State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
Bureau of Technical Services
CN 411
Trenton, N.J. 08625-0411
(609) 530-4041

June 12, 1990

**MEMORANDUM**

TO: Chief, Bureau of Enforcement Operations

THROUGH: Edward Choromanski

FROM: Michael Pratt

SUBJECT: U.S. Silica Company
APC ID No. 75013
NJ Stack No. 006
P/CT Log No. 01-89-3389

Emission tests were conducted at the above referenced facility on sand silos (and auxiliary belts and an elevator) controlled by a scrubber.

The purpose of these tests was to determine particulate emissions rates and then compare them to P/CT Log No. 01-89-3389 allowables.

NOTES:

1) Production rate during stack testing (as explained to this writer by Harry Hornikel, SRO observer witnessing subject stack tests) was at about half P/CT Log No. 01-89-3389 submitted information. Only one, out of two, dryers is normally in operation (as during subject stack test).

2) According to Air Nova, Inc. stack tests report, production rate during all three (3) stack test runs was equal to 300,000 lb/hr.

Therefore (as per item above) percent of "normal" production during stack tests was equal to

$$\frac{300,000}{\frac{640,000}{2}} \quad (100) = \text{about } 97\%$$

Debra Berman reviewed the submitted test report. Her review indicated that particulate emission rates were within P/CT Log No. 01-89-3389 allowables.

CONCLUSION:

Compliance

RECOMMENDATIONS:

1) SRO should resolve P/CT Log No. 01-89-3389 production rates.

2) Temporary certificate can be changed to permanent status pending approval by SRO.

c Milt Polakovic
Lou Mikolajczyk
Harry Hornikel
Debra Berman
Gary Andrew

State of New Jersey
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June 6, 1990

MEMORANDUM

TO: Michael Pratt

FROM: Debra Berman DB

SUBJECT: U.S. Silica Company
Newport, New Jersey
APC Plant ID No. 75013
NJ Stack No. 006
PCT No. 30934

On March 8, 1990, Air Nova Inc. conducted a stack emissions test on the sand storage silos wet scrubber system (NJ Stack No. 006) at the above referenced facility. Particulate emissions were tested to determine compliance with Permit 30934. The results as reported by Air Nova are as follows:

PARTICULATE EMISSIONS

| Run No. | Location | Concentration (grains/dscf) | Emission Rate (lbs/hr) |
|---|---|---|---|
| 1 | Outlet | 0.0018 | 0.23 |
| 2 | Outlet | 0.0021 | 0.26 |
| 3 | Outlet | 0.0007 | 0.09 |
| Allowable | Outlet | --- | 3.3 |

Operation and production parameters during the stack test as reported by John Deemer, Project Manager, Air Nova, Inc. are as follows.

| Run No. | Usage Rate (lbs/hr) | % Foundry Sand (by weight) |
|---|---|---|
| 1 | 300,000 Avg. | 100 |
| 2 | 300,000 Avg. | 100 |
| 3 | 300,000 Avg. | 100 |
| As on permit 30934 | 640,000 | 99.9 |

CONCLUSIONS:

Calculations by the Bureau of Technical Services, using the raw data supplied produced substantially the same results.

Particulate emissions were in compliance with Permit 30934 for all three runs.

Operating conditions were acceptable for all three runs.

Project No. 1309

# U. S. Silica Company
# Newport, New Jersey

# Emission Compliance Test Program

Prepared for:

Mr. David Mason
U. S. Silica Company
700 Railroad Avenue
Newport, New Jersey 08345

April 1990

Table of Contents

## 1.0 Introduction

AirNova, Inc. conducted an emission compliance test program at the U. S. Silica Company facility located in Newport, New Jersey for the purpose of demonstrating compliance with applicable New Jersey Department of Environmental Protection (NJDEP) regulations. The emission sampling was conducted on March 8, 1990 to evaluate the performance of a foundry sand storage silo system and its associated wet scrubber. The specific parameters determined as part of this test project include the following:

| Location | Emission Test Parameters |
|---|---|
| Scrubber Outlet | Particulates |

The emission test program was conducted by the following AirNova, Inc. personnel:

| | |
|---|---|
| John J. Deemer | Project Manager |
| Joseph May | Testing Technician |

This report contains a description of the program, as well as the results of the emission testing.

## 2.0 Process Description

The emission sampling was conducted at the outlet exhaust stack associated with a W. W. Sly impinjet gas scrubber operated at approximately 15,000 ACFM. The exhaust stack dimensions at the test location were 27 inches x 27 inches and are located a minimum of 8 equivalent diameters downstream and 2 equivalent diameters upstream from the nearest flow disturbance. Three test ports were utilized for all sampling.

## 3.0 Test Results

### 3.1 Air Flows, Temperatures, Moisture Levels

| Run | Location | ACFM | Temp. °F | Moisture Level % | DSCFM |
|---|---|---|---|---|---|
| 1 | Outlet | 14,637 | 57 | 0.8 | 15,179 |
| 2 | Outlet | 14,609 | 57 | 0.4 | 15,197 |
| 3 | Outlet | 14,773 | 58 | 0.5 | 15,315 |
| Average | | 14,673 | 57 | 0.6 | 15,230 |

### 3.2 Particulate Concentrations, Particulate Emission Rates

| Run | Location | Concentration (grains/dscf) | Emission Rate (lbs/hr) |
|---|---|---|---|
| 1 | Outlet | 0.0018 | 0.23 |
| 2 | Outlet | 0.0021 | 0.26 |
| 3 | Outlet | 0.0007 | 0.09 |
| Average | | 0.0015 | 0.19 |

