transactions of ASAE. The original reference used in B.1-34, 35 was data from only one single observation. The information in the enclosed paper will greatly expand the data base for PM2.5 and PM10 emission factors.

Please let me know if you have any questions.

Enclosures

National Cotton Council OF AMERICA

Box 12285 • Memphis, TN 38182-0285
(901) 274-9030 • FAX (901) 725-0510

PRODUCERS • GINNERS • WAREHOUSEMEN • MERCHANTS • CRUSHERS • COOPERATIVES • MANUFACTURERS

August 21, 1997

Mr. Matt Haber
Chief, Permits Office
U.S. Environmental Protection Agency
Region IX Office
75 Hawthorne
San Francisco, California 94105-3901

Dear Mr. Haber:

The National Cotton Council (NCC) and National Cotton Ginners Association (NCGA) would like to provide clarification and comments to your correspondence, dated July 23, 1997, to Seyed Sadredin of the San Joaquin Valley Unified Air Pollution District. NCC is the central organization of the cotton industry, representing producers, ginners, warehouses, crushers, merchants, textile mills, and cooperatives. NCGA is the umbrella organization for eight state and regional ginner associations, representing ginners in 17 states.

Our organizations were asked to review and comment on the 1995 proposed revisions for Section 9.7: Cotton Ginning, AP-42, Compilation of Air Pollutant Emission Factors, which we did with the help of USDA and industry ginning experts. Our latest comments were presented on October 31, 1995, and in another letter on May 23, 1996. These comments followed earlier comments and several meetings with Dallas Safriet and representatives of the contractor, Midwest Research Institute, starting in 1992.

Discussions between our organizations and EPA, prior to our review of the 1995 AP-42 draft, focused primarily on recent California emission data and the appropriate use of AP-42 emission factors by both industry and state regulatory agencies. Regarding the use of AP-42 emission factors, our associations strongly recommended that language be included in the preamble of the revised fifth edition of AP-42, published in 1996, to explain that its emission factors should be considered as default numbers for making emission estimates, not absolutes not to be exceeded, especially when no local data exists. Those recommendations appear to be understood and noted in the following fifth edition of AP-42 preamble language:

"As stated, source specific tests or continuous emission monitors can determine the actual pollutant contribution from an existing source better than can emission factors..... If representative source-specific data cannot be obtained, emissions information from equipment vendors, particularly emission performance guarantees or actual test data from similar equipment, is a better source of information for permitting decisions than an AP-42 emission factor."

With that background on the appropriate use of AP-42 emission factors, our associations reviewed the 1995 draft cotton ginning section of AP-42. In addition to our recommendations on the industry's description and flow diagrams, we commented on the data review and analysis, as well as the review of specific data sets available at that time. The data sets were all from Method Five sampling, which EPA requires, except for one gin in Halls, Tennessee. In all, about 16 sets of the latest gin emission data were pulled together by EPA, with the assistance of Ed Hughs, research leader at the USDA ginning laboratory in New Mexico. The following general points were made in our comments:

1. *There is no reason to distinquish between emissions from ginning stripper-harvested and spindle picked cottons if gins have high efficiency cyclones.*

The initial 1995 draft had erroneously stated that certain California emission sources process stripper-harvested cotton. There may be emission data available at some point that calls for a distinction between the two harvesting methods, but current data would suggest that there is not sufficiently good reason to do so, especially given the nature and use of AP-42.

2. *A distinction between 1D3D and 2D2D cyclones under normal operating conditions is not justified because there is such a small difference in the overall efficiencies.*

Our comments took into account only the gin emission data available at that time; we understand source sampling has been conducted at an additional 33 gins since our comments were made, which could possibly shed more light on the relative efficiencies of these cyclone designs. Based on the initial data set, this distinction was not justified.

3. *A distinction is justified for emission factors from gins with high efficiency cyclones but with different collection devices for lint cleaner exhausts. Separate emission factors should be established for gins employing lint cleaner screens or baskets and those using high efficiency cyclones for their lint cleaners.*

Based on the data set, this recommendation asked EPA to look at the most important consideration in determining a gin's overall emissions-- the controls used on low pressure exhausts-- assuming use of high efficiency cyclones on all other exhausts.

