Background Report Reference

AP-42 Section Number: 9.9.7

Background Chapter: 4

Reference Number: 10

Title: Test Summary from Report No.33365. Starch Flash Dryer

Beling Consultants

Beling Consultants

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Sec.4, Ref.10

AP-42 Section 9.9.1
Reference
Report Sect. 4
Reference 10

NOT USED

INTRODUCTION

In accordance with our Proposal dated August 16, 1991, and your Purchase Order Number CS 561283, the Starch Flash Dryer was tested for particulate at your Otis Road, Cedar Rapids, Iowa facility.

Tests were performed on October 2, 1991 by Paul Mangelsdorf and Walt Zuurdeeg. The tests were coordinated with Mark Burianek of Cargill Company.

The tests were conducted and results evaluated in adherence to Environmental Protection Agency (EPA) Method 5 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.

No process data

SUMMARY OF RESULTS

The following Tables present a summary of the emission testing performed by Beling at the Cargill Corn Plant in Cedar Rapids, Iowa. See Appendices for data utilized and developed as part of the tests.

PARTICULATE EMISSIONS
Starch Flash Dryer
Cargill Corn Plant
Cedar Rapids, Iowa
October 2, 1991

Test Number	Particulate gr/dscf	Emissions lb/hr
1	0.008	3.939
2	0.008	3.380
3	0.007	3.245
Average	0.008	3.521

Stack Gas Average Velocity:	77.655 ft/sec
Stack Gas Average Flow Rate:	63,553 ACFM
Stack Gas Average Temperature:	121.9 ^{0}F
Stack Gas Average Moisture:	7.5%

The allowable emission for grain processing plants in Cedar Rapids, Iowa is not to exceed 0.1 gr/dscf of exhaust gas.

TEST METHODS

The method used for the Starch Flash Dryer was EPA Method 5.

EPA METHOD 5 AND 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 and 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 in the flue. Temperatures are measured with a type K thermocouple attached to a calibrated digital temperature indicator.

Integrated gas samples area 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, according to EPA Method 3.

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 $\pm 25^{0}$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^{0}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 diameter 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 a constant 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 constant 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 ether 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.