Table 3-5
Cyclonic Flow Test Data

Outlet Test Location

| Port | Point | Rotational Index |
|---|---|---|
| A | 1 | 0° |
| | 2 | 0° |
| | 3 | 2° |
| | 4 | 0° |
| B | 1 | 0° |
| | 2 | 0° |
| | 3 | 0° |
| | 4 | 0° |
| C | 1 | 1° |
| | 2 | 2° |
| | 3 | 5° |
| | 4 | 2° |
| Average Rotation Angle (absolute value) | | 1° |
| Average Allowable Rotational Angle | | 20° |

3.4 Isokinetic Sampling Rates

| Run No. | Location | % Isokinetic |
|---|---|---|
| 1 | Outlet | 107.2 |
| 2 | Outlet | 107.4 |
| 3 | Outlet | 109.5 |

## 4.0 Description of Project

### 4.1 Methodologies

The following stationary source emission testing methodologies were utilized at the outlet sampling location for this project:

- EPA Reference Method 1 - Sample and Velocity Traverses for Stationary Sources
- EPA Reference Method 2 - Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
- EPA Reference Method 3 - Gas Analysis for Carbon Dioxide, Oxygen, Excess Air, Dry Molecular Weight
- New Jersey Air Test Method 1 - Sampling and Analytical Procedures for Determining Emissions of Particles from Manufacturing Processes and from Combustion of Fuels

### 4.2 Traverse Points (EPA Reference Method 2)

Outlet

The following traverse point locations were utilized at the outlet sampling location. Four (4) traverse points were employed across each of three (3) stack diameters on the 30 inch square stack.

1 - 3.375

2 - 10.125

3 - 16.875

4 - 23.625

### 4.3 Particulate Sampling (NJAT1)

New Jersey Air Test Method 1

A New Jersey Air Test Method 1 sampling trains was utilized to determine the particulate emission rate from the scrubber. The New Jersey Air Test Method 1 sampling train consisted of the following apparatus connected in

series to the sampling module:

- Stainless steel sampling nozzle
- Heated borosilicate glass probe
- A glass microfiber filter with bell assembly contained within a heated compartment with the gas steam temperature maintained at 225°F
- A modified Greenburg-Smith impinger containing 100 ml of water
- A Greenburg-Smith impinger - empty
- A modified Greenburg-Smith impinger containing 250 g of silica gel desiccant

Prior to the start of the sampling runs, leak checks were conducted to insure that all connections were leak free. The leak check was conducted in the following manner. The sample train was completely assembled. The sampling nozzle orifice was capped. A vacuum of at least fifteen (15) inches Mercury (Hg) was drawn on the sampling train to demonstrate that the sampling train had a leak rate which was less than 0.02 cubic feet per minute ($ft^3$/min.). Following the leak check the sample heating system (probe and hot box) was turned on and adjusted to a sufficient temperature to maintain a sample gas temperature of 225°F. In-line thermocouples were utilized before and after the filter bell assembly to monitor the sample gas temperature.

The following information was recorded at each traverse point:

- Stack temperature
- Dry gas meter temperatures (inlet and outlet)
- Stack gas differential pressure (velocity heads)
- Differential pressure across the orifice meter

4.4 Carbon Dioxide, Oxygen Content (EPA Method 3)

The carbon dioxide and oxygen content of the stack gases was determined by extraction of a single point sample, collection in a flexible tedlar bag, and analysis by an Orsat combustion gas analyzer.

Determination of percent $CO_2$, $O_2$, and CO was performed using a Fisher Type B No. 10-605 Orsat gas analyzer. The analyzer was leak-checked by the method described in EPA Method 3 before analysis begins. A gas sample was drawn from the tedlar bag through glass manifold into the sampling chamber using a leveling bottle. The analysis is performed by drawing the sample through a series of three absorbers. The first absorber absorbs $CO_2$ in a potassium hydroxide solution, the second absorber absorbs $O_2$ in a potassium pyrogallate solution, and the final absorber absorbs CO in a cupric chloride solution.

The volume of a specific gaseous component collected in an individual absorbing solution was determined by the change in volume of sample gas in the sample chamber after the bubbling through that solution is complete. Any change in volume represents the percentage of the specific gaseous component found in the gas stream.

# Appendix A

## Laboratory Analytical Data

U.S. Silica
Particulate Sample Analysis

Glass Microfibre Filters

| Run | Tare Wt (g) | Final Wt (g) | Gain Wt (g) |
|---|---|---|---|
| 1 | 0.3304 | 0.3319 | 0.0015 |
| 2 | 0.3296 | 0.3299 | 0.0003 |
| 3 | 0.3406 | 0.3414 | 0.0008 |

Acetone Front -half Washes

| Run | Tare Wt (g) | Final Wt (g) | Gain Wt (g) | Vol (ml) |
|---|---|---|---|---|
| 1 | 95.2806 | 95.2836 | 0.003 | 242 |
| 2 | 95.9983 | 96.003 | 0.0047 | 216 |
| 3 | 102.5941 | 102.5954 | 0.0013 | 224 |
| blank | 98.7123 | 98.7125 | 0.0002 | 200 |

# Appendix B

## Field Data Sheets

# AirNova, Inc.

PLANT U.S Silica
DATE 03/08/90
SAMPLING LOCATION Outlet
SAMPLE TYPE NJAT1
RUN NUMBER 1 OPERATOR J. Deemer
BAROMETRIC PRESSURE 30.5 STATIC PRESSURE
FILTER NUMBER(S)
GEL NUMBER(S)
THIMBLE NUMBER PLATE NUMBER
$H_2O$ PICKUP (ml) -6

