Background Report Reference

AP-42 Section Number: 9.9.1

Background Report Section: 4

Reference Number: 44

Title: Sampling of Grain Elevators in Kansas City to Determine Particulate Emissions to the Atmosphere

Midwest Research Institute

October 1966

Tom Bath

AP-42 Section Reference 9.9.1
Report Sect. Reference 4

MIDWEST RESEARCH INSTITUTE

425 VOLKER BOULEVARD, KANSAS CITY, MISSOURI 64110 - - AREA CODE 816 - LOGAN

October 20, 1966

Mr. W. Theis, Director
Kansas City Chapter
Terminal Elevator Grain Merchants Association
Suite 401
Kansas City Board of Trade
4800 Main
Kansas City, Missouri

Subject: Final Report on Project 5-233-C, "Sampling of Grain Elevators in Kansas City to Determine Particulate Emissions to the Atmosphere."

Dear Mr. Theis:

Attached are the results of the air sampling tests conducted at the Santa Fe Elevator of Continental Grain Co., Turner, Kansas. Four cyclones were checked for efficiency and output of particulate material under typical operating conditions. The results are summarized in Table I. Further details are presented in Table II.

In general, the dust removal systems for the elevator itself appeared to discharge less than 0.3 grains of dust per standard cubic foot of air at all times. The exception measured was the dust conveyor system, which transported the dust collected by other cyclones to a common collection bin. The discharge from this cyclone was obviously dustier than the other cyclones tested, and was measured at 0.7 grains/SCF. The cyclones operating on the grain cleaning systems had similarly dusty discharges, but no measurements were made on them.

In consultation with Mr. Robert Wilson, the decision has been made that the data collected at this time are sufficient for present purposes. Therefore, the project has been terminated; and the Kansas City Chapter of the Terminal Grain Elevator Merchants Association is being billed only for the charges to date of $2,250, as shown in the attached invoice.

Sincerely yours,

W. E. Clark
Senior Chemical Engineer

Table II

DETAILED TEST RESULTS

Test	System	Grain Handled Type	Grain Handled Lb/Hr	Particle Size, μ	Dust: Cyclone Air Inlet Lb/Hr	Dust: Cyclone Air Inlet %	Dust: Cyclone Air Outlet Lb/Hr	Dust: Cyclone Air Outlet %	Air Flow SCFH	Dust, Grains/SCF: Cyclone Air Inlet	Dust, Grains/SCF: Cyclone Air Outlet	Per Cent of Dust Removed
1	Overhead tripper system	No. 2 Malt barley	-	Total	34.4	-	-		5.72×10^5	0.42	-	-
2	Overhead tripper system	Nos. 4 and 5 yellow corn on 2 belts and wheat on 1 belt	2.4×10^6	+104	50.8	51.2	0.22	9.5	5.72×10^5			99.6
				-104 + 74	12.0	12.2	0.08	3.4				99.3
				-74 + 44	10.9	11.0	0.16	6.8				98.5
				-44	25.3	25.6	1.86	80.3				92.6
				Total	99	100.0	2.32	100.0		1.21	0.0284	97.6
3	Basement system including boots	No. 2 hard wheat, 12.6% moisture, 0.5% dockage, 1.5% shrunken and broken 10,000 bu/hr	0.6×10^6	+104	99	41.4	0.8	4.6	1.15×10^6			99.2
				-104 + 74	36	15.0	0.9	5.0				97.5
				-74 + 44	26	11.0	2.2	12.6				91.5
				-44	78	32.6	13.5	77.8				82.7
				Total	239	100.0	17.4	100.0		1.46	0.106	92.7
4	Basement system	Milo and wheat, average flow 40,000 bu/hr	2.3×10^6	+104	0.8	5.0	*		6.03×10^5			
				-104 + 74	0.7	4.4						
				-74 + 44	1.0	6.4						
				-44	13.2	84.2						
				Total	15.7	100.0	0.28			0.26	0.00324	98.2
5	Dust conveyor system	Soybeans, 7,500 bu/hr; wheat, 12,000 bu/hr; milo and yellow corn, 10,000 bu/hr; cleaning yellow corn, 3,000 bu/hr	1.9×10^6	+104	318	57.0	8.2	21.1	3.88×10^5			97.4
				-104 + 74	97	17.4	3.7	9.5				96.2
				-74 + 44	107	19.2	4.5	11.5				95.8
				-44	36	6.4	22.6	57.9				37.2
				Total	558	100.0	39.0	100.0		10.1	0.705	93.0

* Dust sample was too small for accurate size determinations by sieving.

Table I

SUMMARY

System	Grain Handled Lb/Hr	Dust in the Cyclone Air Outlet Lb/Hr	Dust in the Cyclone Air Outlet Grains/SCF	Per Cent of Dust Removed by the Cyclone
Overhead Tripper System	2.4×10^6	2.3	0.03	97.6
Basement System including Boots	0.6×10^6	17	0.1	92.7
Basement System	2.3×10^6	0.3	0.003	98.2
Dust Conveyor System	1.9×10^6	39	0.7	93.0