The following are our comments to specific references made in your letter:

1. Coverletter: *"EPA has determined that the emission difference between 2D2D cyclones and 1D3D cyclones is much smaller than assumed by the District, and this position is supported by data submitted to EPA by the National Cotton Council of America."*

The National Cotton Council (and NCGA) did not submit data to EPA. We submitted an analysis of available data and recommendations on how the data should be organized and applied. In those comments, we acknowledged that in most cases 1D3D cyclones are slightly more efficient than 2D2D cyclones. That acknowledgment was based on existing data at the time, and the appropriate use of AP-42 data.

2. Page One of Enclosure: *"Since particulate emissions vary based on the time that the cotton was harvested and the harvesting method (AP-42 section 9.7), the permit must also include on-going source testing."*

We acknowledged in our comments that particulate emissions can vary based on the time and conditions at harvest. However, based on available data, we recommended no distinction in emission factors for the two primary harvesting methods of cotton. We recognize that the data available provided good default numbers for gins, which were on the high side. Actual measurements for gins using appropriate cyclone configurations should give lower numbers. On-going source testing, which would be prohibitively expensive, is not necessary because of available data.

3. Page 3 of Enclosure: *"We are concerned that this gin and others have been allowed to take credit for major emission reductions by replacing 2D2D cylcones with 1D-3D cyclones . This policy has been used to grant sources emission reduction credits, allow large production increases and sometimes both. In this case, the District has estimated that the emissions at gin #3 would be reduced from 2.45 lb PM-10/bale to 0.97 lb. PM-10/bale based on emission factors from the California Cotton Ginners Association."*

Without reviewing this gin permit application, we can only surmise that this large emission reduction is due primarily to the change in emission controls on the low pressure exhausts (assume going from lint baskets or condenser screens on low pressure

exhausts to high efficiency cyclones on these same exhausts). This, again, is the point we made in our AP-42 comments.

4. Page 3 of Enclosure: "*EPA believes that 1D3D cyclones are only slightly more efficient that 2D2D cyclones (AP-42 section 9.7 fifth edition) and that the actual reductions are generally more much lower. The National Cotton Ginners Association and the National Cotton Council recently commented to EPA that emission rates above 1.32 lbs. PM-10/bale are unrealistic for facilities controlled by 2D2D cyclones.*"

This most likely is a reference to our January 8, 1997, comments to Tim Smith of EPA, for purposes of establishing PTE guidance for cotton gins. We presented calculations for helping establish an upper bound source threshold which provided a 95 percent upper confidence level (that a gin would be be 5 percent below the major source level) for two control scenarios: cyclones on all exhausts, and screen cages/screens on lint cleaner (low pressure) exhausts. Those calculations resulted in the following emission factors (lbs./bale) for gins using high efficiency cyclones on all exhausts: 1.32 (assuming 50% PM-10), 0.902 (assuming AP-42 PM-10 of 34.2%), and 0.82 (AP-42). These calculations consider the use of high efficiency cyclones (either 2D2D or 1D3D) and make no other distinction.

NCC and NCGA appreciate the opportunity to clarify our recommendations to EPA on the 1995 AP-42 draft and offer our views on your letter. In summary, we offered recommendations to EPA based on our understanding of AP-42's use by both regulatory agencies and the industry. At the time those recommendations were made, the available data was best interpreted on whether or not high efficiency cyclones are used on all exhausts. California's emission factors handbook includes the very latest emission data from that state, which should more accurately characterize the harvesting/ginning conditions and emissions from California gins. It has been acknowledged in the AP-42 preamble that emission data collected locally should have more veracity than AP-42 emission factors.

Sincerely,

Phil Wakelyn
National Cotton Council

Fred Johnson
National Cotton Ginners Association

From: Ed Pike
To: RTP3.RTMU538(SMITH-TIM)
Date: 7/21/97 7:21pm
Subject: READ ME FIRST: San Joaquin cotton gins

Note: the District originally gave me only three emision data columns labeled Ave, +STD, and -STD. So I added the average to the value in the positive standard deviation column to get the high emissions value. Today, however, I received the original source test data, Computing these numbers from source test values revealed that the "+STD" column actually represents the sum of the
average value and the standard deviation, not just how much should be added to the average value to get the high value. Sorry for any confusion.

Please read the corrected values below and delete the original message. Thanks.