$CO_2$
$O_2$
CO

PYROMETER NUMBER
THERMOCOUPLE NUMBER
PROBE NUMBER TYPE
NOZZLE NUMBER I.D. 3/16"
METER BOX NUMBER $\Delta H_@$
PITOT NUMBER $C_p$
SAMPLE BOX NUMBER(S) 4
ASSUMED MOISTURE (%) 4%
ASSUMED METER TEMPERATURE 80
C FACTOR REFERENCE $\Delta p$

READ AND RECORD ALL DATA EVERY 5 MINUTES

| TRAVERSE POINT NUMBER | SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK) | GAS METER READING ($V_m$), $ft^3$ | VELOCITY HEAD ($\Delta p_s$), in. $H_2O$ | ORIFICE PRESSURE DIFFERENTIAL ($\Delta H$), in. $H_2O$ | | STACK TEMPERATURE ($T_s$), °F | DRY GAS METER TEMPERATURE | | PUMP VACUUM, in. Hg | SAMPLE BOX TEMPERATURE, °F (Sample) | IMPINGER TEMPERATURE, °F | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | DESIRED | ACTUAL | | INLET ($T_{m\,in}$), °F | OUTLET ($T_{m\,out}$), °F | | | | |
| 1 | 00 11:28 | 956.895 | .92 | 1.55 | 1.55 | 57 | 66 | 64 62 | 5.5 | 160 | 53 | 181 |
| 2 | 05 | 960.7 | .93 | 1.55 | 1.55 | 57 | 72 | 68 65 | 5.5 | 229 | 53 | 242 |
| 3 | 10 | 963.8 | .82 | 1.35 | 1.35 | 58 | 74 | 70 66 | 5.0 | 236 | 54 | 255 |
| 4 | 15 | 967 | .62 | 1.05 | 1.05 | 57 | 77 | 73 68 | 4.0 | 229 | 54 | 248 |
| | 20 | 969.58 | | | | | | | | | | |
| 5 | 20 | 969.58 | .90 | 1.5 | 1.5 | 57 | 75 | 72 69 | 5.5 | 228 | 55 | 240 |
| 6 | 25 | 973.0 | .81 | 1.35 | 1.35 | 57 | 77 | 73 70 | 5.0 | 226 | 55 | 245 |
| 7 | 30 | 976.1 | .78 | 1.3 | 1.3 | 56 | 78 | 74 71 | 5.0 | 221 | 56 | 248 |
| 8 | 35 | 979.03 | .74 | 1.25 | 1.25 | 55 | 77 | 74 72 | 5.0 | 227 | 57 | |
| | 40 | 982.0 | | | | | | | | | | |
| 9 | 40 | 982.0 | .79 | 1.30 | 1.30 | 56 | 77 | 74 72 | 5.0 | 231 | 57 | 254 |
| 10 | 45 | 984.9 | .68 | 1.25 | 1.25 | 56 | 79 | 76 73 | 4.5 | 230 | 59 | 298 |
| 11 | 50 | 988.1 | .64 | 1.05 | 1.05 | 56 | 78 | 76 73 | 4.0 | 195 | 58 | 242 |
| 12 | 55 | 993.8 | .56 | .99 | .99 | 56 | 78 | 76 74 | 3.5 | 242 | 58 | 264 |
| | 60 12:32 | 993.615 | | | | | | | | | | |
| | | | | LK | .01 | /a.m | | | | | | |

# AirNova, Inc.

PLANT U.S Silica
DATE 03/08/90
SAMPLING LOCATION Outlet
SAMPLE TYPE NIATI
RUN NUMBER 2 OPERATOR J Dennis
BAROMETRIC PRESSURE 30.52 STATIC PRESSURE
FILTER NUMBER(S)
GEL NUMBER(S)
THIMBLE NUMBER PLATE NUMBER
$H_2O$ PICKUP (ml)

$CO_2$
$O_2$
CO

PYROMETER NUMBER
THERMOCOUPLE NUMBER
PROBE NUMBER TYPE
NOZZLE NUMBER I.D.
METER BOX NUMBER $\Delta H_@$
PITOT NUMBER $C_p$
SAMPLE BOX NUMBER(S)
ASSUMED MOISTURE (%)
ASSUMED METER TEMPERATURE
C FACTOR REFERENCE $\Delta p$

READ AND RECORD ALL DATA EVERY ____ MINUTES

| TRAVERSE POINT NUMBER | SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK) | GAS METER READING ($V_m$), $ft^3$ | VELOCITY HEAD ($\Delta p_s$), in. $H_2O$ | ORIFICE PRESSURE DIFFERENTIAL ($\Delta H$), in. $H_2O$ | | STACK TEMPERATURE ($T_s$), °F | DRY GAS METER TEMPERATURE | | PUMP VACUUM, in. Hg | SAMPLE BOX TEMPERATURE, °F Sample | IMPINGER TEMPERATURE, °F | Prb |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | DESIRED | ACTUAL | | INLET ($T_{m\,in}$), °F | OUTLET ($T_{m\,out}$), °F | | | | |
| 1 | 00 13:25 | 993.872 | .92 | 1.55 | 1.55 | 58 | 67 | 68.570 | 6.0 | 160 | 51 | 163 |
| 2 | 05 | 997.5 | .90 | 1.50 | 1.50 | 57 | 71 | 70.570 | 6.0 | 198 | 49 | 210 |
| 3 | 10 | 0010 | .85 | 1.45 | 1.45 | 58 | 73 | 71.570 | 6.0 | 216 | 50 | 227 |
| 4 | 15 | 003.8 | .64 | 1.1 | 1.1 | 57 | 76 | 73 70 | 5.0 | 226 | 51 | 250 |
| | 20 | 006.615 | | | | | | | | | | |
| 5 | 20 | 006 615 | .87 | 1.45 | 1.45 | 58 | 79 | 72 70 | 6.0 | 234 | 52 | 253 |
| 6 | 25 | 009.7 | .88 | 1.45 | 1.45 | 57 | 75 | 73.570 | 6.0 | 232 | 52 | 25 |
| 7 | 30 | 13.2 | .80 | 1.35 | 1.35 | 57 | 76 | 73.571 | 6.0 | 237 | 54 | 257 |
| 8 | 35 | 16.3 | .72 | 1.2 | 1.2 | 56 | 77 | 74 71 | 5.5 | 234 | 55 | 252 |
| | 40 | 19 305 | | | | | | | | | | |
| 9 | 40 | 19.305 | .72 | 1.2 | 1.2 | 57 | 76 | 73.571 | 5.0 | 236 | 55 | 254 |
| 10 | 45 | 22.4 | .66 | 1.1 | 1.1 | 57 | 76 | 73.571 | 5.0 | 223 | 55 | 250 |
| 11 | 50 | 25.1 | .64 | 1.05 | 1.05 | 56 | 79 | 72.571 | 5.0 | 227 | 54 | 243 |
| 12 | 55 | 28.0 | .56 | .94 | .94 | 56 | 73 | 72.570 | 4.0 | 225 | 54 | 241 |
| | 60 14:28 | 30.665 | | | | | | | | | | |

