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FERROALLOY FURNACE EMISSION FACTOR DEVELOPMENT FOOTE MINERAL COMPANY, GRAHAM, WEST VIRIGINIA

Final Report

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SECTION 1

INTRODUCTION

The purpose of this program was to establish size specific particulate emission factors for the ferrosilicon furnace at Foote Mineral Company, Graham, West Virginia. Furnace No. 2 at Foote is an open submerged electric arc furnace rated at 35 megawatts (MW). The furnace was producing 50 percent grade ferrosilicon which contained an average of 47 percent silicon alloy during the March 1981 test program. Total particulate concentration and particle size distribution of emissions captured by the canopy hood evacuation system were measured before and after the baghouse using modified EPA Method 1-5 procedures and Andersen cascade impactors. The dual cyclone sampler developed by Southern Research Institute was also used at the inlet sampling location.

Entropy Environmentalists conducted the total particulate testing under subcontract to Research Triangle Institute (RTI) as part of a Level 2 Environmental Assessment of emissions of organic species from various ferroalloy furnaces. This Level 2 characterization of organic species utilized EPA Method 1-5 procedures modified to include an absorbent trap (XAD-2) between the third and fourth impingers. GCA/Technology Division conducted particle size distribution tests simultaneous with the total particulate (Level 2) tests by Entropy. In addition, GCA provided a process observer to document relevant furnace operations and cycle times, to assess the capture efficiency of the canopy hood control system and to ensure that testing was performed only during normal furnace operations. This observer also performed EPA Method 9 visible emission observations of the furnace building roof monitor and the baghouse outlet for at least one tap to tap cycle.

SECTION 2

SUMMARY OF RESULTS AND CONCLUSIONS

The sampling and analysis program was conducted according to the approved Test Plan. Modified EPA Method 5 and Andersen cascade impactor sampling procedures were performed at the inlet and outlet of the baghouse controlling emissions from the No. 2 furnace at Foote Mineral Company. In addition, dual cyclone sampling runs were performed at the inlet sampling location. A summary of results of the combined efforts of GCA/Technology Division and Entropy Environmentalists is presented in Table 1 and Figures 1 and 2. These results were prepared using the total particulate data and the impactor derived size distributions; the results of the dual cyclone sampling effort will be presented later. Research Triangle Institute analyzed the total particulate data that were utilized in the size specific emission factor calculations. The report to be published by RTI should be consulted concerning details of sampling and analytical procedures and other results and discussions. The uncontrolled particulate emission factors (inlet side tests) are considered more viable than controlled emission factors (baghouse outlet test results) since outlet testing was performed at a poor sampling location. Each of the 11 baghouse compartments was sampled immediately (5 feet) above the top of the bags at a single sample point. The gas flow in each compartment was below detectable limits; less than 0.002 in. H_2O velocity pressure; therefore, isokinetic sampling was not possible. Also, each compartment (with one exception) was tested only once. An emission factor based on the average of all outlet test results should be considered one complete test run and since very little confidence can be applied to the results of one test, this emission factor should only be considered an estimate.

Major modifications to the baghouse outlet would have been required to facilitate a more accurate measurement of controlled emission rates. These modifications, which in themselves could alter the outlet emission factors, were considered too costly and since the ferroalloy industry in general uses this baghouse outlet design, EPA requested that testing be performed at this less than ideal sampling location. An industrywide comparison of outlet emission factors is still possible, by performing tests at similar sampling locations at different ferroalloy plants, however, the actual controlled emission rates are questionable.

The field testing program was performed during the week of 16 March 1981 while the furnace was producing ferrosilicon at a rate of about 170 tons per day. The average total electrical load on the furnaces including downtime was

TABLE 1. SUMMARY OF TOTAL PARTICULATE AND PARTICLE SIZE DISTRIBUTION TEST RESULTS, FOOTE MINERAL COMPANY, GRAHAM, WEST VIRGINIA

		Average inlet	Average outlet
Total Particulate Emission Factors			
Mass Concentration	mg/dscm	518.2	9.75
	gr/dscf	0.23	0.004
Mass Emission Rate	kg/MWH	7.36	0.20
	lb/hr	517.6	13.9
Process Weight Rate	kg/Mg produced	34.87	0.92
	lb/ton produced	69.74	1.84
Particle Size Distribution[a]			
Cumulative % mass	15 μm d_{50}	66	80
	2.5 μm d_{50}	57	54
Mass Emission Rate	lb 15 μm d_{50}/hr	341.6	11.1
	lb 2.5 μm d_{50}/hr	295.0	7.5
Size Specific Emission Factors			
kg particulate	15 μm d_{50}/Mg produced	23.0	0.74
lb particulate	15 μm d_{50}/ton produced	46.0	1.47
kg particulate	2.5 μm d_{50}/Mg produced	19.9	0.50
lb particulate	2.5 μm d_{50}/ton produced	39.8	0.99

[a]Results based on cascade impactor data and EPA Method 5 results reported by RTI. Dual cyclone sampler results presented later.

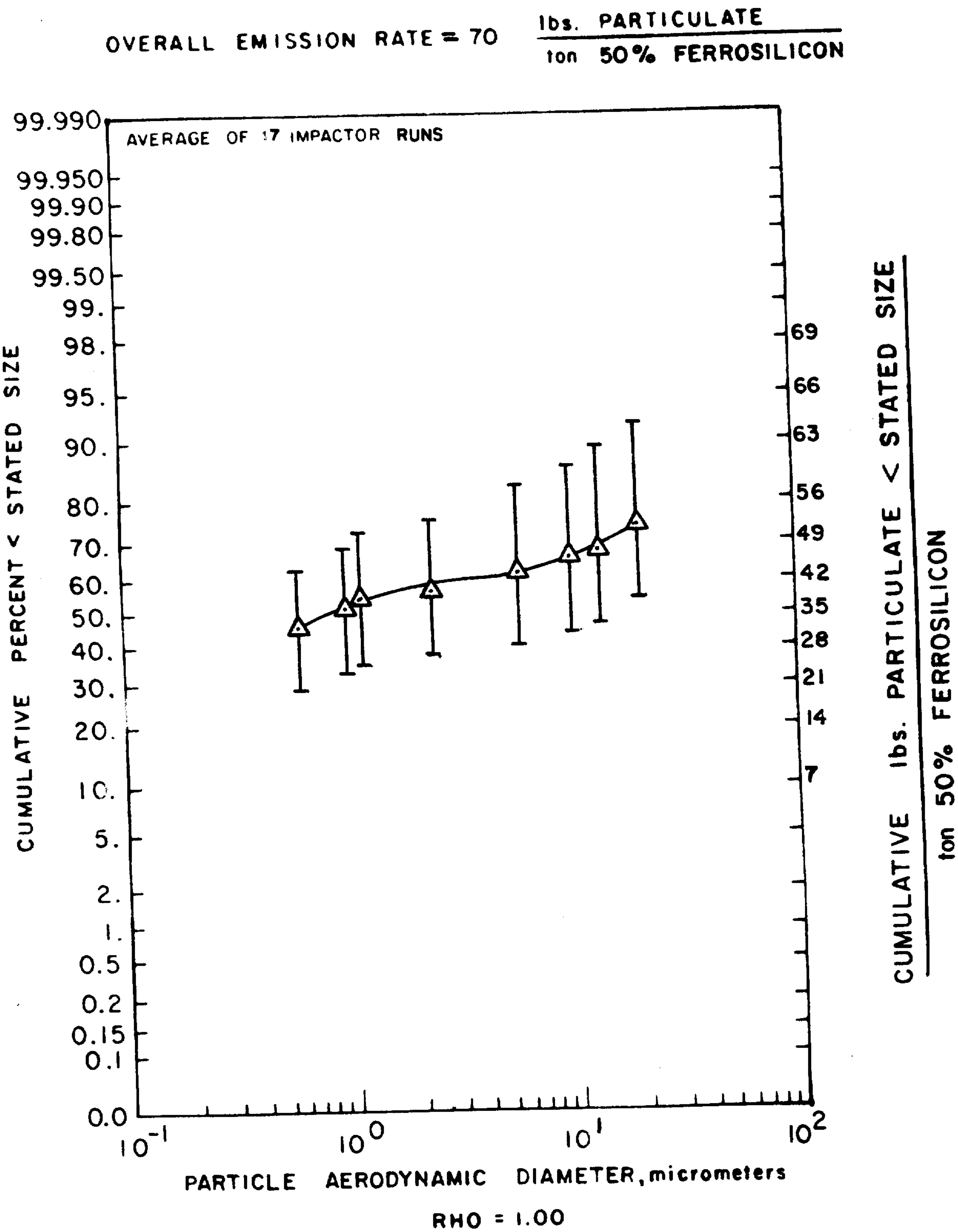

Figure 1. Average particle size distribution, uncontrolled ferrosilicon furnace emissions (baghouse inlet), Foote Mineral Company, Graham, West Virginia.

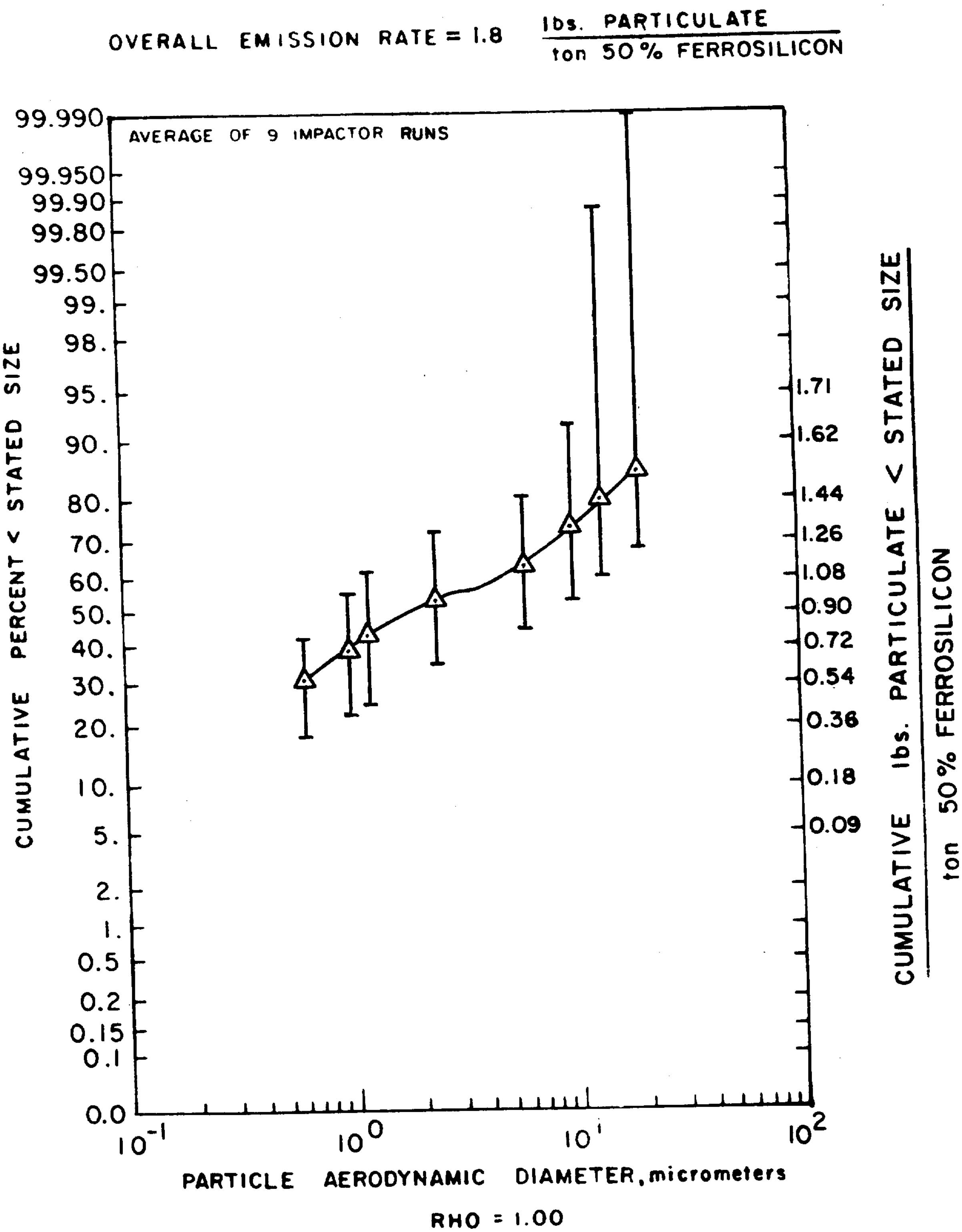

Figure 2. Average particle size distribution, controlled ferrosilicon furnace emissions (baghouse outlet), Foote Mineral Company, Graham, West Virginia.

30 MWH/hr and testing was conducted only when the furnace was operating normally. Testing was performed during all phases of the refining cycle including charging, stoking and tapping.

The results of the process and visible emissions observations indicate good capture of emissions by the canopy hood since none of the 479 furnace shop roof monitor opacity readings were as high as 20 to 25 percent. Observations of the baghouse roof monitor indicated adequate control of emissions with 5 of the 480 readings in the 20 to 25 percent opacity range. (Some of the baghouse visible emissions may have been generated by dust transfer procedures).

SECTION 3

PROCESS DESCRIPTION

The No. 2 furnace at Foote Mineral Company, Graham, West Virginia is a submerged electric arc furnace rated at 35 megawatts. During the test program, the furnace was producing 47 percent ferrosilicon alloy (FeSi). A schematic of the furnace and pollution control system is provided in Figure 3. The furnace vessel has an inside diameter of 37 feet and is 10'-8" deep. A 40' diameter hexagonal shaped hood is fixed 5 feet above the furnace and is connected by two 6'-6" diameter offtakes to a 12'-6" diameter main duct. Exhaust gases are drawn through the main by two 1500 horsepower fans at a total design flow rate of 450,000 acfm at 500°F. The gas is cooled in u-tube heat exchangers, passes through the fans and is then forced through a positive pressure baghouse venting to the atmosphere via a roof monitor. The perimeter of the hood is equipped with fold down panels to further enclose the furnace as desired.

The furnace is charged with raw materials automatically and intermittently through weighing hoppers and automatic feeders. The raw materials drop about 4 feet from the end of the feed pipes to the top of the charge mixture and are typically composed of: 41 percent quartz, 22 percent scrap, 4 percent remelts, 14 percent wood chips and 19 percent coal.

Stoking, the mechanical leveling of the charge, is performed frequently and as necessary to prevent the occurrence of blows. A blow is when gases trapped in the mix escape rapidly (erupt). Blows occur near the electrodes because the mix loses porosity where the refining and melting occurs. Wood chips are added to the charge mix to help maintain porosity. During stoking, the mix is pushed from the perimeter of the vessel into mounds around the electrodes. Stoking is performed with a ram mounted on a fork-lift type vehicle.

Tapping occurs approximately once every 90 minutes or about 5 taps per shift. This is accomplished by poking, drilling, or shooting the carbon-paste plug out of the taphole area. Generally the tapping process lasts about 30 minutes. The molten metal (at 2800 to 3000°F) flows into a transfer ladle for subsequent casting. A tapping hood is mounted over the taphole to direct emissions into the canopy hood above the furnace. The 63,000 cfm fan with 100 hp motor is connected to the tapping hood and is manually started by the control room operator. The tapping emission control system had been in operation for 6 months and appeared to provide greater than 95 percent capture during typical tapping operations.

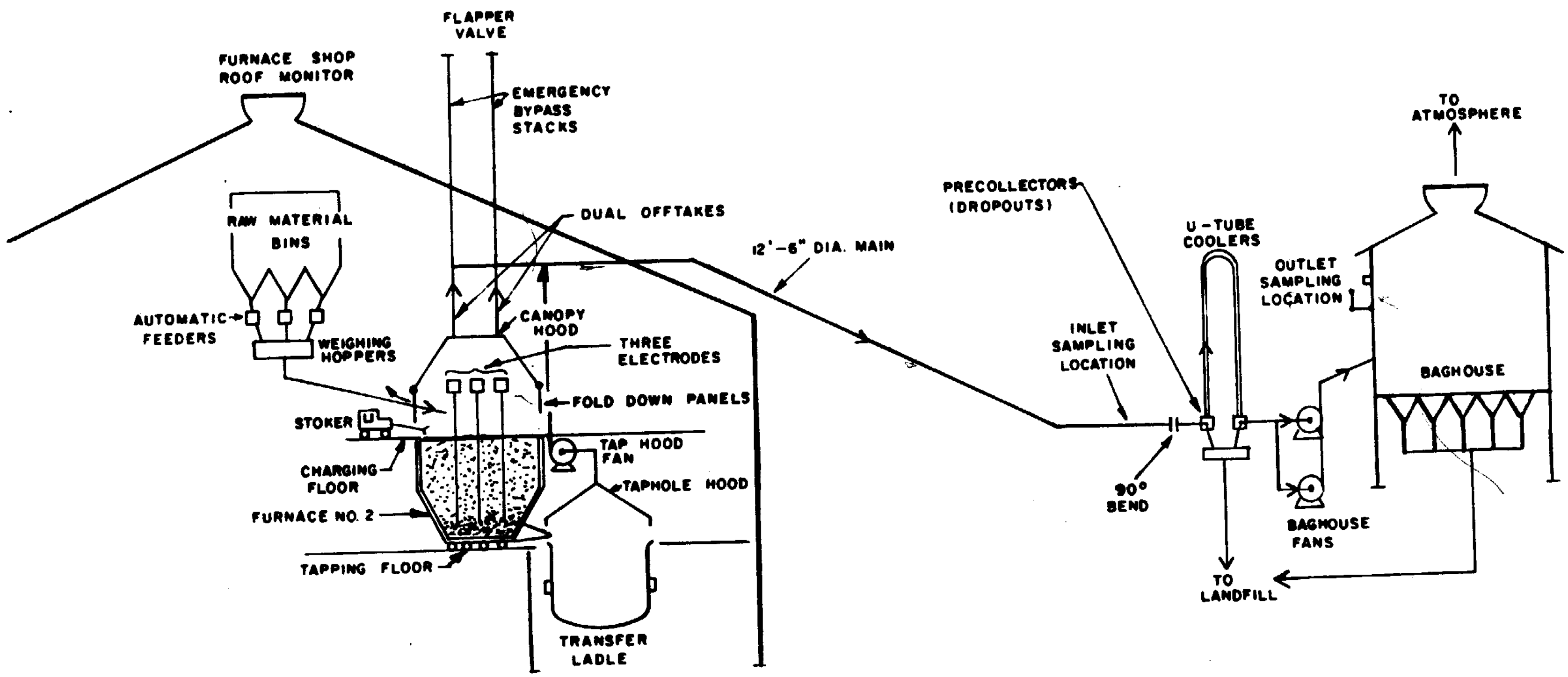

Figure 3. Process schematic, Foote Mineral Company, Graham, West Virginia.

SECTION 4

SAMPLING AND ANALYSIS PROCEDURES

INTRODUCTION

Emissions generated during the ferrosilicon production process are evacuated to a positive pressure baghouse. Prior to initiation of the field sampling program, facilities for traversing the horizontal duct were designed by GCA/Technology Division and installed by CGM Contractors, Vienna, West Virginia. The cost of the sampling facility installation was equitably shared by GCA and RTI. The baghouse inlet sampling facilities, consisting of a platform, slider boards and ports, was approximately 40 feet above grade and sampling was performed from a platform mounted on top of the circular duct as shown in Figure 4. The sampling points were located 4.4 diameters downstream and 1.1 diameters upstream of flow disturbances. Both flow disturbances were bends in the duct, a 45° bend upstream, and a 90° bend downstream. The baghouse outlet sampling ports were installed in each of the 11 baghouse compartments on the compartment wall. The ports were located about 5 feet above the bags.

PRESAMPLING PREPARATIONS

All glassware and Nalgene sample bottles utilized in this test program were cleaned with an Alconox solution, rinsed with tap water, distilled-deionized (DDI) water and finally rinsed with spectral grade acetone. The glassware was air-dried and capped with Parafilm. All filters were desiccated to constant tare weight ($\pm$ 0.5 mg).

Pitot tube-thermocouple-probe assemblies used for preliminary velocity traverses were calibrated by the measurement procedure as specified in 40 CFR 60, Appendix A, Method 2. Sampling nozzles were calibrated with a dial vernier micrometer. Thermocouples were calibrated against a mercury in-glass ASTM thermometer in an ice bath, at ambient temperature and in a boiling water bath. All calibrations are given in Appendix A.

Impactors and cyclones were prepared for sampling by cleaning with soap and water, then rinsing with DDI water and finally with acetone. All particle sizing train dry gas meters and orifices were calibrated according to procedures outlined in APTD 0576 prior to sampling.

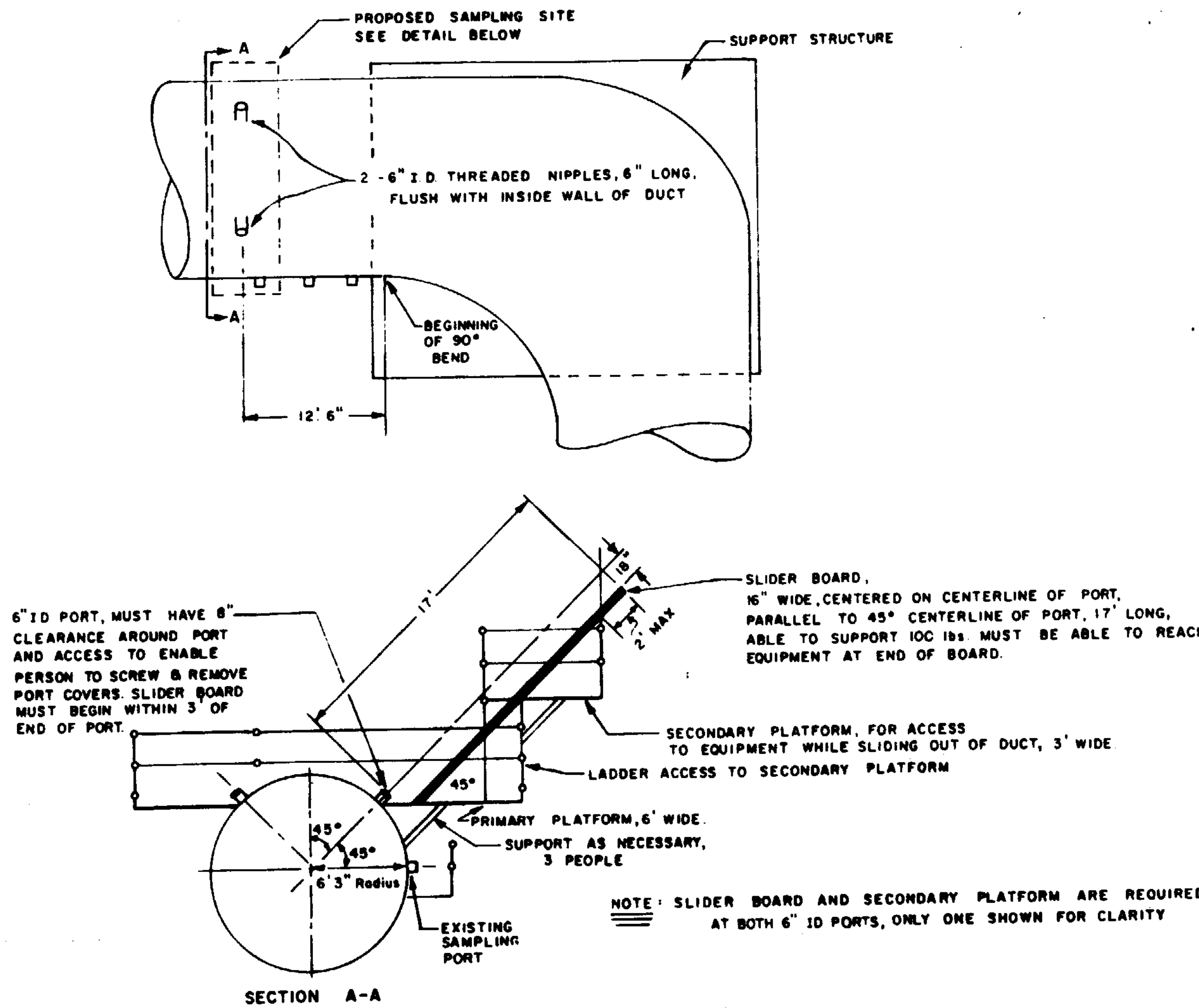

Figure 4. Sampling facility schematic, Foote Mineral Company, Graham, West Virginia.

CASCADE IMPACTOR SAMPLING

Reeve Angel type 934-AH glass fiber substrates were prepared for use in the cascade impactors. Each substrate was labeled and placed in a folded aluminum foil liner. Both foil and filter were placed in labeled petri dishes and desiccated for 24 hours. The top half of each foil liner was folded back during desiccation. Initial tare weights and all subsequent weights are a combination of foil and filter weights. A minimum of 6 hours was allowed between weighings. After reaching constant weight (± 0.5 mg) substrates were sealed in their petri dishes for transport to the field.

Sample train preparation and recovery took place in a clean environment inside the truck used to transport equipment. Once onsite, a preliminary velocity traverse was performed in order to:

1. Determine if cyclonic flow conditions exist and, if present, determine the gas flow angles.

2. Determine which sample points represent average flow and temperature for particle sizing measurements.

3. Properly size nozzles and obtain the data necessary to perform isokinetic sampling.

Four sample points of average velocity near 0.7R (R = duct radius) were determined through use of the preliminary traverse data. The proper nozzle size and sample train flow rate were selected and single-point cascade impactor sampling was performed during each Level 2 test run. Only one of the four sample points was sampled per impactor run and typically four runs were completed per Level 2 run. Total sampling time was designed to collect approximately 50 mg per impactor run through estimated grain loading values, and by visual inspection of the first run filters. Baghouse inlet test runs were performed with a cyclone precutter installed in front of the impactor to remove particles >15 μm diameter. No visible sample was recovered from the cyclone precutter during initial baghouse outlet test runs, therefore straight nozzles were used for all subsequent outlet tests.

Prior to each sampling run the impactors were carefully loaded with tared substrates. The sample train consisting of the impactor, an unheated probe, vacuum hose, silica gel moisture trap and dry gas meter/orifice/pump assembly as shown in Figure 5, was assembled and leak checked. The impactor was then inserted into the gas stream at the appropriate sample point with the nozzle pointed away from the gas flow (inlet tests) and allowed to reach temperature equilibrium. After approximately 10 minutes, the sampling nozzle was turned into the flow (inlet tests) and the sample flow was adjusted to the desired rate. Outlet tests were performed as above; however, the nozzles were perpendicular to the assumed direction of flow at all times. The flow was monitored and recorded by observing the pressure drop across a calibrated orifice and the total dry gas volume sampled was determined by a calibrated dry gas meter. The flow rate through the impactor was held constant (± 0.05 cfm) for the duration of each run.

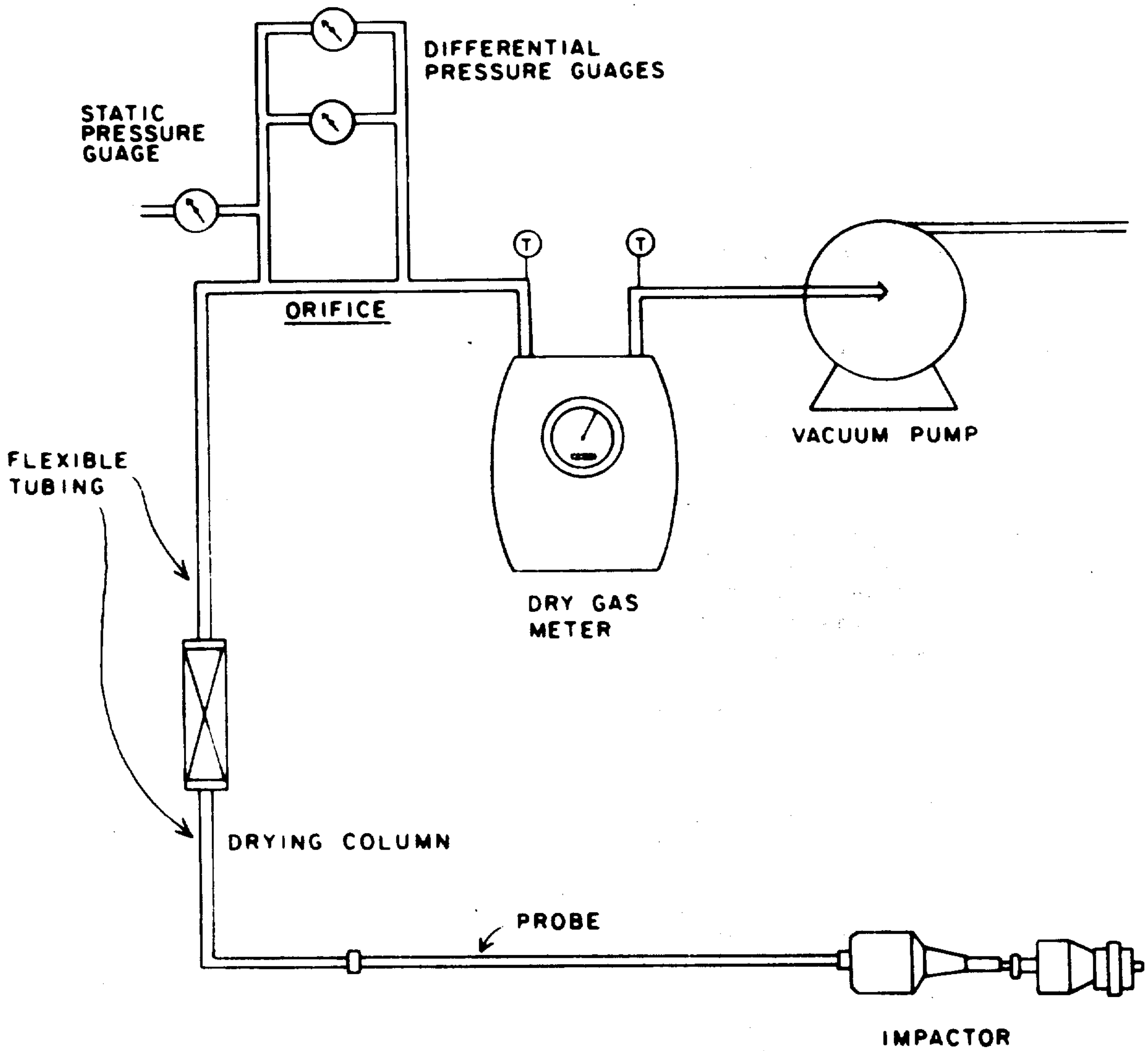

Figure 5. Andersen sampling train.

Upon completion of each sample run, the probe/impactor assembly was removed from the duct and sample train shut off. The nozzle was immediately capped with foil. The probe was disconnected and the impactor transported to the sample recovery area. No leak checks were performed at the end of a run so as not to disturb the particle distribution.

Two types of preliminary impactor runs were performed. The first involved the use of "blank" impactors loaded with pretared substrates to determine anomalous weight gain due to gaseous specie absorption. The impactors were fitted with dual prefilters to prevent particulate matter from reaching the substrates. Blank inlet and outlet runs were 28 minutes and 210 minutes long, respectively.

Preliminary loading runs were conducted to obtain a visual indication of particle loading rates. Impactors equipped with cyclone precutters were operated for the estimated length of time necessary to sample 50 mg of particulate. Upon recovery, substrates were examined and sampling times adjusted according to the degree of loading observed. Also, preliminary outlet runs were conducted with a cyclone precutter in order to verify the assumption that no particles greater than 15 microns were present in the outlet stream. These preliminary loading runs were performed with unweighed substrates which were discarded after visual inspection.

DUAL CYCLONE SAMPLING

Preparations for sampling with the dual cyclones consisted of the same washing steps and filter weighing procedures as the impactors. The newly developed series cyclone designed by Southern Research Institute, Birmingham, Alabama, and built by Sierra Instruments, Carmel Valley, California, was operated simultaneously with the EPA Method 5 train at the inlet sampling location only. The two cyclones in series have size cuts of 15 and 2.5 μm when operated at a nominal flow rate of 0.8 cfm at 300°F. The cyclones, as shown in Figure 6, are operated with the same equipment required by the impactors (as shown in Figure 5).

Prior to each sample run, the train is assembled and leak checked to less than 0.02 cfm at 5 in. Hg. The cyclones are then inserted into the duct with the nozzle pointing away from the flow. The sampler was operated simultaneous (± 5 minutes) with the Level 2 sampling. Upon start-up, the nozzle was turned into the flow and sampling was conducted at one of two points along the traverse. When the EPA Method 5 train completed one-half of a traverse, the nozzle was then moved along the same diameter to the other 0.7R sample point without shutting off. Sampling continued at the second point until the end of the Method 5 traverse.

