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FERROALLOY FURNACE EMISSION FACTOR DEVELOPMENT ROANE LIMITED, ROCKWOOD, TENNESSEE

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SECTION 1

INTRODUCTION

The purpose of this program was to establish size specific particulate emission factors for the ferromanganese furnaces at Roane Ltd., Rockwood, Tennessee. Furnace Nos. 3 and 4 at Roane, Ltd., are open submerged electric arc furnaces rated at 9 to 11 megawatts (MW) each. The furnaces were producing 76 percent ferromanganese alloy during the February 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, Andersen cascade impactors and the dual cyclone sampler developed by Southern Research Institute.

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 first two 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 Nos. 3 and 4 furnaces at Roane Ltd. 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 12 baghouse compartments (15 feet by 24 feet) was sampled immediately (5 feet) above the outlet 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 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.

TABLE 1. SUMMARY OF TOTAL PARTICULATE AND PARTICLE SIZE DISTRIBUTION TEST RESULTS, ROANE LTD., ROCKWOOD, TENNESSEE

		Average inlet	Average outlet
Total Particulate Emission Factors			
Mass Concentration	mg/dscm	253.2	3.22
	gr/dscf	0.11	0.001
Mass Emission Rate	kg/MWH	4.75	0.08
	lb/hr	209	3.39
Process Weight Rate	kg/Mg produced	14.2	0.24
	lb/ton produced	28.4	0.48
Particle Size Distribution[a]			
Cumulative % mass	<15 μm d_{50}	94	83
	<2.5 μm d_{50}	62	40
Mass Emission Rate	lb <15 μm d_{50}/hr	196	2.8
	lb <2.5 μm d_{50}/hr	130	1.4
Size Specific Emission Factors			
kg particulate <15 μm d_{50}/Mg produced		13.3	0.20
lb particulate <15 μm d_{50}/ton produced		26.7	0.40
kg particulate <2.5 μm d_{50}/Mg produced		8.8	0.10
lb particulate <2.5 μm d_{50}/ton produced		17.6	0.20

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

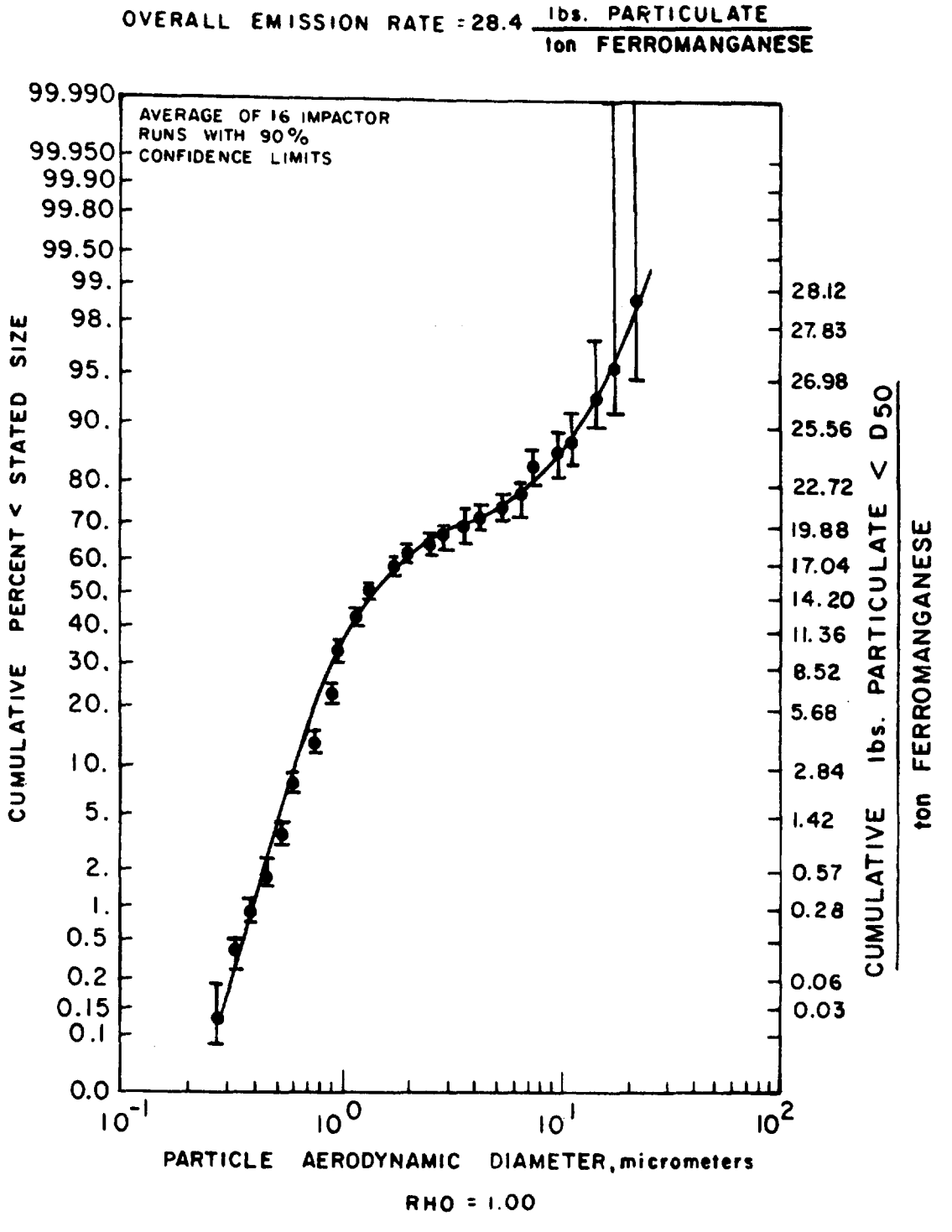


Figure 1. Average particle size distribution, uncontrolled ferromanganese furnace emissions (baghouse inlet), Roane Ltd., Rockwood, Tennessee.

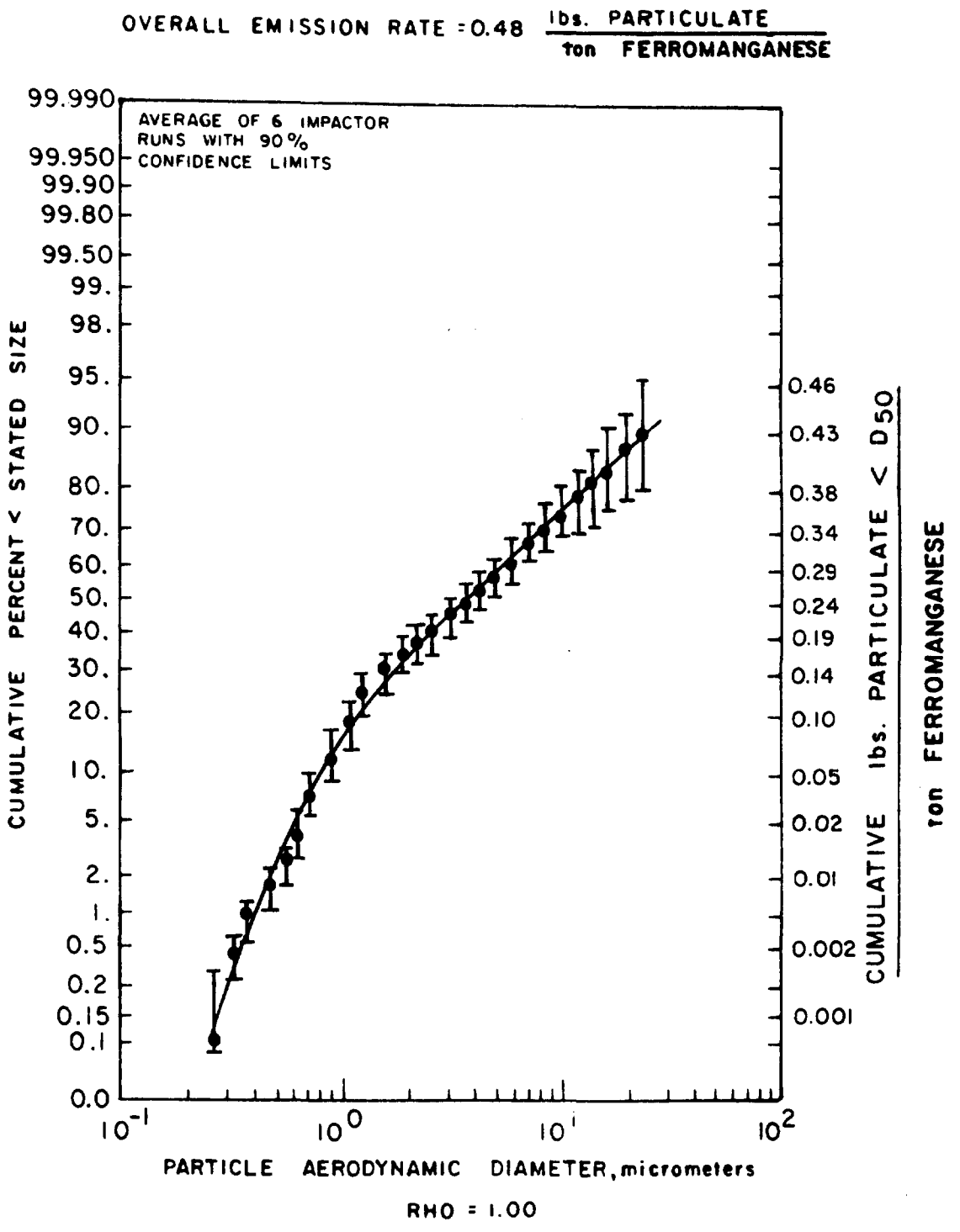


Figure 2. Average particle size distribution, controlled ferromanganese furnace emissions (baghouse outlet), Roane Ltd., Rockwood, Tennessee.

The field testing program was performed during the week of 10 February 1981 while the two furnaces were producing ferromanganese at a rate of about 8 tons per hour. The average total electrical load on the furnaces was 20 MWH/hr and testing was conducted only when both furnaces were operating normally. Testing was performed during all phases of the refining cycle including continuous charging, stoking and tapping.