Tim-

Thanks for your help on gins. Dallas told me that you may have gotten something specific from San Joaquin. I would be very interested to see it. SJV, at the request of the ginning industry, currently uses a baseline of 2.45 lbs PM10/bale for calculating emission (i.e. emission credits and NSR baseline emissions) for sources w/ 2D-2D cyclones. Therefore, I would be very interested to see any information they have submitted asking EPA to use much lower emission rates when determine title V applicability [it appears that they
are asking to establish two categories of pollutants: PM10 (for emission reduction credit purposes) = 3 * PM10 (for title V applicability)] . The California Cotton Ginners' Association submitted source tests with emissions rates for the 2D-2D saw gins from 1.57 lbs PM10/bale to 2.9 lbs PM10/bale. The
high end of the source test data they submitted for 1D-3D (roller gins) is 1.69
lb PM10/bale. I am not convinced that their data is unbiased, but it does show
a very wide discrepancy between their own data and how they want to get out of title V. I will send you and/or Dallas a copy of their latest emission factor handbook if you are interested - I would be very intersted to know your opinion
of the average values they (and the District) use. The industry association rep even invited me to an industry class/tour, but I was afraid of experiencing
the inside of the ginning process first hand.

I would like the opportunity for Region IX to comment on the ginning PTE guidance prior to issuance. I don't know where you are in the process, but if you are trying to get it out I will try to speed our review. We are likely to enforce against San Joaquin cotton gins that lack enforceable limits and are subject to EPA enforcement for failure to get a title V permit. Based on the ginners' association data for San Joaquin Valley, a non-attainment area, we would probably want to review at least 2D-2D sources with an allowable ginning rate of 45,000 bales/yr & 1D-3D sources at about 80,000-100,000 (depending on type). This is not to say that the AP-42 emission factors are not representative of sources' average actual emissions, but just that we would use
max emissions to determine PTE for title V applicability. Also, any other information that you have on calculating max PTE would help me. Thanks.

Please consider this information enforcement confidential - this message will self destruct in fifteen seconds ... tick ... tick ... tick.

Ed.

San Joaquin Valley
Unified Air Pollution Control District

October 26, 1995

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

Re: Revised Draft Report for AP-42 Section 9.7, Cotton Ginning

Dear Mr. Safriet:

Thank you for the opportunity to review the draft revised AP-42 section on cotton ginning. Overall the report appears to provide a thorough update to the current AP-42 section. The following four areas may need to be corrected or additional review may prove beneficial.

Draft table 9.7-1/page 9.7-7 and table 9.7-2/page 9.7-8 indicate that cotton grown in the San Joaquin Valley of California is harvested by stripping. As discussed elsewhere in the text, virtually all cotton grown in the San Joaquin Valley is picker cotton. A review of all facilities in the SJV used to develop emission factors (Ref. #1-9) shows that source tests represent picker cotton.

The total emission factor in draft table 9.7-3 is unusually low. A review of gins operating in the District showed several gins equipped with more efficient control equipment (1D-3D and 2D-2D cyclones rather than 2D-2D cyclones, perforated drums and mesh screens) operate at emission rates greater than 0.66 lb PM/bale. A typical range for a gin controlled by a combination of cyclones is 0.75 to 1.0 lb PM10/bale. It is unlikely the 0.66 lb PM/bale would accurately represent the emission rate for gins with the controls described in draft table 9.7-3.

There is some equipment in use in the District which is not discussed in the draft section. Roller gin stands which use rollers rather than saws to separate the seeds from the cotton lint are sometimes used for "pima" long staple cotton. The use of plenum chambers followed by cyclones is becoming more common as a control strategy. Also, the use of enclosed augers in place of pneumatic conveyance followed by cyclones is increasing, particularly for trash handling.

Finally, several source tests were done during the 1994 ginning season. If you wish to include more tests in your data, these can be made available for inclusion.

David L. Crow
Executive Director/Air Pollution Control Officer

1999 Tuolumne Street, Suite 200 • Fresno, CA 93721 • (209) 497-1000 • FAX (209) 233-2057

Thank you for your cooperation. Should you have any questions, please telephone Mr. Thomas Goff of Permit Services at (805) 861-3682.

