Background Report Reference

AP-42 Section Number: 11.5

Background Chapter: 4

Reference Number: 8

Title: Report of the Particulate Emissions Testing of the Rotary Kiln Cooler Stack, Harbison-Walker Refractories, Fulton, Missouri

Environmental Triple S Company

Environmental Triple S Company

September 1974

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HARBISON-WALKER REFRACTORIES
Division of Dresser Industries, Inc.,
2 Gateway Center, Pittsburgh, Pennsylvania 15222

C. D. GABOR
MANAGER - ENGINEERING

TELEPHONE 412-562-6395
TELETYPE 710-664-4347

FILE COPY

October 30, 1974

Mr. James H. Long
Supervisor Air Quality
Missouri Air Conservation Commission
P.O. Box 1062
Jefferson City, Missouri 65101

RECEIVED
NOV - 4 1974
MISSOURI AIR CONSERVATION COMMISSION

Subject: Rotary Kiln Stack Tests
Fulton, Missouri Plant

Dear Mr. Long:

We attach one copy of a report covering the recent stack tests made on the rotary kiln exhaust gases after the electrical precipitator had been in service for approximately two months. These tests were conducted by Environmental Triple S Company, St. Louis, Missouri on August 20, 1974. Tests were conducted during normal operation and during operations with water added to the gases. Test results and kiln operating conditions are summarized briefly as follows:

	Process Weight Rate	Particulate Emissions
Test 1 (Normal)	22 TPH	28.98 lb/hr.
Test 2 (With Water)	22 TPH	16.9 lb/hr.

In accordance with Regulation S-V of the Missouri Air Pollution Regulations allowable particulate emissions are 32.5 lb/hr. for a Process Weight Rate of 22 TPH. Our results indicate that the rotary kiln emissions are now in complete compliance with these regulations.

We wish to take this opportunity to thank you and members of the staff and Commission for the excellent cooperation and assistance provided during the lengthy period involved in bringing the rotary kiln into compliance. As you are aware completion of this project was extended several times due to various factors beyond our control. We sincerely appreciate the understanding attitude of the Commission which granted the necessary time extensions and permitted production operations to continue during the course of the project.

Yours very truly,

R. R. Crawford

R. R. Crawford
Assistant Manager
Engineering

RRC:hr

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Consulting environmental scientists specializing in monitoring, measuring and testing of pollution, as well as the research and development of pollution control processes.

Environmental Triple S Company

Consulting environmental scientists

12161 Lackland Road
St. Louis, Missouri 63141
(314) 878-1700

September 4, 1974
ETS 350

Harbison-Walker Refractories Company
Division of Dresser Industries
Fulton, Missouri 65251

Attention: Mr. Ed Holdt

Gentlemen:

Enclosed are three (3) copies of the Environmental Triple S Company (ETS) report entitled "Report of the Particulate Emissions Testing of the Rotary Kiln Stack at Harbison-Walker Refractories, Fulton, Missouri." This report covers testing performed at the Fulton Plant on August 20, 1974, as well as a discussion of the sampling train and methods used to determine the particulate emissions from the rotary kiln stack.

The particulate testing included two (2) runs. The results for both runs are presented as a loading and an emission rate. The units for these parameters are respectively, grains per standard cubic foot and pounds per hour.

If you have any questions or comments regarding this report, I shall be pleased to discuss them with you whenever you find it convenient.

Very truly yours,

Daniel L. Vornberg
Manager

DLV:ns
Enclosures

cc: Mr. E. S. Westmoreland
Mr. Andrew J. Polcyn
Ms. C. L. Yenny

REPORT

of the

PARTICULATE EMISSIONS TESTING

of the

ROTARY KILN STACK

at

HARBISON-WALKER REFRACTORIES
Fulton, Missouri

September 4, 1974

E N V I R O N M E N T A L T R I P L E S C O M P A N Y
12161 Lackland Road
St. Louis, Missouri 63141

CONTENTS

INTRODUCTION

On August 1, 1974, Harbison-Walker Refractories requested Environmental Triple S Company (ETS) to quantify the particulate emissions from the Rotary Kiln Stack located at the Fulton, Missouri, Plant.

The process tested involves the calcining of fire clay through a rotary kiln which operates continuously at a process weight rate of approximately twenty-two tons per hour. During the testing period, a process weight rate of 43,540 pounds per hour was observed.

The particulate emissions from this process were sampled in accordance with the current regulations and provisions established by the Missouri State Air Conservation Commission. The sampling, consisting of two separate runs, was performed on August 20, 1974.