The results of the process and visible emissions observations indicate excellent capture of emissions by the canopy hood since only 6 of 482 furnace shop roof monitor opacity readings were as high as 20 to 25 percent. Observations of the baghouse roof monitor also indicate excellent control of emissions since only 2 of 472 readings were greater than 0 percent opacity.

SECTION 3

PROCESS DESCRIPTION

The Nos. 3 and 4 furnaces at Roane, Ltd., Rockwood, Tennessee are submerged electric arc furnaces rated at 9 to 11 megawatts each. During the test program, the furnaces were producing ferromanganese alloy (FeMn). A schematic of the furnaces and pollution control system is provided in Figure 3. The furnace vessel has an inside diameter of 19 feet and an outside diameter of 29 feet. The furnace is 7 to 8 feet deep with an additional 6 foot depth of lining material. A hexagonal shaped hood is fixed 5 feet above each furnace and is connected by two offtakes to a 9 foot diameter main duct. Exhaust gases are drawn through the main duct by one 250 horsepower fan and fifteen 5 horsepower fans at a total design rate of 260,000 acfm at 500°F. The gas is then forced through a positive pressure baghouse and vented to the atmosphere via a roof monitor.

The furnace is charged with raw materials automatically and continuously through weighing hoppers and choke feeders. The charge mixture is typically composed of: 76 percent manganese ores, 1.5 percent fines, 4 percent remelts, 2.3 percent gravel and 16 percent coke.

Stoking, the mechanical leveling of the charge, is performed frequently to prevent the occurrence of blows. A blow occurs when gasses trapped in the mix escape rapidly. Blows often occur near the electrodes because the mix descends more rapidly and loses porosity where the refining and melting occurs. During stoking, the mix is pushed from the perimeter of the vessel into mounds around the electrodes. Stoking is usually performed before and after tapping.

Tapping occurs approximately once every 2 hours. This is accomplished by poking or drilling the carbon-paste plug out of the taphole area. Generally the tapping process lasts about 45 minutes. The molten metal flows into a transfer ladle for subsequent casting in chills. A tapping skirt extends out over the taphole to direct emissions into the canopy hood above the furnace.

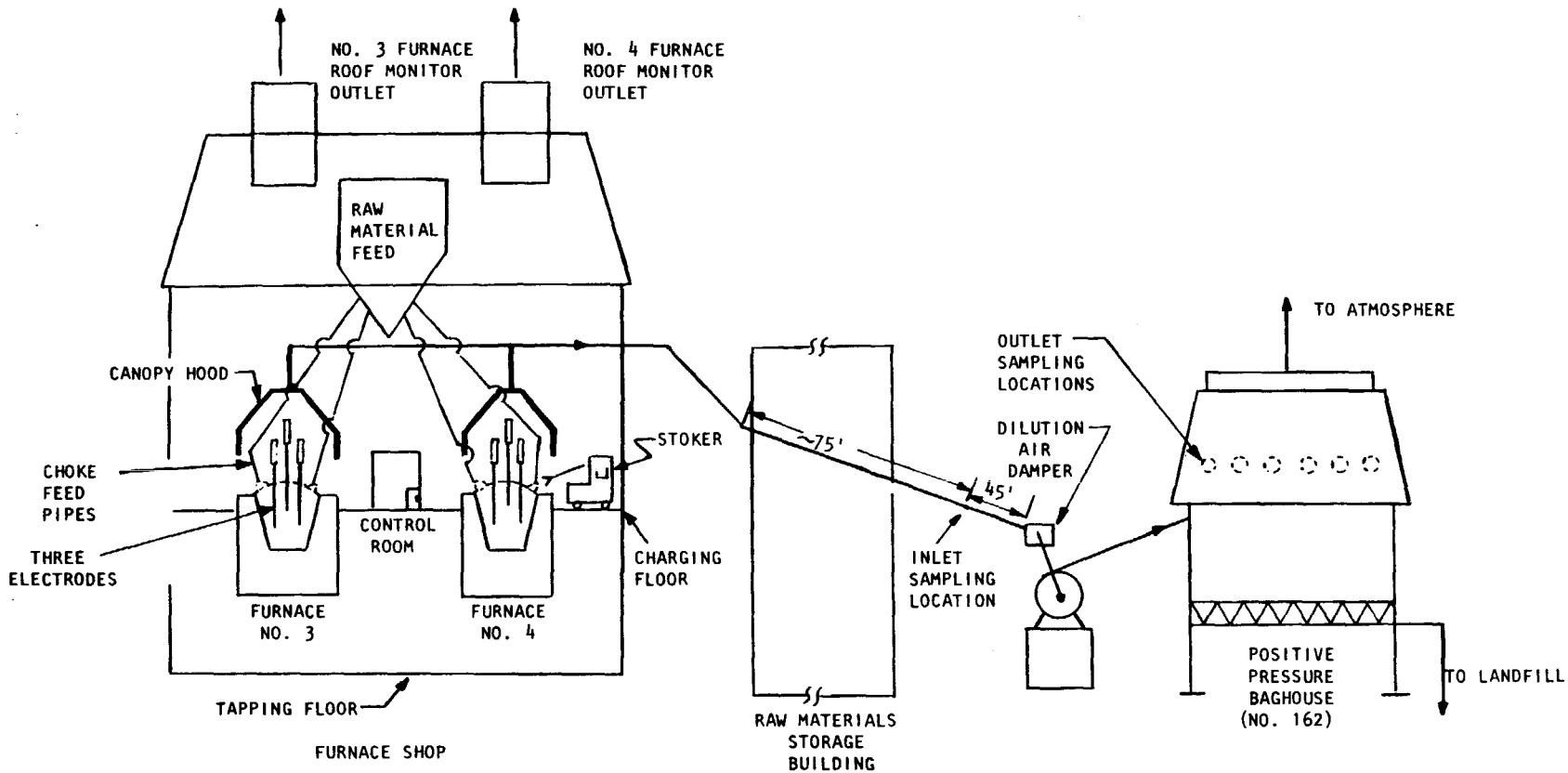


Figure 3. Process schematic, Roane Ltd., Rockwood, Tennessee.

SECTION 4

SAMPLING AND ANALYSIS PROCEDURES

INTRODUCTION

Emissions generated during the ferromanganese refining process are evacuated to a positive pressure baghouse. Prior to initiation of the field sampling program, facilities for traversing the horizontal duct were rented and setup by GCA/Technology Division. The baghouse inlet sampling location was approximately 10 feet above grade and sampling was performed from a platform underneath the circular duct. The sampling points were located 8 diameters downstream and 5 diameters upstream of flow disturbances. Both flow disturbances were bends in the duct. The baghouse outlet sampling ports were installed in each of the 12 baghouse compartments on the access doors. 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.

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 4, 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.

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.

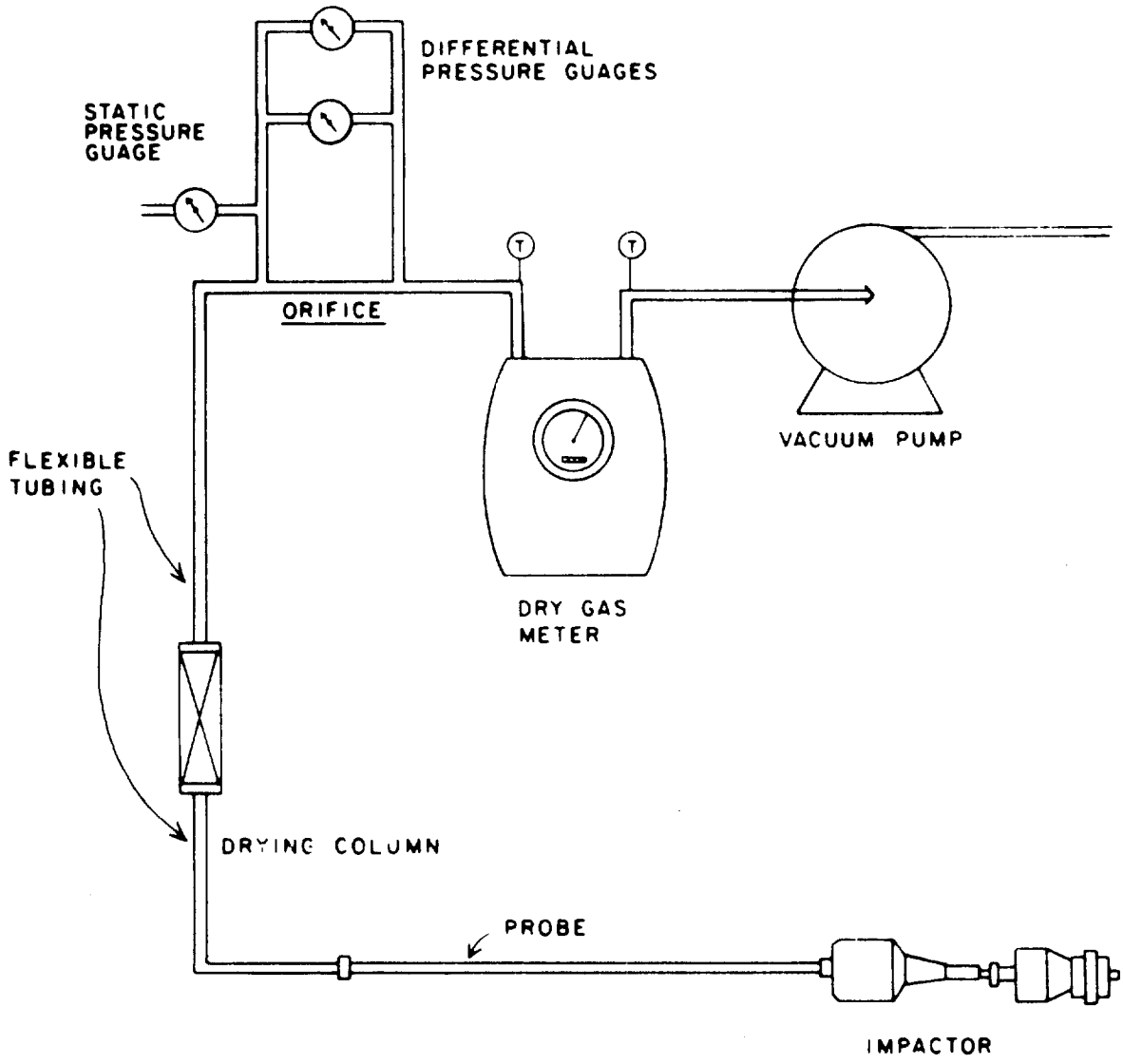


Figure 4. Andersen sampling train.