Sincerely,

Seyed Sadredin
Director of Permit Services

Thomas E. Goff, P.E.
Permit Services Manager - Southern Region

DMR

COMMENTS ON NATIONAL COTTON COUNCIL ADDITIONS TO TABLE 4-1

TABLE 4-1 cont'd

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	C	0.0074-0.0082 (0.016-0.018)	0.0078 (0.017)	10
No. 1 dryer and cleaner	Total PM	3	C	0.022-0.033 (0.049-0.073)	0.027 (0.059)	10
No. 2 dryer and cleaner	Total PM	3	C	0.016-0.018 (0.035-0.039)	0.017 (0.037)	10
Master trash fan	Total PM	3	C	0.028-0.037 (0.062-0.082)	0.033 (0.073)	10
Overflow fan	Total PM	3	C	0.012-0.014 (0.027-0.031)	0.013 (0.029)	10
Lint cleaners with screened drums	Total PM	3	C	0.13-0.15 (0.28-0.34)	0.14 (0.30)	10
Third stage lint cleaners with screened drums	Total PM	3	C	0.0072-0.0096 (0.016-0.021)	0.0084 (0.019)	10
Mote system	Total PM	3	C	0.029-0.034 (0.063-0.075)	0.032 (0.070)	10
Battery condenser with screened drums	Total PM	3	C	0.0050-0.0074 (0.011-0.016)	0.0059 (0.013)	10
Unloading fan	Total PM	2	B	0.094-0.235 (0.21-0.52)	0.16 (0.36)	11
#1 dryer and cleaner	Total PM	3	A	0.12-0.19 (0.27-0.43)	0.15 (0.33)	11
#2 dryer and cleaner	Total PM	3	A	0.044-0.065 (0.097-0.143)	0.056 (0.123)	11
Master trash fan	Total PM	3	A	0.089-0.111 (0.197-0.244)	0.10 (0.22)	11
1st and 2nd stage lint cleaners with screen cages	Total PM	3	A	0.094-0.15 (0.21-0.33)	0.12 (0.26)	11
Mote system	Total PM	3	A	0.053-0.094 (0.12-0.21)	0.071 (0.16)	11
Battery condenser with screen cage	Total PM	3	A	0.042-0.13 (0.092-0.29)	0.092 (0.20)	11
Unloading fan	Total PM	3	A	0.091-0.154 (0.20-0.34)	0.12 (0.26)	11
#1 dryer and cleaner	Total PM	3	A	0.13-0.20 (0.29-0.44)	0.17 (0.38)	11
2nd stage seed cotton cleaning	Total PM	3	A	0.016-0.021 (0.035-0.046)	0.019 (0.042)	11
#2 dryer and cleaner	Total PM	3	A	0.059-0.76 (0.13-0.17)	0.068 (0.15)	11

where are data for mote trashfan?

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	0.39-0.68 (0.86-1.40)	0.57 (1.26)	11
Gin stand feeder trash	Total PM	3	A	0.021-0.027 (0.046-0.060)	0.025 (0.054)	11
1st and 2nd stage lint cleaners with screen cages	Total PM	3	A	0.34-0.42 (0.75-0.93)	0.37 (0.82)	11
Battery condenser with screen cage	Total PM	3	A	0.028-0.070 (0.062-0.15)	0.047 (0.10)	11
Unloading fan	Total PM	3	A	0.16-0.20 (0.35-0.43)	0.18 (0.40)	12
#1 and #2 drying and gin stand trash	Total PM	3	A	0.14-0.17 (0.31-0.37)	0.16 (0.35)	12
#1 and #2 seed cotton cleaners	Total PM	4	A	0.14-0.57 (0.30-1.26)	0.34 (0.74)	12
Mote system (combined)	Total PM	3	A	0.12-0.19 (0.26-0.42)	0.16 (0.35)	12
Mote cleaner	Total PM	3	A	0.066-0.094 (0.15-0.21)	0.075 (0.17)	12
1st and 2nd stage lint cleaners with screen cages	Total PM	3	A	0.12-0.19 (0.26-0.42)	0.16 (0.35)	12
Battery condenser with screen cages	Total PM	3	A	0.16-0.16 (0.35-0.36)	0.16 (0.36)	12
Unloading fan	Total PM	3	C	-	0.019 (0.042)	13
No. 1 dryer and cleaner	Total PM	3	C	-	0.032 (0.070)	13
No. 2 dryer and cleaner	Total PM	3	C	-	0.023 (0.051)	13
1st and 2nd stage lint cleaners with screens	Total PM	3	C	-	0.16 (0.35)	13
Mote system	Total PM	3	C	-	0.014 (0.031)	13
Battery condenser with screens	Total PM	3	C	-	0.032 (0.070)	13
Unloading fan	Total PM	3	C	-	0.27 (0.59)	14
No.1 dryer and cleaner	Total PM	3	C	-	0.10 (0.22)	14
No. 2 dryer and cleaner	Total PM	3	C	-	0.036 (0.079)	14
Master trash fan	Total PM	3	C	-	0.15 (0.34)	14

?

← All runs 66% iso.