Sampling at Foote Mineral Company required a 45° from vertical orientation of the sampler. In this position, the sampler was right side up; that is, the collection cup was below the body of the cyclone during sampling. The procedures manual[1] indicates that the flow through the sampler should not be terminated until the cyclones are approximately horizontal. This would require sampling some ambient air during each run

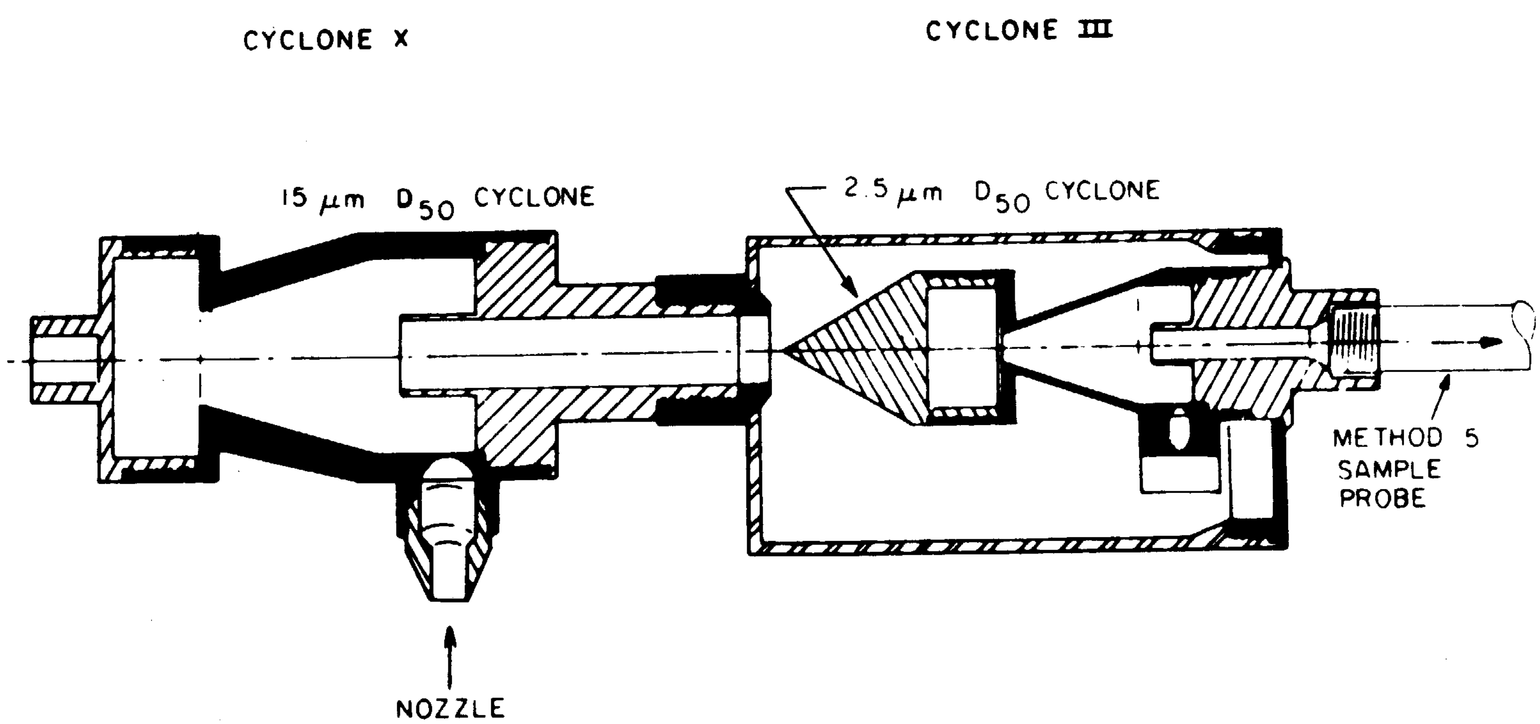

Figure 6. Schematic drawing of the dual cyclone sampler.

while the sampler was removed from the duct and properly positioned. It was assumed in the field that the sampler could be shut off when in the 45° from vertical position without loss of particulate. Sampling was terminated several times during each run for port changes and process upsets without removing it from the duct.

The dual cyclone sampler would normally be fitted with a backup filter to collect particles <2.5 μm. Upon recovery of preliminary cascade impactor runs, it was evident that most of the particulate was very fine. The backup filter was eliminated from the cyclone train in order to allow run times of around 200 minutes. This would allow enough particulate to be caught in the collection cups to recover dry. By eliminating the backup filter, particulate less than 2.5 μm probably travelled through the probe and connecting hose and was caught in the filters before and after the silica gel trap. It was assumed in the field that good quantification of the first two fractions, >15 μm and 2.5 to 15 μm, would allow subtraction from the total particulate results to obtain the <2.5 μm fraction lost by elimination of the backup filter.

ANDERSEN IMPACTOR SAMPLE ANALYSIS

At the conclusion of each test run, each impactor was carefully disassembled and the nozzle, impactor expander section and cyclone precutter (if used) were washed with acetone into a sample container. Each impactor substrate was placed into its respective petri dish and any particulate adhering to both sides of the top jet plate, the crossbar, and the gasket was brushed onto the substrate. In all cases the substrates were carefully placed in preweighed aluminum foil liners to minimize loss of particulate during subsequent handling of the substrate.

Upon completion of the sample recovery procedures, the samples were labeled, sealed, then liquid levels marked, and the samples were carefully packed for shipment to the GCA/Technology Division laboratory for analysis. A chain of custody log book that outlines the recovery procedures and documents the history of the samples was maintained. Each substrate and weighing jacket, upon return to the GCA laboratory, was placed in a desiccator and dried for at least 24 hours before being weighed. A minimum of 6 hours was allowed between each subsequent weighing until constant weight (± 0.5 mg) was achieved. After weighing, all samples were carefully stored in closed containers.

Sampling data reduction was performed by computer. A preliminary program was used to calculate inputs needed to further reduce the data after the weight gains on each impactor stage have been determined. Once the appropriate input parameters were checked, they were keypunched and entered into the "Computer Based Cascade Impactor Data Reduction System" (EPA-600/7-78-042) as developed by SoRI. Example calculations used by the programmable calculator are provided in Appendix B-1.

DUAL CYCLONE SAMPLE ANALYSIS

Recovery of particulate collected in the cyclones was initiated by dismantling the cyclone stages. The sampler was kept upright at an angle of 45° from horizontal during dismantling. Dry samples were recovered from the collection cups of Cyclone X and Cyclone III. After removal of the dry catch, the cyclones and connecting parts were rinsed three times with acetone into one of two sample containers.

The nozzle, body, collection cup and top half of Cyclone X were rinsed into one container; the connecting tube, canister, outside and inside of the body and collection cup of Cyclone III were rinsed into a second container. The samples were labeled and sealed for transfer to the GCA/Technology Division laboratory for analysis. Upon receipt at the weighing laboratory, the samples are logged in and aliquotted appropriately. The dry catches were desiccated for 24 hours before weighing. The rinses were dried in a hood at ambient temperature in preweighed beakers and desiccated to constant weight.

Data analysis was performed by entering the relevant data into a programmable calculator to determine isokinetics, grain loading, etc. Example calculations are provided in Appendix B-2. The size cuts of the cyclones as used in the field were calculated using the calibration factors and equations provided by Southern Research Institute in the operation manual[1] and through previous phone conversations.

PROCESS OBSERVATIONS

During field testing, a GCA process engineer was positioned inside the furnace control room. From this vantage point the process engineer performed the following:

- Notified the test crew by radio when to start and stop so as to test only during normal furnace operating conditions.
- Documented the origin and approximate magnitude of all emissions generated within the furnace shop. Emission magnitude was assessed for charging, stoking and tapping operations using a scale of light, moderate or heavy.

Other process data and information were given to GCA by Research Triangle Institute in the form of daily process data sheets, at the end of the field test program.

<u>Visible Emission Observations</u>

The degree of emissions escaping capture by the canopy hood system was visually evaluated in accordance with EPA Reference Method 9 as published in the Federal Register, 40 CFR, Part 60, Appendix A. The VE observer was certified by EPA within the previous 6 months by the certification technique specified in Method 9. The observer was positioned outside the furnace shop and recorded opacity of visible emissions emanating from the furnace shop roof monitor and also the baghouse roof monitor.

SAMPLING AND ANALYSIS QUALITY ASSURANCE

The GCA/Technology Division Quality Assurance Program conforms with EPA and NIOSH recommendations and is directed by the Division QA Manager who reports directly to the General Manager. This gives the QA Manager the necessary authority and independence to find and correct any existing quality problems. Department QC Coordinators are responsible for the QC program within each technical department; they report to both their Department Manager and the QA Manager.

GCA's program includes a Division QA/QC Committee, Department QC Committees, QA/QC Manuals, specific QA Project Plans and Inspection Plans, personnel training, and audit and corrective action procedures. The program is designed to provide both continuity and flexibility in ongoing QC activities in all departments. GCA's technical staff operates under the guidelines of the QA Program using appropriate procedures provided in the QC Manuals and in sampling and analysis method manuals. This ensures that projects like this one for which a specific QA Project Plan was not prepared have written QC procedures provided.

The number and scope of QC procedures used in this program precludes completely detailing them here; however, some key points should be mentioned. All beaker and filter weights were replicated until constant ($\pm$ 0.5 mg); sample trains were calibrated both before and after a test program to insure H_a and Y integrity; and all data, calculations, and results were reviewed by committee for accuracy. For details concerning all procedures used, please refer to the Division QA/QC Manual, Parts 1 and 2.

The Appendices to this report provide QC data such as the dry gas meter and nozzle calibration data sheets, the calculation formulas used for particle sizing and total particulate calculations, and the standardized field data sheets used to ensure that pertinent data is recorded.

Comments or questions on data quality are made when appropriate in this report; no formal corrective actions were initiated during this program. NO system audit was performed.

SECTION 5

TEST RESULTS

INTRODUCTION

The field sampling program was conducted during the week of 16 March 1981. The program objective, to develop emission factors for ferroalloy production, was met by completion of 5 total particulate (Level 2) runs and 17 cascade impactor runs at the inlet sampling location. Nine impactor runs were completed during three total particulate runs at the baghouse outlet locations. The shorter inlet impactor runs were operated at various times during the production cycle; however, the longer outlet test runs were operated for complete tap to tap cycles or more. Careful monitoring of the process insured that the test runs were conducted only during normal furnace operations. Emissions escaping capture were documented by the process engineer/visible emission observer. Detailed process data were obtained to allow possible correlations between source operations and measured emission factors.

The field samples and data were driven back to the GCA/Technology Division Laboratory for analysis. The following sections describe the results of the sample and data analysis efforts.

TOTAL PARTICULATE RESULTS

The total particulate measurements were performed by Entropy Environmentalists and the sample analysis was performed by RTI. Tables 2 through 6 summarize the results of the total particulate measurements as provided by Dr. Wayne Westbrook of RTI. Tables 2 and 3 present sampling data and gas characteristics, Tables 4 and 5 present the particulate emission rates, and Table 6 presents the baghouse particulate removal efficiency. Example calculations are provided in Appendix C.

As described previously, the outlet tests were conducted at poor sampling locations, only about 5 feet above the bags. The emission rates and baghouse efficiencies presented in Tables 3, 5 and 6 are therefore less viable than the inlet test results. Outlet emission factors are also questionable because outlet gas flow rate could not be measured, since no baghouse inlet temperatures were obtained just prior to the baghouse (after the dilution air inlet). Based on the ambient temperature, baghouse outlet temperature and previous experience, RTI estimated that 30 percent of the outlet gas was ambient air that was drawn into the baghouse through the grates and dilution air intake louvers. The error associated with these test results is carried into the calculation of outlet size specific emission factors.

TABLE 2. BAGHOUSE INLET LEVEL 2 SAMPLING DATA, FOOTE MINERAL COMPANY, GRAHAM, WEST VIRGINIA

Run No.	1	2	3	4	5
Date	3/17/81	3/17/81	3/17/81	3/18/81	3/18/81
Start time	0937	1315	1615	1315	1635
Stop time	1145	1520	1805	1513	1835
Net sampling time, min	90	90	90	90	90
Stack Temp., °F	351	356	340	349	363
Stack flow rate[a] dsm^3/min	6994	7487	8165	7551	7905
Stack flow rate[b] Am^3/min	11,201	12,049	12,049	12,071	12,950
Volume collected dsm^3	1.54	1.67	1.77	1.66	1.77
% Isokinetic	98.0	99.4	96.3	97.5	99.4

[a]Moisture free and at 20°C and 76.0 cm Hg.

[b]Actual flow rate at stack conditions.

TABLE 3. BAGHOUSE OUTLET LEVEL 2 SAMPLING DATA, FOOTE MINERAL COMPANY, GRAHAM, WEST VIRGINIA

Run No.	1	2	3
Date	3/17/81	3/17/81	3/18/81
Start time	0945	1355	1257
Stop time	1252	1659	1557
Net sampling time, min	160	160	160
Stack temp., °F	180	199	205
Volume collected[a] dsm^3	3.28	3.20	3.24
Gas flow rate[b] dsm^3/min	9990	11,180	10,790
Compartments sampled	1,2,3,4	5,6,7,8	8,9,10,11

[a]Moisture free and at 20°C and 76.0 cm Hg.

[b]Estimate based on inlet flow rate, and assumption that 30 percent of the baghouse exhaust gas was dilution air.

TABLE 4. TOTAL PARTICULATE TEST RESULTS (BY RTI), BAGHOUSE INLET SAMPLING LOCATION, FOOTE MINERAL COMPANY, GRAHAM, WEST VIRGINIA

Run No.	Particulate captured (mg)	Particulate concentration (mg/dsm^3)	Particulate generated per hour (kg/hr)	Particulate generated per MWH (kg/MWH)	Particulate generated per Mg feed (kg/Mg)	Particulate generated per Mg alloy (kg/Mg)
1	1,073.8	696.2	292.2	9.74	25.38	47.34
2	1,004.8	600.0	269.5	8.29	21.61	40.30
3	852.1	481.8	236.0	7.31	11.23	33.12
4	700.4	422.7	191.5	5.77	10.34	26.35
5	689.8	390.1	185.0	5.67	10.02	27.26
Average all runs		518.2	234.8	7.36	15.72	34.87

TABLE 5. TOTAL PARTICULATE TEST RESULTS (BY RTI) BAGHOUSE OUTLET SAMPLING LOCATION, FOOTE MINERAL COMPANY, GRAHAM, WEST VIRGINIA

Run No.	Particulate captured (mg)	Particulate concentration (mg/dsm^3)	Particulate emitted per hour (kg/hr)	Particulate emitted per MWH (kg/MWH)	Particulate emitted per Mg feed (kg/Mg)	Particulate emitted per Mg alloy (kg/Mg)
1	20.1	6.13	3.67	0.117	0.31	0.57
2	32.7	10.21	6.85	0.207	0.32	0.94
3	41.8	12.92	8.36	0.267	0.47	1.26
Average all runs		9.75	6.29	0.197	0.37	0.92

TABLE 6. BAGHOUSE TOTAL PARTICULATE REMOVAL EFFICIENCIES
FOOTE MINERAL COMPANY, GRAHAM, WEST VIRGINIA

Outlet Run No.	Inlet Run No. used in calculation	Baghouse particulate capture efficiency[a]
1	1	98.7
2	2,3	97.3
3	4	95.6
Average/all runs		97.2

[a]Calculated using kg generated and kg emitted per hour. Comparisons based on particulate concentration in the gases will overstate baghouse efficiency because of additional air drawn into baghouse through the cooling air grates.

[b]A simple average of the particulate results of runs 2 and 3 was used. Outlet Run No. 2 overlapped both inlet runs 2 and 3.

IMPACTOR PARTICLE SIZING RESULTS

Each inlet impactor run was conducted at one of four points in the inlet duct; each outlet run was conducted in several baghouse compartments at a single point within each compartment. Each inlet sample point was sampled four times; only one compartment was sampled more than once at the outlet.

Figures 7 and 8 (same as Figures 1 and 2 presented in Section 2) are each curve fitted composite plots of mean cumulative percent mass concentration versus particle aerodynamic diameter as defined by the Task Group on Lung Dynamics. Figure 7 is a composite of all 17 impactor runs performed on the inlet and Figure 8 is a composite of all 9 impactor runs completed on the baghouse outlet. To plot the particle size distributions presented in Figures 7 and 8, a computer based cascade impactor data reduction system was used and combined with the total particulate results reported by RTI. During each individual test run an impactor data sheet was filled out, containing time, impactor number, and local barometric pressure. Recorded at specific intervals during the run were elapsed time, dry gas meter volume, inlet and outlet temperature, orifice pressure drop and dry gas meter static pressure. Stack gas temperature, gas static pressure, velocity pressure and gas fraction analysis data were obtained from Entropy Environmentalists. The cascade impactor data reduction system (CIDRS), developed by Southern Research Institute for EPA, was first used to analyze the field and resulting gravimetric data. This reference (EPA 600/7-78-042) contains a thorough discussion of the design and use of the above mentioned data reduction system. The system combined the output from all individual runs made on either the inlet or outlet; screened and removed outlying data; fitted the data to a composite curve, and calculated results with 90 percent confidence intervals. Upon review of the draft report by EPA, the CIDRS program was found to be deficient in the treatment of the cyclone precutter data associated with each inlet impactor run. EPA contracted Research Triangle Institute to develop an interactive computer program using CIDRS with modifications to more accurately treat the particulate catch resulting from the use of precutters.

The particulate Data Reduction System (PADRE) prompts a user for input in the interactive mode and checks the inputted value. In CIDRS, the cyclone precutter particulate catch was added to the first stage substrate weight gain. In PADRE, the lower cutpoint of the cyclone precutter is calculated and associated with the particulate catch. Another major difference between the programs is that CIDRS screens for and eliminates outliers from the calculation of average results whereas PADRE only flags outlying data points. (Appendix D-1).

PADRE allows the user to decide if the back-up filter catch represents a valid number. Basically it gives the option of an all or nothing situation. All impactor runs showed a significant amount of particulate on the filter and upon visual inspection no large particles were found. Therefore, 100 percent of the filter weight was used in all calculations.

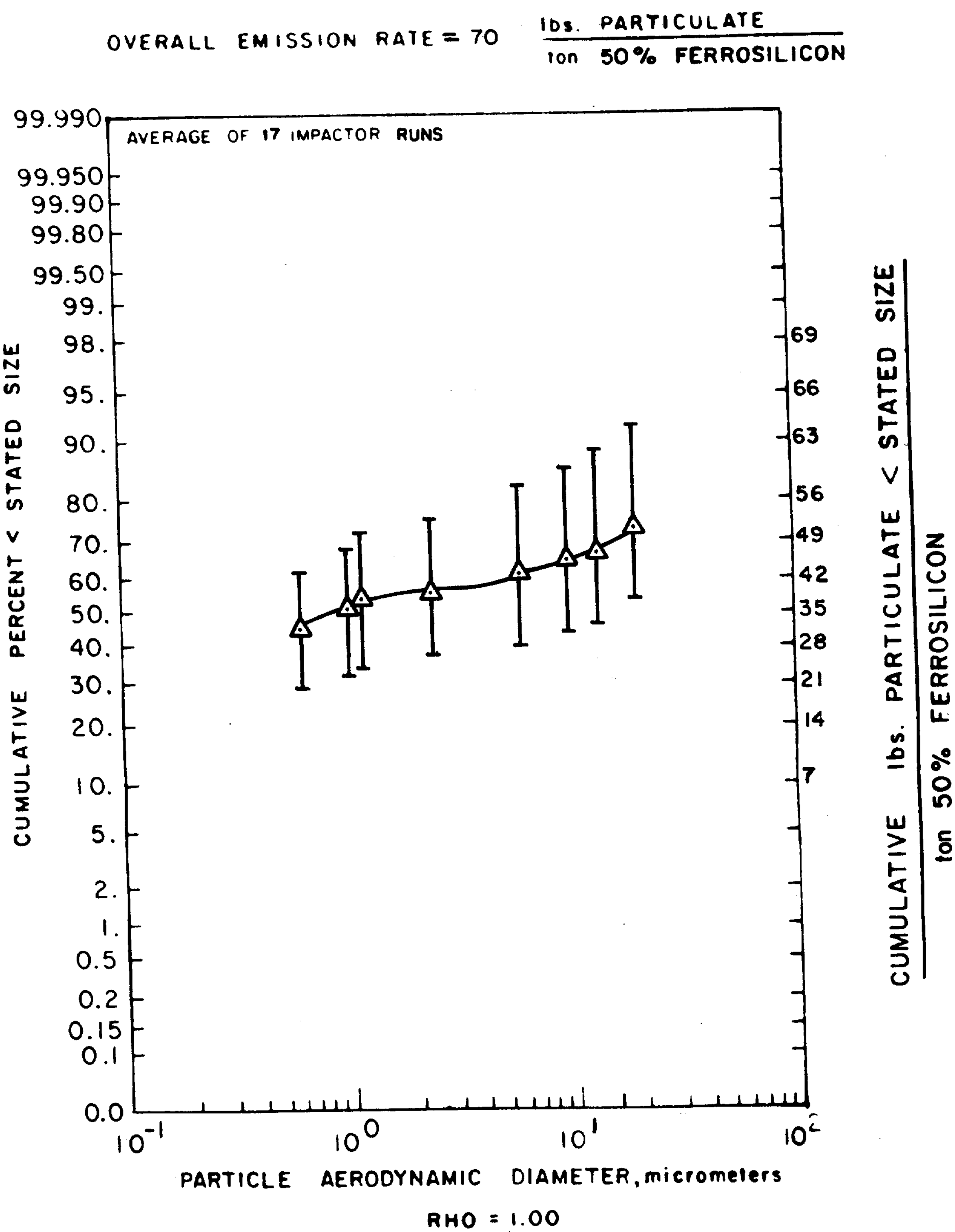

Figure 7. Average particle size distribution, uncontrolled ferrosilicon furnace emissions (baghouse inlet), Foote Mineral Company, Graham, West Virginia.

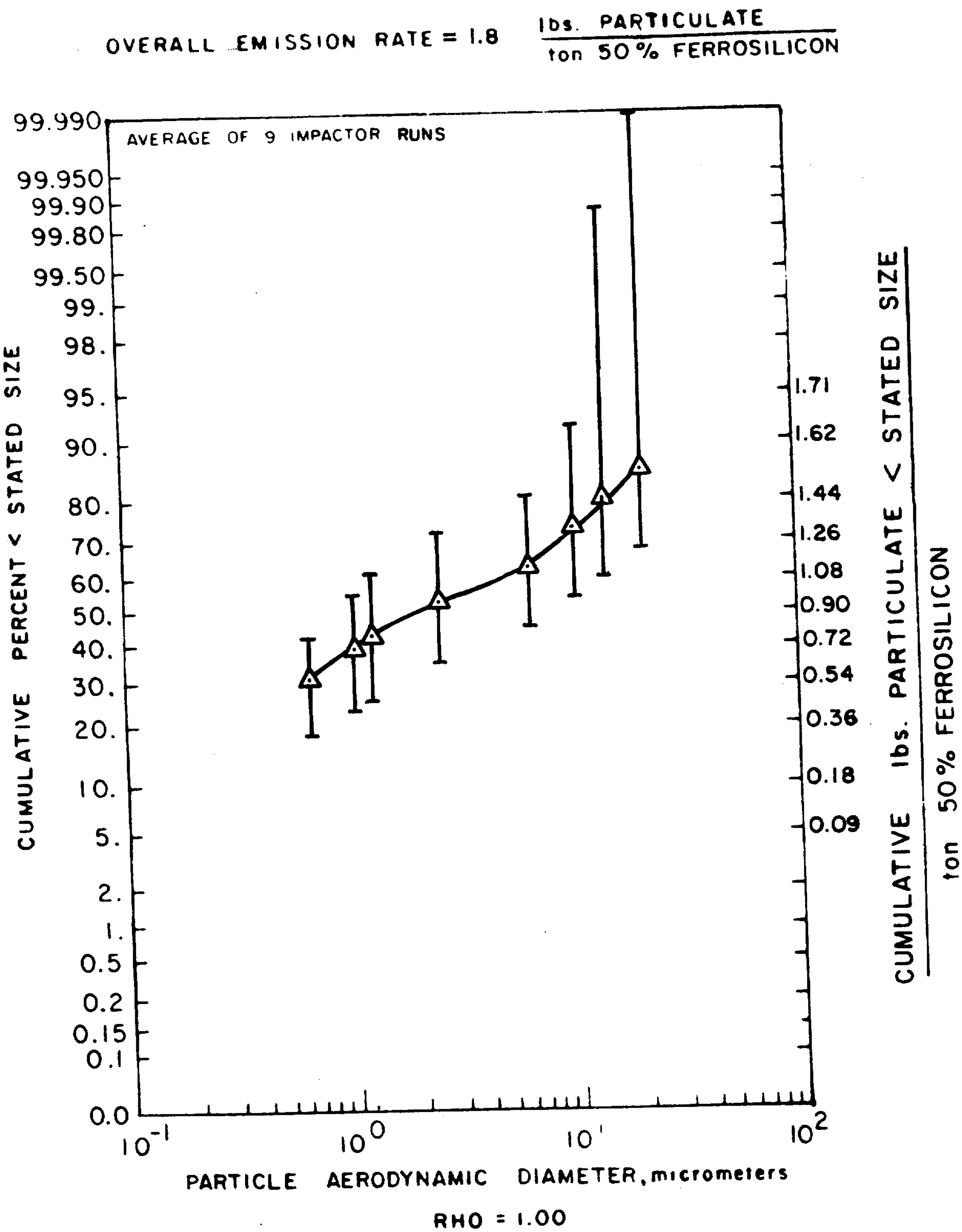

Figure 8. Average particle size distribution, controlled ferrosilicon furnace emissions (baghouse outlet), Foote Mineral Company, Graham, West Virginia.

In the previous draft report the cyclone cutpoints that were recorded were too high. Recalculations showed the cutpoints to the approximately 25 μm which are probably still too high to correct. However, a new formula based on updated calibration data, was developed by SoRI. This has been incorporated into the PADRE program and corrected cyclone cutpoints have been calculated.

Straight nozzles were used on the outlet impactor runs instead of cyclones, and the resulting nozzle rinse weights were combined with the first stage weights for each run. Therefore, the outlet data was treated the same way as the inlet data. The nozzle cutpoint was set equal to the first stage cutpoint which treated the data as if the nozzle wasn't there.

Specific "generic" calibration constants supplied by SoRI were used in all calculations rather than the Ranz and Wong value of 0.38 which was used previously. For the splite fit interpolation, Padre now automatically skips the downstream stage of two stages whose cutpoints differ by less than 30 percent. The computer printouts from Padre are contained in Appendix D-1 and D-2 and the field data sheets are presented in Appendix E-1. Example calculations are provided in Appendix B-1.

Figure 9 is a plot of particle aerodynamic diameter versus the mean change in mass concentration (dM/d log D) for both the inlet and outlet. The graph is a composite of both inlet and outlet runs. The values of dM/d log D for the outlet can be divided by the corresponding inlet value for the same particle size to determine the baghouse efficiency for removing particles of that specific size. Baghouse particulate mass removal efficiency versus particle diameter is illustrated more clearly in Figure 10 and Table 7.

Due to the large cross-sectional area of the baghouse compartments where outlet sampling occurred, no flow could be detected by the s-type pitot tube equipped with a zero to 0.25 in. H_2O micromanometer. No attempt was made to sample isokinetically at this extremely low flow rate, and the impactor nozzles were oriented perpendicular to the assumed direction of flow for convenience when inserting and removing the impactor/probe assembly within the limited space of the outlet sampling location. The lack of a significant flow rate and resultant superisokinetic sampling rates makes the outlet particle size distribution curve (Figure 8) and the control device efficiency plots (Figures 9 and 10) less viable than the inlet size distribution curve (Figure 7) where isokinetic sampling conditions were maintained.

DUAL CYCLONE SAMPLER RESULTS

The recently developed dual cyclone sampler was operated at the inlet location simultaneous with the Modified EPA Method 5 sample train. A summary of results is presented in Figure 11 and Table 8. These results were calculated using the appropriate stack gas characteristics reported by RTI. Example calculations are provided in Appendix B-2 and field data sheets are presented in Appendix E-5. The two dual cyclone runs reported in Table 7 each span more than one Method 5 run. The first cyclone run (No. 1-2) was operated during Method 5 runs 1 and 2, cyclone run 3-4 during Method 5 runs 3 and 4.

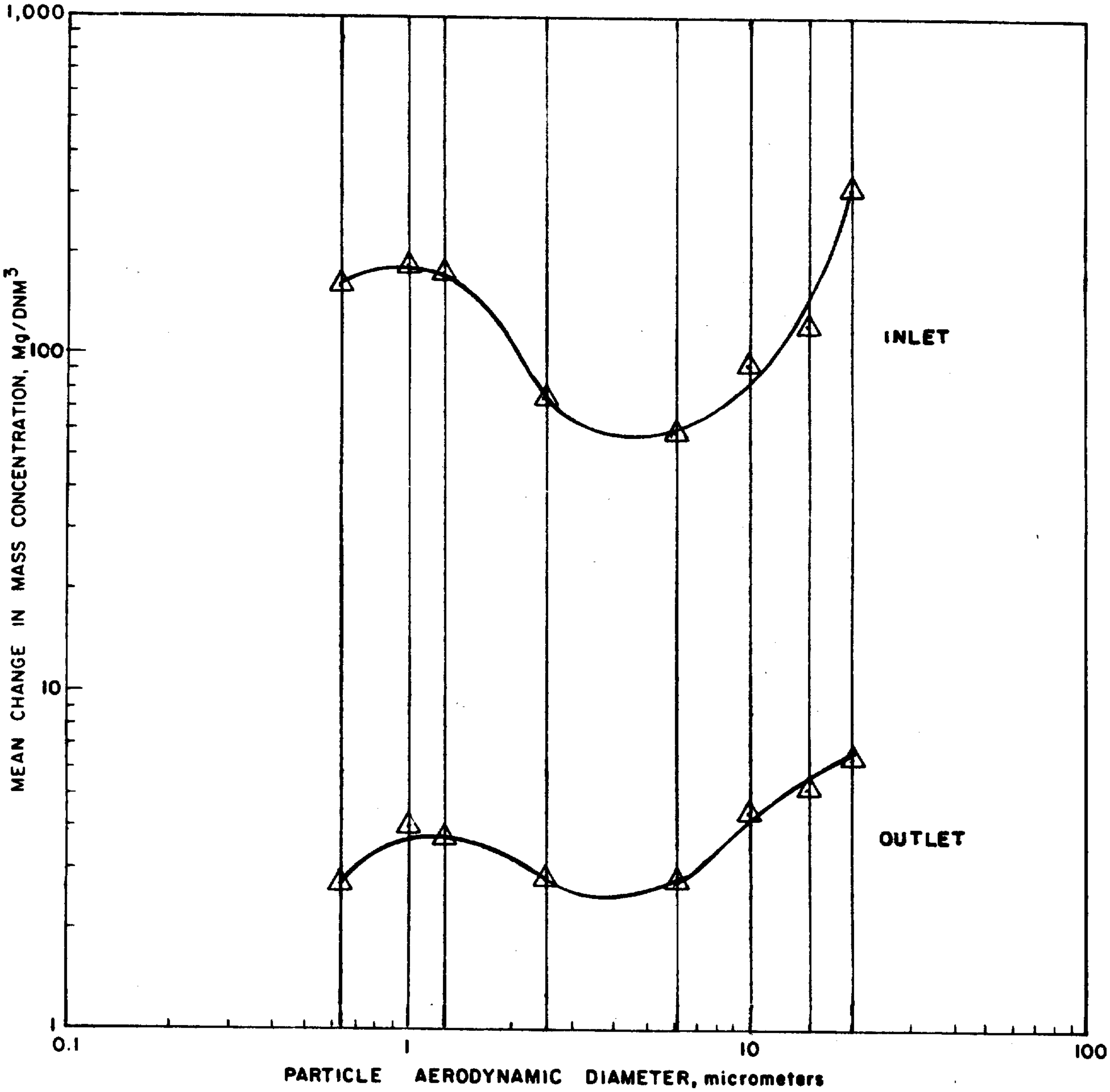

Figure 9. Average change in concentration per particle size (all runs), Foote Mineral Company, Graham, West Virginia.

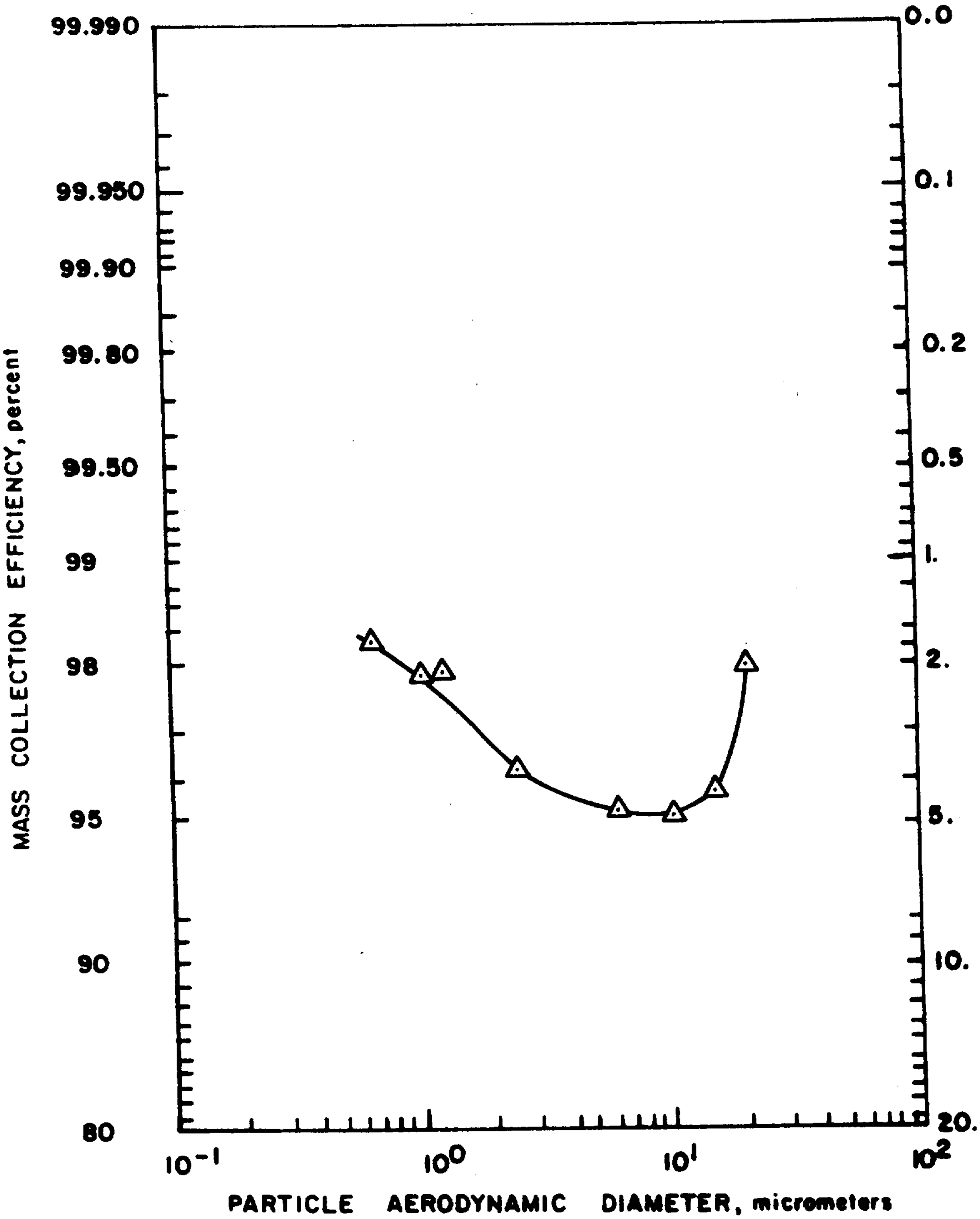

Figure 10. Baghouse efficiency by particle size, Foote Mineral Company, Graham, West Virginia.