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 5, are operated with the same equipment required by the impactors (as shown in Figure 4).

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 ($\pm$ 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 Roane, Ltd. required a 45° from vertical orientation of the sampler. In this position, the sampler is upside down; that is, the collection cup is above the body of the cyclone. 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 while the sampler was removed from the duct and properly positioned. It was determined in the field that unless the collection cup was over 1/3 full, the sampler could be shut off when in the 45° from vertical position without substantial loss of particulate. Sampling was terminated several times during each run for port changes and process upsets without removing it from the duct.

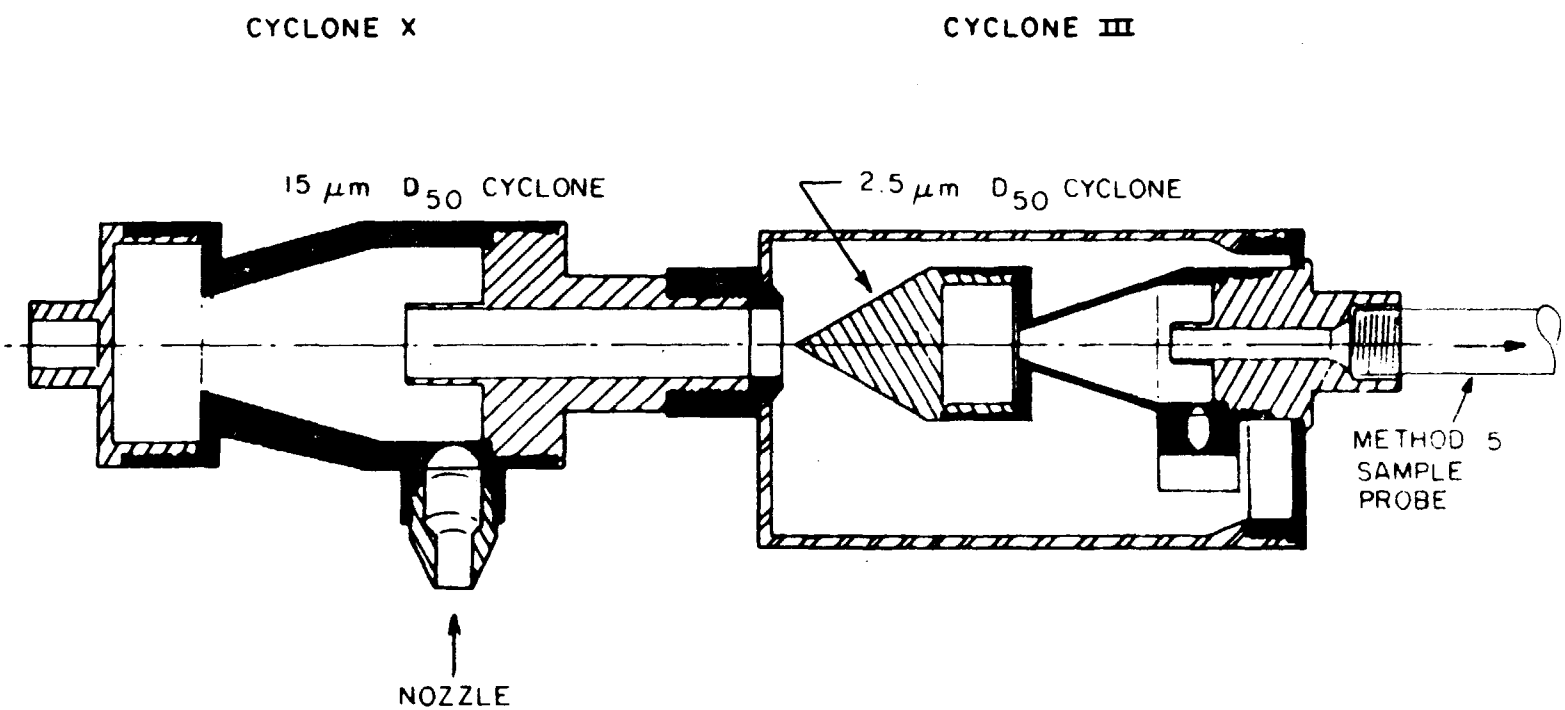


Figure 5. Schematic drawing of the dual cyclone sampler.

The dual cyclone sampler, fitted with a backup filter to collect particles <2.5 μm, was first operated for 70 minutes at which time the backup filter completely plugged requiring the train to be shut down. Upon recovery of the sampler, no dry catch was recoverable (due to the shortened run time) and only rinse samples were collected. The backup filter was eliminated for the subsequent two runs which allowed run times of greater than 200 minutes. Enough particulate was caught in the collection cups to recover dry with these longer run times. 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 ($\pm$ 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.

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.

Visible Emission Observations

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

GCA/Technology Division management is fully committed to an effective Quality Assurance/Quality Control program. The Quality Assurance Manager reports directly to the General Manager, thereby assuring the QA Manager the necessary authority and independence to find and correct any existing quality problems. The QA Manager is also chairman of the Division QA/QC Committee.

Each Technology Division department participates in the quality assurance program in the way most appropriate to divisional needs. Each department manager appoints at least one staff member to serve on the Division QA/QC Committee and report back to the department on QA/QC methods, procedures, requirements, and problems. In addition, the Analytical Laboratory, the Environmental Measurements Department, and the Instrumentation Department maintain department QC committees whose staff members implement and record internal QA activities. These committees are appointed by the department manager and report to him as well as to the QA Manager.

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

SECTION 5

TEST RESULTS

INTRODUCTION

The field sampling program was conducted during the week of 10 February 1981. The program objective, to develop emission factors for ferroalloy production, was met by completion of 6 total particulate (Level 2) runs and 16 cascade impactor runs at the inlet sampling location. Six impactor runs were completed during four total particulate runs at the baghouse outlet locations. The shorter inlet impactor runs were conducted at various times during the production cycle; however, the longer outlet test runs were conducted 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 subsections 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 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, only calculated based on inlet gas flow rates and temperature drop (assumed to be dilution air). The error associated with these test results is carried into the next two sections of this report where the total particulate results are used in calculating outlet size specific emission factors.

TABLE 2. BAGHOUSE INLET LEVEL 2 SAMPLING DATA, ROANE LTD., ROCKWOOD, TENNESSEE

Run No.	1[a]	2	3	4	5	6
Date	2/10/81	2/11/81	2/11/81	2/11/81	2/12/81	2/12/81
Start time	0947[a]	0940	1323	1605	0955	1358
Stop time	1540	1140	1503	1755	1305	1600
Net sampling time, min	96	96	96	96	96	96
Stack Temp., °F	183	178	174	165	171	180
Stack flow rate dsm^3/min[b]	5894	6182	6202	6283	6208	5982
Stack flow rate Am^3/min[c]	7502	7830	7797	7775	7545	7389
Volume collected[b] dsm^3	0.5955	0.6422	0.6618	0.6711	0.6677	0.6363
% Isokinetic	87.9	90.4	92.8	92.9	93.6	92.5

[a]Run interrupted by furnace shutdown from 1017 to 1145.

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

[c]Actual flow rate at stack conditions.

TABLE 3. BAGHOUSE OUTLET LEVEL 2 SAMPLING DATA, ROANE LTD., ROCKWOOD, TENNESSEE

Run No.	1	2	3	4
Date	2/10/81	2/11/81	2/11/81	2/12/81
Start time	0915[a]	0920	1308	0945
Stop time	1610	1248	1655	1325
Net sampling time, min	160	160	160	160
Stack temp., °F	165	145	135	133
Volume collected[b] dsm^3	3.3895	4.2730	3.8681	4.1258
Gas flow rate[c] dsm^3/min	6870	7980	8510	8290
Compartments samples	2,3,4,9	1,10,11,12	5,6,7,8	5,6,7,8

[a]Run interrupted by furnace shutdown from 1017 to 1145.

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

[c]Estimate based on inlet flow rate, ambient temperature, inlet gas temperature, and outlet gas temperature.

TABLE 4. TOTAL PARTICULATE TEST RESULTS (BY RTI) BAGHOUSE INLET SAMPLING LOCATION, ROANE LTD., ROCKWOOD, TENNESSEE

Run No.	Particulate captured (mg)	Particulate concentration (mg/dscm)	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	222.5	373.6	132.1	6.64	6.73	17.9
2	166.4	259.1	96.1	4.83	4.69	14.8
3	124.7	188.4	70.1	3.65	3.57	11.2
4	109.8	163.6	61.7	3.01	2.94	9.2
5	223.5	334.7	124.7	6.20	9.82	19.1
6	149.2	234.5	84.2	4.19	6.62	12.9
Average all runs		253.2	94.8	4.75	5.73	14.2

TABLE 5. TOTAL PARTICULATE TEST RESULTS (BY RTI) BAGHOUSE OUTLET SAMPLING LOCATION, ROANE LTD., ROCKWOOD, TENNESSEE

Run No.	Particulate captured (mg)	Particulate concentration (mg/dscm)	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	5.0	1.48	0.61	0.031	0.031	0.082
2	29.8	6.97	3.34	0.169	0.164	0.517
3	7.0	1.81	0.93	0.047	0.046	0.144
4	10.8	2.62	1.30	0.065	0.103	0.200
Average all runs		3.22	1.54	0.078	0.086	0.236

TABLE 6. BAGHOUSE PARTICULATE REMOVAL EFFICIENCIES
ROANE LTD., ROCKWOOD, TENNESSEE

Outlet Run No.	Inlet Run No. used in calculation	Baghouse particulate capture efficiency[a]
1	1	99.5
2	2	96.5
3	3,4[b]	98.6
4	5	99.0
Average/all runs		98.4

[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 generated in runs 3 and 4 was used. Outlet Run No. 3 overlapped both inlet runs 3 and 4.