SAMPLING PROCEDURES AND ANALYTICAL METHODS

All stack emissions, laboratory analyses, and calculations to determine particulate emissions were conducted in accordance with the American Society of Mechanical Engineers Power Test Code 27 (PTC-27), dated 1957, and entitled "Determining Dust Concentrations in a Gas Stream." When considered necessary by ETS personnel, additional work not covered by the above code was performed as part of normal ETS policy to insure that the required information was obtained. The sampling and analytical techniques utilized in this program are described in the sections of this report which follow.

Velocity and Temperature Determinations

Velocity determinations were conducted using a Stauscheibe (Type S) pitot tube connected to a differential manometer as shown in Figure 1. Velocity traverse point locations were determined by ASME PTC-27 specifications using stack dimensions measured in the field. Stack temperatures were obtained using a thermocouple and a Thermo-Electric Minimite II potentiometer.

Particulate Sampling

The particulate sampling train, as well as the sampling and analytical methods used, are approved and recommended by the Federal Environmental Protection Agency as specified in the Federal Register 40 CFR 60, 36 FR 24876, according to Method 5. The train used is illustrated by Figure 2.

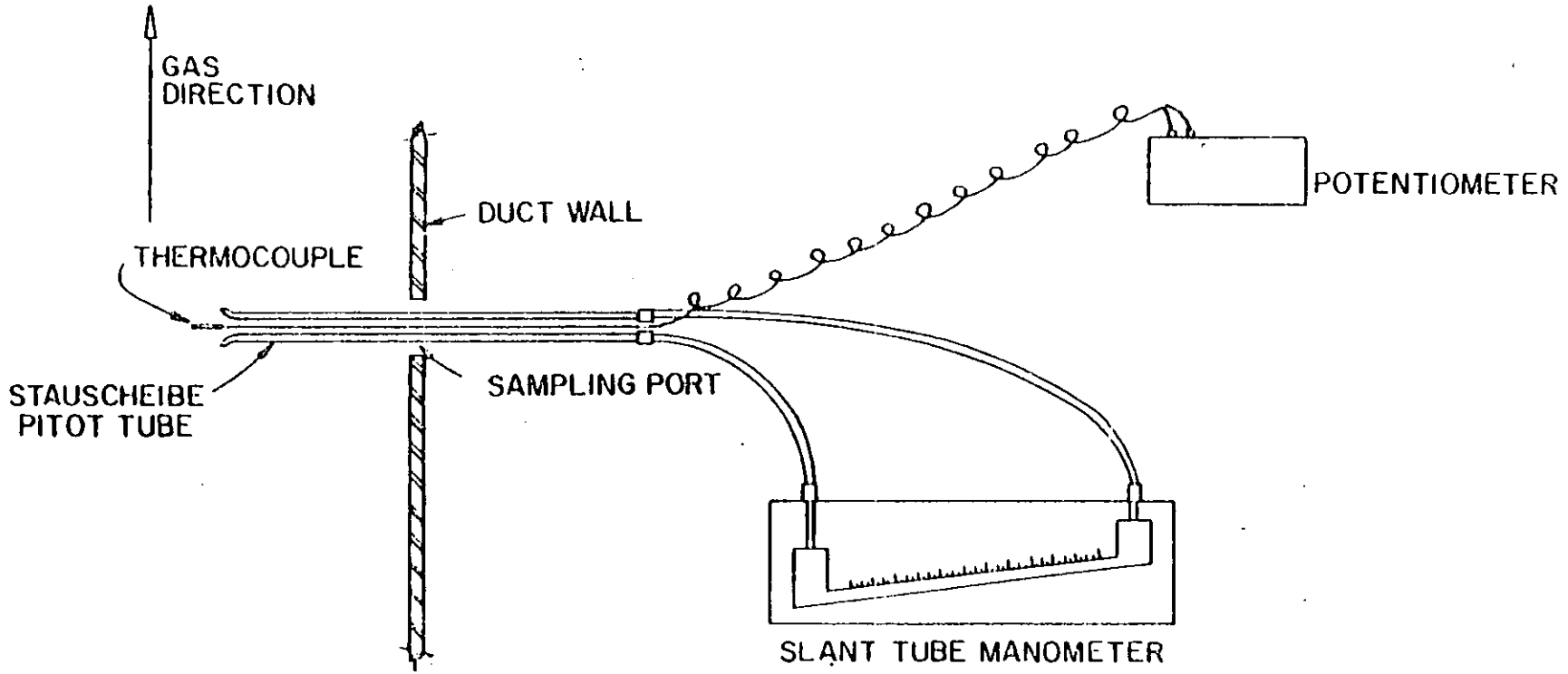

FIGURE 1

VELOCITY TRAVERSE
AND
TEMPERATURE EQUIPMENT

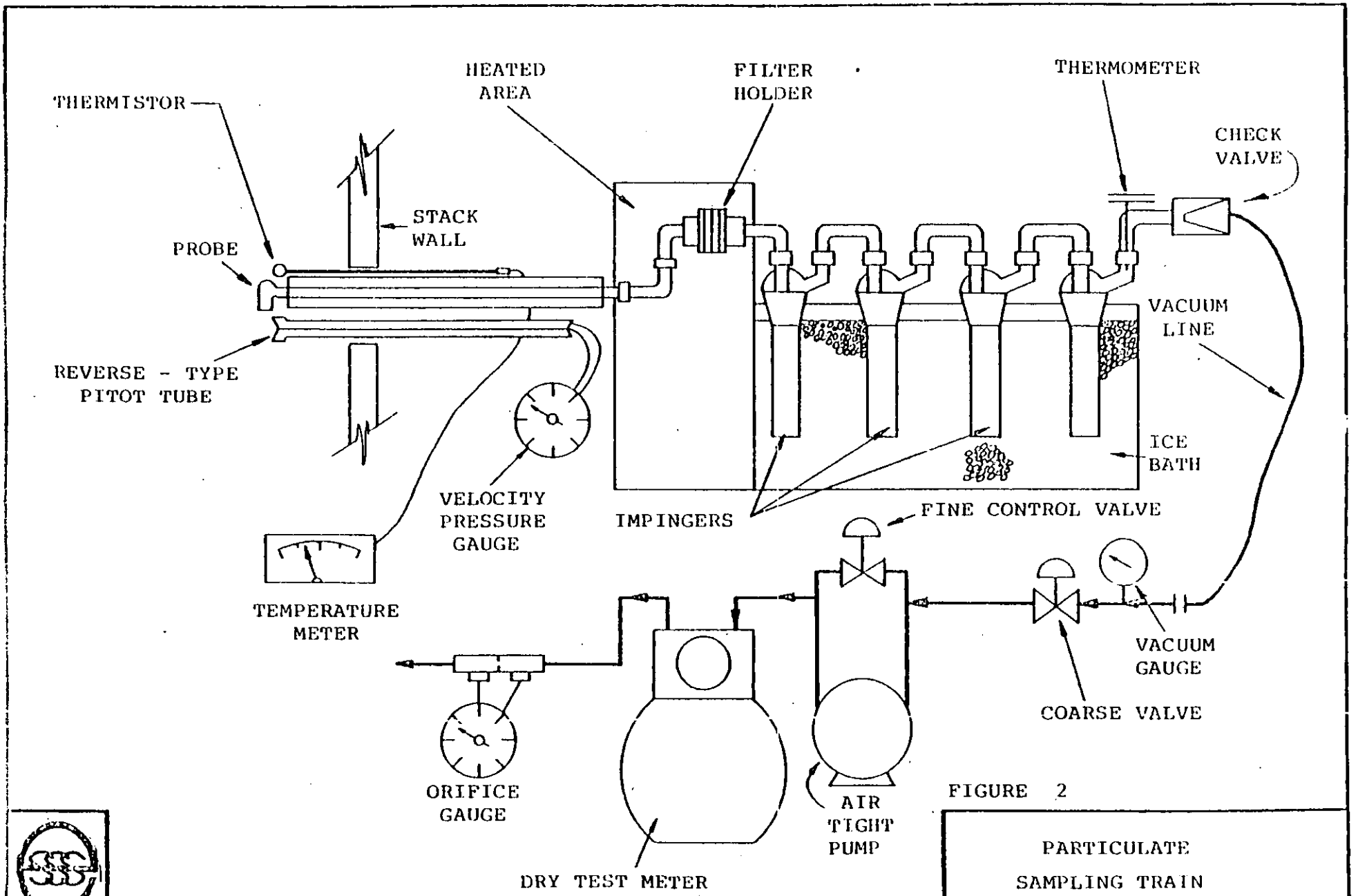

FIGURE 2

PARTICULATE SAMPLING TRAIN

OBSERVATIONS AND TEST RESULTS

The sampling consisted of two separate runs. During the second run, it was observed that approximately five gallons per minute of water was sprayed into the gas stream prior to the particulate control equipment. According to Harbison-Walker Refractories' personnel, this was done to determine the effect on the pollutant emission rate. It may be observed that the addition of the water altered the flue gas conditions by dropping the temperature by an average of approximately 46°F and increasing the per cent moisture by approximately 2.7 per cent. The particulate emissions varied by nearly twelve pounds per hour, or a decrease of 43 per cent between the two runs.