# AirNova, Inc.

PLANT U.S. Silica

DATE 03/09/93

SAMPLING LOCATION Outlet

SAMPLE TYPE NJATI

RUN NUMBER 3 OPERATOR

BAROMETRIC PRESSURE 30.52 STATIC PRESSURE -.23

FILTER NUMBER(S)

GEL NUMBER(S)

THIMBLE NUMBER PLATE NUMBER

$H_2O$ PICKUP (ml)

$CO_2$

$O_2$

CO

PYROMETER NUMBER

THERMOCOUPLE NUMBER

PROBE NUMBER TYPE

NOZZLE NUMBER I.D.

METER BOX NUMBER $\Delta H_@$

PITOT NUMBER $C_p$

SAMPLE BOX NUMBER(S)

ASSUMED MOISTURE (%)

ASSUMED METER TEMPERATURE

C FACTOR REFERENCE $\Delta p$

READ AND RECORD ALL DATA EVERY ____ MINUTES

| TRAVERSE POINT NUMBER | SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK) | GAS METER READING ($V_m$), $ft^3$ | VELOCITY HEAD ($\Delta p_s$), in. $H_2O$ | ORIFICE PRESSURE DIFFERENTIAL ($\Delta H$), in. $H_2O$ | | STACK TEMPERATURE ($T_s$), °F | DRY GAS METER TEMPERATURE | | PUMP VACUUM, in. Hg | SAMPLE BOX TEMPERATURE, °F | IMPINGER TEMPERATURE, °F | $P_{vb}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | DESIRED | ACTUAL | | INLET ($T_{m\,in}$), °F | OUTLET ($T_{m\,out}$), °F | | Sample. | | |
| 1 | 00 15:10 | 30.856 | .99 | 1.55 | 1.55 | 58 | 55 | 56 57 | 6.5 | 112 | 45 | 174 |
| 2 | 05 | 34.3 | .89 | 1.5 | 1.5 | 59 | 56 | 56 57 | 6.5 | 172 | 43 | 215 |
| 3 | 10 | 38.2 | .78 | 1.3 | 1.3 | 59 | 60 | 59 58 | 6.0 | 217 | 45 | 240 |
| 4 | 15 | 40.9 | .65 | 1.1 | 1.1 | 58 | 62 | 59 57 | 5.5 | 230 | 47 | 242 |
| | 20 | 43.4 | | | | | | | | | | |
| 5 | 20 | 43.4 | .89 | 1.5 | 1.5 | 58 | 62 | 60 58 | 6.5 | 226 | 47 | 250 |
| 6 | 25 | 47.0 | .82 | 1.35 | 1.35 | 56 | 62 | 59 57 | 6.0 | 230 | 48 | 250 |
| 7 | 30 | 49.9 | .77 | 1.3 | 1.3 | 59 | 63 | 60 59 | 6.0 | 223 | 49 | 251 |
| 8 | 35 | 53.6 | .75 | 1.25 | 1.25 | 59 | 63 | 60 57 | 6.0 | 223 | 48 | 252 |
| | 40 | 55.925 | | | | | | | | | | |
| 9 | 40 | 55.926 | .78 | 1.3 | 1.3 | 58 | 61 | 59 57 | 6.0 | 219 | 46 | 250 |
| 10 | 45 | 59.1 | .74 | 1.25 | 1.25 | 59 | 62 | 59 56 | 6.0 | 226 | 47 | 250 |
| 11 | 50 | 62.8 | .68 | 1.15 | 1.15 | 59 | 63 | 59 58 | 5.5 | 230 | 49 | 242 |
| 12 | 55 | 65.3 | .65 | 1.1 | 1.1 | 58 | 63 | 60 57 | 5.0 | 227 | 49 | 241 |
| | 60 | 67.712 | | | | | | | | | | |
| | (16.13) | JJD | | | | | | | | | | |

# Appendix C

## Calibration Data Sheets

PUBLIC SERVICE ELECTRIC AND GAS COMPANY
GAS METER SHOP

PROOF TEST RECORD

METER SIZE: CL175

DATE RECEIVED: 10/04/89

INSPECTOR: C. RIZZA

ATE TESTED: 10/05/89

MANUFACTURER: ROCKWEL

PROVER NO. 1264

TEMPERATURE:

OIL : 73° F.

METER NUMBER: 6837018

PROVER AIR: 73° F.