TABLE 7. BAGHOUSE SIZE SPECIFIC PARTICULATE REMOVAL EFFICIENCIES, FOOTE MINERAL COMPANY, GRAHAM, WEST VIRGINIA

Particle aerodynamic (microns)	Inlet dM/d log D (mg/dnm^3)	Outlet dM/d log D (mg/dnm^3)	Removal efficiency (percent)
20	317	6.37	98.0
15	123	5.23	95.7
10	93.3	4.47	95.2
6	58.8	2.74	95.3
2.5	76.0	2.83	96.3
1.25	177	3.80	97.9
1.00	187	4.08	97.8
0.63	164	2.82	98.3

TABLE 8. DUAL CYCLONE SAMPLER RESULTS, FOOTE MINERAL COMPANY, GRAHAM, WEST VIRGINIA

Date		3/17/81	3/17/81 and 3/18/81
Run Number	Units	1-2	3-4
Stack Gas Characteristics			
Temperature	°F	351	360
Velocity	afpm	3295	3585
Pressure	in. Hg abs.	28.8	28.7
Viscosity	micropoise	245.9	247.5
Volume Sampled	dscf	38.99	48.52
Sampler Flow Rate	acfm	0.33	0.33
Nozzle Diameter	in.	0.138	0.138
Isokinetic Sampling Rate	percent	92.5	85.0
Particulate Total Weight Caught[a]			
Cyclone III	mg	63.38	47.58
Cyclone X	mg	34.63	51.28
Total	mg	98.01	98.86
Particulate Emission Rates			
Cyclone III d_{50}	microns	6.8	6.9
Emissions < Cyclone III d_{50}	lb/hr	534.3[b]	396.3[b]
Cyclone X d_{50}	microns	16.2	16.3
Emissions between Cyclone III d_{50} and Cyclone X d_{50}	lb/hr	54.8	36.1
Emissions > Cyclone X d_{50}	lb/hr	30.0	38.9
Total	lb/hr	619.2[c]	471.2[c]
Particulate Emission Factors			
Average Emissions <6.85 μm d_{50}	lb/ton	59.3	
Average Emissions between 6.85 and 16.2 μm d_{50}	lb/ton	5.6	
Average Emissions >16.2 μm d_{50}	lb/ton	4.15	
Total Emission Rate	lb/ton	69.7[c]	

[a]Total weight of dry catch and rinse residue.

[b]Calculated using daily average total particulate emission rate from Method 5 tests less total caught in dual cyclone train since no backup filter was used to measure this fraction.

[c]The average of the corresponding two Method 5 test results.

The cyclone was assembled and operated per the IP protocol, and due to the anticipated large amount of fine particulate in the gas stream, the backup filter assembly was removed in order to increase the possibility of obtaining enough particulate in the collection cups to recover in a dry state. This eliminated quantification of the particles 2.5 μm by the cyclone train; however, this fraction could be calculated by difference between the total particulate (Level 2) results and the total catch from the two cyclones. Removal of the backup filter allowed total sample run times of approximately 200 minutes. This allowed collection of up to 98 mg particulate in the cyclones. This larger amount of sample and the longer test time substantially increases the viability of the results. The dual cyclone results are compared to the cascade impactor results graphically in Figure 11.

The dual cyclone results show a slightly higher fraction of particles in the 6 and 16 μm range than the impactor results. Only 2 cyclone runs are compared to 17 impactor runs in Figure 11 which could explain some of the difference. Particulate loss during recovery and gravimetric analysis is more of a problem with the cyclones than the impactor substrates since actual transfers of particulate from cyclone cup to a sample container to a second weighing container are required. These transfer steps usually result in some loss of particulate in both the impactor cyclone and series cyclones. During this test program, very little particulate was recovered from the cyclone precutter installed on the impactor. An average of 4 mg was caught in the impactor cyclone; an average of 47 mg was caught in each series cyclone, therefore any losses would effect the impactor results more. The sample recovery procedures for the impactor cyclone were identical to those for the dual cyclones. Care is taken during sample recovery and analysis to completely quantify particulate weights by careful rinsing and weighing, however, acetone does not completely remove particulate from the cyclone and sample container walls.

The results of previous tests using the series cyclones have always shown a lesser amount of 3 and 15 μm particles than the impactor results. In all previous tests, however, the cyclones were operated either horizontal or a degree of upside-down. This is the first test program where the cyclones were upright (at 45° from vertical). The capture efficiency of the cyclones may have been enhanced, however, the cyclones operating manual indicates that the orientation is not pertinent while the sampler is in operation.

SIZE-SPECIFIC PARTICULATE EMISSION FACTORS

The emission factors contained in Table 9 were calculated by applying the size distribution test results from GCA's Andersen testing to the total particulate data results from the Level 2 testing. The volumetric flow rate at the outlet of the baghouse was adjusted to include dilution air by consideration of the drop in stack gas temperature. It was not possible to accurately measure flow inside the baghouse utilizing EPA procedures; therefore, the outlet gas flow rate is based strictly on calculations by RTI. The fume and emission factors based on tons produced were calculated by dividing the hourly emission factors by the average production rate recorded by GCA and RTI during the test period.

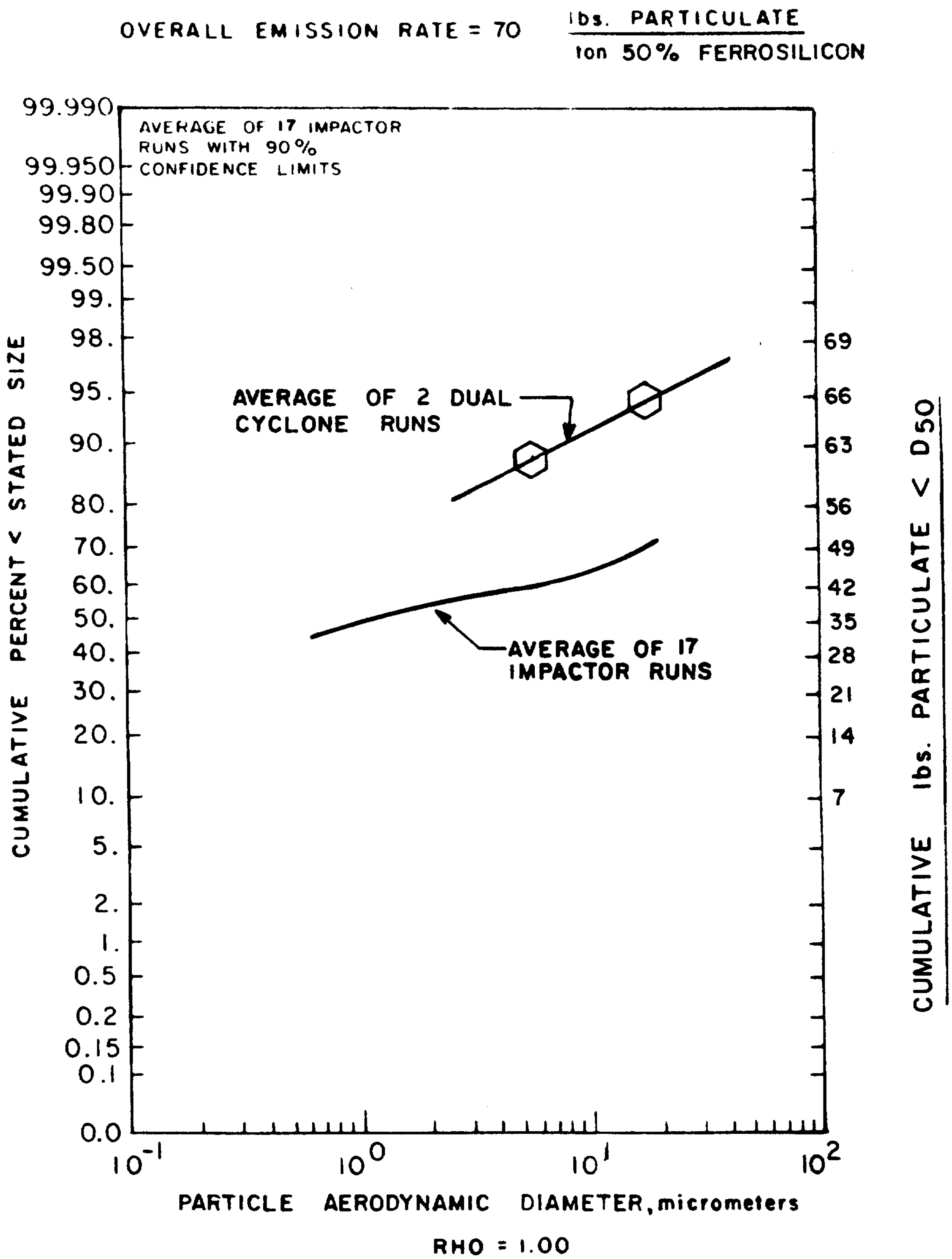

Figure 11. Comparison of dual cyclone and cascade impactor results, baghouse inlet, Foote Mineral Company, Graham, West Virginia.

TABLE 9. SIZE SPECIFIC EMISSION FACTORS, FOOTE MINERAL COMPANY, GRAHAM, WEST VIRGINIA

Sampling location		Particle aerodynamic diameter (d_{50}, μm)					
		∞[a]	15	10	6	2.5	1
Baghouse inlet	Cumulative % mass $<d_{50}$	100	66	63	61	57	50
	Cumulative lb $<d_{50}$/hr	517.6	341.6	326.1	315.7	295.0	258.8
	Cumulative lb $<d_{50}$/ton ferrosilicon	69.7	46.0	43.9	42.5	39.7	34.9
Baghouse outlet	Cumulative % mass $<d_{50}$	100	80	72	63	54	39
	Cumulative lb $<d_{50}$/hr	13.9	11.1	10.0	8.8	7.5	5.4
	Cumulative lb $<d_{50}$/ton ferrosilicon	1.84	1.47	1.32	1.16	0.99	0.72

[a]Obtained from total particulate "front half" test results by Entropy Environmentalists.

VISIBLE EMISSIONS DATA

All visible emissions observations were made in accordance with EPA Method 9. The field data sheets appear in Appendix E-2. Visible emissions were recorded during the 2 days of the test program. The furnace shop roof monitor was observed for 2 hours, the baghouse outlet for 2 hours. A summary of the visible emissions data obtained is presented in Table 10.

At no time during the testing period were visible emissions greater than 20 percent opacity observed originating from the baghouse compartments being tested. Five readings in the 20 to 25 percent range were recorded; these may have been due to dust transfer procedures. Capture efficiency of the canopy hood throughout the study, for all operations other than tapping, was close to 100 percent. Visible emissions originating from the furnace building could be attributed mainly to other operations in the shop such as casting and furnace repairs.

FURNACE OPERATIONS DATA

A process observer recorded furnace operations and cycle times, as well as fluctuations in furnace fume generation. Capture efficiency of the canopy hood and tapping hood was also assessed. Tapping, stoking, charging, and blows, all cause heavier emissions than just the smelting process. Fumes generated by stoking were usually completely captured by the canopy hood. Blows (characterized by an intense white flare) resulted in a short burst of heavier fumes and more flames than normal. Table 11 presents a summary of all materials charged to the furnace for the test day. The furnace was operated at an average of greater than 85 percent design capacity.

The furnace was tapped based on MW consumption. When a set amount of power has been consumed, which usually occurs every 90 minutes, the furnace is tapped. Table 12 presents the daily tap weights and average results of the alloy analysis performed by the source.

~~The product weight rate averaged about 7 ton/hour with an average~~ **tap duration of 30 minutes.**

Baghouse Observations

Individual compartment pressures, overall pressure, temperature range and fan currents, were recorded in the field and are presented in Appendix E-3. A summary of the recorded baghouse data is provided in Table 13. The source provided design parameters for the baghouse and these data are presented in Table 14.

TABLE 10. SUMMARY OF VISIBLE EMISSION OPACITY OBSERVATIONS FOOTE MINERAL COMPANY, GRAHAM, WEST VIRIGNIA

Date	3/18/81	3/18/81
Source	Baghouse roof monitor	Furnace shop roof monitor
Total No. of 15-second observations	480	479
Total minutes	120	120
Number of observations 0-5% opacity	473	456
Total minutes 0-5% opacity	113	114
Number of observations 10-15% opacity	6	6
Total minutes 10-15% opacity	5	0
Number of observations 20-25% opacity	1	0
Total minutes 20-25% opacity	0	0
Number observations >25% opacity	0	0
Total minutes >25% opacity	0	0

TABLE 11. CHARGE COMPOSITION AND WEIGHTS, FOOTE MINERAL COMPANY, GRAHAM, WEST VIRIGINIA

Date	Units	Quartz	Scrap	Wood chips	Silicon remelts	No. 1 coal	No. 2 coal	Regular scrap	Total materials
3/16/81	Tons	177.77	47.39	58.35	10.89	23.09	66.48	52.00	435.97
	Percent	40.8	10.9	13.4	2.5	5.3	15.2	11.9	100
3/17/81	Tons	195.18	36.56	66.04	14.20	22.69	64.11	59.37	458.15
	Percent	42.6	8.0	14.4	3.1	4.9	14.0	13.0	100
3/18/81	Tons	174.21	34.80	68.74	19.77	22.44	61.63	62.76	444.35
	Percent	39.2	7.8	15.5	4.4	5.1	13.9	14.1	100
	Average Tons	182.38	39.58	64.38	14.95	22.74	64.07	58.04	446.2
	Average Percent	40.9	8.9	14.4	3.3	5.1	14.4	13.0	100

TABLE 12. TAP WEIGHT AND ALLOY ANALYSIS, FOOTE MINERAL COMPANY, GRAHAM, WEST VIRGINIA

Date		3/16/81	3/17/81	3/18/81
Tap Weight (daily total)	lbs	338,600	351,600	315,500
	tons	169.3	175.8	157.7
Alloy Analysis				
Percent Silicon		47.73	47.05	47.55
Percent Calcium		0.25	0.45	0.28
Percent Chromium		0.24	0.18	0.24
Percent Aluminum		1.01	1.32	0.97
Percent Cesium		0.01	0.01	0.02

TABLE 13. BAGHOUSE OPERATING DATA, FOOTE MINERAL COMPANY, GRAHAM, WEST VIRGINIA

Date	3/17/81	3/18/81
Average Temperature °F[a]	349	356
Average Compartment Pressure "H_2O	10.5	10.5
Fan Amperage	290	290
Cleaning cycles:		
Collection period	15 minutes	
Clean period	45 seconds	
Null period	30 seconds	
Soft reinflate	20 seconds	

[a]Measured inlet temperature.

TABLE 14. BAGHOUSE CONTROL SYSTEM DESIGN PARAMETERS
FOOTE MINERAL COMPANY, GRAHAM, WEST VIRGINIA

COLLECTION SYSTEM(S)

Baghouse

a. Manufacturer: American Air Filter Inc.

b. Type or trade name: AMER-therm Collector

c. Model No.

d. No. of compartments: 11

e. Bags/compartment: 256

f. Bag l x d: 372 in. x 11.75 in.

g. Total cloth area: 268,535 ft^2 (12 compartments)

Fan

a. Manufacturer: Robinson

b. Model No.: TVC-CCW-Double inlet

c. Blade size: 104 in. x 36 ft 1/8 in.

d. Belt or direct drive: Belt

e. Power rating: 2 at 1500 Hp

f. Positive or negative pressure: Positive

Fabric

a. Manufacturer: Carborundum Co., Filter Media Division

b. Material: Glass cloth

c. Woven or felted: woven

d. Weave: 3:1 cf

e. Weight: 8.5 oz. sq. yard

(continued)

TABLE 14 (continued)

f. Thread Count: 54 x 52

g. Operatimg temp. range: 550°F

h. Surface treatment: Siliconized

i. Coating upon startup: Graphite

j. Guaranteed life: None

k. Actual life: 2 years

Cleaning System

a. Method: Reverse air

b. Frequency: 1 compartment/50 minutes

c. Actuated by: Timer

d. Anti-collapse rings: Yes

e. Wire mesh cages: None

f. Cleaning air: 300 Hp Robinson

Operating Parameters

a. Design volume flow rate: 450,000 acfm

b. Design temperature: 550°F

c. Gross media design efficiency: 99+

d. Design inlet grain loading:

e. Total power consumption: 2400 volts, 3300 Hp

f. Design air/cloth ratio: 1.68 acf/ft^2 min gross; 2.05 acf/ft^2 min net (9 compartments)

g. Design pressure (absolute): 24 in. H_2O

h. Design ΔP (WC): 24 in. H_2O

(continued)

TABLE 14 (continued)

Precollector	
a.	Manufacturer: American Air Filter
b.	Type: Multiclone
c.	Model No.: No. 9 VU14, Size 170-S
d.	Design Temperature: 1200°F
e.	Cooler surface area: 24,000 ft^2

APPENDIX A

SAMPLE TRAIN CALIBRATIONS

$P_B = 29.95$

DGm # VI

Man ΔH	D.G.M. Initial	DGM Final	DGM Net	W.T.M Initial	W.T.M Final	W.T.M Net	Temp In	Temp Out	WTM °F
				1	6	5	76	72	69°
0.05	428.582						76	72	
	428.91						76	72	
	429.300						76	72	
25.80 min	429.600						76	72	
	429.92						76	72	
	430.55						76	72	
	430.90						76	72	
	431.33						76	72	
	431.650						76	72	
	432.100						76	72	
	432.500						76	72	
	432.417						76	72	
	432.300						76	72	
		433.605	5.023				76	72	

Y = 1.005
ΔH@ = .738

BOX # V

ΔH						
0.05	0.1	0.2	0.3	0.4	0.5	1.0

.10

$P_B = 29.9$

DGM # V1

man ΔH	DGM Initial	DGM Final	DGM Net	WTM Initial	WTM Final	WTM Net	Temp In	Temp out	WTM OF
0.1	423.558			6	11	5	76	72	69°F
	424.00								
	424.2								
	424.67								
	425.40								
20.9 min	426.00								
	426.500								
	427.10								
	427.500								
	427.900								
	428.37								
	428.582								
		428.582	5.024						
0.2	396.700			9.5	14.5	5	76	72	69°F
	397.64								
	398.21								
14.5 min	398.81								
	399.52								
	400.71								
	401.01								
	401.714	401.714	5.014						

$Y = 1.004$
$\Delta H@ = 0.969$

$Y = 1.006$
$\Delta H@ = .931$

P_B = 29.95

DGM # V1

man ΔH	DGM Initial	DGM Final	DGM NET	WTM Initial	WTM Final	WTM NET	Temp In	Temp out	WTM °F
0.3	403.250			6	11	5	76	72	69°F
	404.42		Y = .997						
	404.95		ΔH@ = .863						
11.39 min	406.00								
	406.75								
	407.70								
	408.307	408.307	5.057						
0.4	408.307			1	6	5			
	409.52		Y = .994						
9.92 min	410.55		ΔH@ = .873						
	411.66								
	412.12								
	413.379	413.379	5.072						
0.5	413.379			6	11	5	76	72	
	414.20		Y = .994						
9.10 min	415.60		ΔH@ = .921						
	416.60								
	417.77								
	418.450	418.450	5.071						
1.0	418.450			1	6	5	76	72	
	420.52		Y = .986						
6.40 min	421.65		ΔH@ = .909						
	423.20								
	423.558	423.558	5.108						

TEST - FORTE MINERALS 1-616-027
CALIBRATIONS REC'D 03/25/8

Dry Gas Meter Calibrations - V1

ΔH → (in H_2O)	0.05	0.10	0.20	0.30	0.40	0.50	1.00
Wet Volume (ft^3)	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Dry Volume (ft^3)	5.023	5.024	5.014	5.057	5.072	5.071	5.108
Wet Temp. (°F)	69.0	69.0	69.0	69.0	69.0	69.0	69.0
Dry Temp. (°F)	74.0	74.0	74.0	74.0	74.0	74.0	74.0
Time (min)	25.00	20.90	14.50	11.39	9.92	9.10	6.40
Barom. Pressure (in Hg)	29.95	29.95	29.95	29.95	29.95	29.95	29.95

Outputs

Y	1.005	1.004	1.006	0.997	0.994	0.994	0.986
ΔH_a	0.738	0.969	0.933	0.863	0.873	0.919	0.909
Q_a	0.195	0.240	0.346	0.444	0.511	0.557	0.798
C_c	0.031	0.062	0.123	0.185	0.246	0.308	0.616

... 4.40 mg

~~Rate~~ 0.00cm

V2

	DH mm	DG Init	DG Final	Net	Wt Init	Fin	Net	Temp In	Temp Out	Wtm T. °F
0	0.05	917.720			8	13	5	62	64	
		918.07						62	64	
		918.45						62	64	
4		919.01						62	64	
6		919.37						62	64	
8		919.52						62	64	
10		919.720						62	64	
12		919.97						62	64	
14	31:46 min	920.20						62	64	
16	31.7 min	920.75						62	64	
18		920.910						62	64	
20		921.17						62	64	
22		921.45						62	64	
24		921.78						62	64	
26		922.11						62	64	
28		922.34	922.704	4.984				62	64	
30										

$Y = .992$

$\Delta H@ = \cancel{1.142} \rightarrow 1.162$ BN

K.. Mar '81

P_B =

" 1:2

Time				Initial	Final	Net	Temp In	Temp Out	
0	0.1	925.700		4	9	5	67	63	
2		924.21					67	63	
4		924.60					67	63	
6	~~20.35~~	925.17					67	63	
8		925.47					67	63	
10	20.65	926.340					67	63	
12		926.6					67	63	
14		927.20					67	63	
16		927.66					67	63	
18		927.40	928.711	5.011			67	63	
							67		
0	0.2	929.715		0	5		67	63	
2		930.6					67	63	
4	~~15.02~~	931.					67	63	
6		931.8					67	63	
8	15.03	932.40					67	63	
10		933.02					67	63	
12		933.71					67	63	
14		934.400	934.730	5.015			67	63	$\bar{x}$ = 65
0	0.3	934.730		5	10	5	68	62	
2	~~15.20~~	935.60					68	62	
4		936.30					68	62	
6	14.62 min	936.370					68	62	
8		937.53					68	62	
10		938.48					68	62	
12		938.470	939.761	5.031			68	62	

Y = ~~.990~~ → 0.991
D HC = ~~.466~~ → 0.977
BN

Y = ~~.984~~ → 0.990
D HC = ~~1.473~~ → 1.037
BN

Y = .986
D HC = ~~1.432~~ → 1.472
BN

Page 2 of 3

Ambient { Bar 29.30
Temp. 66°F

D.C.M. #V2

Time	ΔH	D.G. Final	D.G. Initial	D.G. Net	W.T. Final	W.T. Initial	W.T. Net	Temp. °F in	Temp. °F out	W.T.M Temp. °F
0	0.4		955.980			85.000		62	64	68.6
			956.350					62	64
			957.475					62	64
			960.075					62	64
10.16		960.361	955.350	4.011	90.000	85.000	5.000			
								$\bar{X}$ = 63		

γ	0.993
ΔH@	1.629

Amb. { Bar 29.30
Temp 66°F

Time	ΔH	D.G. Final	D.G. Initial	D.G. Net	W.T. Final	W.T. Initial	W.T. Net	Temp. °F in	Temp. °F out	W.T.M Temp. °F
0	0.5		963.355			93.000		62	64	68.6
2			964.420					62	65
4			965.490					62	65
6			966.560					62	65
8			966.660					62	65
9.57		968.354	963.355	4.999	98.008	93.000	5.008			
								$\bar{X}$ = 63		

γ	0.[illegible]11
ΔH@	1.011

Amb. { Bar [illegible]
Temp [illegible]

Time	ΔH	D.G. Final	D.G. Initial	D.G. Net	W.T. Final	W.T. Initial	W.T. Net	Temp. °F in	Temp. °F out	W.T.M Temp. °F
0	1.0		969.355			99.000		62	65	68.6
2			970.833					62	66
4			972.345					62	66
6			973.840					62	66
8.06										
10		975.375	969.355	6.020	105.009	99.000	6.009			
								$\bar{X}$ = 64		

γ	0.9987
ΔH@	1.018

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Ambient { B.P. 29.
Temp

DGM H ! 3

Time	All							Temp °F in	Temp °F out	W.T.M Temp °F
			140.9					59	63	68.6
2	0.0		141					60	63	
			141					60	63	
			141					60	63	
			142					61	64	
10			142 6.					61	64	
12			142					61	64	
14			143					61	64	
16			143					61	64	
18			143.815					62	65	
			144					63	66	
22			144.33					63	66	
24			144.70					64	66	
26			145.190					64	66	
			145.					64	67	
	30.00		145.					64	68	
		145.848	145.110		11.	0.00	0.04			

$\bar{X}$ = 63.25

Y = 1.0
Y/Y = 1.013

Time	All							Temp °F in	Temp °F out	W.T.M Temp °F
0	0.1		146			12.000		64	69	68.6
2			147.3					64	69	67
4			147.					64	69	
6			148					64	70	
8			148.165					64	70	
10			149					64	70	
12			149					65	70	
14			150 2.0					65	70	
16			150.705					65	70	
18			151 1					65	70	
20			151					66	70	
	20.39	151.767	146.8	4.9	11.003	12.000	0.003			

$\bar{X}$ = 67

Y 1.013
Y/Y 0.947

50 6 March '81

BAR. 29.00 "Hg

LO

DGM # V3

Min	ΔH	D.G. Initial	D.G. Final	D.G. Net	W.T. Initial	W.T. Final	W.T. Net	D G T. °F In	D G T. °F Out	WTM T° F	WTM ΔP
	0.20	104.505			6.5	11.5	5	71	65	70.5	
		105.44									
		105.95									
	(14.67 min)	106.57									
		107.20									
0		108.55									
2		109.25									
4		109.519		5.014				69.5			
0	0.30	110.030			2	7	5	72	68	70.5	
2		110.920									
4	(12.15 min)	111.70									
6		112.50									
8		113.30									
10		114.120									
12		115.068		5.038							
0	0.40	117.110			9	14	5	68	74	70.5	
2	(10.6 min)	118.01									
		118.98									
6		119.99									
8		120.92									
10		122.173		5.063							

$\boxed{Y = .995 \quad \Delta H@ = .968}$

$\boxed{Y = .991 \quad \Delta H@ = 1.001}$

$\boxed{Y = .988 \quad \Delta H@ = 1.014}$

K. Meserve 5 Mar. '81

 BAR. 29.80"Hg

DGm# V3

Time min	ΔH MAN	D.G. Initial	D.G. Final	D.G. Net	WT Initial	WT Final	WT Net	DG T. °F In	DG T. °F Out	WTM T °F	WTM Pr
0	0.5	123.185			5	10	5	69	75	70.5	
2		124.30									
4		125.52									
6	9.45	126.45									
8		127.30									
10		128.265		5.080				72			
0	2.0	129.290			1	11	10	69	75		
2		131.46									
4	9.6 min	134.30									
6		135.61									
8		137.80									
10		139.535		10245				72			
12											

$Y = .986$
$\Delta H@ = 1.006$

$Y = .974$
$\Delta H@ = 1.034$

K. [illegible] 5 Mar. '81

Dry Gas Meter Calibrations - V2

ΔH →	(in H_2O)	0.05	0.10	0.20	0.30	0.40	0.50	1.00	
Wet Volume	(ft^3)	5.00	5.00	5.00	5.00	5.006	5.008	6.009	
Dry Volume	(ft^3)	4.984	5.011	5.015	5.031	4.981	4.999	6.020	
Wet Temp.	(°F)	68.6	68.6	68.6	68.6	68.6	68.6	68.6	
Dry Temp.	(°F)	63.0	65.0	65.0	65.0	63.0	63.0	64.0	
Time	(min)	31.76	20.63	15.03	14.62	10.56	9.37	8.06	
Barom. Pressure	(in Hg)	29.40	29.40	29.40	29.40	29.30	29.30	29.30	
Outputs									
Y		0.992	0.991	0.990	0.986	0.993	0.990	0.987	
ΔH_a		1.162	0.977	1.037	1.472	1.029	1.012	1.038	
Q_a		0.157	0.243	0.334	0.344	0.472	0.534	0.747	
C_c		0.031	0.062	0.123	0.185	0.247	0.308	0.618	

Dry Gas Meter Calibrations - V3

$\Delta H \rightarrow$	(in H_2O)	0.05	0.10	0.20	0.30	0.40	0.50	2.00
Wet Volume	(ft^3)	5.004	5.003	5.000	5.000	5.000	5.000	10.000
Dry Volume	(ft^3)	4.978	4.937	5.014	5.038	5.063	5.080	10.245
Wet Temp.	(°F)	68.6	68.7	70.5	70.5	70.5	70.5	70.5
Dry Temp.	(°F)	63.2	67.1	69.5	70.0	71.0	72.0	72.0
Time	(min.)	30.06	20.39	14.62	12.15	10.60	9.45	9.60
Barom. Pressure	(in Hg)	29.30	29.30	29.80	29.80	29.80	29.80	29.80
Outputs								
Y		1.015	1.010	0.995	0.991	0.988	0.986	0.974
ΔH_a		1.042	0.953	0.967	1.001	1.014	1.005	1.037
Q_a		0.162	0.242	0.343	0.415	0.478	0.538	1.067
C_c		0.031	0.062	0.123	0.184	0.246	0.308	1.233

Pg 1 of 8

Bar 29.90

5 Mar. '81

DGM # V4

Time	ΔH man	D.G. Initial	D.G. Final	D.G. Net	WT Initial	WT Final	WT Net	DGT °F In	DGT °F out	WTh °F
0	.05	9.395						76	78	
2		9.70								assume
4		10.13								70°F
6		10.410								
8		10.85								
10		11.16								
12		11.40								
14		11.83								
16		12.1								
18	30.3 min	12.45								
20		12.73								
22		13.12								
24		13.34								
26		13.82								
28		14.16								
30		14.40	14.464	5.119	9.5	14.5	5			

$\boxed{Y = .993}$

$\boxed{\Delta H@ = 1.025}$

K. Mescine

DGm # V4 Bp = 29.44

Time	ΔH mm	D.G Initial	D.G Final	D.G NeT	WT Initial	WT Final	WT NeT	D.G.T °F In , out
0	0.1	19.045			9	14	5	75 77
2		19.730						
4		20.10		$\boxed{y = .991 \quad \Delta H@ = .859}$				
6	$\boxed{19.55\text{mm}}$	20.65						
8		21.21						
10		21.65						
12		22.30						
14		22.70						
16		23.22						
18		23.78						
		24.154	24.154	5.109				
0	0.2	976.852			8	13	5	72 72
2		977.650						
4		978.270		$\boxed{y = .994 \quad \Delta H@ = .912}$				
6	14.25mm	978.42						
8		979.95						
10		980.45						
12		981.33						
14		981.914	981.914	5.064				
0	0.3	982.955			5	10		74 74
2		984.95		$\boxed{y = .990 \quad \Delta H@ = .936}$				
4	$\boxed{11.80\text{mm}}$	985.97						
6		986.60						
8		987.40						
10		988.61	989.054	5.099				

D Gm# V4

Time	ΔH min	D.C. Initial	D.C. Final	D.C. Net	WT Initial	WT Final	WT Net	D.C.T In	D.C.T Out
0	0.4	990.375			1	6	5	76	78
2		991.40		Y =	.991				
4	10min	992.85		ΔH@	.842				
6		993.30							
8		994.510							
10		995.440	995.440						
0	0.5	996.750			7	12	5	76	78
2		997.750		Y =	1.008				
4	9.1min	998.880		ΔH@ =	.923				
6		1000.00							
8		1,000							
		1001.605	x	5.135	4.855				
0	1.0	3.675						76	78
2		5.80		Y =	.982				
4	6.5min	6.80		ΔH@ =	.942				
6		8.40							
8		8.835		5.160					

Dry Gas Meter Calibrations - V4

ΔH →	(in H_2O)	0.05	0.10	0.20	0.30	0.40	0.50	1.00
Wet Volume	(ft^3)	5.000	5.000	5.000	5.000	5.000	5.000	5.000
Dry Volume	(ft^3)	5.119	5.109	5.064	5.099	5.125	5.135	5.160
Wet Temp.	(°F)	70.0	70.0	70.0	70.0	70.0	70.0	70.0
Dry Temp	(°F)	77.0	76.0	72.0	74.0	77.0	77.0	77.0
Time	(min)	30.30	19.55	14.25	11.80	10.00	9.10	6.50
Barom. Pressure	(in Hg)	29.80	29.44	29.44	29.44	29.44	29.44	29.44

Outputs

Y	0.990	0.989	0.991	0.987	0.988	0.985	0.979
ΔH_a	1.022	0.963	0.924	0.946	0.901	0.933	0.952
Q_a	0.169	0.261	0.355	0.432	0.513	0.564	0.794
C_c	0.031	0.063	0.125	0.188	0.252	0.315	0.630

3/4/81

inches

straight nozzles

Set 1

	1st	2nd	3rd	Average
G	0.124	0.126	0.126	0.125
H	0.180	0.180	0.185	0.181
I				0.251
J				0.311
K				0.375
L				0.501

SET 2

	Average
G	0.124
H	0.188
I	0.250
J	0.311
K	0.374
L	0.500

Set 3

	Average
F	0.127
G	0.185
H	0.250
I	0.310
J	0.372
K	0.500

46 0.125

4H 0.186

APPENDIX B-1

EXAMPLE CALCULATOR ANDERSEN CASCADE IMPACTOR

The field sampling and laboratory analysis data is reduced by programmable calculation to provide the following input to the SORI data reduction system:

1. Impactor identification (required to call up hardware information)
2. Fractional gas composition (CO_2, CO, N_2, O_2, H_2O)
3. Impactor flow rate (ACFM at stack conditions)
4. Stack pressure (inches of mercury)
5. Stack temperature (degrees Fahrenheit)
6. Gas temperature within impactor (degrees Fahrenheit)
7. Duration of sampling (minutes)
8. True density of particles (grams per cubic centimeter)
9. Maximum particle diameter present in sample (micrometers)
10. Masses of catches by stage (milligrams)

The following field data are also entered into the calculator to obtain the above input data:

- Barometric pressure (inches of mercury)
- Molecular weight of gas stream at meter (lb/lb-mole)
- Average static pressure at meter (inches of mercury)
- Average temperature at meter (°F)
- Water collected in condenser and silica gel (grams)

- Gas volume at meter (ft^3)
- Average stack static pressure, (inches of water)
- Average stack temperature (°F)
- Particulate mass collected in probe and expander section prior to top stage (grams)
- Particulate mass collected on each impactor stage (grams)
- Particulate mass on backup filter (grams)

The following calculations are performed by the calculator as a preliminary data check, however the results reported in the Appendix are the computer printouts detailing the calculations performed by the Data Reduction System developed by SoRI (EPA-600/7-78-042).

a. <u>Total Mass Collected</u>:

$$M_T = M_p + \sum_{L=t}^{b} M_s + M_f$$

where: M_T = total mass collected (grams)

M_p = mass collected in probe and impactor prior to top impactor stage (grams)

M_s = mass collected on impactor stage (grams)

L=t = corresponds to the top impactor stage

L=b = corresponds to the bottom impactor stage

M_f = mass collected on backup filter (grams)

b. Volume H_2O Vapor at STP:

where: V_{H_2O} = volume of water vapor @ STP (ft^3)

W = water collected (grams)

STP = 29.92 in. Hg and 70°F

c. Meter Volume at STP:

$$V_{ms} = V_m \left(\frac{P_b - P_m}{T_m + 460}\right)\left(\frac{530}{29.92}\right)$$

where: V_{ms} = meter volume @ STP (ft^3)

V_m = meter volume (ft^3)

P_b = barometric pressure ("Hg)

P_m = average static pressure at meter (-"Hg)

T_m = average meter temperature (°F)

d. Total Volume Sampled at STP, V_T (ft^3):

(1) Outlet impactor only

$$V_T = V_{H_2O} + V_{ms}$$

(2) Inlet impactor only

$$V_T = V_{ms}/F$$

where: F = dry gas fraction.

e. Percent Moisture, H_2O (%):

$$H_2O = (V_{H_2O}/V_T)\ (100)$$

f. Mass Concentration, C_m (grains/dscf):

$$C_m = (M_T/V_{ms})\ (15.43 \text{ grains/gram})$$

g. Volume Sampled at Stack Conditions:

$$V_s = V_T \left(\frac{T_s + 460}{P_b + P_s/13.596}\right)\left(\frac{29.92}{530}\right)$$

where: V_s = volume sampled at stack conditions (ft^3)

T_s = average stack temperature (°F).

