Sec. 4, Ref. 15
From Cargill

AP-42 Section 9.9.1
Reference 9
Report Sect.
Reference

INTRODUCTION

In accordance with your P.O. No. 367326 Particulate emission tests were conducted on the starch flash dryer, main stack of the boiler, starch storage bin, and the starch loadout. Nitrogen Oxides emission test were conducted on the No. 3 boiler. The five sources tested are located at your 1710 16th Street, S.E., Cedar Rapids, Iowa facility.

Tests were performed on November 16-20, 1992 by Paul Mangelsdorf and Mike Wells. The tests were coordinated with Greg Hobby and Dennis Byrne of Cargill Company. Mr. David Phelps of the Iowa Department of Natural Resources and Mr. Shawn Peters of the Linn County Health Department were present during the testing.

The tests were conducted and results evaluated in adherence to Environmental Protection Agency (EPA) Methods 5 and 7 and Iowa Compliance Manual procedures.

DISCLAIMER

The results of this stack test reflect the conditions at the time the tests were conducted. Compliance to regulatory agencies' requirements are normally determined by those agencies.

CONTACT REPORT--MRI Project No. 4601-08-03

From: Tom Lapp, Environmental Engineering Department

Date of Contact: June 15, 1994

Contacted by: Telephone

Company/Agency: Cargill Company, 1710 16th St., S.E., Cedar Rapids, IA.

Telephone Number: (319) 399-2111

Person(s) Contacted/Title(s)

Mr. Greg Hobby (ext. 2160)

CONTACT SUMMARY:

Mr. Hobby was contacted for information on the particulate emissions tests conducted by Beling Consultants at the Cargill facility on November 16-20, 1992 (Report No. 33402). Specifically, the information concerned the method of starch bin loadout used during the test, i.e., bulk transfer or bags. Mr. Hobby stated that the starch bin loadout system tested was bulk transfer to either railcars or trucks. No tests were performed for the bagging operations. At this facility, he stated that approximately 80% of the starch was shipped using bulk transfer and about 20% was in the form of bagged starch. Mr. Hobby stated that these percentages were only for this facility and he did not know how they would compare to the overall starch industry. For economic reasons, bagged starch is shipped only to small usage customers or to customers using batch operations.

Iowa Compliance Full Work-up
Particulate Emissions
Starch Bin
Cargill Corn Plant
Cedar Rapids, Iowa
November 18, 1992

DW Process weight from pt-5 23,000 lb/hr = 11.5 T/hr

Test Number	Particulate Emissions	
	gr/dscf	lb/hr
1	0.002	0.032
2	0.003	0.039
3	0.002	0.030
Average	0.003	0.034
Stack Gas Average Velocity:		50.562 ft/sec
Stack Gas Average Flow Rate:		1,990 ACFM
Stack Gas Average Temperature:		65.5° F
Stack Gas Average Moisture:		1.3%

EF = 0.034 lb/hr / 11.5 T/hr = 0.003 lb/Ton

Iowa Compliance Front Half Only
Particulate Emissions
Starch Bin
Cargill Corn Plant
Cedar Rapids, Iowa
November 18, 1992

Test Number	Particulate Emissions	
	gr/dscf	lb/hr
1	0.001	0.014
2	0.001	0.017
3	0.001	0.017
Average	0.001	0.016
Stack Gas Average Velocity:		50.562 ft/sec
Stack Gas Average Flow Rate:		1,990 ACFM
Stack Gas Average Temperature:		65.5° F
Stack Gas Average Moisture:		1.3%

EF = 0.016 lb/hr / 11.5 T/hr = 0.0014 lb/Ton

Iowa Compliance Full Work-up
Particulate Emissions
Starch Bin Loadout
Cargill Corn Plant
Cedar Rapids, Iowa
November 19-20, 1992