175 C.F.H.

| | | | |
|---|---|---|---|
| TEST # 1 | 2.0 CU. FT. | PERCENT PROOF | 100.0 |
| TEST # 2 | 2.0 CU. FT. | | 100.0 |
| TEST # 3 | 2.0 CU. FT. | | 100.0 |

35 C.F.H

| | | | |
|---|---|---|---|
| TEST # 1 | 2.0 CU. FT. | PERCENT PROOF | 100.I |
| TEST # 2 | 2.0 CU. FT. | | 100.0 |
| TEST # 3 | 2.0 CU. FT. | | 100.0 |

A calibration and accuracy test was performed on test meter number 6837018 for:

AirNova Inc
931 Haddon Avenue
Collingswood,N.J.
08108

METER REPAIR SUPERVISOR

CARMEN RIZZA

Carmen Rizzi

CALIBRATION CALCULATIONS METER BOX  Calibrated by JAY  Date 4-10-90  Box No. 5

| $0.0317$ (Man. orifice) $\left(\frac{(T_w + 460)t}{P_b\ (T_d \text{ avg.} + 460)}\right)^2 \left(\frac{}{CF_w}\right)$ | Man. | $\Delta H_@$ | $\frac{CF_w\ P_b\ (T_d \text{ avg.} + 460)}{CF_d\ (P_b + \frac{\text{Man. orifice}}{13.6})\ (T_w + 460)}$ | Man. | Y |
|---|---|---|---|---|---|
| 0.01585 $\left(\frac{(66 + 460)\ 5}{30.11\ (70 + 460)}\right)^2 \left(\frac{}{1.985}\right)$ | .5 | 1.74 | $\frac{1.985 \times 30.11\ (70 + 460)}{2.020\ (30.11 + 0.0368)\ (66 + 460)}$ | .5 | .99 |
| 0.0317 $\left(\frac{(67 + 460)\ 5}{30.11\ (71 + 460)}\right)^2 \left(\frac{}{2.758}\right)$ | 1.0 | 1.80 | $\frac{2.758 \times 30.11\ (71 + 460)}{2.809\ (30.11 + 0.0735)\ (67 + 460)}$ | 1.0 | .99 |
| 0.0634 $\left(\frac{(69 + 460)\ 10}{30.11\ (76 + 460)}\right)^2 \left(\frac{}{7.824}\right)$ | 2.0 | 1.80 | $\frac{7.824 \times 30.11\ (76 + 460)}{7.899\ (30.11 + 0.147)\ (69 + 460)}$ | 2.0 | 1.0 |
| 0.0951 $\left(\frac{(70 + 460)\ 10}{30.11\ (79.5 + 460)}\right)^2 \left(\frac{}{9.616}\right)$ | 3.0 | 1.78 | $\frac{9.616 \times 30.11\ (79.5 + 460)}{9.801\ (30.11 + 0.221)\ (70 + 460)}$ | 3.0 | .99 |
| 0.1268 $\left(\frac{(70 + 460)\ 10}{30.11\ (84.5 + 460)}\right)^2 \left(\frac{}{11.155}\right)$ | 4.0 | 1.76 | $\frac{11.155 \times 30.11\ (84.5 + 460)}{11.249\ (30.11 + 0.294)\ (70 + 460)}$ | 4.0 | 1.00 |
| 0.1585 $\left(\frac{(70 + 460)\ 10}{30.11\ (85 + 460)}\right)^2 \left(\frac{}{12.428}\right)$ | 5.0 | 1.76 | $\frac{12.428 \times 30.11\ (85 + 460)}{12.537\ (30.11 + 0.368)\ (70 + 460)}$ | 5.0 | 1.007 |

# Appendix D

## Calculations Printouts

Air Nova Inc.

NJAT Methods 1 And 3 Calculations
**** ******* * *** * ***********

| | |
|---|---|
| Plant | U.S. Silica |
| Operation | Sand Silo System |
| Run | 1 |
| Location | Newport , New Jersey |
| Date | 03/08/90 |

Outlet Test Data

| | | | |
|---|---|---|---|
| Vw = | 6.4 | cc | Vol. of H2O collected (impingers) |
| Vm = | 36.72 | cf | Dry gas meter reading |
| Pb = | 30.5 | in. Hg | Barometric pressure |
| Ps = | 30.48 | in. Hg | Stack pressure |
| dP = | 0.766 | in. H2O | Average differential pressures |
| dH = | 1.287 | in. H2O | Average draft gauge reading |
| Tm = | 532.63 | R | Average meter temperature |
| Ts = | 516.50 | R | Average stack temperature |
| Y = | 0.99 | | Meter calibration factor |
| t = | 60 | min. | Duration of sampling time |
| A = | 5.0625 | sq.ft. | Cross sectional area of stack |
| An = | 0.00019 | sq.ft. | Area of nozzle orifice |
| Cp = | 0.84 | | Pitot tube correction factor |

1) Volume of gas sampled at stack conditions, Vt.

Vt= Vm *(Ts/Tm)*(1/(1-Q))*((Pb+dH/13.6)/Ps)*Y

Vt = 35.67 dscf

2) Volume of gas sampled at standard conditions, Vmstd

Vmstd = Y * Vm * (Pm/Pstd) * (Tstd/Tm)

Vmstd = 36.74 cf

3) Volume of water vapor collected at meter conditions , Vv.

Vv = .00267 *(Vw *(Tm +460))/(Pb +dH/13.6)

Vv = 0.30 cf

4) Decimal fraction of moisture by volume in stack gas, Q.

Q = Vv/(Vv + Vm)

Q = 0.008

5) Molecular weight of the stack gas, Ms.