P_s = average stack static pressure (+ "H_2O)

h. Impactor Flow Rate:

$$Q_I = V_s/t$$

where: Q_I = impactor flow rate (acfm)

t = time (minutes)

i. Impactor Stage Size Cutoffs:

$$d_{pca} = \left(\frac{0.135\ \pi \mu g\ d_c^{\ 3}\ N\ K_{p50}}{Q\ (10^{-8})} \right)^{1/2}$$

with $d_{pca} = dp\ (C\ \ \rho p)^{1/2}\ 10^4$

and $C' = 1 + \frac{2\lambda}{dp}\ [1.257 + 0.40 \exp\ (^1{-1.10}\ dp/2\lambda)\ ]$

where: C' = Cunningham slip correction factor

λ = mean free path of gas molecules, cm

d_p = particle diameter, cm

ρp = particle density, g/cm^3

d_{pca} = cut diameter, m $(g/cm^3)^{1/2}$

μg = gas viscosity, g/cm-sec

dc = jet diameter, cm

N = number of jets in an impaction stage

K_{p50} = inertial impaction cut parameter at 50 percent efficiency*

Q = total flow rate, l/min

j. Percent Mass Collected on Backup Filter, P_F (%)

$$P_F = (M_f/M_T)\ 100$$

k. Percent Mass Collected on Each Impactor Stage, P_I (%)

$$P_I = (M_s/M_T)\ 100$$

l. Percent Mass Collected in Probe and Impactor Prior to Top Impactor Stage, P_p (%)

$$P_p = (M_p/M_T)\ 100$$

m. Cumulative Percent Mass ≤ Stage Cutoff Diameter for Each Impactor Stage, C_{pn} (%)

$$C_{pn} = \sum_{L=b}^{n=1} P_I + P_F$$

where: L=b = corresponds to the bottom impactor stage

L=n = corresponds to the impactor stage of interest

n. <u>dM/d Log D (grains/dscf)</u>:

$$dM/d\ \log D = \frac{(P_I/100)\ C_m}{(\log D_{s+1}) - (\log D_s)}$$

where: P_I = percent mass collected on a particular stage s (%)

o. Geometric Mean Diameter, D_M (μm):

$$D_M = \sqrt{D_{s+1} \times D_s}$$

---

*d_{50} from manufacturers calibration curves.

APPENDIX B-2

EXAMPLE CALCULATIONS
DUAL CYCLONE SAMPLERS

1. Calculate stack gas velocity given flow rate by RTI

$$V_s = Q_s \times 288.13 \times \frac{(T_s + 460)}{A_s \times M_d \times P_s}$$

where V_s = velocity in afpm
Q_s = flow rate in dscm/min
T_s = gas temperature in °F
A_s = stack or duct area in square inches
M_d = mole fraction of dry gas - unitless
P_s = stack gas absolute pressure in inches Hg.

and

$$288.13 = 35.31 \frac{\text{dscf}}{\text{dscm}} \times 29.92 \text{ in. Hg abs} \times \frac{144 \text{ in}^2/\text{ft}^2}{528°\text{R}}$$

2. Gas viscosity calculation

$$= 174.4 + 0.406\ (T_s\ °\text{C}) \text{ in micropoise}$$

3. Isokinetic rate

$$\%\ I = \frac{1039 \times (T_s + 460) \times V_m \text{ STD}}{V_s + TT \times P_s \times M_d \times (DN)^2}$$

4. Cyclone III cut size

$$\text{Cyclone III } d_{50} = [0.024\ \ - 3.09]\ Q_i^{-0.8} \text{ in microns}$$

where $\quad$ = viscosity in micropoise

Q_i = sampler flow rate in acfm.

5. Cyclone X cut size

$$\text{Cyclone X } d_{50} = 15 \quad \frac{Q_{cal}}{Q_i}$$

where $Q_{cal} = 69.5 \log \quad - 150.0$

APPENDIX C

TOTAL PARTICULATE EXAMPLE CALCULATIONS (BY RTI)

1.00

Baghouse Inlet

A. Concentrations in gas check with those I gave you prev

B. Kg generated / hour

(10⁻⁶) Conc in gas mg/dsm³ (Flowrate dsm³/min)(60) = Kg/hr

Run #1	( )(696.2)(.6994)(60) =	292.2 Kg	÷	644.1 lb/hr
Run #2	( ) (600) (7487)(60) =	269.5 Kg	=	594.2
Run 3	( ) (481.8)(8165)(60) =	236.0		520.4
Run 4	( ) (422.7)(7551)(60) =	191.5		422.2
Run 5	( ) (390.1)(7905)(60) =	185.0		407.9
		234.8		517.8

C. Avg Load during Test

Run #	meter reading at	MW	in hours	Avg Load
1	950 - 1200	65	2.167	30.0
Run 2	1200 - 1600	130	4	32.5
3	1600 - 1810	70	2.167	32.3
4	1300 - 1530	83	2.5	33.2
5	1600 - 1807	69	2.11667	32.6

D. Generated / mw-hr

Run No	Particulate/hr	÷	MW	=	Kg/mw-h	
1	292.2	÷	30	=	9.74 Kg/mw-h	21.47 lb/hr
2	269.5	÷	32.5	=	8.29	18.28
3	236.0	÷	32.3	=	7.31	16.11
4	191.5	÷	33.2	=	5.77	12.72
5	185.0	÷	32.6	=	5.67	12.51
					7.36	16.22

Run #1 Power consumed 8-4 shift = 248 MW-hr
Mix 95.16 Mg = 104.899 tons
95.16 Mg ÷ 248 MW-hr = 0.38371 Mg/MW-hr
0.38371 Mg/MW-hr × 30 MW-hr = 11.5113 Mg feed/hr
292.2 ÷ 11.5113 = 25.38 Kg/Mg feed = 50.77 lb/ton

Run #2 32.5 MW-hr × 0.38371 = 12.47 Mg/hr
269.5 ÷ 12.47 = 21.61 Kg/Mg = 43.22 lb/ton

Run #3 Power on 4-12 shift 252 MW
Mix 163.91 Mg = 180.68 tons
163.91 ÷ 252 = 0.6504 Mg/MW-hr

32.3 MWh × 0.6504 = 21.009 Mg/hr
236 ÷ 21.005 = 11.23 Kg/Mg = 22.47 lb/ton

Run #4 Power consumed 8-4 shift = 181 MW-hrs
100.93 Mg = 111.247 tons
100.93 ÷ 181 = 0.5576 Mg/MWh

33.2 MWh × 0.5576 Mg/MWh = 18.5131 Mg/hr
191.5 ÷ 18.513 = 10.34 Kg/Mg = 20.69 lb/ton

Run #5 4-12 shift power = 273 MW-hr
Mix feed 154.61 Mg = 170.43 tons

* Note: I have changed the value Sandy sent me for mix on this shift. I changed the amount of ± ttmon coal from 3.24 tons to 23.24 tons. The 3.24 ton figure is severely different from mix feed on other shifts, leads to a drastic change in the quartz/coal ratio, and if actually feed would probably have slagged up the furnace to the point of non operability. Changing to 23.24 brings it back in line with previous feed and with the % theoretical reduction. It still doesn't add up to her figure of 176 tons total mix.

154.61 ÷ 273 = 0.566337 Mg/MWh
32.6 MW × 0.566337 = 18.463 Mg/hr
185 ÷ 18.463 = 10.02 Kg/Mg = 20.04 lb/ton

... kg / Mg alloy (Front Inlet)

Run #1 power 248 MW-h 8-4 shift
Alloy 51,029 Kg - 112,500 lbs on shift
51,029 ÷ 248 = 0.20576 Kg/kW-h

30 MW × 0.20576 = 6.173 Mg/hour
292.2 ÷ 6.173 = 47.34 Kg/Mg = 94.67 lbs/t

Run #2 32.5 MW × 0.20576 = 6.687 Mg/hr
269.5 ÷ 6.687 = 40.30 Kg/Mg = 80.60 lb/ton

Run #3 55.588 Mg Tapped on 4-12 shift (122,550 lbs)
252 MW-hr on shift
55.588 ÷ 252 = 0.220587 Mg/MW-h
32.3 MW × 0.220587 = 7.1250 Mg/hr
236 ÷ 7.1250 = 33.12 Kg/Mg = 66.25 lb/t

Run #4 8-4 shift 39.621 Mg alloy = 87,350 lbs
181 MW on shift
39.621 ÷ 181 = 0.2189 Mg/MW-h
33.2 MW × 0.2189 = 7.2675 Mg/hr
191.5 ÷ 7.2675 = 26.35 Kg/Mg = 52.70 lb

Run #5 4-12 shift 56.835 Mg alloy = 125,300 lbs
power = 273 MW-hr/shift
56.835 ÷ 273 = 0.20819 Mg/MW-h
32.6 × 0.20819 = 6.7869 Mg/hr
185 ÷ 6.7869 = 27.26 Kg/Mg = 54.52 lb/ton

Baghouse outlet

A. First step is to get flow rate leaving Baghouse. Unfortunately we didn't get the gas temperature after the U-Tube coolers (or at least the correct temp). The inlet gas temp meter in the baghouse was reading about 400 °F, well above the temp at the inlet sample location. Thus either the meter was wrong or it reads temp before the inlet sample point.

Faced with this problem I have chosen to estimate the outlet flow rate based on comparison to other baghouses operating at similar outlet temp. and ambient temp. For Alamet, the outlet flow rate is about 32 percent ambient air with baghouse gas temp + ambient temp both slightly higher than for Foote. This number quite similar to other EPA tests where flow rate into grates of baghouse measured by wind anemometer. I have, therefore, assumed that 30 percent of the gas flow leaving the baghouse is ambient air drawn into the baghouse grates. This assumption to be pointed out in text of my report. It is inappropriate to assume outlet flow rate same as measured at inlet sample point. Even with this assumption, emission is still less than NSPS of 0.23 Kg/MW-hr.

Thus to get outlet flow rate, multiply the inlet flow rate by 1.4286

$$\left(\text{ie } 0.7\,(\text{outlet flow}) = \text{inlet flow} \qquad \text{outlet flow} = \frac{\text{inlet flow}}{0.7} = 1.4286 \text{ inlet flow} \right)$$

Run #1 $1.4286 \times 6994\ dsm^3/min = 9990\ dsm^3/min$

Lt Runs 2, 3 — 2 $(\quad)\left[\frac{(7487 + 8165)}{2}\right] = 11{,}180$

3 $(\quad)(7551) = 10{,}790$

These check with data previously given to you

C. Emitted/hour
(10^{-6}) (Conc in gas, mg/dsm³)(gas flowrate/min, dsm³/min)(60) = Kg/hr

Run 1 ( ) (6.13)(9990)(60) = 3.67 Kg/hr = 8.1 lb/hr
2 ( ) (10.21)(11,180)(60) = 6.85 = 15.1
3 ( ) (12.92)(10,790)(60) = 8.36 = 18.4

D. Avg Load

Run #1 meter readings at 950 – 1405 → 133 mw-hr in 4.25 hr
= 31.3 mw-hr/hr

Run 2 meter readings at 1405 – 1710 → 102 mw-hr in 3.0833
= 33.1 mw-hr/hr

Run #3 meter readings at 1300 – 1600 → 94 mw-hr in 3.0 h
= 31.3 mw-hr/hr

E. Emitted/mw-hr

	Kg/hr		mw		Kg/mw-hr	lb/mw-hr
Run #1	3.67	÷	31.3	=	0.117	0.258
2	6.85	÷	33.1	=	0.207	0.456
3	8.36	÷	31.3	=	0.267	0.589

F. Emitted / Mg feed
Power 8-4 shift 248 mw-hr, 95.16 Mg feed
= 0.38371 Mg/mw-hr
Run #1 0.38371 × 31.3 = 12.01 Mg/hr
3.67 ÷ 12.01 = 0.31 Kg/Mg = 0.61 lb/

Run #2 4-12 shift 252 mw-hr, 163.91 Mg feed
= 0.6504 Mg/mw-hr
0.6504 × 33.1 mw = 21.529 Mg/hr
6.85 ÷ 21.529 = 0.32 Kg/Mg = 0.64 lb/T

... Mg/ Mg feed

Run #3 power 8-4 = 181 mw-hr, 100.93 Mg feed
= 0.5576 Mg/mw-hr
power 4-12 = 273 mw-hrs, 154.61 Mg feed
= 0.5663 Mg/mw-hr
Run was 1 hr 3 min on 8-4 shift
and 1 hr 57 min on 4-8 shift
then

8-4 (1.05)(0.5576)(31.3) = 18.3255 Mg feed
4-12 (1.95)(0.5663)(31.3) = 34.5641 Mg feed
52.8896 Mg feed in 3 hrs
= 17.62988 Mg feed / hour
8.36 ÷ 17.62988 = 0.47 Kg/Mg feed = 0.95 lb/ton

G. Emitted / Mg alloy

Run #1 8-4 Shift Tapped 51.029 Mg, power 248 MWhr
= 0.20576 Mg alloy / mw-hr
0.20576 X 31.3 = 6.4403 Mg/ hour
3.67 ÷ 6.44 = 0.57 Kg/Mg alloy = 1.14 lb/ton

Run #2 4-12 Shift Tapped 55.583 Mg, power 252 mW
= 0.220567 Mg/ mw-hr
0.22057 X 33.1 = 7.301 Mg/hr
6.85 ÷ 7.301 = 0.938 Kg/Mg alloy = 1.88 lb/ton

Run #3 8-4 shift 39.621 Mg alloy, power 181 mw
= 0.2189 Mg/mw-hr
4-12 shift 56.835 Mg alloy, power 273 mw
= 0.20819 Mg/mw-hr

4-8 shift (1.05 hours)(0.2189)(31.3 mw) = 7.194 Mg feed
8-4 shift (1.95 hour)(0.20819)(31.3 mw) = 12.707 Mg feed
19.90 Mg ~~feed~~ 3 hours
= 6.634 Mg/hr
8.36 ÷ 6.634 = 1.26 Kg/Mg = 2.52 lb/ton

APPENDIX D-1

CASCADE IMPACTOR DATA REDUCTION SYSTEM PRINTOUTS,
BAGHOUSE INLET

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 11/29/83 10:20:30
DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 1
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 1IA15
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.8

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .257 ACFM IMPACTOR TEMPERATURE = 351.0 F (177.2 C) SAMPLING DURATION = 2.50 MIN

IMPACTOR PRESSURE DROP = .083 IN. OF HG STACK TEMPERATURE = 351.0 F (177.2 C) STACK PRESSURE = 27.40 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.70 O2 = 17.90 H2O = .40

CALC. MASS LOADING = 4.1289-001 GR/ACF 6.9328-001 GR/DNCF 9.4483+002 MG/ACM 1.5865+003 MG/DNCM
SAMPLING AT 76.3 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	19.92	17.36	15.33	10.22	6.83	3.79	1.84	1.13	.60	.60/2.0
MASS (MG)	10.89	.18	.23	.01	.25	.51	.17	.78	.81	3.36
MG/DNCM/STAGE	1.01+003	1.66+001	2.12+001	9.23-001	2.31+001	4.71+001	1.57+001	7.20+001	7.48+001	3.10+002
CUM. % OF MASS < D50	36.65	35.60	34.26	34.21	32.75	29.78	28.80	24.26	19.55	
CUM. MASS (MG/ACM) < D50	3.46+002	3.36+002	3.24+002	3.23+002	3.09+002	2.81+002	2.72+002	2.29+002	1.85+002	
CUM. MASS (MG/DNCM) < D50	5.81+002	5.65+002	5.44+002	5.43+002	5.20+002	4.73+002	4.57+002	3.85+002	3.10+002	
CUM. MASS (GR/ACF) < D50	1.51-001	1.47-001	1.41-001	1.41-001	1.35-001	1.23-001	1.19-001	1.00-001	8.07-002	
CUM. MASS (GR/DNCF) < D50	2.54-001	2.47-001	2.38-001	2.37-001	2.27-001	2.06-001	2.00-001	1.68-001	1.36-001	
GEO. MEAN DIA.(MICRONS)	3.73+001	1.86+001	1.63+001	1.25+001	8.35+000	5.09+000	2.64+000	1.44+000	8.25-001	4.26-001
DM/DLOGD (MG/DNCM)	1.04+003	2.78+002	3.93+002	5.24+000	1.32+002	1.84+002	5.00+001	3.41+002	2.73+002	1.03+003
DN/DLOGD (NUMBER/DNCM)	6.75+007	8.25+007	1.73+008	5.10+006	4.32+008	2.67+009	5.19+009	2.17+011	9.28+011	2.54+013

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 17.36 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 15.33 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 1.8399127 3.7089188
*** LINEAR INTERPOLATION USED BETWEEN 10.218364 19.924791
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

S.D. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	313.875	368.624	403.709	463.497	510.632	541.427	564.951	581.675
DM/DLOGD (MG/DNCM)	.00	2.96+002	4.09+002	5.00+001	1.67+002	1.33+002	1.34+002	3.38+002

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 11/29/83 10:20:30
DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 2
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 1IA05
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.8

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3550
5	264	.0533	.0000	.3590
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .312 ACFM IMPACTOR TEMPERATURE = 351.0 F (177.2 C) SAMPLING DURATION = 4.00 MIN

IMPACTOR PRESSURE DROP = .122 IN. OF HG STACK TEMPERATURE = 351.0 F (177.2 C) STACK PRESSURE = 27.40 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.70 O2 = 17.90 H2O = .40

CALC. MASS LOADING = 1.1797-001 GR/ACF 1.9808-001 GR/DNCF 2.6995+002 MG/ACM 4.5328+002 MG/DNCM
SAMPLING AT 92.7 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	18.19	15.75	13.90	9.26	6.18	3.43	1.66	1.01	.53	.53/2.0
MASS (MG)	3.33	.12	.01	.14	.25	.04	.49	.45	.66	4.00
MG/DNCM/STAGE	1.61+002	5.70+000	4.75-001	6.65+000	1.19+001	1.90+000	2.33+001	2.14+001	3.14+001	1.90+002
CUM. % OF MASS < D50	64.57	63.31	63.21	61.74	59.12	58.70	53.56	48.85	41.93	
CUM. MASS (MG/ACM) < D50	1.74+002	1.71+002	1.71+002	1.67+002	1.60+002	1.58+002	1.45+002	1.32+002	1.13+002	
CUM. MASS (MG/DNCM) < D50	2.93+002	2.87+002	2.87+002	2.80+002	2.68+002	2.66+002	2.43+002	2.21+002	1.90+002	
CUM. MASS (GR/ACF) < D50	7.62-002	7.47-002	7.46-002	7.28-002	6.97-002	6.92-002	6.32-002	5.76-002	4.95-002	
CUM. MASS (GR/DNCF) < D50	1.28-001	1.25-001	1.25-001	1.22-001	1.17-001	1.16-001	1.06-001	9.68-002	8.31-002	
GEO. MEAN DIA.(MICRONS)	3.57+001	1.69+001	1.48+001	1.13+001	7.57+000	4.60+000	2.38+000	1.30+000	7.36-001	3.78-001
DM/DLOGD (MG/DNCM)	2.74+002	9.10+001	8.79+000	3.77+001	6.77+001	7.41+000	7.38+001	1.00+002	1.13+002	6.31+002
DN/DLOGD (NUMBER/DNCM)	1.15+007	3.59+007	5.18+006	4.93+007	2.98+008	1.45+008	1.04+010	8.78+010	5.40+011	2.23+013

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 15.75 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 13.90 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 3.4258346 6.1830958
*** LINEAR INTERPOLATION USED BETWEEN 9.2608150 18.189036
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	198.078	220.771	231.072	258.810	267.879	281.313	289.019	296.519
DM/DLOGD (MG/DNCM)	1.16+002	1.08+002	1.02+002	6.90+001	3.06+001	4.53+001	4.38+001	1.37+002

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 11/29/83 10:20:30
DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 3
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 11B15
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.8

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3950
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .382 ACFM   IMPACTOR TEMPERATURE = 351.0 F (177.2 C)   SAMPLING DURATION = 2.50 MIN

IMPACTOR PRESSURE DROP = .183 IN. OF HG   STACK TEMPERATURE = 351.0 F (177.2 C)   STACK PRESSURE = 27.40 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.70 O2 = 17.90 H2O = .40

CALC. MASS LOADING = 1.2622-001 GR/ACF 2.1194-001 GR/DNCF 2.8884+002 MG/ACM 4.8499+002 MG/DNCM
SAMPLING AT 113.5 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM.   MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	16.54	14.22	12.55	8.34	5.57	3.08	1.43	.90	.47	.47/2.0
MASS (MG)	5.98	.29	.06	.58	.22	.00	.05	.11	.10	.42
MG/DNCM/STAGE	3.71+002	1.80+001	3.73+000	3.60+001	1.37+001	6.21-002	3.10+000	6.83+000	6.21+000	2.61+001
CUM. % OF MASS < D50	23.44	19.73	18.96	11.54	8.72	8.71	8.07	6.66	5.38	
CUM. MASS (MG/ACM) < D50	6.77+001	5.70+001	5.48+001	3.33+001	2.52+001	2.51+001	2.33+001	1.92+001	1.55+001	
CUM. MASS (MG/DNCM) < D50	1.14+002	9.57+001	9.20+001	5.59+001	4.23+001	4.22+001	3.91+001	3.23+001	2.61+001	
CUM. MASS (GR/ACF) < D50	2.96-002	2.49-002	2.39-002	1.46-002	1.10-002	1.10-002	1.02-002	8.40-003	6.79-003	
CUM. MASS (GR/DNCF) < D50	4.97-002	4.18-002	4.02-002	2.44-002	1.85-002	1.85-002	1.71-002	1.41-002	1.14-002	
GEO. MEAN DIA.(MICRONS)	3.40+001	1.53+001	1.34+001	1.02+001	6.82+000	4.15+000	2.14+000	1.16+000	6.52-001	3.33-001
DM/DLOGD (MG/DNCM)	5.93+002	2.74+002	6.88+001	2.04+002	7.77+001	2.41-001	9.79+000	3.17+001	2.19+001	8.66+001
DN/DLOGD (NUMBER/DNCM)	2.87+007	1.45+003	5.52+007	3.62+008	4.67+008	6.47+006	1.91+009	3.89+010	1.51+011	4.50+012

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 14.22 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 12.55 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 3.0826482 5.5742677
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	28.395	33.991	37.181	41.673	43.628	63.792	100.787	143.436
DM/DLOGD (MG/DNCM)	2.12+001	3.69+001	2.89+001	7.54+000	4.64+001	1.34+002	2.86+002	5.05+002

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 11/29/83 10:20:30
DATA FOR TEST BY CONTRACTOR CCA , AT SITE FOOT, ON DATE 31781, RUN NO. 4
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 11B65
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.8

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3050
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3520
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .335 ACFM IMPACTOR TEMPERATURE = 351.0 F (177.2 C) SAMPLING DURATION = 6.00 MIN

IMPACTOR PRESSURE DROP = .141 IN. OF HG STACK TEMPERATURE = 351.0 F (177.2 C) STACK PRESSURE = 27.40 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.70 O2 = 17.90 H2O = .40

CALC. MASS LOADING = 3.2938-001 GR/ACF 5.5307-001 GR/DNCF 7.5374+002 MG/ACM 1.2656+003 MG/DNCM
SAMPLING AT 99.5 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	17.59	15.19	13.41	8.93	5.96	3.30	1.59	.97	.51	.51/2.0
MASS (MG)	13.76	.00	.11	.05	.19	.69	2.12	2.49	3.60	19.89
MG/DNCM/STAGE	4.06+002	2.95-002	3.25+000	1.48+000	5.61+000	2.04+001	6.25+001	7.35+001	1.06+002	5.87+002
CUM. % OF MASS < D50	67.93	67.92	67.67	67.55	67.11	65.50	60.56	54.75	46.36	
CUM. MASS (MG/ACM) < D50	5.12+002	5.12+002	5.10+002	5.09+002	5.05+002	4.94+002	4.56+002	4.13+002	3.49+002	
CUM. MASS (MG/DNCM) < D50	8.60+002	8.60+002	8.56+002	8.55+002	8.49+002	8.29+002	7.66+002	6.93+002	5.87+002	
CUM. MASS (GR/ACF) < D50	2.24-001	2.24-001	2.23-001	2.23-001	2.21-001	2.16-001	1.99-001	1.80-001	1.53-001	
CUM. MASS (GR/DNCF) < D50	3.76-001	3.76-001	3.74-001	3.74-001	3.71-001	3.62-001	3.35-001	3.03-001	2.56-001	
GEO. MEAN DIA.(MICRONS)	3.51+001	1.63+001	1.43+001	1.09+001	7.30+000	4.44+000	2.29+000	1.25+000	7.06-001	3.61-001
DM/DLOGD (MG/DNCM)	6.77+002	4.63-001	6.00+001	8.36+000	3.19+001	7.93+001	1.90+002	3.43+002	3.79+002	1.95+003
DN/DLOGD (NUMBER/DNCM)	2.99+007	2.02+005	3.94+007	1.22+007	1.57+008	1.73+009	3.13+010	3.38+011	2.06+012	7.88+013

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 15.19 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 13.41 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 8.9322457 17.591031
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	621.127	697.539	733.281	809.959	849.433	855.726	858.568	870.291
DM/DLOGD (MG/DNCM)	3.87+002	3.78+002	3.42+002	1.83+002	4.52+001	1.61+001	1.61+001	3.46+002

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR CCA , AT SITE FOOT, ON DATE 31781, RUN NO. 5
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 2IA15
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.2

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .331 ACFM　　IMPACTOR TEMPERATURE = 366.0 F (185.6 C)　　SAMPLING DURATION = 6.00 MIN

IMPACTOR PRESSURE DROP = .135 IN. OF HG　　STACK TEMPERATURE = 366.0 F (185.6 C)　　STACK PRESSURE = 27.29 INCHES OF HG

DRY GAS COMPOSITION (PERCENT)　CO2 = 1.20　CO = .00　N2 = 80.00　O2 = 18.00　H2O = .00

CALC. MASS LOADING = 2.3615-001 GR/ACF　4.0383-001 GR/DNCF　5.4040+002 MG/ACM　9.2411+002 MG/DNCM
SAMPLING AT 98.3 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM.　　MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	18.15	15.39	13.59	9.05	6.04	3.34	1.61	.99	.52	.52/2.0
MASS (MG)	4.24	.00	.57	.40	.80	.62	.95	1.59	2.48	18.74
MG/DNCM/STAGE	1.29+002	3.04-002	1.73+001	1.22+001	2.43+001	1.89+001	2.89+001	4.83+001	7.54+001	5.70+002
CUM. % OF MASS < D50	86.05	86.05	84.17	82.85	80.22	78.18	75.06	69.82	61.66	
CUM. MASS (MG/ACM) < D50	4.65+002	4.65+002	4.55+002	4.48+002	4.34+002	4.22+002	4.06+002	3.77+002	3.33+002	
CUM. MASS (MG/DNCM) < D50	7.95+002	7.95+002	7.73+002	7.66+002	7.41+002	7.22+002	6.94+002	6.45+002	5.70+002	
CUM. MASS (GR/ACF) < D50	2.03-001	2.03-001	1.99-001	1.96-001	1.89-001	1.85-001	1.77-001	1.65-001	1.46-001	
CUM. MASS (GR/DNCF) < D50	3.47-001	3.47-001	3.40-001	3.35-001	3.24-001	3.16-001	3.03-001	2.82-001	2.49-001	
GEO. MEAN DIA.(MICRONS)	3.56+001	1.67+001	1.45+001	1.11+001	7.39+000	4.49+000	2.32+000	1.26+000	7.13-001	3.65-001
DM/DLOGD (MG/DNCM)	2.20+002	4.25-001	3.20+002	6.89+001	1.39+002	7.34+001	9.14+001	2.25+002	2.69+002	1.89+003
DN/DLOGD (NUMBER/DNCM)	9.28+006	1.74+005	2.02+008	9.65+007	6.55+008	1.55+009	1.39+010	2.15+011	1.42+012	7.43+013

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 15.39 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 13.59 OMITTED FROM INTERPOLATION

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	593.590	647.060	671.466	711.703	741.018	768.357	784.610	800.653
DM/DLOGD (MG/DNCM)	2.79+002	2.59+002	2.27+002	8.94+001	1.26+002	6.81+001	1.17+002	1.56+002

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 6
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 2IA05
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.2

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3050
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .326 ACFM   IMPACTOR TEMPERATURE = 366.0 F (185.6 C)   SAMPLING DURATION = 3.00 MIN