DW/HR Process Weight from p A, 5 142,000 lb/hr = 71 T/hr

Test Number	Particulate Emissions	
	gr/dscf	lb/hr
1	0.003	0.094
2	0.002	0.061
3	0.002	0.076
Average	0.002	0.077
Stack Gas Average Velocity:		80.649 ft/sec
Stack Gas Average Flow Rate:		4,123 ACFM
Stack Gas Average Temperature:		53.1° F
Stack Gas Average Moisture:		0.8%

$EF = \frac{0.077 \text{ lb/hr}}{71 \text{ T/hr}} = 1.1 \times 10^{-3} \text{ lb/ton}$

Iowa Compliance Front Half Only
Particulate Emissions
Starch Bin Loadout
Cargill Corn Plant
Cedar Rapids, Iowa
November 19-20, 1992

Test Number	Particulate Emissions	
	gr/dscf	lb/hr
1	0.002	0.054
2	0.001	0.017
3	0.001	0.033
Average	0.001	0.035
Stack Gas Average Velocity:		80.649 ft/sec
Stack Gas Average Flow Rate:		4,123 ACFM
Stack Gas Average Temperature:		53.1° F
Stack Gas Average Moisture:		0.8%

$EF = \frac{0.035 \text{ lb/hr}}{71 \text{ T/hr}} = 4.9 \times 10^{-4} \text{ lb/ton}$

TEST METHODS

The Starch Flash Dryer, Main Boiler Stack, Starch Storage Bin and Starch Loadout were tested for particulate emissions. The emissions were conducted using EPA Method Five.

EPA METHOD 5 AND IOWA PARTICULATE METHOD

EPA Method 1, "Sample and Velocity Traverses for Stationary Sources", as revised August 14, 1986 is used to determine the quantity and location of velocity traverse points. The method accounts for flow disturbances, both upstream and downstream of the sampling points.

EPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (type S Pitot Tube)", is used to determine the flue gas velocity and flow rate. An S-type pitot tube is connected to an inclined manometer (0.00-1.00 inches of water incline range and 1.0 to 10.0 inches water vertical range) to measure velocity pressures inthe flue. Temperatures are measured with a type K thermocouple attached to a calibrated digital temperature indicator.

EPA Method 3, "Gas Analysis for CO_2, O_2, Excess Air, and Dry Molecular Weight" - Integrated gas samples are collected during each test period. An Orsat analyzer is used to determine the percent carbon dioxide and oxygen, which is subtracted from 100% to determine the percent nitrogen.

EPA Method 4, "Determination of Moisture Content in Stack Gases" is accomplished by weighing the impingers before and after tests. The weight gain is used to calculate the moisture content of the flue gas.

EPA Method 5 is the "Determination of Particulate Emissions from Stationary Sources". EPA reference methods one through four are used to determine the sampling points, flue gas velocity, gas composition and moisture content. Based on these preliminary measurements, a sampling nozzle of appropriate diameter is selected to maintain isokinetic sampling.

The stack gas is drawn through a calibrated stainless steel nozzle into a heated, glass-lined probe and through a heated filter assembly held at 250 ± 25°F. The gas then goes through an ice-cooled impinger train. The moisture in the flue gas is condensed by passing it through the ice-cooled impinger train, maintaining a temperature of 70°F or less as it leaves the last impinger. The first, third and fourth impingers are modified by replacing the high velocity tip with a one-half inch inside diarneter glass tube. The second impinger is of the standard Greenburg-Smith design. the gas then flows through a leakless vacuum pump, a dry gas meter and

a calibrated orifice. The dry gas meter and orifice are calibrated before and after the tests.

The sampling rate is adjusted during the sampling period to maintain isokinetic conditions. At isokinetic conditions, the velocity of the stack gas entering the nozzle should be equal to the stack gas velocity at the sampling point. These conditions are maintained by adjusting the pressure drop across the orifice meter relative to the stack gas velocity pressure. The proper orifice differential is determined by calculation.

Prior to each test run, the test trains are leak checked at ten inches of vacuum. At the conclusion of each test, the system is leak checked at the highest vacuum pulled during the sampling period. Allowable leakage rate under EPA reference methods is 0.02 cubic feet per minute.