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 in each compartment. Each inlet sample point was sampled four times; only a couple of compartments were sampled more than once at the outlet.

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 1 is a composite of all 16 impactor runs performed on the inlet and Figure 2 is a composite of all 6 impactor runs completed on the baghouse outlet. Some of the impactor runs incorporated into Figures 1 and 2 had rather light substrate loading. To determine if light substrate loading (less than 10 mg total particulate) affected the shape of the particle size distribution curves, the data were analyzed using only those runs with greater than 10 mg total particulate loading. This included 7 of 16 inlet runs and 3 of the 6 outlet runs. This treatment of the data produced no significant change in the shape of the particle size distribution curves.

Figure 6 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 all inlet and all outlet runs. The values of dM/d log D for the outlet can be divided by the inlet value corresponding to the same particle size to determine the baghouse efficiency for removing particles of that specific size. Baghouse efficiency versus particle diameter is illustrated more clearly in Figure 7. The confidence intervals marked on both Figures 6 and 7 correspond to a 90 percent confidence.

The methods used to determine the particle size distributions presented in Figures 1 and 2 are explained below. During each individual test run a 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.

A computer based cascade impactor data reduction system, developed by Southern Research Institute for the EPA, was used to analyze the field data. This reference contains a thorough discussion of the design and use of the above mentioned system. The system calculates and prints for each impactor run: the D-50 cutpoint of each stage, the cumulative percent mass less than D-50, the cumulative mass concentration less than D-50, the geometric mean diameter of particles caught by each stage, the change in particle mass concentration with respect to log of particle size (dM/d log D), and the change in particle number concentration with respect to log of particle size (dN/d log D).

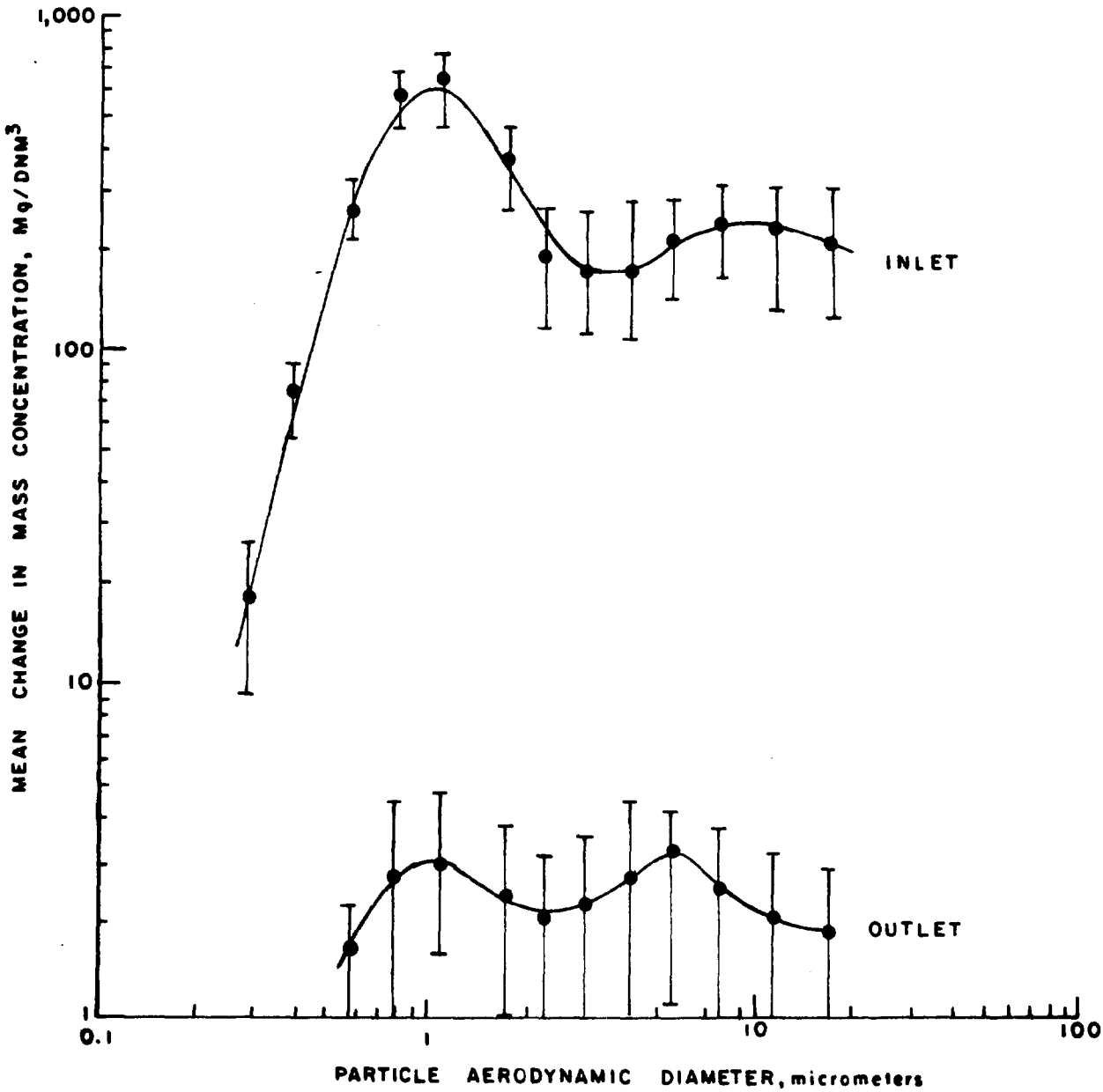


Figure 6. Average change in concentration per particle size (all runs), Roane Ltd., Rockwood, Tennessee.

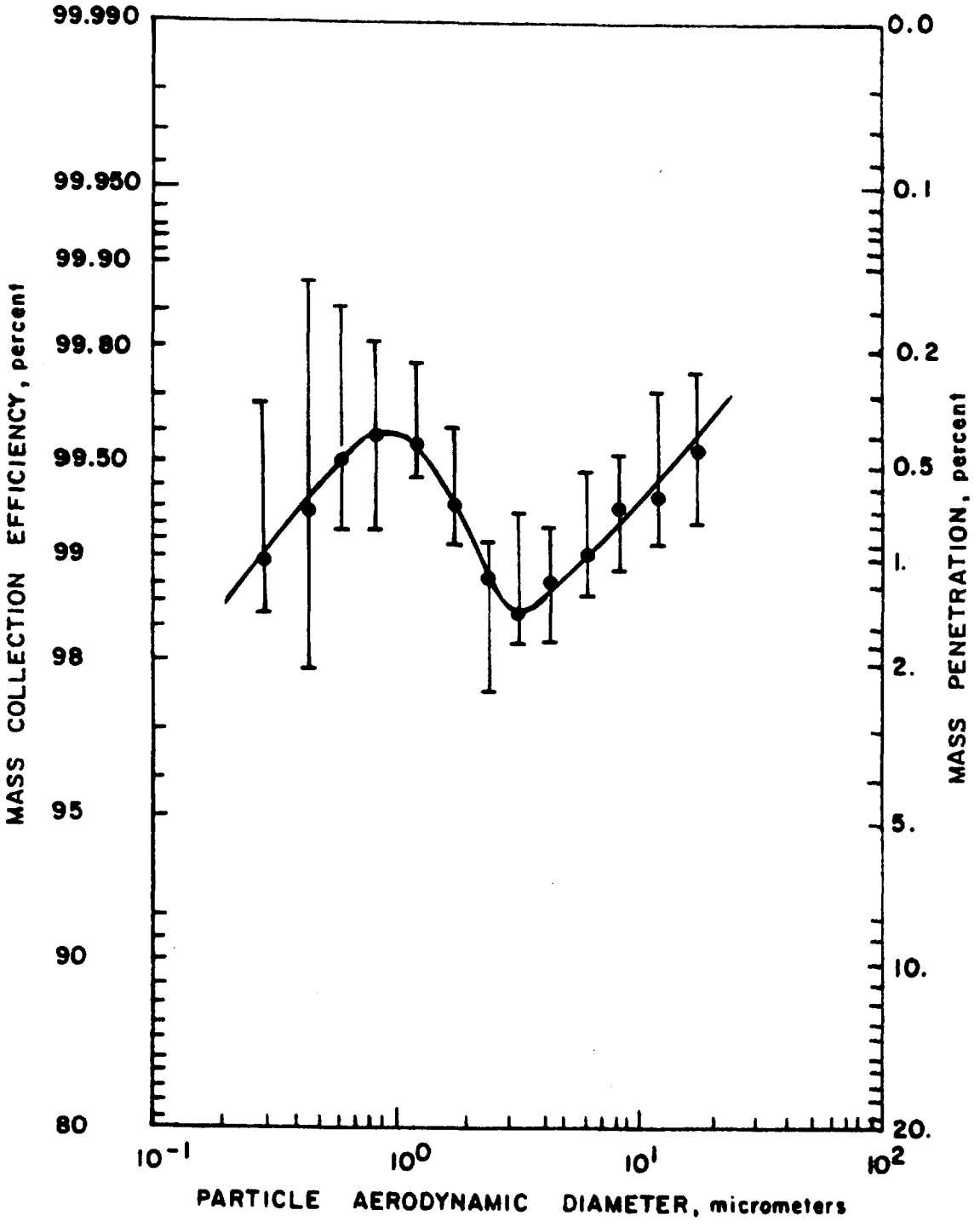


Figure 7. Baghouse efficiency by particle size, Roane Ltd., Rockwood, Tennessee.

The system combines the output from all individual runs made on either the inlet or outlet; screens for and removes outlying data; fits the data to a composite curve, and calculates 90 percent confidence intervals. It is the output of this curve fitting program that was used to create Figures 1, 2, and 6. The computer printouts are contained in Appendix D-1 and D-2 and the field data sheets are presented in Appendix E-1.