IMPACTOR PRESSURE DROP = .131 IN. OF HG   STACK TEMPERATURE = 366.0 F (185.6 C)   STACK PRESSURE = 27.29 INCHES OF HG

DRY GAS COMPOSITION (PERCENT)   CO2 = 1.20   CO = .00   N2 = 80.00   O2 = 18.00   H2O = .00

CALC. MASS LOADING = 3.8549-001 GR/ACF   6.5921-001 GR/DNCF   8.8214+002 MG/ACM   1.5085+003 MG/DNCM
SAMPLING AT 96.8 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM.   MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	18.28	15.51	13.69	9.12	6.09	3.37	1.63	.99	.52	.52/2.0
MASS (MG)	3.50	.13	.09	.35	.34	.51	1.08	1.64	1.72	15.07
MG/DNCM/STAGE	2.16+002	8.03+000	5.56+000	2.16+001	2.10+001	3.15+001	6.67+001	1.01+002	1.06+002	9.31+002
CUM. % OF MASS < D50	85.67	85.14	84.77	83.34	81.95	79.86	75.44	68.73	61.69	
CUM. MASS (MG/ACM) < D50	7.56+002	7.51+002	7.48+002	7.35+002	7.23+002	7.04+002	6.65+002	6.06+002	5.44+002	
CUM. MASS (MG/DNCM) < D50	1.29+003	1.28+003	1.28+003	1.26+003	1.24+003	1.20+003	1.14+003	1.04+003	9.31+002	
CUM. MASS (GR/ACF) < D50	3.30-001	3.28-001	3.27-001	3.21-001	3.16-001	3.08-001	2.91-001	2.65-001	2.38-001	
CUM. MASS (GR/DNCF) < D50	5.65-001	5.61-001	5.59-001	5.49-001	5.40-001	5.26-001	4.97-001	4.53-001	4.07-001	
GEO. MEAN DIA.(MICRONS)	3.59+001	1.68+001	1.46+001	1.12+001	7.45+000	4.53+000	2.34+000	1.27+000	7.20-001	3.69-001
DM/DLOGD (MG/DNCM)	3.71+002	1.13+002	1.03+002	1.22+002	1.20+002	1.23+002	2.11+002	4.73+002	3.79+002	3.09+003
DN/DLOGD (NUMBER/DNCM)	1.55+007	4.51+007	6.34+007	1.68+008	5.52+008	2.52+009	3.14+010	4.39+011	1.94+012	1.18+014

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 15.51 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 13.69 OMITTED FROM INTERPOLATION

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	957.431	1038.336	1089.480	1181.068	1235.438	1258.843	1277.057	1299.140
DM/DLOGD (MG/DNCM)	3.56+002	4.95+002	4.80+002	2.02+002	1.21+002	5.44+001	1.54+002	2.25+002

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR CCA , AT SITE FOOT, ON DATE 31781, RUN NO. 7
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 21015
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.2

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .388 ACFM IMPACTOR TEMPERATURE = 366.0 F (185.6 C) SAMPLING DURATION = 4.00 MIN

IMPACTOR PRESSURE DROP = .185 IN. OF HG STACK TEMPERATURE = 366.0 F (185.6 C) STACK PRESSURE = 27.29 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 80.00 O2 = 18.00 H2O = .00

CALC. MASS LOADING = 3.2008-001 GR/ACF 5.4735-001 GR/DNCF 7.3246+002 MG/ACM 1.2525+003 MG/DNCM
SAMPLING AT 115.2 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	16.84	14.20	12.54	8.35	5.57	3.08	1.48	.90	.47	.47/2.0
MASS (MG)	6.76	.45	.24	.32	.59	1.13	1.90	1.89	2.27	16.64
MG/DNCM/STAGE	2.63+002	1.75+001	9.34+000	1.25+001	2.30+001	4.40+001	7.39+001	7.35+001	8.83+001	6.47+002
CUM. % OF MASS < D50	79.00	77.60	76.86	75.86	74.03	70.52	64.62	58.74	51.69	
CUM. MASS (MG/ACM) < D50	5.79+002	5.68+002	5.63+002	5.55+002	5.40+002	5.17+002	4.73+002	4.30+002	3.79+002	
CUM. MASS (MG/DNCM) < D50	9.89+002	9.72+002	9.63+002	9.50+002	9.27+002	8.83+002	8.09+002	7.36+002	6.47+002	
CUM. MASS (GR/ACF) < D50	2.53-001	2.48-001	2.46-001	2.43-001	2.37-001	2.26-001	2.07-001	1.88-001	1.65-001	
CUM. MASS (GR/DNCF) < D50	4.32-001	4.25-001	4.21-001	4.15-001	4.05-001	3.86-001	3.54-001	3.22-001	2.83-001	
GEO. MEAN DIA.(MICRONS)	3.43+001	1.55+001	1.33+001	1.02+001	6.02+000	4.14+000	2.13+000	1.15+000	6.48-001	3.30-001
DM/DLOGD (MG/DNCM)	4.25+002	2.37+002	1.73+002	7.04+001	1.31+002	1.71+002	2.33+002	3.40+002	3.10+002	2.15+003
DN/DLOGD (NUMBER/DNCM)	2.01+007	1.22+008	1.39+009	1.26+009	7.87+009	4.60+009	4.57+010	4.22+011	2.18+012	1.15+014

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 14.20 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 12.54 OMITTED FROM INTERPOLATION

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	685.633	753.016	786.483	864.498	931.502	954.618	970.913	1007.509
DM/DLOGD (MG/DNCM)	3.00+002	3.65+002	3.26+002	2.26+002	1.73+002	[illegible]	[illegible]	3.60+002

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 8
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 2IB35
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.2

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .327 ACFM IMPACTOR TEMPERATURE = 366.0 F (185.6 C) SAMPLING DURATION = 4.00 MIN

IMPACTOR PRESSURE DROP = .132 IN. OF HG STACK TEMPERATURE = 366.0 F (185.6 C) STACK PRESSURE = 27.29 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 80.00 O2 = 18.00 H2O = .00

CALC. MASS LOADING = 1.7721-001 GR/ACF 3.0304-001 GR/DNCF 4.0552+002 MG/ACM 6.9346+002 MG/DNCM
SAMPLING AT 97.1 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	18.25	15.49	13.67	9.11	6.08	3.36	1.62	.99	.52	.52/2.0
MASS (MG)	2.40	.32	.05	.18	.24	.49	.27	.82	1.63	8.62
MG/DNCM/STAGE	1.11+002	1.48+001	2.31+000	8.31+000	1.11+001	2.26+001	1.25+001	3.79+001	7.53+001	3.98+002
CUM. % OF MASS < D50	84.02	81.89	81.56	80.36	78.76	75.50	73.70	68.24	57.39	
CUM. MASS (MG/ACM) < D50	3.41+002	3.32+002	3.31+002	3.26+002	3.19+002	3.06+002	2.99+002	2.77+002	2.33+002	
CUM. MASS (MG/DNCM) < D50	5.83+002	5.68+002	5.66+002	5.57+002	5.46+002	5.24+002	5.11+002	4.73+002	3.98+002	
CUM. MASS (GR/ACF) < D50	1.49-001	1.45-001	1.45-001	1.42-001	1.40-001	1.34-001	1.31-001	1.21-001	1.02-001	
CUM. MASS (GR/DNCF) < D50	2.55-001	2.48-001	2.47-001	2.44-001	2.39-001	2.29-001	2.23-001	2.07-001	1.74-001	
GEO. MEAN DIA.(MICRONS)	3.57+001	1.68+001	1.46+001	1.12+001	7.44+000	4.52+000	2.34+000	1.27+000	7.18-001	3.68-001
DM/DLOGD (MG/DNCM)	1.90+002	2.07+002	4.27+001	4.71+001	6.31+001	8.81+001	3.94+001	1.77+002	2.68+002	1.32+003
DN/DLOGD (NUMBER/DNCM)	7.94+006	8.32+007	2.65+007	6.47+007	2.93+008	1.82+009	5.89+009	1.65+011	1.38+012	5.07+013

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 15.49 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 13.67 OMITTED FROM INTERPOLATION

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	422.353	474.047	493.932	516.422	545.774	559.417	573.209	587.031
DM/DLOGD (MG/DNCM)	2.91+002	2.22+002	1.80+002	4.44+001	6.77+001	5.80+001	9.95+001	1.34+002

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 11/29/83 10:20:30
DATA FOR TEST BY CONTRACTOR GCA , AT SITE FCOT, ON DATE 31781, RUN NO. 9
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 3IA15
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.2

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3590
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .332 ACFM IMPACTOR TEMPERATURE = 340.0 F (171.1 C) SAMPLING DURATION = 6.00 MIN

IMPACTOR PRESSURE DROP = .141 IN. OF HG STACK TEMPERATURE = 340.0 F (171.1 C) STACK PRESSURE = 27.40 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 80.00 O2 = 18.00 H2O = .00

CALC. MASS LOADING = 1.1118-001 GR/ACF 1.8341-001 GR/DNCF 2.5442+002 MG/ACM 4.1971+002 MG/DNCM
SAMPLING AT 98.6 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	17.41	15.20	13.42	8.94	5.97	3.30	1.60	.98	.51	.51/2.0
MASS (MG)	6.04	.35	.00	.10	.05	.20	.38	.56	.71	5.16
MG/DNCM/STAGE	2.00+002	1.02+001	2.92-002	2.92+000	1.46+000	5.85+000	1.11+001	1.64+001	2.08+001	1.51+002
CUM. % OF MASS < D50	52.34	49.90	49.89	49.20	48.85	47.45	44.81	40.90	35.96	
CUM. MASS (MG/ACM) < D50	1.33+002	1.27+002	1.27+002	1.25+002	1.24+002	1.21+002	1.14+002	1.04+002	9.15+001	
CUM. MASS (MG/DNCM) < D50	2.20+002	2.09+002	2.09+002	2.06+002	2.05+002	1.99+002	1.88+002	1.72+002	1.51+002	
CUM. MASS (GR/ACF) < D50	5.82-002	5.55-002	5.55-002	5.47-002	5.43-002	5.28-002	4.98-002	4.55-002	4.00-002	
CUM. MASS (GR/DNCF) < D50	9.60-002	9.15-002	9.15-002	9.02-002	8.96-002	8.70-002	8.22-002	7.50-002	6.59-002	
GEO. MEAN DIA.(MICRONS)	3.49+001	1.63+001	1.43+001	1.10+001	7.30+000	4.44+000	2.30+000	1.25+000	7.08-001	3.63-001
DM/DLOGD (MG/DNCM)	3.31+002	1.74+002	5.41-001	1.66+001	8.33+000	2.28+001	3.52+001	7.66+001	7.44+001	5.01+002
DN/DLOGD (NUMBER/DNCM)	1.49+007	7.71+007	3.55+005	2.41+007	4.09+007	4.97+008	5.54+009	7.51+010	4.00+011	2.00+013

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 15.20 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 13.42 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 5.9666266 8.9379099
*** LINEAR INTERPOLATION USED BETWEEN 8.9379090 17.407903

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	157.184	172.630	180.783	195.409	205.034	208.698	216.721	227.466
DM/DLOGD (MG/DNCM)	7.39+001	8.41+001	7.65+001	3.36+001	1.17+001	4.56+001	4.56+001	2.04+002

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 11/29/03 10:20:10
DATA FOR TEST BY CONTRACTOR CCA , AT SITE FOOT, ON DATE 31781, RUN NO. 10
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 3IA85
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.2

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3050
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .335 ACFM IMPACTOR TEMPERATURE = 340.0 F (171.1 C) SAMPLING DURATION = 3.00 MIN

IMPACTOR PRESSURE DROP = .143 IN. OF HG STACK TEMPERATURE = 340.0 F (171.1 C) STACK PRESSURE = 27.40 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 80.00 O2 = 18.00 H2O = .00

CALC. MASS LOADING = 3.0038-001 GR/ACF 4.9554-001 GR/DNCF 6.8738+002 MG/ACM 1.1340+003 MG/DNCM
SAMPLING AT 99.5 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	17.33	15.13	13.36	8.90	5.94	3.29	1.59	.97	.51	.51/2.0
MASS (MG)	4.57	.16	.09	.00	.00	.73	1.19	1.23	1.17	10.42
MG/DNCM/STAGE	2.65+002	9.27+000	5.22+000	5.80-002	5.80-002	4.23+001	6.90+001	7.13+001	6.78+001	6.04+002
CUM. % OF MASS < D50	76.64	75.82	75.36	75.36	75.35	71.62	65.54	59.25	53.27	
CUM. MASS (MG/ACM) < D50	5.27+002	5.21+002	5.18+002	5.18+002	5.18+002	4.92+002	4.50+002	4.07+002	3.66+002	
CUM. MASS (MG/DNCM) < D50	8.69+002	8.60+002	8.55+002	8.55+002	8.54+002	8.12+002	7.43+002	6.72+002	6.04+002	
CUM. MASS (GR/ACF) < D50	2.30-001	2.28-001	2.26-001	2.26-001	2.26-001	2.15-001	1.97-001	1.78-001	1.60-001	
CUM. MASS (GR/DNCF) < D50	3.80-001	3.76-001	3.73-001	3.73-001	3.73-001	3.55-001	3.25-001	2.94-001	2.64-001	
GEO. MEAN DIA.(MICRONS)	3.48+001	1.62+001	1.42+001	1.09+001	7.27+000	4.42+000	2.29+000	1.24+000	7.04-001	3.61-001
DM/DLOGD (MG/DNCM)	4.37+002	1.57+002	9.65+001	3.28-001	3.30-001	1.65+002	2.18+002	3.33+002	2.43+002	2.01+003
DN/DLOGD (NUMBER/DNCM)	1.97+007	7.06+007	6.41+007	4.84+005	1.64+006	3.65+009	3.49+010	3.32+011	1.33+012	8.14+013

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 15.13 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 13.36 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 5.9392223 8.8971653
*** LINEAR INTERPOLATION USED BETWEEN 8.8971653 17.334460
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	622.255	676.584	710.819	788.292	854.450	857.056	865.901	879.346
DM/DLOGD (MG/DNCM)	2.24+002	3.40+002	3.32+002	2.11+002	3.65+001	5.02+001	5.02+001	2.69+002

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT. ON DATE 31781, RUN NO. 11
TEST COMMENTS: E.P. TEST FERROSILICON
RUN COMMENTS: 32215
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.2

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .333 ACFM   IMPACTOR TEMPERATURE = 340.0 F (171.1 C)   SAMPLING DURATION = 6.00 MIN

IMPACTOR PRESSURE DROP = .141 IN. OF HG   STACK TEMPERATURE = 340.0 F (171.1 C)   STACK PRESSURE = 27.40 INCHES OF HG

DRY GAS COMPOSITION (PERCENT)   CO2 = 1.20   CO = .00   N2 = 80.00   O2 = 18.00   H2O = .00

CALC. MASS LOADING = 2.6887-002 GR/ACF   4.4355-002 GR/DNCF   6.1526+001 MG/ACM   1.0150+002 MG/DNCM
SAMPLING AT 98.9 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM.   MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	17.38	15.18	13.40	8.92	5.96	3.30	1.59	.97	.51	.51/2.0
MASS (MG)	.34	.00	.12	.08	.18	.28	.13	.20	.43	1.72
MG/DNCM/STAGE	9.91+000	2.92-002	3.50+000	2.33+000	5.25+000	8.16+000	3.79+000	5.83+000	1.25+001	5.02+001
CUM. % OF MASS < D50	90.23	90.20	86.76	84.46	79.29	71.24	67.51	61.76	49.41	
CUM. MASS (MG/ACM) < D50	5.55+001	5.55+001	5.34+001	5.20+001	4.83+001	4.39+001	4.15+001	3.80+001	3.04+001	
CUM. MASS (MG/DNCM) < D50	9.16+001	9.16+001	8.81+001	8.57+001	8.05+001	7.23+001	6.85+001	6.27+001	5.02+001	
CUM. MASS (GR/ACF) < D50	2.43-002	2.43-002	2.33-002	2.27-002	2.13-002	1.92-002	1.82-002	1.66-002	1.33-002	
CUM. MASS (GR/DNCF) < D50	4.00-002	4.00-002	3.85-002	3.75-002	3.52-002	3.16-002	2.99-002	2.74-002	2.19-002	
GEO. MEAN DIA.(MICRONS)	3.49+001	1.62+001	1.43+001	1.09+001	7.29+000	4.43+000	2.29+000	1.25+000	7.07-001	3.62-001
DM/DLOGD (MG/DNCM)	1.64+001	4.94-001	6.47+001	1.32+001	2.99+001	3.10+001	1.20+001	2.73+001	4.49+001	1.67+002
DN/DLOGD (NUMBER/DNCM)	7.37+005	2.20+005	4.26+007	1.93+007	1.47+008	6.97+008	1.90+009	2.69+010	2.43+011	6.69+012

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 15.18 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 13.40 OMITTED FROM INTERPOLATION

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	54.616	63.057	65.965	70.051	80.560	86.776	90.352	92.864
DM/DLOGD (MG/DNCM)	4.87+001	3.34+001	2.72+001	1.46+001	3.18+001	2.11+001	1.95+001	2.15+001

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 11/29/83 10:20:30
DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 12
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 3IB05
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 99.2

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .320 ACFM IMPACTOR TEMPERATURE = 340.0 F (171.1 C) SAMPLING DURATION = 3.00 MIN

IMPACTOR PRESSURE DROP = .131 IN. OF HG STACK TEMPERATURE = 340.0 F (171.1 C) STACK PRESSURE = 27.40 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 80.00 O2 = 18.00 H2O = .00

CALC. MASS LOADING = 1.2944-001 GR/ACF 2.1353-001 GR/DNCF 2.9620+002 MG/ACM 4.8864+002 MG/DNCM
SAMPLING AT 95.0 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	17.71	15.48	13.67	9.11	6.08	3.37	1.63	1.00	.53	.53/2.0
MASS (MG)	4.35	.00	.14	.01	.11	.20	.00	.27	.12	2.85
MG/DNCM/STAGE	2.64+002	6.07-002	8.50+000	6.07-001	6.68+000	1.21+001	6.07-002	1.64+001	7.28+000	1.73+002
CUM. % OF MASS < D50	45.98	45.96	44.23	44.10	42.73	40.25	40.24	36.89	35.39	
CUM. MASS (MG/ACM) < D50	1.36+002	1.36+002	1.31+002	1.31+002	1.27+002	1.19+002	1.19+002	1.09+002	1.05+002	
CUM. MASS (MG/DNCM) < D50	2.25+002	2.25+002	2.16+002	2.15+002	2.09+002	1.97+002	1.97+002	1.80+002	1.73+002	
CUM. MASS (GR/ACF) < D50	5.95-002	5.95-002	5.72-002	5.71-002	5.53-002	5.21-002	5.21-002	4.77-002	4.58-002	
CUM. MASS (GR/DNCF) < D50	9.82-002	9.81-002	9.44-002	9.42-002	9.13-002	8.59-002	8.59-002	7.88-002	7.56-002	
GEO. MEAN DIA.(MICRONS)	3.52+001	1.66+001	1.45+001	1.12+001	7.44+000	4.53+000	2.34+000	1.27+000	7.24-001	3.72-001
DM/DLOGD (MG/DNCM)	4.42+002	1.04+000	1.57+002	3.44+000	3.80+001	4.73+001	1.92-001	7.68+001	2.62+001	5.75+002
DN/DLOGD (NUMBER/DNCM)	1.93+007	4.37+005	9.75+007	4.73+006	1.76+008	9.75+008	2.86+007	7.08+010	1.32+011	2.14+013

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 15.48 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 13.67 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN .52545142 .99704189
*** LINEAR INTERPOLATION USED BETWEEN 1.6297005 3.3606947
*** LINEAR INTERPOLATION USED BETWEEN 9.1065738 17.711725
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	174.926	180.374	189.414	196.656	208.577	216.703	222.368	231.873
DM/DLOGD (MG/DNCM)	2.62+001	6.50+001	7.92+001	1.92-001	4.16+001	3.18+001	3.17+001	2.3[illegible]+002

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 PARTICULATE DATA REDUCTION AND ENTRY SYSTEM     11/29/83         10:20:30
DATA FOR TEST BY CONTRACTOR CCA , AT SITE FOOT, ON DATE  31781, RUN NO. 13
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 4IA15
   *** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT   98.8


IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN  PLATE SET ID:     0
MODEL: MARK 3    IMPACTOR DP SCALING FACTOR:      1.287
STAGE  NO.JETS  DIAM.  CUMDP   CALIB
  1      264   .1638   .0000   .3050
  2      264   .1253   .0000   .4030
  3      264   .0948   .0000   .4100
  4      264   .0759   .0000   .3850
  5      264   .0533   .0000   .3690
  6      264   .0343   .1760   .3600
  7      264   .0254   .2940   .3620
  8      156   .0254  1.0000   .2740

 IMPACTOR FLOWRATE =  .341 ACFM              IMPACTOR TEMPERATURE =  360.0 F (182.2 C)      SAMPLING DURATION =   5.00 MIN

 IMPACTOR PRESSURE DROP =  .143 IN. OF HG     STACK TEMPERATURE =  360.0 F (182.2 C)        STACK PRESSURE = 27.08 INCHES OF HG

 DRY GAS COMPOSITION (PERCENT)       CO2 =  1.20          CO =    .00           N2 = 79.70          O2 = 17.90          H2O =    .40

 CALC. MASS LOADING = 1.3169-001 GR/ACF             2.2618-001 GR/DNCF              3.0136+002 MG/ACM              5.1759+002 MG/DNCM
SAMPLING AT  101.3 % OF ISOKINETIC RATE


 AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

 ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM.       MAX. PARTICLE DIAMETER =  70.0 MICRONS


IMPACTOR STAGE                  CYCLONE     S1         S2         S3         S4         S5         S6         S7         S8       FILTER
STAGE INDEX NO.                    1         2          3          4          5          6          7          8          9         10

D50 (MICRONS)                    17.69      15.11      13.34       8.88       5.93       3.28       1.58        .97        .50     .50/2.0
MASS (MG)                         2.92        .05        .01        .07        .03        .27        .35        .74       1.99       8.12
MG/DNCM/STAGE                  1.04+002  1.78+000  3.56-001  2.49+000  1.07+000  9.60+000  1.25+001  2.63+001  7.08+001  2.89+002
CUM. % OF MASS      < D50        79.93      79.59      79.52      79.04      78.83      76.98      74.57      69.48      55.81
CUM. MASS (MG/ACM)  < D50      2.41+002  2.40+002  2.40+002  2.39+002  2.38+002  2.32+002  2.25+002  2.09+002  1.68+002
CUM. MASS (MG/DNCM) < D50      4.14+002  4.12+002  4.12+002  4.09+002  4.08+002  3.98+002  3.86+002  3.60+002  2.89+002
CUM. MASS (GR/ACF)  < D50      1.05-001  1.05-001  1.05-001  1.04-001  1.04-001  1.01-001  9.82-002  9.15-002  7.35-002
CUM. MASS (GR/DNCF) < D50      1.81-001  1.80-001  1.80-001  1.79-001  1.78-001  1.74-001  1.69-001  1.57-001  1.26-001
GEO. MEAN DIA.(MICRONS)        3.52+001  1.63+001  1.42+001  1.09+001  7.26+000  4.41+000  2.28+000  1.24+000  6.98-001  3.57-001
DM/DLOGD (MG/DNCM)             1.74+002  2.60+001  6.58+000  1.41+001  6.08+000  3.74+001  3.93+001  1.23+002  2.51+002  9.60+002
DN/DLOGD (NUMBER/DNCM)         7.62+006  1.14+007  4.39+006  2.09+007  3.04+007  8.32+008  6.35+009  1.24+011  1.41+012  4.03+013
   *** CUT POINTS FOR STAGES  0  1 ARE SIMILAR OR INVERTED
       MEASURED DATA FOR STAGE,  1 WITH D50=   15.11 OMITTED FROM INTERPOLATION
   *** CUT POINTS FOR STAGES  1  2 ARE SIMILAR OR INVERTED
       MEASURED DATA FOR STAGE,  2 WITH D50=   13.34 OMITTED FROM INTERPOLATION
   *** LINEAR INTERPOLATION USED BETWEEN    8.8837026       17.688352
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)
STD. DIA. (MICRONS)     .625     1.000     1.250     2.500     6.000    10.000    15.000    20.000*
CUM. MASS (MG/DNCM)  316.747   362.011   375.207   393.855   408.036   409.884   412.607   416.735
DM/DLOGD (MG/DNCM)  2.76+002  1.59+002  1.21+002  3.91+001  1.13+001  1.55+001  1.55+001  9.35+001
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PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 11/29/83 10:20:30
DATA FOR TEST BY CONTRACTOR CCA , AT SITE FOOT, ON DATE 31781, RUN NO. 20
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 4IA85
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.8

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .328 ACFM IMPACTOR TEMPERATURE = 360.0 F (182.2 C) SAMPLING DURATION = 5.00 MIN

IMPACTOR PRESSURE DROP = .132 IN. OF HG STACK TEMPERATURE = 360.0 F (182.2 C) STACK PRESSURE = 27.08 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.70 O2 = 17.90 H2O = .40

CALC. MASS LOADING = 6.1560-002 GR/ACF 1.0573-001 GR/DNCF 1.4087+002 MG/ACM 2.4194+002 MG/DNCM
SAMPLING AT 97.4 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE		CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.		1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)		18.01	15.41	13.61	9.06	6.05	3.35	1.62	.99	.52	.52/2.0
MASS (MG)		3.64	.35	.19	.09	.08	.00	.00	.10	.40	1.69
MG/DNCM/STAGE		1.35+002	1.29+001	7.03+000	3.33+000	2.93+000	3.70-002	3.70-002	3.70+000	1.48+001	6.25+001
CUM. % OF MASS	< D50	44.36	39.01	36.11	34.73	33.51	33.49	33.48	31.95	25.83	
CUM. MASS (MG/ACM)	< D50	6.25+001	5.50+001	5.09+001	4.89+001	4.72+001	4.72+001	4.72+001	4.50+001	3.64+001	
CUM. MASS (MG/DNCM)	< D50	1.07+002	9.44+001	8.74+001	8.40+001	8.11+001	8.10+001	8.10+001	7.73+001	6.25+001	
CUM. MASS (GR/ACF)	< D50	2.73-002	2.40-002	2.22-002	2.14-002	2.06-002	2.06-002	2.06-002	1.97-002	1.59-002	
CUM. MASS (GR/DNCF)	< D50	4.69-002	4.12-002	3.82-002	3.67-002	3.54-002	3.54-002	3.54-002	3.38-002	2.73-002	
GEO. MEAN DIA.(MICRONS)		3.55+001	1.67+001	1.45+001	1.11+001	7.40+000	4.50+000	2.33+000	1.26+000	7.14-001	3.66-001
DM/DLOGD (MG/DNCM)		2.28+002	1.91+002	1.30+002	1.89+001	1.63+001	1.44-001	1.17-001	1.73+001	5.27+001	2.08+002
DN/DLOGD (NUMBER/DNCM)		9.74+006	7.83+007	8.17+007	2.63+007	7.93+007	3.02+006	1.77+007	1.64+010	2.76+011	8.10+012

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 15.41 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 13.61 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 3.3476966 6.0474967
*** LINEAR INTERPOLATION USED BETWEEN 6.0474967 9.0609231
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	68.003	77.433	79.436	81.014	81.066	85.515	98.169	112.618
DM/DLOGD (MG/DNCM)	6.11+001	2.80+001	1.75+001	1.20-001	7.81+000	4.20+001	1.02+002	1.51+002

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 11/29/83 10:20:30
DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 21
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 4IB15
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.8

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .370 ACFM IMPACTOR TEMPERATURE = 360.0 F (182.2 C) SAMPLING DURATION = 3.00 MIN

IMPACTOR PRESSURE DROP = .168 IN. OF HG STACK TEMPERATURE = 360.0 F (182.2 C) STACK PRESSURE = 27.08 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.70 O2 = 17.90 H2O = .40

CALC. MASS LOADING = 9.8336-002 GR/ACF 1.6889-001 GR/DNCF 2.2503+002 MG/ACM 3.8648+002 MG/DNCM
SAMPLING AT 109.9 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	17.02	14.50	12.80	8.52	5.69	3.14	1.51	.92	.48	.48/2.0
MASS (MG)	3.34	.00	.08	.00	.04	.00	.11	.48	.45	2.57
MG/DNCM/STAGE	1.83+002	5.46-002	4.37+000	5.46-002	2.19+000	5.46-002	6.01+000	2.62+001	2.46+001	1.40+002
CUM. % OF MASS < D50	52.78	52.76	51.63	51.62	51.05	51.04	49.48	42.70	36.34	
CUM. MASS (MG/ACM) < D50	1.19+002	1.19+002	1.16+002	1.16+002	1.15+002	1.15+002	1.11+002	9.61+001	8.18+001	
CUM. MASS (MG/DNCM) < D50	2.04+002	2.04+002	2.00+002	1.99+002	1.97+002	1.97+002	1.91+002	1.65+002	1.40+002	
CUM. MASS (GR/ACF) < D50	5.19-002	5.19-002	5.08-002	5.08-002	5.02-002	5.02-002	4.87-002	4.20-002	3.57-002	
CUM. MASS (GR/DNCF) < D50	8.91-002	8.91-002	8.72-002	8.72-002	8.62-002	8.62-002	8.36-002	7.21-002	6.14-002	
GEO. MEAN DIA.(MICRONS)	3.45+001	1.57+001	1.36+001	1.04+001	6.95+000	4.23+000	2.18+000	1.18+000	6.64-001	3.39-001
DM/DLOGD (MG/DNCM)	2.97+002	7.85-001	8.08+001	3.07-001	1.24+001	2.12-001	1.89+001	1.22+002	8.66+001	4.66+002
DN/DLOGD (NUMBER/DNCM)	1.36+007	3.86+005	6.10+007	5.18+005	7.04+007	5.37+006	3.48+009	1.41+011	5.64+011	2.29+013

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 14.50 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 12.80 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 3.1438050 5.6854177
*** LINEAR INTERPOLATION USED BETWEEN 8.5225048 17.022648
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	149.070	170.591	183.254	196.077	197.582	200.531	203.157	211.370
DM/DLOGD (MG/DNCM)	8.29+001	1.45+002	1.12+002	1.51+001	9.32+000	1.49+001	1.49+001	1.86+002

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM 11/29/83 10:20:39
DATA FOR TEST BY CONTRACTOR CCA , AT SITE FOOT, ON DATE 31781, RUN NO. 22
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 41B05
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.8

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3050
5	264	.0533	.0300	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .387 ACFM IMPACTOR TEMPERATURE = 360.0 F (182.2 C) SAMPLING DURATION = 5.00 MIN

IMPACTOR PRESSURE DROP = .184 IN. OF HG STACK TEMPERATURE = 360.0 F (182.2 C) STACK PRESSURE = 27.08 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.70 O2 = 17.90 H2O = .40

CALC. MASS LOADING = 9.9213-002 GR/ACF 1.7040-001 GR/DNCF 2.2703+002 MG/ACM 3.8993+002 MG/DNCM
SAMPLING AT 85.9 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	16.67	14.18	12.51	8.33	5.56	3.07	1.48	.90	.47	.47/2.0
MASS (MG)	1.10	.77	.44	.53	.85	.41	.79	.73	1.58	5.24
MG/DNCM/STAGE	3.45+001	2.41+001	1.38+001	1.66+001	2.66+001	1.29+001	2.48+001	2.29+001	4.95+001	1.64+002
CUM. % OF MASS < D50	91.16	84.97	81.43	77.17	70.34	67.04	60.69	54.82	42.12	
CUM. MASS (MG/ACM) < D50	2.07+002	1.93+002	1.85+002	1.75+002	1.60+002	1.52+002	1.38+002	1.24+002	9.56+001	
CUM. MASS (MG/DNCM) < D50	3.55+002	3.31+002	3.18+002	3.01+002	2.74+002	2.61+002	2.37+002	2.14+002	1.64+002	
CUM. MASS (GR/ACF) < D50	9.04-002	8.43-002	8.03-002	7.66-002	6.[illegible]-002	6.65-002	6.02-002	5.44-002	4.18-002	
CUM. MASS (GR/DNCF) < D50	1.55-001	1.45-001	1.39-001	1.31-001	1.20-001	1.14-001	1.03-001	9.34-002	7.18-002	
GEO. MEAN DIA.(MICRONS)	3.42+001	1.54+001	1.33+001	1.02+001	6.80+000	4.13+000	2.13+000	1.15+000	6.46-001	3.29-001
DM/DLOGD (MG/DNCM)	5.53+001	3.43+002	2.55+002	9.40+001	1.51+002	4.99+001	7.79+001	1.06+002	1.74+002	5.46+002
DN/DLOGD (NUMBER/DNCM)	2.65+005	1.81+008	2.06+008	1.69+008	9.19+003	1.35+009	1.54+010	1.32+011	1.23+012	2.92+013

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 14.18 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 12.51 OMITTED FROM INTERPOLATION
*** LINEAR INTERPOLATION USED BETWEEN 3.0708118 5.5559139

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	189.197	219.144	229.521	255.448	279.029	317.672	348.752	367.890
DM/DLOGD (MG/DNCM)	1.78+002	1.12+002	1.02+002	7.12+001	1.36+002	2.00+002	1.53+002	1.35+002

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR GCA , AT SITE FCOT, ON DATE 31781, RUN NO. 23
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 5IB15
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.2

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3350
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .363 ACFM IMPACTOR TEMPERATURE = 367.0 F (186.1 C) SAMPLING DURATION = 6.00 MIN

IMPACTOR PRESSURE DROP = .159 IN. OF HG STACK TEMPERATURE = 367.0 F (186.1 C) STACK PRESSURE = 26.87 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.20 O2 = 17.80 H2O = 1.00