The results have been summarized in Table 1, including stack temperatures, CFM, adjusted standard CFM, per cent moisture, grain loadings and pounds per hour emission at standard conditions (70°F, 29.92 inches Hg). Data summary sheets from the particulate tests will be found in the Appendix.

TABLE 1

RESULTS OF PARTICULATE EMISSIONS TESTS

for the

ROTARY KILN STACK

at

HARBISON-WALKER REFRACTORIES

August 1, 1974

Parameters Measured	Units	Value Determined RUN NO. 1	RUN NO. 2
Temperature	°F	806°	759°
Flow Rate	ACFM	48,620	47,800
	SCFM (Dry)	13,360	13,160
Loading	Grains/SCF (Dry Basis)	0.253	0.1497
Emission Rate	Pounds/H	28.98	16.9
Moisture Content	% Moisture	21.67	24.4

APPENDIX

STACK SAMPLING TEST RESULTS (Particulate) PROJECT NUMBER

I. Client: Harbison-Walker Refractories ETS 350

II. Process: Rotary Kiln Stack

III. Test Run Number: Run No. 1

IV. Date & Time of Run: 8/20/74, 12:30 p.m.

V. Barometric Pressure: 29.08 in. Hg

VI. Particulate Sampling Data:

General Description of Test Section

1. Position of stack at Sampling Station Approx. 45° from Vertical
2. General direction of gas flow in stack Down
3. Cross sectional area of stack 19.63 sq.ft. 60 in. dia.
4. Number of points in pitot & sampling traverses 6 points/traverse, 2 traverses

VII. Dust Sampling Equipment Conditions

1.	Average meter temperature	117.5	°F.
2.	Average meter pressure	29.08	in. Hg
3.	Volume of gas sampled at meter cond.	49.2	C.F.
4.	Volume of condensate	265	cc.
5.	Weight of dust collected	0.7424	grams
6.	Diameter of sampling nozzle	0.25	in.
7.	Actual sampling time	120	min.

Outage Time:

VIII. Stack Gas Conditions

1.	Average temperature in stack	806	°F.
2.	Static pressure in stack	4.0	in. Hg Vac.
3.	Average velocity in stack	41.29	fps.
4.	Moisture content of stack gas	21.67	%
5.	Volume of stack gas at stack cond.	48,620	CFM
6.	Volume of stack gas at std. cond.(Dry Basis)	13,360	SCFM
7.	Dust concentration at std. cond.(Dry Basis)	0.253	gr/SCF

IX. Dust Emission Rate 28.98 lbs./hr.

STACK SAMPLING TEST RESULTS (Particulate) PROJECT NUMBER

I. Client: Harbison-Walker Refractories ETS 350

II. Process: Rotary Kiln Stack

III. Test Run Number: Run No. 2

IV. Date & Time of Run: 8/20/74, 6:30 p.m.

V. Barometric Pressure: 29.08 in. Hg

VI. Particulate Sampling Data:

General Description of Test Section

1.	Position of stack at Sampling Station	Approx. 45° from Vertical	
2.	General direction of gas flow in stack	Down	
3.	Cross sectional area of stack 19.63 sq.ft.	60	in. dia.
4.	Number of points in pitot & sampling traverses	6 points/traverse, 2 traverses	

VII. Dust Sampling Equipment Conditions

1.	Average meter temperature	115.3	°F.
2.	Average meter pressure	29.08	in. Hg
3.	Volume of gas sampled at meter cond.	50.7	C.F.
4.	Volume of condensate	310	c.c.
5.	Weight of dust collected	0.4415	grams
6.	Diameter of sampling nozzle	0.25	in.
7.	Actual sampling time	120	min.
	Outage Time:		

VIII. Stack Gas Conditions

1.	Average temperature in stack	759	°F.
2.	Static pressure in stack	4.0	in. Hg Vac.
3.	Average velocity in stack	40.6	fps.
4.	Moisture content of stack gas	24.4	%
5.	Volume of stack gas at stack cond.	47,800	CFM
6.	Volume of stack gas at std. cond.(Dry Basis)	13,160	SCFM
7.	Dust concentration at std. cond.(Dry Basis)	0.1497	gr/SCF

IX. Dust Emission Rate 16.9 lbs./hr.