After each test, the particulate samples are carefully recovered. The filter is removed from the holder with tweezers, placed in a petri-dish and sealed with tape. The nozzle, probe assembly and front half of the filter holder are rinsed with acetone. A probe brush is used to remove particles which adhere to the walls of the nozzle, probe and filter assemblies. The washing is collected in sample containers and transported to the laboratory for analysis.

The acetone washing of the front half of the particulate sampling train (nozzle, probe assembly and front half of the filter holder) is quantitatively transferred to a desiccated, tared 250 milliliter beaker. The volume of acetone is recorded and evaporated to dryness. The beaker with sample is desiccated and weighed to constance weight, to the nearest 0.1 milligram.

For purposes of definition, the term "constant weight" means a deviation of no more than ± 0.5 milligrams between consecutive weighings, conducted at intervals of no less than six hours apart.

A blank sample is obtained from each lot of acetone used during the test program. The blanks are processed and analyzed in the same manner as a particulate sample.

Filters from the particulate test runs are removed from their sample containers and placed in a desiccator for a 24 hour period prior to weighing to a constance weight.

The impinger contents (back half) are analyzed for organic and inorganic condensable matter as follows: the impinger contents are first extracted with three 25 milliliter portions of ethyl either and three 25 milliliter portions of chloroform. the two extractions are combined in a single tared beaker, evaporated to dryness, then

desiccated for 24 hours, and reweighed to the nearest 0.1 milligram constituting the organic portion. The remaining water is transferred to a tared beaker, evaporated and weighed to the nearest 0.1 milligram constituting the inorganic condensable material.

EPA Method 5 (Modified for Ducts Smaller then 12 Inches in Diameter)

For ducts smaller than 12 inches in diameter, the velocities are determined by a standard pitot tube. The velocity readings are taken two to eight diameters downstream of the sampling port. This is done to allow the gas stream flow to recover from the blockage caused by the sampling probe sheath. The plane of the nozzle is located at least two nozzle diameters upstream of the plane of the sampling probe sheath.

AIR POLLUTION CONTROL EQUIPMENT OPERATING DATA*

Plant Cargill Inc Location 1710 16th Street Cedar Rapids
Source Type Baghse Rated Production 160,000
Date 11/19/92 Time _____ Actual Production _____
Air Flow Data 3600 SCFM Run No. 1-3
Industrial Stoker #79

Mechanical Collector:
Tube Dia. _____in. No. of Tubes _____. Design p _____in. H_2O @ Gas Temp _____°F
Observed Δp _____in H_2O. Design cfm/tube @ Observed Δp _____ @ _____°F.
Fan Rated H.P. _____. Operating Volts _____. Operating Amps _____.

Electrostatic Precipitator:

Field No.	Primary Voltage (volts)	Primary Current (amps)	Secondary Voltage (KV)	Secondary Current (ma)	Spark Rate (per min.)

Scrubber:
Type _____. Δp (across scrubber) _____in. H_2O.
Fan Rated H.P. _____. Operating Volts _____. Operating Amps _____.
Liquid Circulation Rate _____gal/min. % Make-up _____. Blowdown _____gpm.
Scrubbing Water Change Interval _____
Settling Tank Cleaning Interval _____

Baghouse:
Pressure-Positive _____. Negative X. No. Compartments 1.
Type Cleaning Air Pulse. Clean Cycle 1/178 secs min.
Avg. Baghouse Δp .6 in H_2O. Δp Range .6 - .7 in. H_2O.
Fan: Rated H.P. 15 hp. Operating Volts 480. Operating Amps 16.8.
480 x 16.8 = 8.064 kw => 10.8 hp

Cyclone:
Type _____. Δp _____in. H_2O. Diameter _____.
Fan: Rated H.P. _____. Operating Volts _____. Operating Amps _____.

Person Responsible for Data: _____
Signature: _____
Title/Position: Project Manager

*Averages of operating data taken during actual test run unless requested otherwise.