CALC. MASS LOADING = 4.7190-002 GR/ACF 8.2892-002 GR/DNCF 1.0799+002 MG/ACM 1.8969+002 MG/DNCM
SAMPLING AT 107.8 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	CYCLONE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	17.30	14.67	12.95	8.62	5.75	3.18	1.53	.93	.48	.48/2.0
MASS (MG)	1.01	.34	.37	.10	.26	.28	.55	.34	.91	2.50
MG/DNCM/STAGE	2.88+001	9.69+000	1.05+001	2.85+000	7.41+000	7.97+000	1.57+001	9.68+000	2.59+001	7.12+001
CUM. % OF MASS < D50	84.83	79.73	74.17	72.67	68.77	64.56	56.31	51.20	37.54	
CUM. MASS (MG/ACM) < D50	9.16+001	8.61+001	8.01+001	7.85+001	7.43+001	6.97+001	6.08+001	5.53+001	4.05+001	
CUM. MASS (MG/DNCM) < D50	1.61+002	1.51+002	1.41+002	1.38+002	1.30+002	1.22+002	1.07+002	9.71+001	7.12+001	
CUM. MASS (GR/ACF) < D50	4.00-002	3.76-002	3.50-002	3.43-002	3.25-002	3.05-002	2.66-002	2.42-002	1.77-002	
CUM. MASS (GR/DNCF) < D50	7.03-002	6.61-002	6.15-002	6.02-002	5.70-002	5.35-002	4.67-002	4.24-002	3.11-002	
GEO. MEAN DIA.(MICRONS)	3.49+001	1.59+001	1.38+001	1.06+001	7.04+000	4.28+000	2.21+000	1.19+000	6.71-001	3.42-001
DM/DLOGD (MG/DNCM)	4.74+001	1.35+002	1.95+002	1.61+001	4.21+001	3.10+001	4.94+001	4.48+001	9.12+001	2.37+002
DN/DLOGD (NUMBER/DNCM)	2.15+006	6.39+007	1.42+008	2.61+007	2.30+008	7.57+008	8.78+009	5.03+010	5.76+011	1.13+013

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 14.67 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 12.95 OMITTED FROM INTERPOLATION
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000	20.000*
CUM. MASS (MG/DNCM)	83.120	98.465	102.763	118.028	131.014	143.254	156.672	165.648
DM/DLOGD (MG/DNCM)	9.69+001	4.64+001	4.52+001	4.59+001	3.47+001	8.18+001	7.06+001	7.34+001

APPENDIX D-2

CASCADE IMPACTOR DATA REDUCTION SYSTEM PRINTOUTS, BAGHOUSE OUTLET

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 14
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 10A
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.5

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3550
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .383 ACFM — IMPACTOR TEMPERATURE = 180.0 F (82.2 C) — SAMPLING DURATION = 90.00 MIN

IMPACTOR PRESSURE DROP = .248 IN. OF HG — STACK TEMPERATURE = 180.0 F (82.2 C) — STACK PRESSURE = 29.10 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.40 O2 = 17.90 H2O = .80

CALC. MASS LOADING = 3.2638-003 GR/ACF 4.0868-003 GR/DNCF 7.4686+000 MG/ACM 9.3520+000 MG/DNCM
SAMPLING AT 163.0 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	NOZZLE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	13.07	13.07	11.54	7.69	5.14	2.86	1.39	.86	.46	.46/2.0
MASS (MG)	2.41	.00	.35	.86	.43	.59	.70	.43	.57	.95
MG/DNCM/STAGE	3.09+000	1.28-003	4.49-001	1.10+000	5.52-001	7.57-001	8.98-001	5.52-001	7.31-001	1.22+000
CUM. % OF MASS < D50	66.95	66.94	62.14	50.34	44.44	36.35	26.75	20.85	13.03	
CUM. MASS (MG/ACM) < D50	5.00+000	5.00+000	4.64+000	3.76+000	3.32+000	2.71+000	2.00+000	1.56+000	9.73-001	
CUM. MASS (MG/DNCM) < D50	6.26+000	6.26+000	5.81+000	4.71+000	4.16+000	3.40+000	2.50+000	1.95+000	1.22+000	
CUM. MASS (GR/ACF) < D50	2.19-003	2.18-003	2.03-003	1.64-003	1.45-003	1.19-003	8.73-004	6.81-004	4.25-004	
CUM. MASS (GR/DNCF) < D50	2.74-003	2.74-003	2.54-003	2.05-003	1.82-003	1.49-003	1.09-003	8.52-004	5.33-004	
GEO. MEAN DIA.(MICRONS)	3.02+001	1.31+001	1.23+001	9.42+000	6.29+000	3.83+000	1.99+000	1.09+000	6.25-001	3.23-001
DM/DLOGD (MG/DNCM)	4.24+000	1.01+001	8.32+000	6.26+000	3.15+000	2.96+000	2.87+000	2.62+000	2.68+000	4.05+000
DN/DLOGD (NUMBER/DNCM)	2.93+005	8.61+006	8.58+006	1.43+007	2.42+007	1.01+008	6.93+008	3.86+009	2.10+010	2.30+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 13.07 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 11.54 OMITTED FROM INTERPOLATION

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000*	20.000*
CUM. MASS (MG/DNCM)	1.587	2.123	2.378	3.231	4.304	5.512	6.661	7.451
DM/DLOGD (MG/DNCM)	2.68+000	2.59+000	2.68+000	2.90+000	2.79+000	6.75+000	6.58+000	6.02+000

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 15
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 20A
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.7

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.237

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .396 ACFM IMPACTOR TEMPERATURE = 199.0 F (92.8 C) SAMPLING DURATION = 90.00 MIN

IMPACTOR PRESSURE DROP = .257 IN. OF HG STACK TEMPERATURE = 199.0 F (92.8 C) STACK PRESSURE = 29.10 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.60 O2 = 17.90 H2O = .60

CALC. MASS LOADING = 2.5591-003 GR/ACF 3.2930-003 GR/DNCF 5.8560+000 MG/ACM 7.5355+000 MG/DNCM
SAMPLING AT 168.6 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	NOZZLE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	12.99	12.99	11.47	7.64	5.11	2.84	1.38	.85	.45	.45/2.0
MASS (MG)	.37	.00	.54	.56	.59	.37	.70	.31	.47	2,00
MG/DNCM/STAGE	4.70-001	1.28-003	6.89-001	7.14-001	7.52-001	4.72-001	8.93-001	3.95-001	5.99-001	2.55+000
CUM. % OF MASS < D50	93.76	93.74	84.60	75.13	65.14	58.88	47.04	41.79	33.84	
CUM. MASS (MG/ACM) < D50	5.49+000	5.49+000	4.95+000	4.40+000	3.81+000	3.45+000	2.75+000	2.45+000	1.98+000	
CUM. MASS (MG/DNCM) < D50	7.06+000	7.06+000	6.38+000	5.66+000	4.91+000	4.44+000	3.54+000	3.15+000	2.55+000	
CUM. MASS (GR/ACF) < D50	2.40-003	2.40-003	2.17-003	1.92-003	1.67-003	1.51-003	1.20-003	1.07-003	8.66-004	
CUM. MASS (GR/DNCF) < D50	3.09-003	3.09-003	2.79-003	2.47-003	2.15-003	1.94-003	1.55-003	1.38-003	1.11-003	
GEO. MEAN DIA.(MICRONS)	3.02+001	1.30+001	1.22+001	9.36+000	6.25+000	3.81+000	1.98+000	1.08+000	6.17-001	3.18-001
DM/DLOGD (MG/DNCM)	6.43-001	1.07+001	1.27+001	4.05+000	4.30+000	1.85+000	2.84+000	1.87+000	2.18+000	8.47+000
DN/DLOGD (NUMBER/DNCM)	4.48+004	9.29+006	1.34+007	9.43+006	3.36+007	6.40+007	7.04+008	2.84+009	1.77+010	5.03+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 12.99 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 11.47 OMITTED FROM INTERPOLATION
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000*	20.000*
CUM. MASS (MG/DNCM)	2.874	3.266	3.453	4.306	5.177	6.448	7.352	7.532
DM/DLOGD (MG/DNCM)	2.17+000	1.75+000	2.11+000	2.49+000	4.14+000	6.08+000	3.31+000	2.86-001

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 16
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 10B
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.5

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .396 ACFM IMPACTOR TEMPERATURE = 180.0 F (82.2 C) SAMPLING DURATION = 90.00 MIN

IMPACTOR PRESSURE DROP = .265 IN. OF HG STACK TEMPERATURE = 180.0 F (82.2 C) STACK PRESSURE = 29.10 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.40 O2 = 17.90 H2O = .80

CALC. MASS LOADING = 1.3523-002 GR/ACF 1.6933-002 GR/DNCF 3.0945+001 MG/ACM 3.8748+001 MG/DNCM
SAMPLING AT 169.2 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	NOZZLE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	12.85	12.85	11.35	7.56	5.05	2.81	1.36	.84	.45	.45/2.0
MASS (MG)	18.84	.00	.50	1.10	.89	1.52	3.00	1.84	1.19	2.35
MG/DNCM/STAGE	2.34+001	1.24-003	6.20-001	1.36+000	1.10+000	1.89+000	3.72+000	2.28+000	1.48+000	2.92+000
CUM. % OF MASS < D50	39.68	39.67	38.07	34.55	31.70	26.83	17.23	11.34	7.52	
CUM. MASS (MG/ACM) < D50	1.23+001	1.23+001	1.18+001	1.07+001	9.81+000	8.30+000	5.33+000	3.51+000	2.33+000	
CUM. MASS (MG/DNCM) < D50	1.54+001	1.54+001	1.48+001	1.34+001	1.23+001	1.04+001	6.68+000	4.39+000	2.92+000	
CUM. MASS (GR/ACF) < D50	5.37-003	5.36-003	5.15-003	4.67-003	4.29-003	3.63-003	2.33-003	1.53-003	1.02-003	
CUM. MASS (GR/DNCF) < D50	6.72-003	6.72-003	6.45-003	5.85-003	5.37-003	4.54-003	2.92-003	1.92-003	1.27-003	
GEO. MEAN DIA.(MICRONS)	3.00+001	1.28+001	1.21+001	9.26+000	6.18+000	3.77+000	1.96+000	1.07+000	6.13-001	3.16-001
DM/DLOGD (MG/DNCM)	3.18+001	2.06+001	1.15+001	7.75+000	6.31+000	7.38+000	1.19+001	1.08+001	5.39+000	9.69+000
DN/DLOGD (NUMBER/DNCM)	2.25+006	1.85+007	1.25+007	1.86+007	5.10+007	2.64+008	3.03+009	1.69+010	4.48+010	5.86+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 12.85 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 11.35 OMITTED FROM INTERPOLATION
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000*	20.000*
CUM. MASS (MG/DNCM)	3.491	5.194	6.251	9.904	12.710	14.118	16.401	20.224
DM/DLOGD (MG/DNCM)	5.59+000	1.07+001	1.12+001	1.02+001	6.16+000	8.93+000	2.13+001	3.80+001

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 17
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 20B
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.7

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID:. 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .388 ACFM IMPACTOR TEMPERATURE = 199.0 F (92.8 C) SAMPLING DURATION - 90.00 MIN

IMPACTOR PRESSURE DROP = .247 IN. OF HG STACK TEMPERATURE = 199.0 F (92.8 C) STACK PRESSURE = 29.10 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.60 O2 = 17.90 H2O = .50

CALC. MASS LOADING = 2.9123-003 GR/ACF 3.7438-003 GR/DNCF 6.6644+000 MG/ACM 8.5671+000 MG/DNCM
SAMPLING AT 165.8 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	NOZZLE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	13.12	13.12	11.59	7.72	5.16	2.87	1.39	.86	.46	.46/2.0
MASS (MG)	.84	.00	.28	.47	.39	.28	.63	.79	.55	2.36
MG/DNCM/STAGE	1.09+000	1.30-003	3.64-001	6.11-001	5.07-001	3.64-001	8.19-001	1.03+000	7.15-001	3.07+000
CUM. % OF MASS < D50	87.27	87.25	83.00	75.87	69.95	65.71	56.15	44.16	35.81	
CUM. MASS (MG/ACM) < D50	5.82+000	5.81+000	5.53+000	5.06+000	4.66+000	4.38+000	3.74+000	2.94+000	2.39+000	
CUM. MASS (MG/DNCM) < D50	7.48+000	7.48+000	7.11+000	6.50+000	5.99+000	5.63+000	4.81+000	3.78+000	3.07+000	
CUM. MASS (GR/ACF) < D50	2.54-003	2.54-003	2.42-003	2.21-003	2.04-003	1.91-003	1.64-003	1.29-003	1.04-003	
CUM. MASS (GR/DNCF) < D50	3.27-003	3.27-003	3.11-003	2.84-003	2.62-003	2.46-003	2.10-003	1.65-003	1.34-003	
GEO. MEAN DIA.(MICRONS)	3.03+001	1.31+001	1.23+001	9.46+000	6.31+000	3.85+000	2.00+000	1.09+000	6.25-001	3.22-001
DM/DLOGD (MG/DNCM)	1.50+000	-1.14+001	6.74+000	3.47+000	2.90+000	1.42+000	2.61+000	4.87+000	2.61+000	1.0[illegible]+001
DN/DLOGD (NUMBER/DNCM)	1.03+005	-9.63+006	6.86+006	7.82+006	2.20+007	4.78+007	6.26+008	7.14+009	2.04+010	5.83+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 13.12 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 11.59 OMITTED FROM INTERPOLATION

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000*	20.000*
CUM. MASS (MG/DNCM)	3.339	4.152	4.615	5.506	6.158	7.014	7.705	8.084
DM/DLOGD (MG/DNCM)	2.61+000	5.19+000	4.36+000	2.21+000	2.75+000	4.26+000	3.63+000	2.48+000

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 18
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 30A
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.7

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .401 ACFM IMPACTOR TEMPERATURE = 199.0 F (92.8 C) SAMPLING DURATION = 90.00 MIN

IMPACTOR PRESSURE DROP = .264 IN. OF HG STACK TEMPERATURE = 199.0 F (92.8 C) STACK PRESSURE = 29.10 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.60 O2 = 17.90 H2O = .50

CALC. MASS LOADING = 3.9340-003 GR/ACF 5.0571-003 GR/DNCF 9.0023+000 MG/ACM 1.1572+001 MG/DNCM
SAMPLING AT 170.7 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	NOZZLE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	12.91	12.91	11.40	7.60	5.08	2.82	1.37	.84	.45	.45/2.0
MASS (MG)	1.41	.00	.57	.90	.57	.33	.70	.90	1.25	2.57
MG/DNCM/STAGE	1.77+000	1.26-003	7.17-001	1.13+000	7.17-001	4.15-001	8.81-001	1.13+000	1.57+000	3.23+000
CUM. % OF MASS < D50	84.68	84.67	78.48	68.70	62.50	58.91	51.30	41.52	27.93	
CUM. MASS (MG/ACM) < D50	7.62+000	7.62+000	7.06+000	6.18+000	5.63+000	5.30+000	4.62+000	3.74+000	2.51+000	
CUM. MASS (MG/DNCM) < D50	9.80+000	9.80+000	9.08+000	7.95+000	7.23+000	6.82+000	5.94+000	4.81+000	3.23+000	
CUM. MASS (GR/ACF) < D50	3.33-003	3.33-003	3.09-003	2.70-003	2.46-003	2.32-003	2.02-003	1.63-003	1.10-003	
CUM. MASS (GR/DNCF) < D50	4.28-003	4.28-003	3.97-003	3.47-003	3.16-003	2.98-003	2.59-003	2.10-003	1.41-003	
GEO. MEAN DIA.(MICRONS)	3.01+001	1.29+001	1.21+001	9.31+000	6.21+000	3.78+000	1.96+000	1.07+000	6.12-001	3.16-001
DM/DLOGD (MG/DNCM)	2.41+000	1.36+001	1.33+001	6.42+000	4.09+000	1.62+000	2.81+000	5.35+000	5.72+000	1.07+001
DN/DLOGD (NUMBER/DNCM)	1.70+005	1.20+007	1.42+007	1.52+007	3.27+007	5.73+007	7.08+008	8.30+009	4.75+010	6.53+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 12.91 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 11.40 OMITTED FROM INTERPOLATION
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000*	20.000*
CUM. MASS (MG/DNCM)	4.083	5.259	5.760	6.700	7.458	8.986	10.274	10.931
DM/DLOGD (MG/DNCM)	5.70+000	5.65+000	4.68+000	2.37+000	3.81+000	7.98+000	6.54+000	4.09+000

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 19
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 30B
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.7

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3650
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .395 ACFM IMPACTOR TEMPERATURE = 199.0 F (92.8 C) SAMPLING DURATION = 90.00 MIN

IMPACTOR PRESSURE DROP = .256 IN. OF HG STACK TEMPERATURE = 199.0 F (92.8 C) STACK PRESSURE = 29.10 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.60 O2 = 17.90 H2O = .50

CALC. MASS LOADING = 1.1860-003 GR/ACF 1.5246-003 GR/DNCF 2.7139+000 MG/ACM 3.4887+000 MG/DNCM
SAMPLING AT 168.8 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	NOZZLE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	13.01	13.01	11.49	7.65	5.12	2.84	1.38	.85	.45	.45/2.0
MASS (MG)	1.24	.00	.00	.04	.18	.28	.15	.29	.00	.55
MG/DNCM/STAGE	1.58+000	1.28-003	1.28-003	5.11-002	2.30-001	3.58-001	1.92-001	3.70-001	1.28-003	7.02-001
CUM. % OF MASS < D50	54.65	54.61	54.58	53.11	46.52	36.27	30.78	20.17	20.13	
CUM. MASS (MG/ACM) < D50	1.48+000	1.48+000	1.48+000	1.44+000	1.26+000	9.84-001	8.35-001	5.47-001	5.46-001	
CUM. MASS (MG/DNCM) < D50	1.91+000	1.91+000	1.90+000	1.85+000	1.62+000	1.27+000	1.07+000	7.04-001	7.02-001	
CUM. MASS (GR/ACF) < D50	6.48-004	6.48-004	6.47-004	6.30-004	5.52-004	4.30-004	3.65-004	2.39-004	2.39-004	
CUM. MASS (GR/DNCF) < D50	8.33-004	8.33-004	8.32-004	8.10-004	7.09-004	5.53-004	4.69-004	3.07-004	3.07-004	
GEO. MEAN DIA.(MICRONS)	3.02+001	1.30+001	1.22+001	9.38+000	6.26+000	3.81+000	1.98+000	1.08+000	6.18-001	3.19-001
DM/DLOGD (MG/DNCM)	2.16+000	8.90+000	2.36-002	2.90-001	1.31+000	1.40+000	6.11-001	1.75+000	4.65-003	2.33+000
DN/DLOGD (NUMBER/DNCM)	1.50+005	7.72+006	2.47+004	6.72+005	1.02+007	4.83+007	1.50+008	2.65+009	3.76+007	1.38+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 13.01 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 11.49 OMITTED FROM INTERPOLATION

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000*	20.000*
CUM. MASS (MG/DNCM)	.703	.851	1.015	1.212	1.734	1.830	1.951	2.188
DM/DLOGD (MG/DNCM)	4.65-003	1.90+000	1.48+000	8.92-001	1.41+000	2.33-001	1.15+000	2.50+000

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 24
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 40A
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.3

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
-1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3850
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .484 ACFM IMPACTOR TEMPERATURE = 205.0 F (96.1 C) SAMPLING DURATION = 90.00 MIN

IMPACTOR PRESSURE DROP = .388 IN. OF HG STACK TEMPERATURE = 205.0 F (96.1 C) STACK PRESSURE = 29.68 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.30 O2 = 17.80 H2O = .90

CALC. MASS LOADING = 8.8215-004 GR/ACF 1.1266-003 GR/DNCF 2.0187+000 MG/ACM 2.5780+000 MG/DNCM
SAMPLING AT 206.0 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	NOZZLE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	11.77	11.77	10.39	6.92	4.62	2.56	1.24	.76	.40	.40/2.0
MASS (MG)	.01	.00	.04	.25	.07	.13	.41	.36	.20	1.02
MG/DNCM/STAGE	9.32-003	1.04-003	4.14-002	2.59-001	7.25-002	1.35-001	4.24-001	3.73-001	2.07-001	1.06+000
CUM. % OF MASS < D50	99.64	99.60	97.99	87.95	85.14	79.92	63.45	49.00	40.96	
CUM. MASS (MG/ACM) < D50	2.01+000	2.01+000	1.98+000	1.78+000	1.72+000	1.61+000	1.28+000	9.89-001	8.27-001	
CUM. MASS (MG/DNCM) < D50	2.57+000	2.57+000	2.53+000	2.27+000	2.19+000	2.06+000	1.64+000	1.26+000	1.06+000	
CUM. MASS (GR/ACF) < D50	8.79-004	8.79-004	8.64-004	7.76-004	7.51-004	7.05-004	5.60-004	4.32-004	3.61-004	
CUM. MASS (GR/DNCF) < D50	1.12-003	1.12-003	1.10-003	9.91-004	9.59-004	9.00-004	7.15-004	5.52-004	4.61-004	
GEO. MEAN DIA.(MICRONS)	2.87+001	1.18+001	1.11+001	8.48+000	5.66+000	3.44+000	1.78+000	9.70-001	5.50-001	2.81-001
DM/DLOGD (MG/DNCM)	1.20-002	1.77+001	7.66-001	1.47+000	4.13-001	5.25-001	1.35+000	1.75+000	7.39-001	3.51+000
DN/DLOGD (NUMBER/DNCM)	9.72+002	2.08+007	1.08+006	4.59+006	4.36+006	2.46+007	4.54+008	3.66+009	8.50+009	3.00+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 11.77 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 10.39 OMITTED FROM INTERPOLATION

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000*	20.000*
CUM. MASS (MG/DNCM)	1.167	1.481	1.642	2.051	2.226	2.491	2.578	2.578
DM/DLOGD (MG/DNCM)	9.68-001	1.73+000	1.68+000	8.26-001	5.26-001	1.19+000	.00	.00

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 25
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 40B
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.3

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3350
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .390 ACFM IMPACTOR TEMPERATURE = 205.0 F (96.1 C) SAMPLING DURATION = 90.00 MIN

IMPACTOR PRESSURE DROP = .252 IN. OF HG STACK TEMPERATURE = 205.0 F (96.1 C) STACK PRESSURE = 29.68 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.30 O2 = 17.80 H2O = .90

CALC. MASS LOADING = 2.1939-003 GR/ACF 2.8019-003 GR/DNCF 5.0205+000 MG/ACM 6.4116+000 MG/DNCM
SAMPLING AT 166.7 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	NOZZLE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	13.12	13.12	11.59	7.72	5.16	2.87	1.39	.86	.46	.46/2.0
MASS (MG)	1.24	.00	.03	.48	.15	.39	.54	.30	.39	1.47
MG/DNCM/STAGE	1.59+000	1.28-003	3.85-002	6.17-001	1.93-001	5.01-001	6.94-001	3.85-001	5.01-001	1.89+000
CUM. % OF MASS < D50	75.17	75.15	74.55	64.93	61.92	54.11	43.29	37.27	29.46	
CUM. MASS (MG/ACM) < D50	3.77+000	3.77+000	3.74+000	3.26+000	3.11+000	2.72+000	2.17+000	1.87+000	1.48+000	
CUM. MASS (MG/DNCM) < D50	4.82+000	4.82+000	4.78+000	4.16+000	3.97+000	3.47+000	2.78+000	2.39+000	1.89+000	
CUM. MASS (GR/ACF) < D50	1.65-003	1.65-003	1.64-003	1.42-003	1.36-003	1.19-003	9.50-004	8.18-004	6.46-004	
CUM. MASS (GR/DNCF) < D50	2.11-003	2.11-003	2.09-003	1.82-003	1.74-003	1.52-003	1.21-003	1.04-003	8.25-004	
GEO. MEAN DIA.(MICRONS)	3.03+001	1.31+001	1.23+001	9.46+000	6.31+000	3.85+000	2.00+000	1.09+000	6.25-001	3.23-001
DM/DLOGD (MG/DNCM)	2.19+000	-1.84+001	7.14-001	3.50+000	1.10+000	1.96+000	2.21+000	1.83+000	1.83+000	6.27+000
DN/DLOGD (NUMBER/DNCM)	1.50+005	-1.56+007	7.27+005	7.90+006	8.35+006	6.58+007	5.30+008	2.68+009	1.43+010	3.57+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 13.12 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 11.59 OMITTED FROM INTERPOLATION

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000*	20.000*
CUM. MASS (MG/DNCM)	2.139	2.505	2.684	3.344	4.011	4.492	4.989	5.364
DM/DLOGD (MG/DNCM)	1.83+000	1.77+000	1.91+000	2.13+000	9.09-001	2.86+000	2.96+000	2.99+000

PARTICULATE DATA REDUCTION AND ENTRY SYSTEM DATA FOR TEST BY CONTRACTOR GCA , AT SITE FOOT, ON DATE 31781, RUN NO. 26
TEST COMMENTS: I.P. TEST FERROSILICON
RUN COMMENTS: 50A
*** GAS COMPONENTS NORMALIZED SO SUM= 100%, NOT 98.3

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN PLATE SET ID: 0
MODEL: MARK 3 IMPACTOR DP SCALING FACTOR: 1.287

STAGE	NO.JETS	DIAM.	CUMDP	CALIB
1	264	.1638	.0000	.3050
2	264	.1253	.0000	.4030
3	264	.0948	.0000	.4100
4	264	.0759	.0000	.3250
5	264	.0533	.0000	.3690
6	264	.0343	.1760	.3600
7	264	.0254	.2940	.3620
8	156	.0254	1.0000	.2740

IMPACTOR FLOWRATE = .417 ACFM IMPACTOR TEMPERATURE = 205.0 F (96.1 C) SAMPLING DURATION = 90.00 MIN

IMPACTOR PRESSURE DROP = .288 IN. OF HG STACK TEMPERATURE = 205.0 F (96.1 C) STACK PRESSURE = 29.68 INCHES OF HG

DRY GAS COMPOSITION (PERCENT) CO2 = 1.20 CO = .00 N2 = 79.30 O2 = 17.80 H2O = 1.20

CALC. MASS LOADING = 2.2205-003 GR/ACF 2.8444-003 GR/DNCF 5.0812+000 MG/ACM 6.5089+000 MG/DNCM
SAMPLING AT 177.5 % OF ISOKINETIC RATE

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 70.0 MICRONS

IMPACTOR STAGE	NOZZLE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NO.	1	2	3	4	5	6	7	8	9	10
D50 (MICRONS)	12.68	12.68	11.20	7.46	4.99	2.77	1.34	.82	.44	.44/2.0
MASS (MG)	.37	.00	.19	.19	.32	.15	.50	.91	.84	1.93
MG/DNCM/STAGE	4.45-001	1.21-003	2.29-001	2.29-001	3.86-001	1.81-001	6.03-001	1.10+000	1.01+000	2.33+000
CUM. % OF MASS < D50	93.17	93.15	89.63	86.11	80.19	77.41	68.15	51.30	35.74	
CUM. MASS (MG/ACM) < D50	4.73+000	4.73+000	4.55+000	4.38+000	4.07+000	3.93+000	3.46+000	2.61+000	1.82+000	
CUM. MASS (MG/DNCM) < D50	6.06+000	6.06+000	5.83+000	5.60+000	5.22+000	5.04+000	4.44+000	3.34+000	2.33+000	
CUM. MASS (GR/ACF) < D50	2.07-003	2.07-003	1.99-003	1.91-003	1.78-003	1.72-003	1.51-003	1.14-003	7.94-004	
CUM. MASS (GR/DNCF) < D50	2.65-003	2.65-003	2.55-003	2.45-003	2.28-003	2.20-003	1.94-003	1.46-003	1.02-003	
GEO. MEAN DIA. (MICRONS)	2.98+001	1.27+001	1.19+001	9.14+000	6.10+000	3.71+000	1.93+000	1.05+000	6.01-001	3.09-001
DM/DLOGD (MG/DNCM)	5.99-001	3.00+001	4.24+000	1.30+000	2.20+000	7.07-001	1.92+000	5.18+000	3.67+000	7.73+000
DN/DLOGD (NUMBER/DNCM)	4.33+004	2.81+007	4.79+006	3.25+006	1.65+007	2.64+007	5.12+008	8.49+009	3.24+010	4.97+011

*** CUT POINTS FOR STAGES 0 1 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 1 WITH D50= 12.68 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 11.20 OMITTED FROM INTERPOLATION

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000*	20.000*
CUM. MASS (MG/DNCM)	2.838	3.838	4.309	4.979	5.400	5.877	6.194	6.354
DM/DLOGD (MG/DNCM)	3.78+000	5.46+000	4.10+000	1.44+000	2.21+000	1.96+000	1.59+000	9.92-001

APPENDIX E-1

CASCADE IMPACTOR FIELD DATA SHEETS

ANDERSEN IMPACTOR FIELD DATA

Plant: Foote
Time: 140
Nozzle Dia.: 3.5
Location: INLET
Run No.: IIA.15
Avg. ΔP: ____
Operator: Vay/Hobbs
Impactor Location: ____
Traverse Pt.: ____
Date: 3/17/81
D.G.M. No.: V1
Pb: ____
Andersen Imp No.: II
D.G.M. Y: ____
Static "Hg: ____

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	294	295	296	297	298	299	300	301	B151	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
441.078	0	0.06	52	52	0.6		
441.18	.30	0.06	52	52	0.6		
441.29	1	0.06	52	52	0.6		
441.38	1.30	0.06	52	52	0.6		
441	2	0.06	52	52	0.6		
441.468	2.30	0.06	52	52	0.6		

The impactor nozzel was in the wake of IP Cyclone during run

Initial leak check: 0.018 ft3
Si-Gel Initial: ____
Final leak check: ____
Si-Gel Final: ____
Total H_2O Collected in Flask: ____
Net: ____
Total H_2O Collected: ____

ANDERSEN IMPACTOR FIELD DATA

Plant Foote Time 1059 Nozzle Dia. ______

Location Jay/Hobbs Run No. IIA.85 Avg. ΔP ______

Operator [illegible] Fcé Impactor Location ______ Traverse Pt. ______

Date 3/17/81 D.G.M. No. VI Pb ______

Andersen Imp No. 2 I D.G.M. Y ______ Static "Hg ______

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	26	327	328	329	330	331	332	333	B-155	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
439.855	0	0.06	54	54	0.7		
440.04	1	0.06	54	54	0.7		
440.23	2	0.06	54	54	0.8		
440.42	3	0.06	54	54	0.8		
440.620	4	0.06	54	53	0.8		

Initial leak check 0.010 Si-Gel initial ______

Final leak check ______ Si-Gel final ______

Total H_2O Collected in Flask ______ Net ______

Total H_2O Collected ______

ANDERSEN IMPACTOR FIELD DATA

Plant: Foote
Location: #2 FCE - INLET
Operator: Vay
Date: 03/17/81
Andersen Imp No.: II

Time: 10:20
Run No.: 1-I-B.15
Impactor Location: ____
D.G.M. No.: V1
D.G.M. Y: ____

Nozzle Dia.: A
Avg. ΔP: 0.7
Traverse Pt.: B OUTSIDE
Pb: ____ Ts = 400
Static "Hg: --

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	510	511	512	513	514	515	516	517	B-179	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
439.209	0	0.08	37	40	0.4		
439.33	.30	0.08	36	41	0.4		
439.44	1	0.08	37	41	0.4		
439.55	1.30	0.08	37	41	0.4		
439.66	2	0.08	37	41	0.4		
439.772	2.30	0.08	37	41	0.4		

Low Loading

V-3 ΔH = 0.08

Initial leak check: 0.005 5"/min
Final leak check: ____
Total H_2O Collected in Flask: ____
Total H_2O Collected: ____

Si-Gel Initial: ____
Si-Gel Final: ____
Net: ____

ANDERSEN IMPACTOR FIELD DATA

Plant: Foote
Time: 9:35
Nozzle Dia.: 3.5 B
Location: #2FCL, INLET
Run No.: 1 I B .85
Avg. ΔP: 0.7
Operator: VAY
Impactor Location:
Traverse Pt.: B-0.85D
Date: 3/17/81
D.G.M. No.: V1
Pb: Ts=400
Andersen Imp No.: 2I
D.G.M. Y:
Static "Hg:

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	156	487	488	489	490	491	492	493	B-175	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
437.947	0	0.06	37	38	0.7		
438.17	1	0.06	37	38	0.7		
438.36	2	0.06	36	39	0.8		
438.56	3	0.06	37	39	0.9		
438.75	4	0.06	37	39	1.0		
438.95	5	0.06	37	39	1.0		
439.146	6	0.06	37	39	1.2		

HIGH LOADING

Initial leak check: 0.008 ft³/min
Si-Gel initial:
Final leak check:
Si-Gel final:
Total H_2O Collected in Flask:
Net:
Total H_2O Collected:

ANDERSEN IMPACTOR FIELD DATA

Plant FOOTE
Time 14:00
Nozzle Dia. 3.5
Location INLET
Run No. 2IA.5
Avg. ΔP
Operator Vay / Hoobs
Impactor Location
Traverse Pt. -? 0.85 or 0.15.
Date 3/17/81
D.G.M. No. V1
Pb
Andersen Imp No. 1I
D.G.M. Y
Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	454	455	456	457	458	459	460	461	B-171 171	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
442.531	0	0.06	51	51	0.6		
442.77	1	0.06	50	50	0.7		
442.93	2	0.06	50	50	0.7		
443.13	3	0.06	50	50	0.8		
443.32	4	0.06	50	50	0.8		
443.52	5	0.06	50	50	0.9		
443.721	6	0.06	50	50	1.0		

Initial leak check 0.016 ft³/min
Si-Gel initial
Final leak check
Si-Gel final
Net
Total H_2O Collected in Flask
Total H_2O Collected

ANDERSEN IMPACTOR FIELD DATA

Plant Foote Time 13:23 Nozzle Dia. .35

Location INLET Run No. 2IA-.85 Avg. ΔP

Operator Vay Hobbs Impactor Location Traverse Pt.