The 90 percent confidence intervals indicated on the above-mentioned figures were determined using the standard deviation of the data after outlying points were removed. The confidence intervals do not consider the accuracy of the sampling equipment and methods.

Table 7 summarizes isokinetic sampling rates, actual flow rate through the impactor, volume metered at standard conditions and duration for each individual Andersen run. The inlet isokinetics ranged between 74 percent and 113 percent, the average for all runs was 97 percent. Due to the large cross-sectional area of the baghouse compartment where outlet sampling occurred, no flow could be detected by the s-type pitot tube equipped with a 0 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 2) and the control device efficiency plots (Figures 6 and 7) less viable than the inlet size distribution curve (Figure 1) 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 8 and Table 7. These results were calculated using the appropriate stack gas characteristics as 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. 3-75-16) was operated during Method 5 runs 3 and 4, cyclone run 4-75-16 during Method 5 runs 5 and 6. A preliminary dual cyclone run, not reported in Table 7 was voided due to insufficient particulate catch. The cyclone was assembled and operated per the IP protocol, and due to a large amount of fine particulate in the gas stream, the backup filter plugged in 70 minutes. Upon recovery, very little particulate could be found in either cyclone cup. In order to increase the possibility of obtaining enough particulate in the collection cups to recover in a dry state, the backup filter assembly was removed. This eliminated quantification of the particles <2.5 µm by the cyclone train; however, this fraction could be calculated by difference with the total particulate results. Removal of the backup filter allowed total sample run times of

TABLE 7. DUAL CYCLONE SAMPLER RESULTS, ROANE LTD., ROCKWOOD, TENNESSEE

	Units	Run 3-75-16	Run 4-75-16
Stack Gas Characteristics			
Temperature	°F	172	175
Velocity	afpm	4276	3711
Pressure	in. Hg abs.	29.22	29.42
Viscosity	micropoise	206.6	206.6
Volume Sampled	dscf	95.49	112.77
Sampler Flow Rate	acfm	0.57	0.59
Nozzle Diameter	in.	0.157	0.157
Isokinetic Sampling Rate	percent	99.4	117.1
Particulate Total Weight Caught[a]			
Cyclone III	mg	107.02	133.17
Cyclone X	mg	172.45	196.61
Total	mg	279.47	329.78
Particulate Emission Rates			
Cyclone III d_{50}	microns	2.9	2.8
Emissions < Cyclone III d_{50}	lb/hr	145.4[b]	84.4[b]
Cyclone X d_{50}	microns	12.3	12.1
Emissions between Cyclone III d_{50} and Cyclone X d_{50}	lb/hr	32.5	33.2
Emissions > Cyclone X d_{50}	lb/hr	52.4	49.8
Total	lb/hr	230.2	167.4
Particulate Emission Factors			
Average Emissions <2.85 μm d_{50}	lb/ton	17.7	
Average Emissions between 2.85 and 12.2 μm d_{50}	lb/ton	5.0	
Average Emissions >12.2 μm d_{50}	lb/ton	7.85	
Total Emission Rate	lb/ton	30.6	

[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.

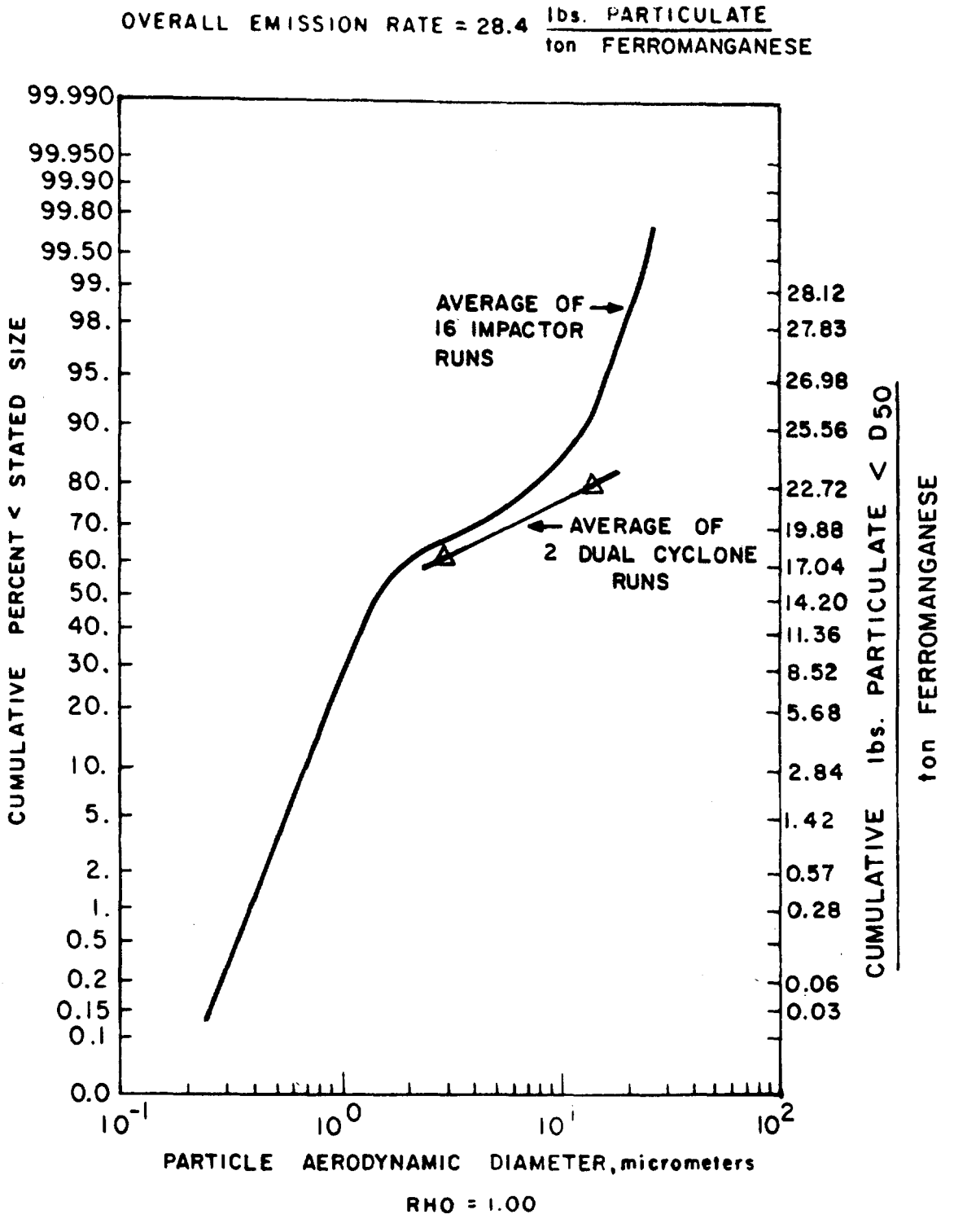


Figure 8. Comparison of dual cyclone and cascade impactor results, Roane, Ltd., Rockwood, Tennessee.

TABLE 8. SIZE SPECIFIC EMISSION FACTORS, ROANE LTD., ROCKWOOD, TENNESSEE

Sampling location	Parameter	Particle aerodynamic diameter (d_{50}, μm)					
		∞	15	10	5	2.5	1
Baghouse inlet	Cumulative % mass < d_{50}	100	94	87	73	62	32
	Cumulative lb < d_{50}/hr	209	196	182	153	130	67
	Cumulative lb < d_{50}/ton ferromanganese	28.4	26.7	24.7	20.7	17.6	9.1
Baghouse outlet	Cumulative % mass < d_{50}	100	83	75	57	40	17
	Cumulative lb < d_{50}/hr	3.4	2.8	2.5	1.9	1.4	0.6
	Cumulative lb < d_{50}/ton ferromanganese	0.48	0.40	0.36	0.27	0.20	0.08

greater than 200 minutes. This allowed collection of up to 330 mg of particulate in the cyclones. This larger amount of sample and the longer test period substantially increased the viability of the results. The dual cyclone results are compared to the cascade impactor results graphically in Figure 8.

The dual cyclone results show a slightly lesser fraction of particles in the 2 and 12 micron range than the impactor results. Only 2 cyclone runs are compared to 16 impactor runs in Figure 8 which in itself could explain some of the difference. Also, particulate loss during recovery and gravimetric analysis is more of a problem with the cyclones since actual transfers of particulate from cyclone cup to container to a second container are required. These transfer steps initially result in some loss of particulate whereas the impactor substrates are immediately sealed in a foil packet upon recovery. Care is taken during recovery and analysis to completely quantify particulate weights by careful rinsing and weighing particulate in the rinse after evaporation; however, the acetone does not completely clean the cyclone and container walls. Several other polarities and types of solvents would be required; however, the resulting dissolution would probably also decrease the particulate weight gain.

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.

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 3 days of the test program. The furnace shop roof monitor was observed for 3 hours, the baghouse outlet for 2 hours. A summary of the visible emissions data obtained is presented in Table 9.

At no time during the testing period were visible emissions greater than 5 percent opacity observed originating from the baghouse compartments being tested. 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 to mainly the tapping operation which occurs for about 45 minutes every 2 hours.

TABLE 9. SUMMARY OF VISIBLE EMISSIONS OBSERVATIONS AT ROANE LTD., ROCKWOOD, TENNESSEE

Date	2/11/81	2/12/81
Source	Baghouse roof monitor	Furnace shop roof monitor
Total No. of 15-second observations	472	482
Total minutes	118	120.5
Number of observations 0-5% opacity	472[a]	447
Total minutes 0-5% opacity	118	111.75
Number of observations 10-15% opacity	0	29
Total minutes 10-15% opacity	0	7.25
Number of observations 20-25% opacity	0	6
Total minutes 20-25% opacity	0	1.50
Number observations >25% opacity	0	0
Total minutes >25% opacity	0	0

[a]Only 2 of 472 readings were 5% opacity.

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.