Ms = (1-Q)*((44*%CO2)+(28*%CO)+(32*%O2)+(28*%N2))+(18*Q)

Ms = 28.73

Orsat analysis

| | |
|---|---|
| % CO2 | 0 |
| % CO | 0 |
| % O2 | 20.3 |
| % N2 | 79.7 |

6) Specific gravity of stack gas, Gd.

Gd = Ms/28.95

Gd = 0.99

7) Stack gas velocity, Us in fps.

Us = 2.9*Cp*(dp*Ts*(1/Gd)*(29.92/Ps))^.5

Us = 48.19 fps

8) Actual Stack gas volumetric flow rate , Vo.

Vo = A * Us * 60 sec/min

Vo = 14636.6 cfm

9) Standardized volumetric flow rate , Vdscfm.

Vdscfm = Vo * (1-Bws) * (Tstd/Pstd) * (Ps/Ts)

Vdscfm = 15178.9 dscfm

10) Particulate sample analytical data

Gravimetric Analysis

| | |
|---|---|
| Filter sample net wt. | 0.0015 g |
| Filter blank net weight | 0 g |
| Front 1/2 acetone wash | 242 ml |
| Total wash particulate wt | 0.003 g |
| Acetone blank volume | 200 ml |
| Acetone blank residue wt | 0.0002 g |

---

Calculations

| | |
|---|---|
| Acetone wash residue wt | 0.000242 g |
| Adj Acetone wash part.wt. | 0.002758 g |
| Tot. (gravimetric) sample wt -- Wt | 0.004258 g |

11) Front Half Particulate Concentration in grains/cf

G = (Front Half Wt) * (1/Vt) * 15.43

G = 0.0018 grains/cf

12) Particulate emission rate , E.

E = G * Vo * A *(60 min/7000grains)

E = 0.231 lbs/hr

13) Sample nozzle gas velocity , Un ,in fps.

Un = Vt/(An*t*60)

Un = 51.67 fps

14) Isokinecity

% I = 100 * (Un/Us)

% I = 107.23

Air Nova Inc.

NJAT Methods 1 And 3 Calculations
**** ******* * *** * ***********

| | |
|---|---|
| Plant | U.S. Silica |
| Operation | Sand Silo System |
| Run | 2 |
| Location | Newport , New Jersey |
| Date | 03/08/90 |

Outlet Test Data

| | | | |
|---|---|---|---|
| Vw = | 3.2 | cc | Vol. of H2O collected (impingers) |
| Vm = | 36.793 | cf | Dry gas meter reading |
| Pb = | 30.5 | in. Hg | Barometric pressure |
| Ps = | 30.48 | in. Hg | Stack pressure |
| dP = | 0.763 | in. H2O | Average differential pressures |
| dH = | 1.278 | in. H2O | Average draft gauge reading |
| Tm = | 532.21 | R | Average meter temperature |
| Ts = | 517.00 | R | Average stack temperature |
| Y = | 0.99 | | Meter calibration factor |
| t = | 60 | min. | Duration of sampling time |
| A = | 5.0625 | sq.ft. | Cross sectional area of stack |
| An = | 0.00019 | sq.ft. | Area of nozzle orifice |
| Cp = | 0.84 | | Pitot tube correction factor |

1) Volume of gas sampled at stack conditions, Vt.

Vt= Vm *(Ts/Tm)*(1/(1-Q))*((Pb+dH/13.6)/Ps)*Y

Vt = 35.66 dscf

2) Volume of gas sampled at standard conditions, Vmstd

Vmstd = Y * Vm * (Pm/Pstd) * (Tstd/Tm)

Vmstd = 36.84 cf

3) Volume of water vapor collected at meter conditions , Vv.

Vv = .00267 *(Vw *(Tm +460))/(Pb +dH/13.6)

Vv = 0.15 cf

EMISSION TEST PRODUCTION
REPORT FORM

I. Company Name U.S Silica Company APC Plant ID# _____
Plant Location Newport, NJ
Certificate Number 99132
Designation of Equipment Foundry Sand Storage Silo

II. Emission Test Date(s) March 8, 1990
Tests Conducted By:
Name of Firm Air Nova, Inc.
Business Address 5845-A Clayton Ave Pennsauken, NJ 08109
Phone Number (609) 486-1500
Test Team Representatives John J. Deemer
Joseph May

Length of Test 11:28 - 16:13 4 hours 45 min

| | Run #1 | Run #2 | Run #3 |
|---|---|---|---|
| Test Time (Start/Finish) | 11:28/12:32 | 13:25/14:28 | 15:10/16:13 |

III. Certificate Operating Conditions

A. List Conditions

| List Conditions | Achieved (Yes or No) |
|---|---|
| Particulate Emission Rate < 3.0 lbs/hr | Yes |
| | |
| | |
| | |
| | |
| | |

B. Log of Certificate Conditions During Stack Test
(Record at least every 15 minutes)

| Condition | Run # | Readout | Time of Recording |
|---|---|---|---|
| Not Applicable | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

IV. Equipment Operation/Process Parameters

Number of Sources Connected _____

Number of Sources Operating _____

Production Rate: Normal _____

Maximum _____

A. Raw Materials:

| | Test Run #1 | Test Run #2 | Test Run #3 |
|---|---|---|---|
| Usage Rate (lbs/hr) | 300,000 avg | 300,000 avg | 300,000 avg |
| | | | |
| Breakdown (% by weight) | Foundry Sand 100% | Foundry Sand 100% | Foundry Sand 100% |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

B. Surface Coating:

Material Being Coated Not Applicable

Type of Coating _____

Coating Rate (Gals/Hr) _____

Is Coating Altered (Yes or No) _____

With _____

Distance From Coating Head to Exhaust Duct _____

C. Fuel Burning - Incineration:

Type of Fuel Not Applicable

Fuel Burning Rate _____ (lbs/hr), (gals/hr), (ft/hr)

Fuel Additives _____, % _____

| Meter Reading (if available) | Time |
|---|---|
| | |
| | |
| | |
| | |
| | |

Type of Waste Constituents Not Applicable

Auxiliary Fuel

Burning Rate

D. Other:

Description of Operation and Process Rate

The process involves the loading of foundry sand from a silo system into trucks. A wet scrubber is utilized as the pollution control device

V. Control Equipment Parameters

CEMs Required (Yes/No) No

Contaminant?