Date 3/17/81 D.G.M. No. V1 Pb

Andersen Imp No. 2-I D.G.M. Y Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	430	431	432	433	434	435	436	437	B-165	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
441.547	0	0.06	53	52	0.6		
441.75	1	0.06	53	52	0.8		
441.94	2	0.06	53	52	0.9		
442.137	3	0.06	53	52	1.0		
	~~4~~						

Initial leak check 0.012 ft³/min Si-Gel initial

Final leak check Si-Gel final

Total H_2O Collected in Flask Net

Total H_2O Collected

ANDERSEN IMPACTOR FIELD DATA

Plant Foote
Time 15:20
Nozzle Dia. 3.5
Location Inlet
Run No. 2 I B, 15
Avg. ΔP
Operator Vay/Hobbs
Impactor Location
Traverse Pt.
Date 3/17/81
D.G.M. No. V1
Pb
Andersen Imp No. 11
D.G.M. Y
Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	502	503	504	505	506	507	508	509	B-177	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
445,105	0	0.06	53	53	~~0.5~~ .5		
445.30	1	0.06	53	53	0.6		
445.50	2	0.06	53	53	0.7		
445.71	3	0.06	53	53	0.8		
445.917	4	0.06	53	54	0.9		
	~~5~~						

Initial leak check 0.016
Final leak check
Total H_2O Collected in Flask
Total H_2O Collected

Si-Gel initial
Si-Gel final
Net

ANDERSEN IMPACTOR FIELD DATA

Plant Foote Time 14:41 Nozzle Dia. 3.5

Location Inlet Run No. 2 I B .85 Avg. ΔP

Operator Vay/Hobbs Impactor Location Traverse Pt.

Date 3/17/81 D.G.M. No. V1 Pb

Andersen Imp No. 2 I D.G.M. Y Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	414	415	416	417	418	419	420	421	B-166	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
444.030	0	0.06	50	50	0.6		
444.33	1:30	0.06	50	50	0.6		
444.42	2	0.06	50	50	0.7		
444.61	3	0.06	50	51	0.8		
444.812	4	0.06	50	51	0.9		
	~~5~~						

Initial leak check 0.019 ft³/min. Si-Gel initial

Final leak check Si-Gel final

Total H_2O Collected in Flask Net

Total H_2O Collected

ANDERSEN IMPACTOR FIELD DATA

Plant Foote Time ~~1650~~ 18:11 Nozzle Dia. ____

Location [illegible], W.Va Run No. 3IB-0.15 Avg. ΔP ____

Operator Vaj / Nolte Impactor Location B-0.15 Traverse Pt. B-0.15

Date 3/17/81 D.G.M. No. V1 Ph ____

Andersen Imp No. 1I D.G.M. Y ____ Static "Hg ____

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	302	303	304	305	306	307	308	309	B-152	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
446.849	0:0	0.06	50	50	0.7		
447.06	1	0.06	49	49	0.7		
447.26	2	0.06	50	50	0.8		
447.47	3	0.06	50	50	0.8		
447.69	4	0.06	50	50	0.8		
447.89	5	0.06	50	50	0.8		
448.089	6	0.06	50	50	0.8		

Initial leak check 0.018 ft³/min Si-Gel initial ____

Final leak check ____ Si-Gel final ____

Total H_2O Collected in Flask ____ Net ____

Total H_2O Collected ____

ANDERSEN IMPACTOR FIELD DATA

Plant Foote | Time 16:35 | Nozzle Dia. 3.5
Location Inlet | Run No. 3-I-B-85 | Avg. ΔP
Operator Jay | Impactor Location | Traverse Pt. B-85
Date 3/17/81 | D.G.M. No. V1 | Pb
Andersen Imp No. 2 I | D.G.M. Y | Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	398	399	400	401	402	403	404	405	B-161	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
445.988	0	0.06	52	52	0.7		
446.19	1	0.06	52	52	0.7		
446.39	2	0.06	52	52	0.7		
446.585	3	0.06	52	52	0.8		

Initial leak check 0.012 ft³/min | Si-Gel initial

Final leak check | Si-Gel final

Total H_2O Collected in Flask | Net

Total H_2O Collected

ANDERSEN IMPACTOR FIELD DATA

Plant Foote | Time 18:19 | Nozzle Dia. 3.5

Location Inlet | Run No. 3 I A .15 | Avg. ΔP ____

Operator Jay/Hobbs | Impactor Location ____ | Traverse Pt. ____

Date 3/17/81 | D.G.M. No. V1 | Pb ____

Andersen Imp No. 1 I | D.G.M. Y ____ | Static "Hg ____

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	446	447	448	449	450	451	452	453	B-170	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
448.897	0	0.06	46	46	0.7		
449.10	1	0.06	46	47	0.7		
449.31	2	0.06	47	47	0.7		
449.51	3	0.06	47	47	0.7		
449.71	4	0.06	47	47	0.8		
449.92	5	0.06	47	47	0.8		
450.123	6	0.06	47	47	0.8		

Initial leak check 0.019 | Si-Gel initial ____

Final leak check ____ | Si-Gel final ____

Total H_2O Collected in Flask ____ | Net ____

Total H_2O Collected ____

ANDERSEN IMPACTOR FIELD DATA

Plant Foote
Time 17-47
Nozzle Dia. 3.5
Location Inlet
Run No. 3 I A .85
Avg. ΔP
Operator Jay / Hobbs
Impactor Location
Traverse Pt.
Date 3/17/81
D.G.M. No. V1
Pb
Andersen Imp No. 2I
D.G.M. Y
Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	518	519	520	521	522	523	524	525	B-179	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
448.181	0	0.06	46	46	0.8		
448.38	1	0.06	46	46	0.8		
448.58	2	0.06	46	46	0.9		
448.801	3	0.06	47	47	0.9		
	~~4~~						

Initial leak check
Final leak check
Total H_2O Collected in Flask
Total H_2O Collected

Si-Gel initial
Si-Gel final
Net

10.

ANDERSEN IMPACTOR FIELD DATA

Plant Foote
Location inlet
Operator Vay/Hobbs
Date 3/18/81
Andersen Imp No. 2I

Time 13:45
Run No. 4IA.15
Impactor Location ____
D.G.M. No. V1
D.G.M. Y ____

Nozzle Dia. 3.5
Avg. ΔP ____
Traverse Pt. ____
Pb ____
Static "Hg ____

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	406	407	408	409	410	411	412	413	3-165	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
451.472	0	0.06	51	50	0.8		
451.65	1	0.06	51	48	0.8		
451.88	2	0.06	51	49	0.8		
452.08	3	0.06	51	49	0.9		
452.28	4	0.06	51	49	0.9		
452.497	5	0.06	51	49	1.0		

Initial leak check 0.011 ft³/min
Final leak check ____
Total H_2O Collected in Flask ____
Total H_2O Collected ____

Si-Gel initial ____
Si-Gel final ____
Net ____

ANDERSEN IMPACTOR FIELD DATA

Plant Foote
Time 13:03
Nozzle Dia. 3.5
Location
Run No. 4 I A .85
Avg. ΔP
Operator Vay/Hobbs
Impactor Location
Traverse Pt.
Date 3/18/81
D.G.M. No. V1
Pb
Andersen Imp No. 1 I
D.G.M. Y
Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	286	287	288	289	290	291	292	293	B-150	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
450.415	0	0.06	52	52	0.7		
450.61	1	0.06	50	50	0.7		
450.80	2	0.06	51	50	0.7		
451.00	3	0.06	51	50	0.7		
451.20	4	0.06	51	51	0.8		
451.395	5	0.06	51	51	0.8		

• Impactor dropped ~ 10 ft. before recover.
• Warmup was ~ 30 hours

Initial leak check 0.020 ft3/min
Si-Gel initial
Final leak check
Si-Gel final
Total H_2O Collected in Flask
Net
Total H_2O Collected

10

ANDERSEN IMPACTOR FIELD DATA

Plant Foote | Time 15:41 | Nozzle Dia. 3.5
Location ____ | Run No. 4 I B .15 | Avg. ΔP ____
Operator Uay/Hobbs | Impactor Location ____ | Traverse Pt. ____
Date 3/18/81 | D.G.M. No. U1 | Pb ____
Andersen Imp No. 2I | D.G.M. Y ____ | Static "Hg ____

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	382	383	384	385	386	387	388	389	B-162	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
454.022	0	0.07	37	37	0.7		
454.24	1	0.07	47	47	0.7		
454.45	2	0.07	47	47	0.8		
454.678	3	0.07	48	48	0.8		
	~~5~~						

Initial leak check 0.005 ft³/min
Final leak check ____
Total H_2O Collected in Flask ____
Total H_2O Collected ____

Si-Gel initial ____
Si-Gel final ____
Net ____

ANDERSEN IMPACTOR FIELD DATA

Plant Foote Time 14:36 Nozzle Dia. 4.0

Location Run No. 4 I B-85 Avg. ΔP

Operator Vay/Hobbs Impactor Location Traverse Pt.

Date 3/17/81 D.G.M. No. V1 Pb

Andersen Imp No. I D.G.M. Y Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	478	479	480	481	482	483	484	485	S 174	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
452.761	0	0.11	56	48	0.2		
452.85	1	0.11	55	48	0.7		
453.10	2	0.11	55	48	0.7		
453.38	3	0.11	55	47	0.8		
453.64	4	0.11	54	47	0.8		
453.918	5	0.11	54	47	0.9		

note the first 60 seconds of run did not draw at proper ΔH
ΔH was 0.011 instead of 0.11

Initial leak check 0.015 ft³/min

Final leak check

Total H_2O Collected in Flask

Total H_2O Collected

Si-Gel initial

Si-Gel final

Net

ANDERSEN IMPACTOR FIELD DATA

Plant: Foote

Time: 16:48

Nozzle Dia.: 3.5

Location:

Run No.: #5 I B .15

Avg. ΔP:

Operator: Clay/Hobbs

Impactor Location:

Traverse Pt.:

Date: 3/18/81

D.G.M. No.: V1

Pb:

Andersen Imp No.: 2 I

D.G.M. Y:

Static "Hg:

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	365	366	367	368	369	370	371	372	B160	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
457.983	0	0.07	53	53	0.7		
458.20	1	0.07	53	53	0.8		
458.41	2	0.07	53	53	0.8		
458.63	3	0.07	53	53	0.8		
458.84	4	0.07	54	54	0.8		
459.09	5	0.07	55	54	0.8		
459.269	6	0.07	55	54	0.8		

Initial leak check: 0.006 ft³/min

Final leak check:

Total H_2O Collected in Flask:

Total H_2O Collected:

Si-Gel Initial:

Si-Gel final:

Net:

ANDERSEN IMPACTOR FIELD DATA

Client Foote
Time 16:55
Nozzle Dia. X

Location Inlet
Run No. 1 I Blank
Avg. ΔP

Operator Vay/Hobbs
Impactor Location
Traverse Pt.

Date 3/18/81
D.G.M. No. V1
Pb

Andersen Imp No. I
D.G.M. Y
Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	
Substrate No.	342	343	344	345	346	347	348	349	B157	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
454.747	0	0.07	55	55	0.8		
454.95	1	0.07	55	55	1.2		
455.28	2	0.07	55	55	1.4		
455.38	3	0.07	55	55	1.6		
455.69	4	0.07	55	55	1.6		
455.80	5	0.07	55	55	2.0		
456.01	6	0.07	55	55	2.4		
456.22	7	0.07	55	55	2.7		
456.44	8	0.07	55	55	3.1		
456.64	9	0.07	55	55	3.5		
456.85	10	0.07	54	54	3.8		
457.06	11	0.07	54	54	4.0		
457.27	12	0.07	54	54	4.1		
457.48	13	0.07	54	54	4.3		
457.69	14	0.07	55	55	4.8		
457.894	15	0.07	55	55	5.1		

Initial leak check 0.008 ft³/min
Si-Gel initial

Final leak check
Si-Gel final

Total H_2O Collected in Flask
Net

Total H_2O Collected

10

ANDERSEN IMPACTOR FIELD DATA

Plant Fook   Time 0933   Nozzle Dia. 1/4

Location Graham WUG OUTLET   Run No. 10A   Avg. ΔP

Operator T Epstein   Impactor Location Ad'l # 11   Traverse Pt. ~6'

Date 3/17/81   D.G.M. No. V2   Pb

Andersen Imp No. 4 A   D.G.M. Y   Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	438	439	440	441	442	443	444	445	169	

ΔH - 0.17

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
7.795	0	0.17	48	50	0.25		
9.600	6.0	0.17	45	51	0.25		
11.500	12.0	0.17	43	51	0.30		
13.395	18.0	0.17	45	51	0.30		
15.270	24.0	0.17	46	51	0.30		
17.145	30.0	0.17	48	52	0.30		
19.020	36.0	0.17	49	52	0.30		
20.900	42.0	0.17	51	54	0.30		
22.775	48.0	0.17	54	56	0.30		
24.655	54.0	0.17	54	58	0.30		
26.535	60.0	0.17	55	59	0.30		
28.415	66.0	0.17	58	60	0.30		
30.300	72.0	0.17	58	61	0.30		
32.175	78.0	0.17	60	62	0.30		
34.060	84.0	0.17	60	63	0.30		
35.938	90.0	0.17	58	63	0.30		

Initial leak check 0.015   Si-Gel initial —

Final leak check —   Si-Gel final —

Vol H_2O Collected in Flask —   Net —

Total H_2O Collected —

ANDERSEN IMPACTOR FIELD DATA

Plant Foote Time 0930 Nozzle Dia. 2L

Location OUTLET Run No. 10B Avg. ΔP

Operator T Epstein Impactor Location [illegible] #10 Traverse Pt. ~6'

Date 3/17/81 D.G.M. No. V4 Pb

Andersen Imp No. 4B D.G.M. Y Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	[illegible]	[illegible]	[illegible]	[illegible]	498	499	500	501	502	

ΔH -0.17

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
54.934	0	0.17	60	51	0.65	[illegible]	
56.960	6.0	0.17	59	51	0.65		
58.960	12.0	0.17	59	50	0.70		
60.960	18.0	0.17	59	51	0.70		
62.950	24.0	0.17	59	51	0.70		
64.930	30.0	0.17	59	52	0.75		
66.915	36.0	0.17	59	53	0.75		
68.900	42.0	0.17	60	55	0.75		
70.880	48.0	0.17	59	57	0.75		
72.855	54.0	0.17	60	58	0.75		
74.835	60.0	0.17	60	60	0.75		
76.815	66.0	0.17	60	61	0.75		
78.790	72.0	0.17	62	63	0.80		
80.770	78.0	0.17	62	64	0.80		
82.745	84.0	0.17	66	66	0.80		
84.723	90.0	0.17	66	66	0.80		

Initial leak check 0.004 Si-Gel initial —

Final leak check — Si-Gel final —

Net —

Total H_2O Collected in Flask —

Total H_2O Collected —

ANDERSEN IMPACTOR FIELD DATA

Plant Foote
Time 1315
Nozzle Dia. 1L
Location Graham W Va
Run No. 20-A
Avg. ΔP
Operator TEpstein
Impactor Location outlet #1
Traverse Pt. 6'
Date 3/17/81
D.G.M. No. V4
Pb
Andersen Imp No. 4A
D.G.M. Y
Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	470	471	472	473	474	475	476	477	B-123	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point.
84.884	0	0.17	72	70	0.85		
86.900	6.0	0.17	73	69	0.90		
88.910	12.0	0.17	73	70	0.90		
90.910	18.0	0.17	73	69	0.90		
92.910	24.0	0.17	73	70	0.90		
94.910	30.0	0.17	74	71	0.90		
96.910	36.0	0.17	74	71	0.95		
98.910	42.0	0.17	74	72	0.95		
100.910	48.0	0.17	74	72	0.95		
102.910	54.0	0.17	74	72	0.95		
104.910	60.0	0.17	74	72	0.95		
106.905	66.0	0.17	74	72	0.95		
108.900	72.0	0.17	73	72	0.95		
110.895	78.0	0.17	74	72	0.95		
112.890	84.0	0.17	73	72	0.95		
114.887	90.0	0.17	73	72	0.95		

Initial leak check 0.003
Final leak check —
Total H_2O Collected in Flask —
Total H_2O Collected —

Si-Gel initial —
Si-Gel final —
Net —

ANDERSEN IMPACTOR FIELD DATA

Plant Fook | Time 1318 | Nozzle Dia. .24

Location Graham, W.Va | Run No. 2-0-B | Avg. ΔP

Operator T Epstein | Impactor Location outlet #2 | Traverse Pt. 6'

Date 3/17/81 | D.G.M. No. V2 | Pb

Andersen Imp No. 4B | D.G.M. Y | Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	318	319	320	321	322	323	324	325	B-154	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
35.999	0	0.17	84	78	0.55		
37.975	6.0	0.17	77	80	0.55		
40.265	~~12.0~~ 13.0	0.17	76	81	~~0.60~~ 0.60		
41.900	18.0	0.17	75	82	0.60		
43.885	24.0	0.17	74	82	0.60		
45.860	30.0	0.17	76	83	0.60		
47.840	36.0	0.17	76	83	0.60		
49.815	42.0	0.17	77	84	0.65		
51.765	48.0	0.17	74	84	0.65		
53.720	54.0	0.17	75	84	0.65		
55.680	60.0	0.17	76	84	0.65		
57.630	66.0	0.17	75	85	0.65		
59.595	72.0	0.17	74	84	0.65		
61.535	78.0	0.17	77	84	0.65		
63.480	84.0	0.17	76	85	0.65		
65.439	90.0	0.17	74	84	0.65		

Initial leak check 0.005

Final leak check —

Total H_2O Collected in Flask —

Total H_2O Collected —

Si-Gel initial —

Si-Gel final —

Net

10

ANDERSEN IMPACTOR FIELD DATA

Plant: Foote
Time: 1610
Nozzle Dia.: JL
Location: Graham, W Va
Run No.: 3-0-A
Avg. ΔP:
Operator: T Epstein
Impactor Location: Outlet, #3
Traverse Pt.: 6'
Date: 3/17/81
D.G.M. No.: V4
Pb:
Andersen Imp No.: 4A
D.G.M. Y:
Static "Hg:

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	358	359	360	361	362	363	364	365	B-159	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
115.014	0	0.17	70	66	0.65		
117.035	6.0	0.17	71	67	0.70		
119.050	12.0	0.17	72	68	0.70		
121.020	18.0	0.17	72	68	0.75		
123.355	~~25~~ 24.0	0.17	71	68	0.75		
125.030	30.0	0.17	71	68	~~0.20~~ 0.75		
127.035	36.0	0.17	71	69	0.75		
129.035	42.0	0.17	71	69	0.75		
131.035	48.0	0.17	71	69	0.75		
133.035	~~55.0~~ 54.0	0.17	71	69	0.75		
135.030	60.0	0.17	70	69	0.80		
137.030	66.0	0.17	70	68	0.80		
139.025	72.0	0.17	70	68	0.80		
141.025	78.0	0.17	70	69	0.80		
143.020	84.0	0.17	70	67	0.80		
145.007	90.0	0.17	70	67	0.80		

Initial leak check: 0.015
Final leak check: —
Total H_2O Collected in Flask: —
Total H_2O Collected: —

Si-Gel initial: —
Si-Gel final: —
Net: —

ANDERSEN IMPACTOR FIELD DATA

Plant Foote | Time 1613 | Nozzle Dia. 2L

Location Graham WVa | Run No. 3-0-6 | Avg. ΔP

Operator J Epstein | Impactor Location outlet, #4 | Traverse Pt. 6'

Date 3/17/81 | D.G.M. No. V2 | Pb

Andersen Imp No. 4B | D.G.M. Y | Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	390	391	392	393	394	395	396	397	B-163	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
65.501	0	0.17	60	63	0.75		
67.475	6.0	0.17	60	65	0.75		
69.450	12.0	0.17	59	65	0.75		
71.405	18.0	0.17	60	65	0.80		
73.355	24.0	0.17	60	65	0.80		
75.315	30.0	0.17	60	65	0.80		
77.270	36.0	0.17	60	65	0.80		
79.220	42.0	0.17	60	65	0.80		
81.180	48.0	0.17	61	65	0.80		
83.085	54.0	0.17	60	65	0.80		
85.020	60.0	0.17	60	65	0.80		
86.960	66.0	0.17	60	65	0.80		
88.900	72.0	0.17	60	65	0.80		
90.840	78.0	0.17	58	64	0.80		
92.775	84.0	0.17	58	64	0.80		
94.715	90.0	0.17	58	63	0.80		

1613

Initial leak check 0.005

Final leak check —

Total H_2O Collected in Flask —

Total H_2O Collected —

Si-Gel initial —

Si-Gel final —

Net —

ANDERSEN IMPACTOR FIELD DATA

Plant Foote
Time 1300
Nozzle Dia. 1L

Location Graham W.Va
Run No. 4-0-A
Avg. ΔP

Operator T Eggen
Impactor Location Ht4, #5
Traverse Pt. 6'

Date 3/18/81
D.G.M. No. V4
Pb

Andersen Imp No. 4A
D.G.M. Y
Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	462	463	464	465	466	467	468	469	B-172	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
145.067	0	0.17	60	65	0.60		
147.125	6.0	0.17	60	63	0.60		
149.105	12.0	0.17	61	65	0.60		
151.085	18.0	0.17	61	66	0.65		
153.060	24.0	0.17	61	68	0.65		
155.045	30.0	0.17	61	68	0.65		
157.010	36.0	0.17	61	68	0.65		
158.980	42.0	0.17	61	69	0.65		
160.950	48.0	0.17	68	70	0.65		
162.915	54.0	0.17	69	70	0.65		
164.885	60.0	0.17	72	72	0.65		
166.850	66.0	0.17	74	74	0.65		
168.815	72.0	0.17	75	75	0.65		
170.780	78.0	0.17	74	74	0.65		
172.745	84.0	0.17	74	71	0.65		
174.708	90.0	0.17	74	71	0.65		

Initial leak check 0.015
Si-Gel initial —

Final leak check —
Si-Gel final —

Total H_2O Collected in Flask —
Net —

Total H_2O Collected —

warmed up for 3hrs.+

ANDERSEN IMPACTOR FIELD DATA

Plant Suite Time 1303 Nozzle Dia. .32

Location Graham, W.Va Run No. B 4-O-B Avg. ΔP

Operator T Epstein Impactor Location outlet, #6 Traverse Pt. 6'

Date 3/15/91 D.G.M. No. V2 Pb

Andersen Imp No. 4B D.G.M. Y Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	422	423	424	425	426	427	428	429	B-167	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
94.798	0	0.17	44	43	0.70		
96.670	6.0	0.17	44	44	0.70		
98.540	12.0	0.17	46	45	0.70		
100.400	18.0	0.17	48	46	0.70		
102.250	24.0	0.17	48	47	0.70		
104.095	30.0	0.17	48	48	0.75		
1303 105.935	36.0	0.17	49	49	0.75		
107.800	42.0	0.17	50	50	0.75		
109.640	48.0	0.17	52	52	0.75		
111.470	54.0	0.17	53	53	0.75		
113.300	60.0	0.17	52	52	0.75		
115.145	66.0	0.17	54	54	0.75		
116.980	72.0	0.17	57	52	0.75		
118.825	78.0	0.17	54	50	0.75		
120.655	84.0	0.17	54	49	0.75		
122.496	90.0	0.17	40	47	0.80		

Initial leak check 0.010 Si-Gel initial —

Final leak check — Si-Gel final —

Total H_2O Collected in Flask — Net —

Total H_2O Collected —

warmed up for 3 hrs, +

10

ANDERSEN IMPACTOR FIELD DATA

Plant: Fook
Time: 1545
Nozzle Dia.: 1L
Location: Graham, WVa
Run No.: 5-0-A
Avg. ΔP:
Operator: T Epstein
Impactor Location: outlet, #7
Traverse Pt.: 61
Date: 3/18/81
D.G.M. No.: V4
Pb:
Andersen Imp No.: 4A
D.G.M. Y:
Static "Hg:

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	310	311	312	313	314	315	316	317	B153	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
174.943	0	0.17	62	56	0.65		
176.970	6.0 ~~6.0~~	0.17	62	56	0.65		
178.980	12.0	0.17	62	56	0.65		
180.995	18.0	0.17	63	58	0.70		
183.005	24.0	0.17	62	58	0.70		
185.015	30.0	0.17	63	58	0.70		
187.015	36.0	0.17	63	60	0.70		
189.020	42.0	0.17	63	60	0.70		
191.020	48.0	0.17	64	61	0.70		
193.035	54.0	0.17	64	60	0.70		
195.060	60.0	0.17	64	60	0.75		
197.090	66.0	0.17	64	60	0.75		
199.110	72.0	0.17	64	60	0.75		
201.140	78.0	0.17	64	60	0.75		
203.160	84.0	0.17	64	60	0.75		
205.182	90.0	0.17	64	60	0.75		

Initial leak check: 0.015
Si-Gel initial: —
Final leak check: —
Si-Gel final: —
Total H_2O Collected in Flask: —
Net: —
Total H_2O Collected: —

ANDERSEN IMPACTOR FIELD DATA

Plant Foote

Time 1548

Nozzle Dia. none

Location Graham, W Va

Run No. 5-0-B(blank)

Avg. ΔP

Operator T Epstein

Impactor Location outlet #8

Traverse Pt. 6'

Date 3/18/81

D.G.M. No. V2

Pb

Andersen Imp No. 4B

D.G.M. Y

Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	334	335	336	337	338	339	340	341	B156	

Blank

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
122.556	0	0.17	42	45	1.70		
124.500	6.0	0.17	42	47	1.75		
126.430	12.0	0.17	44	47	1.75		
128.345	18.0	0.17	46	49	1.85		
130.280	24.0	0.17	45	49	2.05		
1548 132.235	30.0	0.17	47	50	2.30		
134.155	36.0	0.17	50	52	2.45		
136.115	42.0	0.17	50	53	2.50		
138.080	48.0	0.17	50	54	2.60		
140.050	54.0	0.17	48	54	2.85		
142.030	60.0	0.17	49	54	2.95		
144.010	66.0	0.17	49	54	2.95		
145.975	72.0	0.17	49	54	2.95		
147.950	78.0	0.17	50	54	3.15		
149.960	84.0	0.17	50	55	3.30		
151.446	90.0	0.17	51	55	3.30		

Initial leak check 0.005

Final leak check —

Total H_2O Collected in Flask —

Total H_2O Collected —

Si-Gel initial —

Si-Gel final —

Net —

ANDERSEN IMPACTOR FIELD DATA

Plant Foote

Time 1314

Nozzle Dia. 14.5

Location [illegible]

Run No. outlet visible

Avg. ΔP

Operator T E [illegible]

Impactor Location #3 outlet

Traverse Pt. ~6'

Date 3/16/81

D.G.M. No. V2 2500014

Pb

Andersen Imp No. 4B

D.G.M. Y

Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	254	255	256	257	258	259	260	261	6146	

w/cyclone & visibles (outlet)

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
~~[illegible]~~							
975.467	0	0.20	47	48	0.50		
978.155	8.0	0.20	44	46	0.50		
980.830	16.0	0.20	42	48	0.55		
983.530	24.0	0.20	42	47	0.60		
986.215	32.0	0.20	43	47	0.60		
988.890	40.0	0.20	45	47	0.65		
991.540	48.0	0.20	47	48	0.65		
994.180	56.0	0.20	50	50	0.70		
996.815	64.0	0.20	51	51	0.70		
999.440	72.0	0.20	49	52	0.70		
1002.110	80.0	0.20	48	52	0.70		
1004.780	88.0	0.20	47	52	0.75		
1007.444	96.0	0.20	48	53	0.80		

Initial leak check 0.002

Final leak check —

Total H_2O Collected in Flask —

Total H_2O Collected —

Si-Gel initial —

Si-Gel final —

Net —

ANDERSEN IMPACTOR FIELD DATA

Plant Fort

Location [illegible] W Va

Operator J Epstein

Date [illegible]

Andersen Imp No. 21

Time 1245

Run No. outlet blank

Impactor Location outlet, #2

D.G.M. No. V4 2800014

D.G.M. Y

Nozzle Dia.

Avg. ΔP

Traverse Pt. ~6'

Pb

Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	350	351	352	353	354	355	356	357	B158 blank	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
27.275	0	0.20	54	53	1.70		
31.540	[illegible]	[illegible]	56	55	1.70		
32.975	16.0	0.20	56	56	1.70		
35.515	24.0	0.20	62	60	1.70		
38.685	32.0	0.20	64	61	1.70		
41.455	40.0	0.20	67	67	1.75		
44.245	48.0	0.20	65	64	1.75		
47.030	56.0	0.20	84	80	1.75		
49.550	64.0	0.20	92	86	1.75		
52.625	72.0	0.20	96	92	1.85		

scrubbed, no petri dishes for filters!

Initial leak check 0.002

Final leak check —

Total H_2O Collected in Flask —

Total H_2O Collected —

Si-Gel initial —

Si-Gel final —

Net —

APPENDIX E-2

VISIBLE EMISSION OBSERVER FIELD DATA SHEETS

A-10

GCA CORPORATION
Technology Division
213 Burlington Road
Bedford, Massachusetts, 01730
(617) 275-5444

VISIBLE EMISSION OBSERVATION FORM

Date 3/18/81

Observer Sandra Beaton

U.S. EPA Region

Company Name Foote Mineral Co.

Location Graham, W.VA.

Source: Baghouse Roof MONITOR

Source Height:	~ 100 ft
Distance from Source:	~ 300 ft
Direction from Source:	
Wind Direction:	Speed: 0-5 mph
Background(s) Used: (1)	SKY
(2)	(3)
Colors of Background(s): (1)	Blue
(2)	(3)
Color of Emissions: (1)	Red + Brown
(2)	(3)
Ambient Temperature:	40 °F
Relative Humidity:	<50% ☒ >50% ☐
Reading Conditions:	EX ☒ GD ☐ FR ☐ PR ☐

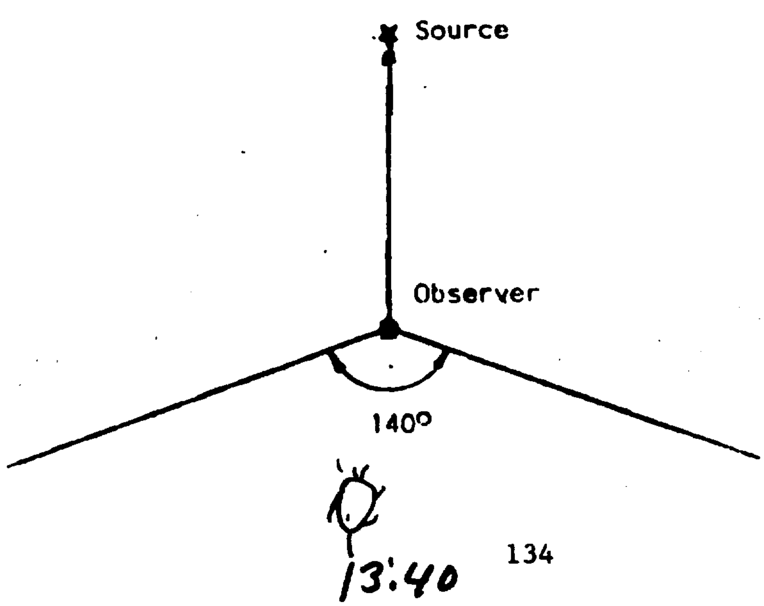
Comments: (Include Contacts)

Observation Point: across R.R. track in front of power station

Signature: Sandra A. Beaton

Date Last Certified: 10/28/80

Show: Sun, Wind, and North Arrow



~/7 -

10

GCA

COMPANY: Foote Mineral Co.

LOCATION: Graham, W.VA.

CAST:

OBSERVER: S. Beaton

DATE: 3/18/81

Time (M)		0	15	30	45	Proc.	Loca.	Color
13	0							
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

Time (M)		0	15	30	45	Proc.	Loca.	Color
	30							
	31							
	32							
	33							
	34							
	35							
13	36	0	0	0	0			
	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	45	0	0	0	0			
	46	0	0	0	0			
	47	0	0	0	0			
	48	0	0	0	0			
	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
	57	0	0	0	0			
	58	0	0	0	0			
	59	0	0	0	0			

COMMENTS:

a) See legend for abbreviated words.
b) Location of emissions applicable to a roof monitor: (E) East. (C) Center. (W) West.
c) Color of emissions: (Bl) Black, (Br) Brown. (R) Red. (O) Orange. (W) White. (G) Gray.

3.4 0

GCA

COMPANY: Foote Mineral Co

LOCATION: Graham, W.VA.

CAST:

OBSERVER: S. Beaton

DATE: 3/18/81

Time (M)		0	15	30	45	Proc.	Loca.	Color
M	0	0	0	0	0			
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	0	0	0			
	5	0	0	0	0			
	6	0	0	0	0			
	7	0	0	0	0			
	8	0	0	0	0			
	9	0	0	0	0			
	10	0	0	0	0			
	11	0	0	0	0			
	12	0	0	0	0			
	13	0	0	0	0			
	14	0	0	0	0			
	15	0	0	0	0			
	16	0	0	0	0			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	21	0	0	0	0			
	22	0	0	0	0			
	23	0	0	0	0			
	24	0	0	0	0			
	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			
	30	0	0	0	0			
	31	0	0	0	0			
	32	0	0	0	0			
	33	0	0	0	0			
	34	0	0	0	0			
	35	0	0	0	0			
	36	0	0	0	0			
	37	0	0	0	0			
	38	0	0	0	0			
	39	0	0	0	0			
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	0	0			
	43	0	0	0	0			
	44	0	0	0	0			
	45	0	0	0	0			
	46	0	0	0	0			
	47	0	0	0	0			
	48	0	0	0	0			
	49	0	0	0	0			
	50	0	0	0	0			
	51	0	0	0	0			
	52	0	0	0	0			
	53	0	0	0	0			
	54	0	0	0	0			
	55	0	0	0	0			
	56	0	0	0	0			
	57	0	0	0	0			
	58	0	0	0	0			
	59	0	0	0	0			

COMMENTS:

a) See legend for abbreviated words.

b) Location of emissions applicable to a roof monitor: (E) East. (C) Center. (W) West.

c) Color of emissions: (Bl) Black, (Br) Brown. (R) Red. (O) Orange. (W) White. (G) Gr

114

GCA

COMPANY: Foote Mineral Co.