Furnace No. 3 consumed 6 percent more charge materials than furnace No. 4 during the testing program. Table 10 presents a summary of all materials charged to the furnaces for 16 hours per test day. Furnace No. 4 however produced more metal and consumed less power than Furnace No. 3 as shown in Table 11. Furnace No. 4 averaged 9.76 MWH/hr while Furnace No. 3 averaged 10.43 MWH/hr. It is important to note that charge materials composition is for 16 hours only while tap weights are on a 24 hour basis.

The furnaces are tapped on a point system based on MW consumption. When approximately 100 MW of power have been consumed, which usually occurs every 2 hours, the furnace is tapped. Table 12 presents the daily average results of the metal and slag analyses performed by the source. Tap weights are provided in Table 11.

The product weight rate averaged about 80 ton/day with an average tap duration of 45 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. CHARGE MATERIALS FOR FURNACE NOS. 3 AND 4 AT ROANE LTD., ROCKWOOD, TENNESSEE

Date	Mana-twan[a]	Wessels[b]	Buck wheat coke	Alabama Gravel	Broken Hill[c]	Std. fines FeMn	Std. remelts FeMn	Total lbs charge mats.
Furnace 3								
2/10/81	178,850	49,000	51,450	7,350	17,150	4,900	12,250	320,950
2/11/81	171,550	47,000	51,700	7,050	16,450	4,700	11,750	310,200
2/12/81	160,600	44,000	47,700	4,550	15,400	4,400	11,000	287,650
Average[d]	170,333	46,667	50,283	6,317	16,333	4,667	11,667	306,267
Furnace 4								
2/10/81	171,550	47,000	51,700	7,050	16,450	4,700	11,750	310,200
2/11/81	171,550	47,000	51,700	7,050	16,450	4,700	11,750	310,200
2/12/81	135,050	37,000	38,850	3,700	12,950	3,700	9,250	240,500
Average[d]	159,383	43,667	47,417	5,933	15,283	4,367	10,917	286,967

[a]Manatwan is manganese ore, high iron.

[b]Wessels is manganese ore, low iron.

[c]Broken Hill is manganese ore, low iron.

[d]Average values based on 16 hours.

TABLE 11. TAP WEIGHT AND POWER CONSUMPTION AT ROANE LTD., ROCKWOOD, TENNESSEE

Furnace No.	Date	Actual[a] tap weight (lbs)	Tap weight (tons)	Daily power consumption (MWH)	Daily power[b] load (MWH/hr)
3	2/9/81	106,248	53.1	-	-
3	2/10/81	167,756	83.9	222.8457	10.46
3	2/11/81	177,118	88.6	230.4161	10.40
3	2/12/81	174,002	87.0	237.2913	10.43
Average		156,281	78.1	230.1844	10.43
4	2/9/81	164,312	82.2	-	-
4	2/10/81	178,909	89.45	199.5267	9.56
4	2/11/81	146,357	73.2	219.0354	9.88
4	2/12/81	149,416	74.7	214.5089	9.83
Average		159,748	79.9	211.0237	9.76

[a]Actual tap weight is the weight of the metal tapped minus any slag that was tapped with it and minus 5% of the FeMn fines which are used to line the molds into which the metal is poured. From long term experience the plant estimates 5% of the fines dissolve into the alloy.

[b]Power load is based on MWH total divided by actual hours furnace was in operation.

TABLE 12. METAL AND SLAG ANALYSIS DATA, ROANE LTD., ROCKWOOD, TENNESSEE

	Furnace No. 3				Furnace No. 4			
Date	2/10	2/11	2/12	Avg.	2/10	2/11	2/12	Avg.
Metal								
Mn	78.4	78.53	78.07	78.33	78.0	77.67	78.20	77.96
Fe	12.86	12.79	13.15	12.93	13.38	13.66	13.09	13.37
Si	0.37	0.25	0.46	0.36	0.13	0.24	0.32	0.23
C	6.87	6.93	6.82	6.87	6.99	6.93	6.89	6.94
Slag								
Mn	18.80	17.33	19.17	18.4	23.27	20.97	18.77	21.0
MnO	24.25	22.36	24.73	23.8	30.02	27.05	24.21	27.1
FeO	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
SiO_2	33.67	32.64	32.59	33.0	29.04	30.91	31.83	30.6
Al_2O_3	2.16	2.19	3.12	2.5	2.67	1.59	2.65	2.3
CaO	30.14	32.53	29.58	30.8	28.60	30.56	30.84	30.0
MgO	7.06	7.56	7.26	7.3	6.96	7.16	7.76	7.3
BaO	0.82	0.82	0.82	0.82	0.81	0.83	0.83	0.83
Total	98.45	98.45	98.45		98.45	98.45	98.45	

TABLE 13. OPERATING PARAMETERS OF THE BAGHOUSE SERVING FURNACES 3 AND 4, ROANE LTD., ROCKWOOD, TENNESSEE

Date	Average temp. (°F)	Recorder pressure (in. H_2O)	Gauge pressure (in. H_2O)	Fan (amps)
2/10/81	178	7.5	7.1	266
2/11/81	157.6	5.9	6.3	264.3
2/12/81	152.8	7.5	7.3	267
Average	163	7.0	6.9	266

TABLE 14. BAGHOUSE CONTROL SYSTEM DESIGN PARAMETERS, ROANE LTD., ROCKWOOD, TENNESSEE

Baghouse

a. Manufacturer: Wheelabrator-Frye

b. Type or trade name: Continuous Automatic, DUSTUBE Dust Collector

c. Model No. 366, No. 818, Series 11.5 Open Pressure Type

d. No. of compartments: 12

e. Bags/compartment: 145

f. Bag l x d: 369 in. x 11.5 in.

g. Total Cloth Area: 158,976 ft^2 (12 compartments)

Fan

a. Manufacturer: Zurn Air Systems

b. Model No. Clarage Series 3200IT, Fan Size 8900

c. Blade Size: --

d. Belt or direct drive: Belt

e. Power rating: 1 at 250 Hp, 15 at 5 Hp

f. Positive or negative pressure: Positive

Fabric

a. Manufacturer: W.W. Criswell, Division of Wheelabrator-Frye

b. Material: Fiberglass "DUSTUBES" No. 425-04

c. Woven or felted: Woven

d. Weave: 3:1 cf

e. Weight: 9 oz. sq. yard

(continued)

TABLE 14 (continued).

f. Thread Count: 55 x 52

g. Operating temp. range: Design 500°F, Actual 170°F

h. Surface Treatment: None

i. Coating upon startup: None

j. Guaranteed life: None

k. Actual life: --

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: 10-15 cfm at 120 psi

Operating Parameters

a. Design volume flow rate: 260,000 cfm

b. Design temperature: 500°F

c. Gross mass design efficiency: 99+

d. Design inlet grain loading: 0.04 gr/dscf

e. Total power consumption: 530,000 KWH

f. Design air/cloth ratio: 1.96:a ft^3/ft^2 min

g. Design pressure (absolute): —

h. Design ΔP (WC): --

APPENDIX A

SAMPLE TRAIN CALIBRATIONS

GCA TECHNOLOGY DIVISION

SHEET ___ OF ___
BY T Epsom
DATE 1/16/81
CH'K. BY ___
DATE CH'K. ___
B'K. CH'K. BY ___

JOB NO. 1618018
PROJECT Selma / Alamet
SUBJECT Dry Gas Meter Calibration

Meter # V1

$\Delta H = 0.40$

$V_w = \cancel{5.000}\ 4.00$

$V_d = \cancel{5.055}\ 4.055$

$T_w = 63.7$

$T_d = 68.5$

$\Phi = 10.87$

$P_b = 30.00$

Time	V_D	T_D in	T_D out
0	187.635	~~66~~ 67	70
2	188.575	~~66~~ 67	70
4	189.120	67	70
6	189.870	67	70
8	190.618	67	70
10	191.365	67	70
12	191.690	67	70
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			

$Y = \cancel{0.997}\ 0.995$

$\Delta H_a = \cancel{1.037}\ 1.620$

$Q_a = \cancel{0.966}\ 0.373$

$C_c = \cancel{0.243}\ 0.243$

Static = 0.05" H_2O

GCA/TECHNOLOGY DIVISION

SHEET ____ OF ____

BY T R/Shea

DATE 1/16/81

JOB NO. 161801.8

PROJECT

SUBJECT Dry Gas Meter Calibration

CH'K. BY

DATE CH'K.

B'K. CH'K. BY

8+

Meter # V_1

$\Delta H = 2.0$

$V_w = 11.00$

$V_d = 11.123$

$T_w = 63.5$

$T_s = 68.5$

$\theta = 12.50$

$P_b = 30.00$

time	V_D	T_D in	T_D out
0	194.870	67	70
2	196.500	67	70
4	198.140	67	70
6	199.770	67	70
8	201.422	67	70
10	203.058	67	70
12	204.692	67	70
14	205.993	67	70
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			

$Y = 0.994$

$\Delta H_a = 1.415$

$Q_a = 0.890$

$C_f = 1.217$

GCA/TECHNOLOGY DIVISION

BURLINGTON ROAD, BEDFORD, MASSACHUSETTS 01730 / PHONE: 617-275-9000

JOB NO. 1618014

PROJECT

SUBJECT Dry Gas Meter Calibration

SHEET ___ OF ___

BY T Gosden

DATE 11/9/81

CH'K. BY [illegible]

DATE CH'K. 11/15/81

B'K. CH'K. BY

Meter # 800017

$\Delta H = 0.40$

$V_w = 5.10$

$V_d = 5.168$

$T_w = 63.0$

$T_d = 61.0$

$\phi = 10.78$

$P_b = 30.07$

time	V_D	ΔH IN	ΔH OUT
0	839.580	64	60
2	840.535	62	60
4	841.490	62	60
6	842.460	62	60
8	843.410	62	60
10	844.370	62	60
12	844.748	62	60
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			

$Y = 0.982$

$\Delta H_a = 0.989$

$Q_a = 0.479$

$C_r = 0.239$

V_2

leak check √ - 0

static - 0.08 " Hg

GCA/TECHNOLOGY DIVISION

BURLINGTON ROAD, BEDFORD, MASSACHUSETTS 01730 / PHONE: 617-275-9000

JOB NO. 161801Y

PROJECT

SUBJECT Dry Gas Meter Calibration

SHEET ____ OF ____

BY T Rysdale

DATE 11/15/81

CH'K. BY

DATE CH'K.