STACK TEST CEM READING

| Parameter Cont/Read | Parameter Cont/Read | Parameter Cont/Read | Time | Test Run # |
|---|---|---|---|---|
| | Not | Applicable | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

A. Control Equipment performance Parameter

| Parameter | Reading | Time | Run # |
|---|---|---|---|
| | Not Applicable | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

B. Additional Observations

Fugitive Emissions (Yes/No) No

Equipment Location

Visible Emissions From Stack (Yes/No) No

Odors Noticeable

Vicinity of Equipment (Yes/No) No
Near Exhaust Stack (Yes/No) No
Off Property (Yes/No) No

VI. Samples

Type of Sample

Time of Sampling

Sampled By

Sample Taken From

To Be Analyzed For

Analyzed By

Form Information Supplied by: Name/Title (Please Print)

John J. Deemer / Project Manager

Signature(s)/Date John J Deemer 05/03/90

DEP Usage Only
Rec'd By Sample Rec'd Rev'd By
Date/Time

4) Decimal fraction of moisture by volume in stack gas, Q.

Q = Vv/(Vv + Vm)

Q = 0.004

5) Molecular weight of the stack gas, Ms.

Ms = (1-Q)*((44*%CO2)+(28*%CO)+(32*%O2)+(28*%N2))+(18*Q)

Ms = 28.77

Orsat analysis

| | |
|---|---|
| % CO2 | 0 |
| % CO | 0 |
| % O2 | 20.3 |
| % N2 | 79.7 |

6) Specific gravity of stack gas, Gd.

Gd = Ms/28.95

Gd = 0.99

7) Stack gas velocity, Us in fps.

Us = 2.9*Cp*(dp*Ts*(1/Gd)*(29.92/Ps))^.5

Us = 48.09 fps

8) Actual Stack gas volumetric flow rate , Vo.

Vo = A * Us * 60 sec/min

Vo = 14608.7 cfm

9) Standardized volumetric flow rate , Vdscfm.

Vdscfm = Vo * (1-Bws) * (Tstd/Pstd) * (Ps/Ts)

Vdscfm = 15196.5 dscfm

10) Particulate sample analytical data

Gravimetric Analysis

| | |
|---|---|
| Filter sample net wt. | 0.0003 g |
| Filter blank net weight | 0 g |
| Front 1/2 acetone wash | 216 ml |
| Total wash particulate wt | 0.0047 g |
| Acetone blank volume | 200 ml |
| Acetone blank residue wt | 0.0002 g |

---

Calculations

| | |
|---|---|
| Acetone wash residue wt | 0.000216 g |
| Adj Acetone wash part.wt. | 0.004484 g |
| Tot. (gravimetric) sample wt -- Wt | 0.004784 g |

11) Front Half Particulate Concentration in grains/cf

G = (Front Half Wt) * (1/Vt) * 15.43

G = 0.0021 grains/cf

12) Particulate emission rate , E.

E = G * Vo * A *(60 min/7000grains)

E = 0.259 lbs/hr

13) Sample nozzle gas velocity , Un ,in fps.

Un = Vt/(An*t*60)

Un = 51.66 fps

14) Isokinecity

% I = 100 * (Un/Us)

% I = 107.40

Air Nova Inc.

NJAT Methods 1 And 3 Calculations
**** ******* * *** * ***********

| | |
|---|---|
| Plant | U.S. Silica |
| Operation | Sand Silo System |
| Run | 3 |
| Location | Newport , New Jersey |
| Date | 03/08/90 |

Outlet Test Data

| | | | |
|---|---|---|---|
| Vw = | 4 | cc | Vol. of H20 collected (impingers) |
| Vm = | 36.856 | cf | Dry gas meter reading |
| Pb = | 30.5 | in. Hg | Barometric pressure |
| Ps = | 30.48 | in. Hg | Stack pressure |
| dP = | 0.778 | in. H20 | Average differential pressures |
| dH = | 1.304 | in. H20 | Average draft gauge reading |
| Tm = | 519.00 | R | Average meter temperature |
| Ts = | 518.33 | R | Average stack temperature |
| Y = | 0.99 | | Meter calibration factor |
| t = | 60 | min. | Duration of sampling time |
| A = | 5.0625 | sq.ft. | Cross sectional area of stack |
| An = | 0.00019 | sq.ft. | Area of nozzle orifice |
| Cp = | 0.84 | | Pitot tube correction factor |

1) Volume of gas sampled at stack conditions, Vt.

Vt= Vm *(Ts/Tm)*(1/(1-Q))*((Pb+dH/13.6)/Ps)*Y

Vt = 36.76 dscf

2) Volume of gas sampled at standard conditions, Vmstd

Vmstd = Y * Vm * (Pm/Pstd) * (Tstd/Tm)

Vmstd = 37.84 cf

3) Volume of water vapor collected at meter conditions , Vv.

Vv = .00267 *(Vw *(Tm +460))/(Pb +dH/13.6)

Vv = 0.18 cf

4) Decimal fraction of moisture by volume in stack gas, Q.