LOCATION: Graham, W. VA

CAST:

OBSERVER: S. Beaton

DATE: 3/18/81

	Time (M)	0	15	30	45	Proc.	Loca.	Color
15	0	0	0	0	0			
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	0	0	0			
	5	0	0	0	0			
	6	0	0	5	5			Red
	7	0	0	0	0			
	8	0	0	0	0			
	9	0	0	0	0			
	10	0	0	0	0			
	11	0	0	0	0			
	12	0	5	5	5			Red
	13	5	5	5	5			
	14	10	10	5	5			
	15	5	5	10	20			
	16	10	5	5	5			
	17	5	10	20	10			Br
	18	5	10	20	20			
	19	15	5	10	25			
	20	10	5	5	0			
	21	5	10	10	5			
	22	5	5	5	0			
	23	10	10	5	0			
	24	0	0	0	0			
	25	10	5	10	5			
	26	0	0	0	0			
	27	0	0	0	0			
	28	5	5	5	0			
	29	0	0	0	0			

	Time (M)	0	15	30	45	Proc.	Loca.	Color
	30	0	0	5	5			
	31	0	0	0	0			
	32	0	0	0	0			
	33	10	10	10	5			Red.
	34	5	5	5	5			
	35	5	15	15	15			
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
	46							
	47							
	48							
	49							
	50							
	51							
	52							
	53							
	54							
	55							
	56							
	57							
	58							
	59							

COMMENTS:

a) See legend for abbreviated words.

b) Location of emissions applicable to a roof monitor: (E) East. (C) Center. (W) West.

c) Color of emissions: (Bl) Black, (Br) Brown. (R) Red. (O) Orange. (W) White. (G) Gray.

GCA CORPORATION
Technology Division
213 Burlington Road
Bedford, Massachusetts 01730
(617) 275-5444

VISIBLE EMISSION OBSERVATION FORM

Page 1 of 4.

Date 3/18/81

Observer Sandra Beaton

U.S. EPA Region

Company Name Fook Mineral Co.

Location Graham, W.VA.

Source: Furnace Bldg.
ROOF + OFFTAKE STACKS

Source Height:	~ 200	ft
Distance from Source:	~ 200	ft
Direction from Source:		
Wind Direction:	Speed: 0-5	mph
Background(s) Used: (1)	SKY	
(2)	(3)	
Colors of Background(s): (1)	blue	
(2)	(3)	
Color of Emissions: (1)	white	
(2)	(3)	
Ambient Temperature:	40	°F
Relative Humidity: <50% ☒ >50% ☐		
Reading Conditions: EX ☒ GD ☐ FR ☐ PR ☐		

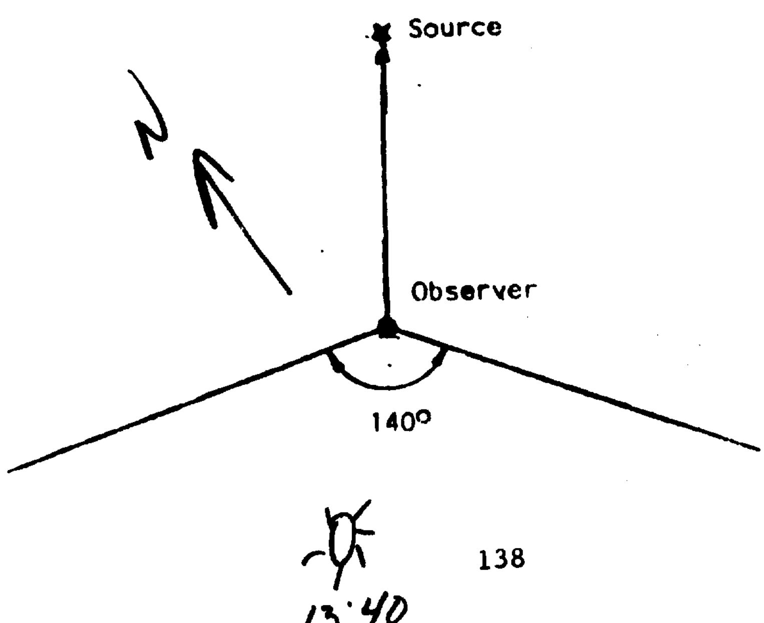
Comments: (Include Contacts)

Observation Point: across R.R. tracks in front of Power station

Signature: Sandra A. Beaton

Date Last Certified: 10/28/80

Show: Sun, Wind, and North Arrow



COMPANY: Foote Mineral Co.
LOCATION: Graham, W.Va.
CAST:

OBSERVER: S. Beaton
DATE: 3/18/81
Fce.

	Time (M)	0	15	30	45	Proc.	Loca.	Color
	0							
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

	Time (M)	0	15	30	45	Proc.	Loca.	Color
	30							
	31							
	32							
	33							
	34							
	35							
13	36	0	0	0	0			
	37	0	0	0	0			
	38	0	0	0	0			
	39	0	5	0	0		Stack	wh
	40	0	0	0	0			
	41	0	0	0	0			
	42	0	0	5	5		Stack	wh
	43	5	5	0	0			
	44	0	0	0	0			
	45	0	0	0	0			
	46	0	0	5	5		Stack	wh
	47	0	0	0	0			
	48	0	5	5	10			
	49	5	5	5	5			
	50	10	15	15	15			
	51	10	10	10	10			
	52	10	10	10	10			
	53	10	10	10	10			
	54	10	10	10	10			
	55	5	5	5	5			
	56	5	5	5	5			
	57	5	5	0	0			
	58	0	0	0	0			
	59	0	0	0	0			

COMMENTS:

a) See legend for abbreviated words.
b) Location of emissions applicable to a roof monitor: (E) East. (C) Center. (W) West.
c) Color of emissions: (Bl) Black, (Br) Brown. (R) Red. (O) Orange. (W) White. (G) Gray

3/4A.D.

GCA

COMPANY: Foote Mineral Co.

LOCATION: Graham, W.VA.

OBSERVER: S. Beaton

DATE: 3/18/81

CAST:

	Time (M)	0	15	30	45	Proc.	Loca.	Color
14	0	0	0	0	0			
	1	0	0	0	0			
	2	0	0	0	0			
	3	0	0	0	0			
	4	0	5	5	5		Stack	White
	5	5	0	0	0			
	6	0	5	5	5			
	7	5	5	5	5			
	8	5	5	5	5			
	9	5	0	0	0			
	10	0	0	0	0			
	11	0	0	0	0			
	12	0	0	0	0			
	13	0	0	10	5			
	14	0	5	5	5			
	15	0	0	5	5			
	16	5	5	5	5			
	17	0	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	21	0	0	0	0			
	22	0	0	0	0			
	23	0	0	0	0			
	24	0	0	0	0			
	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	X	0	int f/ lower R.M.		
	29	0	0	0	0			

FC

Time (M)	0	15	30	45	Proc.	Loca.	Color
30	0	0	0	0			
31	0	0	0	0			
32	0	0	0	0			
33	0	0	0	0			
34	0	0	0	0			
35	0	0	0	0			
36	0	0	0	0			
37	0	0	0	0			
38	0	0	0	0			
39	0	0	0	0			
40	0	0	0	0			
41	0	0	0	0			
42	0	0	0	0			
43	0	0	0	0			
44	0	0	5	5		Stack	Wh
45	5	5	5	5			
46	5	5	5	5			
47	5	5	5	5			
48	5	5	5	5			
49	5	5	5	5			
50	5	5	5	5			
51	5	5	5	5			
52	5	5	5	5			
53	5	5	5	5			
54	5	5	0	0			
55	0	0	0	0			
56	0	0	0	0			
57	5	5	5	5			
58	5	5	5	5			
59	5	0	0	0			

COMMENTS:

a) See legend for abbreviated words.
b) Location of emissions applicable to a roof monitor: (E) East. (C) Center. (W) West.
c) Color of emissions: (Bl) Black, (Br) Brown. (R) Red. (O) Orange. (W) White. (G) Gra

COMPANY: Foote Mineral Co.

LOCATION: Graham, W. VA.

CAST:

OBSERVER: S Beaton

DATE: 3/18/81

	Time (M)	0	15	30	45	Proc.	Loca.	Color
15	0	0	0	0	5			
	1	5	5	5	0			
	2	0	5	5	5			
	3	5	5	5	5			
	4	5	5	0	0			
	5	0	0	5	5			
	6	5	5	5	5			
	7	5	5	5	5			
	8	5	5	5	5			
	9	5	5	5	5			
	10	5	5	5	5			
	11	5	5	5	10			
	12	5	5	5	5			
	13	5	5	5	5			
	14	5	5	5	5			
	15	5	0	0	0			
	16	0	5	5	5			
	17	5	0	0	0			
	18	0	0	0	0			
	19	0	0	0	0			
	20	0	0	0	0			
	21	0	0	0	0			
	22	0	0	0	0			
	23	0	0	0	0			
	24	0	0	0	0			
	25	0	0	0	0			
	26	0	0	0	0			
	27	0	0	0	0			
	28	0	0	0	0			
	29	0	0	0	0			

Time (M)	0	15	30	45	Proc.	Loca.	Color
30	0	0	0	0			
31	0	0	0	0			
32	0	0	0	0			
33	0	0	0	0			
34	0	0	0	0			
35	0	0	0	0			
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							

COMMENTS:

a) See legend for abbreviated words.

b) Location of emissions applicable to a roof monitor: (E) East. (C) Center. (W) West.

c) Color of emissions: (Bl) Black, (Br) Brown. (R) Red. (O) Orange. (W) White. (G) Gray.

APPENDIX E-3

PROCESS OBSERVER FIELD DATA SHEETS

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA CONTRACT No. 68-02-2687 Technical Directive 017

OBSERVER: S. Beaton
DATE: 3/16/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
1311	Smelting		95%	
1321	Stoking	VH		
1322	BLOW			
1333	Stoking	VH		
1335	charging			≈ 30 secs.
13:36:20	end stoking			
13:37	stoking			
13:38	end stoking.			
13:38:30	Start test		Normal emissions.	
13:41:30	end test		100%	Capture – Normal E. thruout test.
13:52	Stoking	VH Surge	90%	
13:53	end stok.			

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA Contract No. 68-02-2687 Technical Directive 01

OBSERVER: S. Beatix
DATE: 3/16/81

CONTROL ROOM DATA

Time	13:13	13:39	13:42					
FUR. POWER MW	33.18	32.87	32.24					
KWH	4874.2							

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA CONTRACT No. 68-02-2687 Technical Directive 017

OBSERVER: S. Beaton
DATE: 3/17/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
9:26	SMELTING	Normal	100	
9:35	stoking			
9:37	end stoking.			lowered 1 door to keep heat off stoking machine.
9:38	Charging			
9:38	Blow	VHE	100%	
9:35	TAPPING		100%	capture by Tap Hood.
9:43	stoking. In progress	VVHE	90%	Same mix spilling out of fce.
9:44	end stoking			
9:52	START	I.P.	RUN.	Normal Emissions
10:07	PLUGGING TAPHOLE			
10:10	JET + CHARGING	HE		
10:11	Normal	Emissions		

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA CONTRACT No. 68-02-2687 Technical Directive 017

OBSERVER: S. Beaton
DATE: 3/17/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
10:16	JET		75% → 100%.	BLOWING MIX OUT FCE.
10:20	Stoking in Progress			
10:23	end Stoking			
10:28	Hard BLOW		≥95%.	SHOOTING MIX OUT
10:31	STOKING			
10:32	END STOKING			
10:35	Hard Blow		100%	
10:37	Charging		100%.	≃ 4 minutes.
10:38	STOKING			for 1 minute
10:45	CHARGING			
10:48	HARD BLOW			
CONTINUING		VH		

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA CONTRACT No. 68-02 2687 Technical Directive 017

OBSERVER: S. Beaton
DATE: 3/17/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
10:57	Stoking	VHE	100	
10:59	END STOKING			
10:59	START RUN			Normal fumes ~~throughout test.~~
11:03	END TEST			
11:12	poking plug out Taphole			
	START Run (I.P.) TAPPING			
11:13	Stoking in progress			
11:15	END.			
SMELTING		to 11:31		
1132	STOKING			~ 1.0 min.
11:41	BLOW	VHE		BLOWING MIX. OUT FCE.
11:43	STOKING			

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

10

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA CONTRACT No. 68-02-2687 Technical Directive 017

OBSERVER: S. Beaton
DATE: 3/17/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
1146	PLUGGING —			
WILL	SHOOT OUT ~~PLUG~~		SLAG	etc.
1149	STILL	TAPPING		
1152	SHOOTING TAPHOLE			
11:58	STLL NOT	RUNNING		WELL
1205	to 12:15	—	Break	
12:19	Smelting			
1222	hard Blows			
1223	Stoking			~ 2 mins.
12:37	Normal			
12:45	PLUGGED TAPHOLE.			
12:47	STOKING			~ 1.0 minute
12:49	SMELTING	—		heavier than normal
13:00	Stoking	HE		

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA CONTRACT No. 68-02-2687 Technical Directive 017

OBSERVER: S. Beaton
DATE: 3/17/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
13:17	stoking		100	~ 1.0 min.
13:22	2 Blows	HVE	100	~ 30 sec.
13:23	Charging	Start Run (?)		~ 10 secs.
13:25	Charging	+ Blowing HE.		
13:27	stoking	VHE		
	END RUN			
13:29	end stoking			
13:29	stoking			~ 1.0 min.
14:03	PLUGGING TAPHOLE ← start a run			Note: had to shoot the plug out. fce is slaggy so had to let it run
14:05	PLUGGED ← END RUN.			
14:08	BLOW	VHE		~ 2.0 mins.
				Furnace is running smoothly now.

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA CONTRACT No. 68-02-2687 Technical Directive 017

OBSERVER: S. Beaton
DATE: 3/17/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
14:12	Charging mix			~ 10 secs. Normal Emissions
14:26	BLOW	HE		
14:29	Stoking	till Stoking	100	
14:30	end Stoking			
14:42	around	Start Run.		
14:45				Still tapping - have been all along.
SMELTING				
1455	BLOW			~ 5 sec.
1455	STOKING			
15:01	added mix.			~ 5 sec.
15:02	Stoking			
15:03	end Stoking			
15:20	PLUGGED			

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA CONTRACT No. 68-02-2687 Technical Directive 017

OBSERVER: S. Beaton
DATE: 3/17/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
1522	JET			
1521	START	RUN.		
1523	Charge			5 secs:
1524	Charge			5 secs.
1525	Stoking	MHE	100	
1533	END STOKING			
1547	BLOW			
1548	Stoking			5 secs.
1554	Stoking	VHE		
1557	END STOKING			
16:15	tapping — poking plug out.			
16:24	FLOWING	GOOD		

LE = Light emissions; 5 to 25 percent opacity

MF = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA CONTRACT No. 68-02-2687 Technical Directive 017

OBSERVER: S. Beaton
PROCESS DATA DATE: 3/17/81

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
16:25	Stoking in progress			
16:26	END STOKING			
16:30	BLOW			
16:31	STOKING			
16:33	END STOKING			
16:36 or 37	Start run			Normal fce emissions still tapping.
14:40.58	Run Over With			
16:55	add mix.			2 secs.
16:56	Stoking	HE	100%	
16:58	END stoking			
17:07	Stoking			
17:11	END STOKING			

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA CONTRACT No. 68-02-2687 Technical Directive 017

OBSERVER: S. Beaton
DATE: 3/17/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
17:11 ↓ 17:24	SMELTING		100	NORMAL FUMES
	"			
17:36	JET	VHE		spitting mix
17:37	STOKING			
17:41	END STOKING			
17:47	TAPPING IN PROGRESS			
	RUN TEST			
17:54	JET			
17:55	STOKE			
17:57	END STOKE			
18:20	add mix			5 sec.
18:21	testing			

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA CONTRACT No. 68-02-2687 Technical Directive 017

OBSERVER:
DATE:

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
1825	Stoking			
1826	Run over.			

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA Contract No. 68-02-2687 Technical Directive 017

OBSERVER: S. Beaton
DATE: 3/17/81

CONTROL ROOM DATA

Time	9:29	9:48	10:14	10:41	11:28	12:24	13:50	15:00
Furnace MW.	25.48	28.88	28.49	30.83	29.76	30.69	32.62	31.62
Power Factor	.54	.6143	.5951	.6711	.6686	.6849	.7465	.7258
Mega Vars.	47	45	45	44	42	43	38.5	40.5
KWH		4938.8						
TIME	15:46	16:46	17:38	16:22				
FURNACE MW.	32.21	31.87	31.35	30.37				
Power Factor.	.7128	.7335	.7072	.6735				
Mega Vars.	41	39.0	42	43				
KWH.				4966.1				

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA CONTRACT No. 68-02-2687 Technical Directive 017

OBSERVER: CLW
DATE: 3/18/81

PROCESS DATA

Time	Process	Magnitude of ~~Emissions~~ furnace fume	Percent Capture By Hood	Comments
12:58	PLUGGING		100	
	START RUN			
13:03	STOKING			
13:05	Tap plugged			
13:14	Blow - 15 sec	Heavy	100	
13:15	add mix - Stoke			
13:17	Stop stoke			
13:31	add mix stoke			
13:42	Light blow add mix stoke	Moderate	100	
14:14	Hard blow add mix ~~stoke~~	Heavy (for 15 sec)	80%	
14:15	Stoke	Moderate	100	
13:45	tap			
14:15	Plug tap			

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., [illegible], W. VA
EPA CONTRACT No. 68-02-2[illegible]8 Technical Directive 017

OBSERVER: cww

PROCESS DATA

DATE: 3/18/81

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
14:39	add mix	Light	100	
14:45	Stoke	Moderate	100	Lasted ~ 2 min
14:50	Tapping		100	
15:07	Add mix	moderate	100	
15:10	stoke	" "	" "	
15:20	Plug Tap			
15:40	Stoking	Heavy ~~moderate~~	90%	(moderate most of time with 100% capture) Hood blow on one phase during stoke
16:02	BLOW			~ 1.0 min.
16:06	add mix			5 sec
	Stoking			
16:20	BLOW	Heavy		
16:15 on 50	TAPPED			
16:22	stoking			

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA CONTRACT No. 68-02-2687 Technical Directive 017

OBSERVER: S. Beaton
DATE: 3/18/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
16:26	end Stoking		100	
16:39	Stoking			
before 16:44	END TAPPING			
16:49	START RUN			Normal Emissions
16:56	END TEST.			
17:00	add mix			
17:02	Stoking	HEAVY		
17:09	END Stoking			

LE = Light emissions, 5 to 25 percent opacity
ME = Moderate emissions; 30 to 60 percent opacity
HE = Heavy emissions; 65 to 100 percent opacity

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA Contract No. 68-02-2687 Technical Directive 017

OBSERVER: S. Beaton
DATE: 3/18/81

CONTROL ROOM DATA

Time	13:00	13:30	14:00	14:32	15:00	15:38	16:00	16:39
POWER	31.47	29.86	33.29	30.49	33.11	30.05	31.18	35.16
Power Factor	.8410	.7651	.8333	.8059	.8191	.8100	0.80	.7824
Mega Vars	28	34013.4 33	34015.2 31	34017.0 31	34018.6 31	34020.9 30	34022.1 36	37
KWH	5018.8	5020.2	5022.0	5023.9	5025.1	5027.1	5028.2	5030.8

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA Contract No. 68-02-2687 Technical Directive 017

BAGHOUSE CONTROL ROOM DATA

OBSERVER: GRONBERG
DATE: 03/17/81 + 3/18/80

Time	COMPARTMENT PRESSURES (inches Water) 1	2	3	4	5	6	7	8	9	10	11	TEMP	2 COMBINED FAN AMPS	TIMER SETTINGS
1100												420	285	COLLECTION CYCLE 15 min
1230												420	285	CLEAN PERIOD 45 secs
1500	12.5	13	12.5	0	11	11	11.5	10.2	10.5	10.5	10.8	420	290	NULL PERIOD 30 secs
1725												420	302	SOFT REINFLATE 20 secs
1845	10	10.5	10.5	10	9.5	10	9.5	11.5	9.5	9.5	9.5	410	291	
	#2 Compartment just went off.													
	TESTS 1-3 above						3/18/81 Test 4, 5, 6 Below.							
0915	11	11	11	10.8	10.5	9	0	10.5	9	9	9	380	290	
1305	9.7	9.7	10	9	9	8	8.5	9	8.5	0	8.2	420	290	
1430	10.2	10.5	11	10.5	10	9.5	9.7	10	9	9	9.5	390	290	

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Foote Mineral Co., Graham, W. VA
EPA Contract No. 68-02-2687 Technical Directive [illegible]

OBSERVER: [illegible]
DATE. 03/15/81

BAGHOUSE DATA

Time	COMPARTMENT PRESSURES (inches Water)											TEMP	FAN AMPS COMBINED
--	1	2	3	4	5	6	7	8	9	10	11		
[illegible]	11	11	[illegible]	0	10.2	[illegible]	10.5	11	10.5	9.5	9.5	410	295
1756	12	12	12	12	11	11	11	11.8	10	↓ dropping	11.0	390	290

Fact Sheet: American Air Filter
Fume Collectors, Graham

247
u 260

	#2	#5
Gas Volume	450,000 ACFM	250,000 ACFM
Max Operating Temp.	550° F	550° F
Max System Sp	24" W. G.	24" W. G.
Main Fans	2 @ 1500 HP	1 @ 1500 HP
Reverse Air Fans	1 @ 300 HP	1 @ 300 HP
Auxilliaries	150 HP	125 HP
Total HP	3450	1925
Physical Size		
Length	157'	100'
Width (Incl. Precoolers)	92'	79'
Height	90' +	90' +
Duct Diameter	12' - 6"	9' - 2"
Compartments		
Number	11	7
No. Bags/Comp.	256 - 2816	256 - 1792
Size	11 3/4" x 31'	11 3/4" x 31'
Mat'l.	Glass Cloth Crows Foot Weave, 15 - 20 perm - Siliconized, Graphitized	
Life Of Bags (Approx.)	2 yrs.	2 yrs.

APPENDIX E-4

DUAL CYCLONE SAMPLER FIELD DATA SHEETS

IP DUAL CYCLONE SAMPLER FIELD DATA

8618C 10

Plant Name [illegible]		Nozzle # 3.5 mm		Diameter 0.138"	
Location [illegible]		Av. ΔP 0.7		Stack T 40	
Date 3 17 [illegible]		Barom P 29.7		Static P −1.0"	
Operator [illegible]		Start Time 0953		Meter # V-3 Y =	
IP Sampler # 1		Impactor Location 1-B 0.85			
Run No. 1-B-0.85 1-2		% Moisture 2%		Leak Check 0.01 ft³/m	
Filter # none		X Part. Bottle# —		III Part. Bottle# —	

DGM Reading	Elapsed Time	Orifice Δh("H_2O)	Meter Temperature Inlet	Meter Temperature Outlet	Orifice SP-"Hg	Comments
153.952	0.0	0.08	35	40	0.0	
154.01	5.00	0.08	35	40	0.2	out to
154.75	10	0.08	35	40	0.1	0.15 @ Ev
155.45	15	0.08	35	40	0.2	
156.57	20	0.08	36	41	0.2	
157.6	25	0.08	36	41	0.2	SWITCH TO 1
158.66	30 1108.5	0.08	44	49	0.2	
159.74	35	0.08	44	49	0.2	
160.80	40	0.08	43	49	0.3	
162.08	46	0.08	44	49	0.5	
162.93	50	0.08	45	50	0.8	
163.99	55	0.08	45	50	1.0	
164.96	60	0.08	45	50	3.2	Andersen
166.03	65	0.08	45	50	5.4	Running
166.11	65	0.08	45	50	6.0	STOP
167.32	71 1134.5	0.08	45	50	2.0	NOTE: After
170.5	86	0.08	45	50	2.9	andersen
171.66	91	0.08	45	50	3.2	was removed static P dropped
172.78	96	0.08	45	50	3.6	
173.9	101	0.08	45	50	3.9	
174.99	106	0.08	45	50	4.3	← Andersen in for

IP DUAL CYCLONE SAMPLER FIELD DATA

Plant Name Foote Nozzle # 3/17 contd Diameter

Location Graham W. Va Av. ΔP Run 1-2 Stack T

Date 3/17/81 Barom P Stat. P

Operator Hobbs Start Time Meter

IP Sampler # 1 Impactor Location

Run No. 1-B-.85 1-2 % Moisture Leak Check

Filter # not used X Part. Bottle# III Part. Bottle#

DGM Reading	Elapsed Time	Orifice Δh ("H_2O)	Meter Temperature Inlet	Meter Temperature Outlet	Orifice SP-"Hg	Comments
177.20	116	0.8	44	50	0.2	Jiggling hoses
178.31	122	0.8	45	50	0.3	around caused
79.09	126	0.8	45	50	1.4	static P to
180.21	131	0.8	45	50	0.3	drop.
STOPPED TO ~~REPLACE~~ REPLACE SIL GEL @132						Knocking
181.42	137	0.8	43	45	0.9	Sil Gel
182.56	142	0.8	43	48	1.0	Container
186.57	160	0.8	42	49	1.4	lowers
— 170 removed IP for Andersen —						Static P
→ inserted in B-0.15 → 144						
187.82	170					
189.22	175	0.8	38	43	1.7	
191.51	185	0.8	38	43	1.6	
→ 190 Andersen in for warmup @ B-.15						
192.64	191	0.8	38	43	1.9	
194.42	198	0.8	35	43	2.2	
— Stopped to run Andersen @ 199 —						
~~— Reinserted @ B-.88 —~~						

IP DUAL CYCLONE SAMPLER FIELD DATA

Plant Name Forte — Nozzle # 86 1 of 2 — Diameter 0

Location [illegible] — Av. ΔP 0.7 to 0.8" — Stack T 400°F

Date 5/12/81 — Barom P 29.0 — Static P -1.0"

Operator [illegible] — Start Time 1653 — Meter # V-3 Y =

IP Sampler # — Impactor Location B-0.15

Run No. IP-3/4 — % Moisture ~1% — Leak Check 0.015

Filter # — X Part. Bottle# — III Part. Bottle#

DGM Reading	Elapsed Time	Orifice Δh ("H_2O)	Meter Temperature Inlet	Meter Temperature Outlet	Orifice SP-"Hg	Comments
194.719	0:0	0.08	37	44	0	
196.48	7:00	0.08	37	42	2.2	
197.80	13:00	0.08	37	42	7.4	
	- Shut off to run Andersen					← begin at A-0.1
199.34	18:00	0.08	35	43	1.5	
~~200.49~~	- Kink in hose slowed gas flow!					
200.59	30:00	0.08	37	43	0.8	
203.83	41:00	0.08	37	43	1.0	
205.63	51:00	0.08	37	43	1.2	
	- Turned off to run Andersen -					12 ft in duct ~~Back in @~~ A-0.15
207.88	60:00	0.08	37	43	2.0	
209.19	66:00	0.08	37	43	1.5	
211.54	85:00	0.08	37	43	1.2	
	86 off					
[5/13 · 1022 A-0.15 (P) ~ 13:00 noon]						
212.[illegible]	91:00	0.08	35	40	0.6	
216.01	121:00	0.08	38	~~92~~	0.8	
218.16	131:00	0.08	39	43	0.5	
220.30	142:00	0.08	40	44	2.0	
220.75	143	0.08	40	~~44~~	0.6	← Pulled out for An
223.21	154 1422	0.08	53	54	0.8	← into B-0.

IP DUAL CYCLONE SAMPLER ~~FIELD DATA~~ PC 2 of 2

Run 3/4

Plant Name ________ Nozzle # ________ Diameter ________

Location ________ Av. ΔH ________ Stack T ________

Date ________ Barom P ________ Static P ________

Operator ________ Start Time ________ Meter # ________ Y = ________

IP Sampler # ________ Impactor Location ________

Run No. ________ % Moisture ________ Leak Check ________

Filter # ________ X Part. Bottle# ________ III Part. Bottle# ________

DGM Reading	Elapsed Time	Orifice Δh("H_2O)	Meter Temperature Inlet	Meter Temperature Outlet	Orifice SP-"Hg	Comments
224.73	160 239	0.05	51	56	1.0	switch ~~used~~
226.22	166	0.05	51	56	0.8	off for ~3 min
228.45	176 255	0.08	50	57	1.0	
230.00	183	0.05	50	57	1.1	← STOPPED TO RUN
231.36	159	0.06	42	45	0.5	AND.
233.43	196	0.05	42	48	1.1	For 8 min
235.65	208	0.08	42	45	1.0	
238.50	224 251	0.05	42	45	0.8	
240.52	233	0.05	41	45	1.6	
242.31	241	0.08	42	49	1.1	
244.272	250	0.08				

APPENDIX E-5

GRAVIMETRIC ANALYSIS DATA SUMMARY SHEETS

GCA/TECHNOLOGY DIVISION

BURLINGTON ROAD, BEDFORD, MASSACHUSETTS 01730 / PHONE: 617-275-9000

SHEET 1 OF 3

BY SG

DATE 4/14

CH'K. BY

DATE CH'K.

B'K. CH'K. BY

JOB NO. 1 616-027

PROJECT FRONT HALF [illegible] RESULTS

SUBJECT [illegible] 1P

LAST FINAL [illegible] INITIAL [illegible]

Corr factor = - 0.025 mg/ml.

Run No	Beaker #	[illegible] g	Last [illegible]	NET mg	mls	Corrected Net
1IA 15	B155	108.22059	108.21132	9.27	65	10.89
1 I A 85	B177	[illegible]	106 41336	2.26	45	3.38
1 I B 15	B145	[illegible]	108 11717	5.23	30	5.98
1 I B 85	B191	[illegible]459	[illegible]	11.89	75.	13.76
2 I A 15	B153	[illegible]	103.[illegible]	2.62	65	4.24
[illegible] 85	B110	108 [illegible]	108 1300[illegible]	2.60	60	3.50
2 I B 15	B 78	96.[illegible]	96.[illegible]550	4.51	90	6.76
2 I B 85	B[illegible]	10945[illegible]	10945[illegible]	1.15	50	2.40
3 I A 15	B20[illegible]	101.45139	[illegible]	3.09	150	6.84
3[illegible]	B15[illegible]	96.[illegible]	96.[illegible]	2.57	80	4.57
3 I B 15	B20[illegible]	106.74266	106 74370	- 1.04	55	0.34
3 I B 85	B2[illegible]	103 [illegible]	103 [illegible]	2.1[illegible]	[illegible]	4.35
4 I A 15	B142	103.[illegible]	103.86333	1.6[illegible]	50	2.92
4 I A 85	B164	106[illegible]	106[illegible]	1.77	75	3.64
4 I B 15	B171	106.78[illegible]	106.[illegible]	2.09	50	3.34
4 I B [illegible]	B 113	95.[illegible]	9554132	-0.77	75	1.10
5 I B 15	B [illegible]	109.[illegible]	10[illegible]	- [illegible].24	50	1.01

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SHEET 2 OF 3

BY 56

DATE 4/14

CH'K. BY

DATE CH'K.

B'K. CH'K. BY

JOB NO. 1-616-027

PROJECT Front Hag contd

SUBJECT

[illegible]	[illegible] #	[illegible]	[illegible]	[illegible]	[illegible]	Corr [illegible]
10 A	B[illegible]	101.92757	101.[illegible]650	0.79	30	1.54
10B	B113	103.87[illegible]0	[illegible]	16.20	90	18.45
20A	B120	1[illegible]4.17540	104.17754	-2.14	70	-0.39
20B	B116	106.81.75	106[illegible]750	-0.75	50	0.50
30A	B172	104.64735	104[illegible]72	-0.57	60	0.93
30B	B151	103.[illegible]411	103.19412	-0.02	40	0.98
40A	B143	95.00663	95.0790	-1.27	40	-0.27
40B	B173	102.30850	102.30836	0.14	40	1.14
50A	B131	95.90960	95.91030	-1.20	50	0.05

						mg/ml
BLK-1	B150	82.62853	8[illegible] 3040	-1.87	60	.031
BLK-2	B134	83.56565	83.6655	-0.90	45	0.02
BLK-3	B154	102.[illegible]3168	102.53209	-0.41	75	.005
BLK-4	B144	102.96[illegible]	102.16680	-0.80	65	.012
BLK-5	B126	102.64[illegible]	102.[illegible]766	-0.38	75	.005
[illegible]	B112	[illegible]02.[illegible]59[illegible]	102.25950	-0.80	100	.0[illegible]
[illegible]	B145	100.12536	100.12563	-1.17	60	.02

Ave -0.034

-0.025

SHEET 3 OF 3
BY 5G
DATE 4/1V
CH'K. BY
DATE CH'K.
B'K. CH'K. BY

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JOB NO. 1-616-027
PROJECT IP [illegible] FOOTE
SUBJECT

	Run #	[illegible]	[illegible]	Last Σ	Net (mg)	ml	Corr Net
[illegible]	IP-1-2	[illegible]	100.39450	100.33000	64.5	115	63.38
	IP-1-2	B147	101.45350	101.44101	12.49	65	14.12
SM	IP 3 4	B174	102.71701	10[illegible].70406	4[illegible].95	185	47.58
"	IP-[illegible]	B 62	[illegible]	[illegible]	7.21	65	8.84

WEIGHED FOR - Tom EPSTEIN
WEIGHED BY - Lynne Sorensen

15 um DRY CATCHES.

Sample no#	time	Date	1st weight	time	Date	2nd weight	time	Date	1st (clean) weight
15 [illegible]	14 20	3/26	22.76336	1415	3/27/81	22.76351	1420	3/30	22.74300
[illegible]	"	"	22.86600	"	"	22.86620	"	"	22.82376