PARTICULATE EMISSION TEST
Baghouse OPERATING DATA*
(Type of Source)

Owner Cargill Inc Run No. 1-3

Source I.D. Industrial Starch Loadout Emission PT #79 Date 11/19/82

Maximum Continuous Process Weight (Manufacturer's Rating) 160,000 lbs./hr.

Historical Average Process Weight 170,000 - 140,000 lbs./hr.

Historical Maximum Process Weight 170,000 lbs./hr.

Type and Sources of Fuels Normally Burned N/A

Approximate Quantities of Each of Above Fuels Burned Annually

Recycling Capability: Yes _____ No X

Process Data During Run (Averaged)

Process Weight (Dry) 126,400 lbs./hr.

Percent Moisture 11% %

Process Weight (Wet) 142,000 lbs./hr.

How Process Weight Determined By scale

Type of Fuel Burned During Run N/A

Recycling in Progress: Yes _____ No X

Person Responsible for Data: Greg Hobbs

Signature: Dennis Byrne

Title/Position: Project Manager

*Averages of operating data taken during actual test run unless requested otherwise.

AIR POLLUTION CONTROL EQUIPMENT OPERATING DATA*

Plant CARGILL INC Location CEDAR RAPIDS IA
Source Type BAG HOUSE Rated Production _____
Date 11/18/92 Time _____ Actual Production _____
~~Air Flow Data~~ #12 Starch Storage Bin Run No. 1-3

Mechanical Collector:
Tube Dia. ____in. No. of Tubes ____. Design p ____in. H_2O @ Gas Temp ____°F
Observed Δp _____in H_2O. Design cfm/tube @ Observed Δp _____ @ _____°F.
Fan Rated H.P. _____. Operating Volts _____. Operating Amps _____.

Electrostatic Precipitator:

Field No.	Primary Voltage (volts)	Primary Current (amps)	Secondary Voltage (KV)	Secondary Current (ma)	Spark Rate (per min.)

Scrubber:
Type _____. Δp (across scrubber) _____in. H_2O.
Fan Rated H.P. _____. Operating Volts _____. Operating Amps _____.
Liquid Circulation Rate _____gal/min. % Make-up _____. Blowdown _____gpm.
Scrubbing Water Change Interval _____
Settling Tank Cleaning Interval _____

Baghouse:
Pressure-Positive _____. Negative X. No. Compartments 1.
Type Cleaning Air Pulse. Clean Cycle 1/1.75 min.
Avg. Baghouse Δp 1" in H_2O. Δp Range 1" in. H_2O.
Fan: Rated H.P. 3hp. Operating Volts 480. Operating Amps 3.4.
480 x 3.4 = 1.63 kW = 2.2 hp

Cyclone:
Type _____. Δp _____in. H_2O. Diameter _____.
Fan: Rated H.P. _____. Operating Volts _____. Operating Amps _____.

Person Responsible for Data: Dennis Byrne
Signature: Dennis Byrne
Title/Position: Project Manager

*Averages of operating data taken during actual test run unless requested otherwise.

PARTICULATE EMISSION TEST
_____ OPERATING DATA*
(Type of Source)

Owner Cargill Inc Run No. Ave 1-3

Source I.D. #12 Starch Storage Bin Date 11/19/97.
EMISSION PT 92

Maximum Continuous Process Weight (Manufacturer's Rating) 25000 lbs./hr.

Historical Average Process Weight 20-25000 lbs./hr.

Historical Maximum Process Weight 25000 lbs./hr.

Type and Sources of Fuels Normally Burned Steam

Approximate Quantities of Each of Above Fuels Burned Annually NA

Recycling Capability: Yes ✓ No _____

Process Data During Run (Averaged)

1105 Dumps

Process Weight (Dry) 20470 lbs./hr.

Percent Moisture 11% %

Process Weight (Wet) 23000 lbs./hr.

How Process Weight Determined By Batcher fed to dryer.

Type of Fuel Burned During Run NA

Recycling in Progress: Yes X No _____

Person Responsible for Data: Gregg Hobby

Signature: Gregg Hobby

Title/Position: Project Manager.

*Averages of operating data taken during actual test run unless requested otherwise.