B'K. CH'K. BY

Meter # 280017

$\Delta H = 0.20$

$V_w = 5.00$

$V_d = 5.063$

$T_w = 63.0$

$T_d = 61.33$

$\phi = 14.66$

$P_b = 30.08$

time	V_D	T_D in	T_D out
0	849.861	60	62.5
2	850.548	60	62.5
4	851.235	60	62.5
6	851.930	60	62.5
8	852.625	60	62.5
10	~~854.0~~	60	62.5
12	854.015	60	63.0
14	854.700	60	63.0
16	854.924	60	63.0
18			62.67
20			
22			
24			
26			
28			
30			
32			
34			
36			

$Y = 0.984$

$\Delta H_a = 0.951$

$Q_a = 0.345$

$C_c = 0.120$

V_D

leak check ✓ – 0

static ~ 0.05 " Hg

GCA/TECHNOLOGY DIVISION

SHEET____ OF ____

BY_____

DATE_____

CH'K BY_____

DATE CH'K.____

B'K. CH'K. BY_____

JOB NO

PROJECT

SUBJECT Dry Gas Meter Calibration

Meter # V3

$\Delta H = .3$

$V_w = 5.0$

$V_d = 5.120$

$T_w = 63.5$

$T_d = 65.0$

$\phi = 12.34$

$P_b = 30.03$

time	V_d	T_d in	T_d out
0	371.632	65	65
2	372.46	65	65
4	373.29	65	65
6	374.12	65	65
8	374.95	65	65
10	375.00	65	65
12	376.61	65	65
14	376.752		
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			

$Y = .979$

$\Delta H_a = 1.007$

$Q_a = .415$

$C_c = .181$

GCA/TECHNOLOGY DIVISION
BURLINGTON ROAD, BEDFORD, MASSACHUSETTS 01730 / PHONE: 617-275-9000

SHEET ____ OF ____
BY ____
DATE ____
CH'K. BY ____
DATE CH'K. ____
B'K. CH'K. BY ____

JOB NO. ____
PROJECT ____
SUBJECT Dry Gas Meter Calibration

Meter # V3

$\Delta H = .4$

$V_w = 5.0$

$V_r = 5.063$

$T_w = 63.5$

$T_d = 65$

$\phi = 10.66$

$P_b = 30.03$

Time	V_D	T_D in	T_D out
0	365.550	66	65
2	366.46	65	65
4	367.42	65	65
6	368.38	65	65
8	369.33	65	65
10	370.29	65	65
12	370.63		
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			

$Y = .989$

$\Delta H_a = 1.002$

$Q_a = .475$

$C_c = .242$

GCA/TECHNOLOGY DIVISION

BURLINGTON ROAD, BEDFORD, MASSACHUSETTS 01730 / PHONE: 617-275-9000

SHEET ____ OF ____

BY ____

DATE ____

CH'K. BY ____

DATE CH'K. ____

B'K. CH'K. BY ____

JOB NO. ____

PROJECT Alamet

SUBJECT Dry Gas Meter Calibration

$V_{w_i} = 3.0$

Meter # 1517948

$\Delta H = 2.0$

$V_{w_f} = 10.01$

$V_w = 10.37$

$T_w = 63.8 / 63.5$

$T_a = 64.17$

$\phi = 9.64$ min

$P_b = 30.02$"

time	V_D	T_D in	T_D out
0	354.101	65	64
2	355.264	65	64
4	358.402	65	63
6	360.500	65	63
8	362.720	65	63
10	364.473	65	63
12			
14		65	63.33
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			

$Y = 0.962$

$\Delta H_a = 1.024$

$Q_a = 1.076$

$C_f = 1.206$

364.473
354.101
10.372

GCA TECHNOLOGY DIVISION

SHEET 0
BY B. Holbs
DATE 1/15/81
CH'K BY
DATE CH'K.
B'K. CH'K. BY

JOB NO 1618 018
PROJECT Alamet
SUBJECT Dry Test Meter Calibration

Meter # 28000014

$\Delta H = 0.4$

$V_w = 5.0$ ✓

$V_a = 5.129$

$T_w = 63.85$

$T_a = 68.79$

$\phi = 10.59$ min

$P_b = 30.07$

Time	V_D	T_D in	T_D out
0	305.321	69	67
2	306.298	69	68
4	307.278	69	68
6	308.225	69	69
8			
10	309.187	69	69
12	310.155	69	69
14	310.450	69	70
16			
18		69	
20			
22			
24			
26			
28			
30			
32			
34			
36			

V_4

$Y = 0.983$

$\Delta H_a = 0.982$

$Q_a = 0.484$

$C_c = 0.243$

static = 0.04 " H_2O

Leak check - 0.001 cfm/min

GCA/TECHNOLOGY DIVISION

BURLINGTON ROAD, BEDFORD, MASSACHUSETTS 01730 / PHONE: 617-275-9000

JOB NO. 1618018

PROJECT

SUBJECT Dry Gas Meter Calibration

SHEET ___ OF ___

BY T Epstein

DATE 1/15/81

CH'K. BY

DATE CH'K.

B'K. CH'K. BY

Meter # 2800014

3

$\Delta H = 2.0$

$V_w = \cancel{10.0}\ 11.02$

$V_a = 11.445$

$T_w = 63.7$

$T_a = 70$

$\phi = 10.38$

$P_b = 30.07$

time	V_D	T_D in	out
0	312.535	70	70
2	314.725	70	70
4	316.930	70	70
6	319.125	70	70
8	321.325	70	70
10	323.980	70	70
12			
14			
16			
18			
20			
22			
24			
26			
28			
30			
32			
34			
36			

V_4

$Y = 0.970$

$\Delta H_a = 0.968$

$Q_a = 1.103$

$C_t = 1.218$

static 0.2 " Hg

Digimike Calibration

T. Epstein 1/12/81

	Terminal #	Hg (°F)	Digimike (°F)	Hg	Digi	Hg	Digi
Long Probe	1	32.0	24	62.0	64	164.0	158
	2	"	23	"	63	"	159
	3	"	24	"	64	"	157
	4	"	25	"	65	"	158
	5	"	26	"	65	"	163
	6	"	26	"	65	"	160
Short Probe	1	32.0	27	64.0	69	168.0	161
	2	"	"	"	69	"	162
	3	"	"	"	70	"	162
	4	"	"	"	70	"	161
	5	"	"	"	71	"	161
	6	"	"	"	70	"	161

PRETEST NOZZLE CALIBRATION

Date 1/9/81 Set No. CYCLONES Calibrated by J. VAY

Nozzle identification number	D_1 mm, (in.)	D_2 mm, (in.)	D_3 mm, (in.)	ΔD, mm,)in.)	D_{avg}
		ID #			
3.0A	0.114	3.0B	0.116		
3.5A	0.136	3.5B	0.136		
4.0A	0.156	4.0B	0.157		
4.5A	0.176	4.5B	0.176		
5.0A	0.195	5.0B	0.197		
6.0A	0.235	6.0B	0.236		
7.0A	0.276	7.0B	0.275		
8.5A	0.335	8.5B	0.336		
10.0A	0.394	10.0B	0.394		
12.0A	0.468	12.0B	0.471		
14.5A	0.565	14.5B	0.564		

~~POST~~ PRE-TEST NOZZLE CALIBRATION

Date 1/9/81 Set No. ORANGE Calibrated by J. VAY

Impactor Nozzles - Straight

	D		
2G	0.126	3G	0.130
2H	BAD	3H	0.187
2I	0.250	3I	0.250
2J	0.312	3J	0.313
2K	0.374	3K	0.374
2L	0.503	3L	0.501

where:

$D_{1,2,3}$ = average nozzle diameter measured on ~~a different~~ all 3 diameters diameter, mm (in.).
Tolerance = measure within 0.25 mm (0.001 in.).

ΔD = maximum difference in any two measurements, mm (in.).
Tolerance = 0.1 mm (0.004 in.).- if greater

D_{avg} = average of D_1, D_2, D_3.

APPENDIX B-1

EXAMPLE CALCULATIONS
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. Total Mass Collected:

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

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 $\leq$ 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

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

3. Isokinetic rate

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

4. Cyclone III cut size

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

where = viscosity in micropoise
Q_i = sampler flow rate in acfm.

5. Cyclone X cut size

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

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

APPENDIX C

TOTAL PARTICULATE EXAMPLE CALCULATIONS (BY RTI)

Roane

Baghouse Inlet

A. Core in gas

My data in mg/dsm³ compared to previous numbers given you - I checked.