← ?

Source	Pollutant	No. of test runs	Data Rating	Emission factor range, kg/bale (lb/bale)	Average emission factor,kg/bale (lb/bale)	Ref.* No.
Overflow fan	Total PM	3	C	-	0.015 (0.032)	14
1st and 2nd stagre lint cleaners with screens	Total PM	3	C	-	0.39 (0.86)	14
Battery condensers with screens	Total PM	3	C	-	0.035 (0.078)	14
1st and 2nd stage lint cleaners with cyclones	Total PM	3	A	0.014-0.064 (0.031-0.14)	0.039 (0.085)	15
1st and 2nd stage lint cleaners with cyclones	PM10	3	B	0.0064-0.028 (0.014-0.062)	0.019 (0.041)	15
Mote system	Total PM	3	A	0.045-0.059 (0.10-0.13)	0.050 (0.11)	15
Mote system	PM10	3	B	0.024-0.033 (0.052-0.072)	0.029 (0.063)	15
Battery condenser with cyclones	Total PM	3	A	0.0045-0.0068 (0.010-0.015)	0.0054 (0.012)	15
Battery condenser with cyclones	PM10	3	B	0.0012-0.0050 (0.0027-0.011)	0.0031 (0.0069)	15
Unloading cyclone	Total PM	3	A	~~0.11-0.16 (0.25-0.36)~~	~~0.15 (0.32)~~	16
Unloading cyclone	PM10	3	B	~~0.038-0.064 (0.084-0.14)~~	~~0.050 (0.11)~~	16
#2 dryer and cleaner	Total PM	3	A	0.034-0.068 (0.074-0.15)	0.045 (0.10)	16
#2 dryer and cleaner	PM10	3	B	0.010-0.029 (0.022-0.063)	0.017 (0.038)	16
Overflow fan	Total PM	3	A	0.045-0.082 (0.10-0.18)	0.059 (0.13)	16
Overflow fan	PM10	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 (0.069-0.13)	0.044 (0.097)	16
Mote system	PM10	3	B	0.011-0.050 (0.024-0.11)	0.025 (0.056)	16
Battery condenser with cyclones	Total PM	3	A	0.0054-0.014 (0.012-0.032)	0.0095 (0.021)	16
Battery condenser with cyclones	PM10	3	B	0.0016-0.0050 (0.0035-0.011)	0.0031 (0.0069)	16
Unloading fan	Total PM	3	A	0.10-0.21 (0.23-0.47)	0.15 (0.33)	17
Unloading fan	PM10	3	B	0.027-0.033 (0.059-0.073)	0.031 (0.068)	17

Small differences because of mistakes in test reports.

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	0.041-0.059 (0.090-0.13)	0.050 (0.11)	17
Master trash fan	PM10	3	B	0.0054-0.018 (0.012-0.040)	0.014 (0.030)	17
Gin stand feeder trash	Total PM	3	A	0.017-0.018 (0.037-0.040)	0.018 (0.040)	17
Gin stand feeder trash	PM10	3	B	0.0029-0.0045 (0.0063-0.010)	0.0040 (0.0088)	17
Cyclone robber system	Total PM	3	A	0.072-0.091 (0.16-0.20)	0.082 (0.18)	17
Cyclone robber system	PM10	3	B	0.015-0.036 (0.032-0.079)	0.023 (0.051)	17
1st and 2nd stage lint cleaners with cyclones	Total PM	3	A	0.028-0.15 (0.061-0.34)	0.095 (0.21)	17
1st and 2nd stage lint cleaners with cyclones	PM10	3	B	0.054-0.10 (0.12-0.22)	0.045 (0.10)	17
Mote system	Total PM	3	A	0.024-0.032 (0.052-0.070)	0.027 (0.060)	17
Mote system	PM10	3	B	0.0077-0.010 (0.017-0.023)	0.0091 (0.020)	17
#1 dryer and cleaner	Total PM	3	A	0.12-0.15 (0.27-0.33)	0.14 (0.30)	18
#1 dryer and cleaner	PM10	3	B	0.024-0.054 (0.053-0.12)	0.039 (0.087)	18
1st and 2nd stage lint cleaning with cyclones	Total PM	3	A	0.16-0.21 (0.35-0.46)	0.18 (0.39)	18
1st and 2nd stage lint cleaning with cyclones	PM10	3	B	0.045-0.054 (0.10-0.12)	0.050 (0.11)	18

***Reference 11 has source test data from two separate gin plants.**