Q = Vv/(Vv + Vm)

Q = 0.005

5) Molecular weight of the stack gas, Ms.

Ms = (1-Q)*((44*%CO2)+(28*%CO)+(32*%O2)+(28*%N2))+(18*Q)

Ms = 28.76

Orsat analysis

| | |
|---|---|
| % CO2 | 0 |
| % CO | 0 |
| % O2 | 20.3 |
| % N2 | 79.7 |

6) Specific gravity of stack gas, Gd.

Gd = Ms/28.95

Gd = 0.99

7) Stack gas velocity, Us in fps.

Us = 2.9*Cp*(dp*Ts*(1/Gd)*(29.92/Ps))^.5

Us = 48.64 fps

8) Actual Stack gas volumetric flow rate , Vo.

Vo = A * Us * 60 sec/min

Vo = 14773.0 cfm

9) Standardized volumetric flow rate , Vdscfm.

Vdscfm = Vo * (1-Bws) * (Tstd/Pstd) * (Ps/Ts)

Vdscfm = 15314.5 dscfm

10) Particulate sample analytical data

Gravimetric Analysis

| | |
|---|---|
| Filter sample net wt. | 0.0008 g |
| Filter blank net weight | 0 g |
| Front 1/2 acetone wash | 224 ml |
| Total wash particulate wt | 0.0011 g |
| Acetone blank volume | 200 ml |
| Acetone blank residue wt | 0.0002 g |

---

Calculations

| | |
|---|---|
| Acetone wash residue wt | 0.000224 g |
| Adj Acetone wash part.wt. | 0.000876 g |
| Tot. (gravimetric) sample wt -- Wt | 0.001676 g |

11) Front Half Particulate Concentration in grains/cf

G = (Front Half Wt) * (1/Vt) * 15.43

G = 0.0007 grains/cf

12) Particulate emission rate , E.

E = G * Vo * A *(60 min/7000grains)

E = 0.089 lbs/hr

13) Sample nozzle gas velocity , Un ,in fps.

Un = Vt/(An*t*60)

Un = 53.25 fps

14) Isokinecity

% I = 100 * (Un/Us)

% I = 109.48

# Appendix E

## Emission Test Production Data Form

# EMISSION TEST PRODUCTION REPORT FORM

I. Company Name U.S Silica Company APC Plant ID# _____

Plant Location Newport, NJ

Certificate Number 94132

Designation of Equipment Foundry Sand Storage Silo

II. Emission Test Date(s) March 8, 1990

Tests Conducted By:

Name of Firm Air Nova, Inc.

Business Address 5845-A Clayton Ave Pennsauken, NJ 08109

Phone Number (609) 486-1500

Test Team Representatives John J. Deeman

Joseph May

Length of Test 11:28 - 16:13 4 hours 45 min

| | Run #1 | Run #2 | Run #3 |
|---|---|---|---|
| Test Time (Start/Finish) | 11:28/12:32 | 13:25/14:28 | 15:16/16:13 |

III. Certificate Operating Conditions

A. List Conditions

| | Achieved (Yes or No) |
|---|---|
| Particulate Emission Rate < 3.0 lbs/hr | Yes |
| | |
| | |
| | |
| | |
| | |

B. Log of Certificate Conditions During Stack Test
(Record at least every 15 minutes)

| Condition | Run # | Readout | Time of Recording |
|---|---|---|---|
| Not Applicable | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

IV. Equipment Operation/Process Parameters

Number of Sources Connected _____

Number of Sources Operating _____

Production Rate: Normal _____

Maximum _____

A. Raw Materials:

| | Test Run #1 | Test Run #2 | Test Run #3 |
|---|---|---|---|
| Usage Rate (lbs/hr) | 300,000 avg | 300,000 avg | 300,000 avg |
| Breakdown (% by weight) | Foundry Sand 100% | Foundry Sand 100% | Foundry Sand 100% |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

B. Surface Coating:

Material Being Coated Not Applicable

Type of Coating _____

Coating Rate (Gals/Hr) _____

Is Coating Altered (Yes or No) _____

With _____

Distance From Coating Head to Exhaust Duct _____

C. Fuel Burning - Incineration:

Type of Fuel Not Applicable

Fuel Burning Rate _____ (lbs/hr), (gals/hr), (ft/hr)

Fuel Additives _____, % _____

| Meter Reading (if available) | Time |
|---|---|
| | |
| | |
| | |
| | |

Type of Waste Constituents Not Applicable

Auxiliary Fuel

Burning Rate

D. Other:

Description of Operation and Process Rate

The process involves the loading of foundry sand from a silo system into trucks. A wet scrubber is utilized as the pollution control device

V. Control Equipment Parameters

CEMs Required (Yes/No) No

Contaminant?

STACK TEST CEM READING

| Parameter Cont/Read | Parameter Cont/Read | Parameter Cont/Read | Time | Test Run # |
|---|---|---|---|---|
| | Not | Applicable | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

A. Control Equipment performance Parameter

| Parameter | Reading | Time | Run # |
|---|---|---|---|
| | Not Applicable | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

B. Additional Observations

Fugitive Emissions (Yes/No) No

Equipment Location

Visible Emissions From Stack (Yes/No) No

Odors Noticeable

Vicinity of Equipment (Yes/No) No
Near Exhaust Stack (Yes/No) No
Off Property (Yes/No) No

VI. Samples

Type of Sample

Time of Sampling

Sampled By

Sample Taken From

To Be Analyzed For

Analyzed By

Form Information Supplied by: Name/Title (Please Print)

John J. Deemer / Project Manager

Signature(s)/Date John J Deemer 05/03/90

DEP Usage Only
Rec'd By Sample Rec'd Rev'd By
Date/Time