B. Generated / hour

(1×10^{-6})(gas flow dsm³)(conc. mg/dsm³)(60) = Kg/hour

Run #						lb/hr
1	( )	(5894)	(373.6)	( )	= 132.1 Kg/hr	= 291.2
2	( )	(6182)	(259.1)	( )	96.1	= 211.9
3	( )	(6202)	(188.4)	( )	70.1	= 154.5
4	( )	(6283)	(163.6)	( )	61.7	= 136.0
5	( )	(6208)	(334.7)	( )	124.7	= 274.9
6	( )	(5982)	(234.5)	( )	84.2	= 185.6
					94.8	= 209.0

C. Avg Load during Test

Run #1:

Ice 3	Ice 4
Avg 10.32 MW from 946 → 10:01 (26 min of test in this period)	Avg 9.1 MW estimate
Avg 10.36 MW from 1400 → 1430 31 actual min of testing	Avg 9.8 MW
Avg 10.6 MW from 1500 - 1601 40 actual min of testing	Avg 9.3 MW

$$\frac{(26\text{ min})(10.32\text{ MW}) + (31)(10.36) + (10.6)(40)}{(26+31+40)}$$

= 10.45 MW Avg — 9.41 Avg

Total Avg Load = 10.45 + 9.41 = 19.9

C Cont'd

Run #2

Fan 3	Fan 4
meter reading 9:15 → 11:57	→
Less 2% min out time	NO outage
gives 10.1 MW	9.8 MW

Total MW = 10.1 + 9.8 = 19.9 MW

Run #3

Fan 3	Fan 4
meters 1305 – 1502	→
Less 4 min out	NO outage
10.02 MW AVG	9.17 MW

Total MW = 10.02 + 9.17 → 19.2

Run #4

Fan 3	Fan 4
meter 1600 – 1730	→
3 min outage	→
10.52 MW	9.96

Total = 20.5 MW

Run NO 5 No sampling 10:37 → 11:20

Fan 3	Fan 4
1000-1030 (30 min testing)	→
10.68 MW	10.2 MW
1130 – 1300 105 min testing	→
10.09 MW	9.77 MW
10.22 MW AVG	9.87 MW AVG

Total MW = 20.1 MW

Run #6

Fan 3	Fan 4
10.46 MW	9.68 MW

Total MW = 20.1 MW

H. Kg generated / mW

divide Kg generated by Total MW Load / rough

Run #					
	1	132.1 ÷ 19.9	= 6.64	Kg/mW-h =	14.6 lb/mW-h
	2	96.1 ÷ 19.9	= 4.83		10.6
	3	70.1 ÷ 19.2	= 3.65		8.0
	4	61.7 ÷ 20.5	= 3.01		6.6
	5	124.7 ÷ 20.1	= 6.20		13.7
	6	84.25 ÷ 20.1	= 4.19		9.2
			4.75		10.5

E. Generated / Mg feed

Total Mg feed on shift divided by Total MW-h on shift for Mg feed / mW-h. Then multiply by Avg load (mW) for Total feed/hr during test. Then divided into Kg generated

Run #1

Fce 3
70.66 mW-h on 7-3 shift
62.392 Mg feed
10.45 mW load
9.227 Mg/hour

Fce 4
62.36 mW-h on 7-3
68.855 Mg feed
9.41 mW load
10.39 Mg/hr

Total = 9.227 + 10.39
= 19.617 Mg/hr

132.1 ÷ 19.617 = 6.73 Kg sat / Mg feed
= 13.46 lb / ton feed

Run #2

Fce 3
77.40 mW-h
65.862 Mg feed
10.1 mW
8.5944 Mg/hr

Fce 4
64.25 mW-h
77.836 Mg
9.8 mW
11.8723 Mg/hr

Total = 20.4667 Mg/hour
96.1 ÷ 20.4667 = 4.69 Kg/Mg feed

Cont'd

Mon Cont'

Run #3

Fe 3
See Run #2
10.02 MW
8.5263 Mg/hr

Fe 4
See Run #2
9.17 MW
11.08996 Mg/hr

Total 19.6353

70.1 ÷ 19.6 = 3.57 Kg/Mg feed

Run #4 Fe 3
See Run #2
10.52 MW
8.95178 Mg/hr

Fe 4
9.96 MW
12.066 Mg/hr

Total 21.0178

61.7 ÷ 21.0178 = 2.94 Kg/Mg feed

Run #5

Fe 3
890.88 MW hr
50.258 Mg
10.22 MW
6.3506 Mg/hr

Fe 4
73.42 MW hr
47.173 Mg feed
9.67 MW
12.692 Mg/hr

Total 12.692 Mg/hr

124.7 ÷ 12.692 = 9.82 Kg/Mg feed

Run #6

Fe 3
See Run # 5
10.46 MW
6.4857 Mg/hr

Fe 4
7.68 MW
6.219485 Mg/hr

Total 12.7192 Mg/hr

84.2 ÷ 12.7192 = 6.62 Kg/Mg feed

Kg particulate / Mg alloy

Use Total daily alloy production each fce (individual top weights doubled by slag figures - This differs from what I told Sandy to. I would probably do). Correct for Fe ~~and~~ picked up in dilln.

Then determine alloy prod / mw hr (day)
Multiply by fce load - add two together and divided into Kg particulate.

Fe 2/10/61

Fce 3 176,585 lbs alloy x 0.95 (dill correction) = 167255.75 lbs
~~Fce 4 x 0.95 (dill correction)~~ = 4764.093 Mg

222.84599 Mw-hr Consumed =
341.5 Kg alloy / mw-hr (day)

Some method for fce 4

Run #1

fce 3 10.45 mw x 341.5 = 3568.675 Kg / hr
fce 4 9.41 " x 406.7 = 3827.047 Kg / hr
Total 7.3957 Mg Alloy / hr
132.1 ÷ 7.3957 = 17.9 Kg / Mg alloy
= 35.7 lb / ton alloy

Calc Kg alloy / mw hr (day) each fce

Run #2

fce 3 10.1 mw x 348.7 Kg alloy / hr. = 3521.87 Kg
fce 4 9.8 x 303.1 = 2970.38
6492.25
96.1 ÷ 6.49225 = 14.8 Kg / Mg alloy

Run 3 fce 3 10.02 x 348.7
fce 4 9.17 x 303.1
6.2734 = Mg
70.1 ÷ 6.6572 = 10.5 Kg / Mg alloy

etc

Baghouse Outlet Reheat

At first Calc Baghouse Deletion from ambient air

Ambient Temperatures, Run #1 50°F
Run #2, 3 35°F
Run #4 20°F

Using Same general method as for Alamo

Run #1

$$\frac{184-165}{165-50} = 0.165$$

Run #2 $\frac{177-145}{145-35} = 0.291$

Run #3 (avg inlet Runs 3 and 4)

$$\frac{\left(\frac{175+165}{2} - 134\right)}{134-35} = 0.364$$

Run #4 $\frac{171-133}{133-20} = 0.336$

Because of Ambient air temp variance I did not average these

Baghouse exhaust gas flow rate these

Run #1

$1.165 \times 208153 \text{ dscf/min} = 242498 \text{ dscf/m} = 6870 \text{ dscm/m}$

Run #2 $1.291 \times 218331 = 281865$ " " $= 7980$ " "

Run #3 $1.364 \times \frac{219010+221882}{2} = 300,688 = 8510$

Run #4 $1.336 \times 219222 = 292581 = 8290$

12. Core in gas Bayhouse outlet (Room)

My numbers check with data given you previously.

C. Kg emitted / hour

Run #1 $(10^{-6})(1.48\ mg/dsm^3)(6870\ dsm^3/min)(60) = 0.61\ Kg/h = 1.34\ lb$

2 ( ) (6.97)(7980)( ) = 3.34 Kg , 7.36 lb

3 ( ) (1.81)(8570)( ) = 0.93 Kg , 2.05

4 (1) (2.62)(8290)(60) = 1.301 Kg , 2.87

D. Avg Load / Test

Run #1

fce 3 fce 4

meters 907-1001

10.5 mw (55 min Test Time) 9.3

1340-1430

10.36 mw (50 min Test Time) 9.8

1500-1610

10.6 mw (70 min Test Time) 9.3

175 min

Avg 10.5 9.44

Total 19.9

Run #2

945-1230 Lead 4 mi Down fce 4

fce 3 10.2 mw 9.6 mw

Total 19.8

Run #3

1305-1630 Lead 5 mi down 1305-1630 Lead 12 mi down

fce 3 10.2 mw 9.5 mw

Total 19.7

Run #4

fce 3 fce 4

947 → 1030 down 36 min

10.5 mw min 9.8 mw

1130-1330 mw 120 min

fuel 3 10.25 mw

9.8 mw

Total 20.1 mw

E. Kg / mw-hr

Run #				
1	0.61 ÷ 19.9 =	0.031 Kg/mw-hr =	0.068 lb/mw-hr
2	3.34 ÷ 19.8 =	0.169 =	0.372
3	0.93 ÷ 19.7 =	0.047 =	0.104
4	1.30 ÷ 20.1 =	0.065 =	0.143

F Kg / Mg fuel

See Section E for inlet

Run #1 fuel 3 10.5 mw = 9.27136 Mg/hr

fuel 4 9.44 mw = 10.423

19.695 Mg/hr total

0.61 ÷ 19.695 = 0.031 Kg = 0.068 lb/hr

Run # 2

fuel 3 10.2 mw = 8.679486

fuel 4 9.6 = 11.62982

20.309

3.34 ÷ 20.309 = 0.164 Kg = 0.363 lb/hr

Run # 3

fuel 3 10.2 mw = 8.679485

fuel 4 9.5 mw = 11.508775

20.188

0.93 ÷ 20.188 = 0.046 Kg = 0.102 lb/hr

Run # 4

fuel 3 10.25 mw = 6.36923

fuel 4 9.8 = 6.256586

12.66582

1.30 ÷ 12.66582 = 0.103 Kg = 0.226 lb/hr

G. Room Reg/vac outlet

Kg./ Mg alloy

See Section F on inlet

Run #1

fac 3	341.5 Kg/hr-wk	× 10.5 hr/wk	= 3585.75 Kg/wk
fac 4	406.7	× 9.44	= 3839.248
			7.474998 Mg

0.61 ÷ 7.474998 = 0.082 Kg/Mg = 0.163 lb/ton

Run #2

fac 3	348.7	× 10.2	= 3556.74
fac 4	303.1	× 9.6	= 2909.76
			6.4665 Mg alloy

334 ÷ 6.4665 = 0.517 Kg/Mg = 1.033 lb/ton

Run #3

fac 3	348.7	× 10.2	= 3556.74
fac 4	303.1	× 9.5	= 2879.45
			6.4369

0.93 ÷ 6.4369 = 0.144 Kg/Mg = 0.289 lb/ton

Run #4

fac 3	332.6	× 10.25	= 3409.15
fac 4	315.9	× 9.8	= 3095.82
			6.5049

1.30 ÷ 6.5049 = 0.200 Kg/Mg = 0.400 lb/t

APPENDIX D-1

CASCADE IMPACTOR DATA REDUCTION
SYSTEM PRINTOUTS BAGHOUSE INLET

RUN #1-1-A-16 2-10-81 0946

IMPACTOR FLOWRATE = 0.282 ACFM IMPACTOR TEMPERATURE = 184.0 F = 84.4 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.1 IN. OF HG STACK TEMPERATURE = 184.0 F = 84.4 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 28.68 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 5.0291E-01 GR/ACF 6.4431E-01 GR/DNCF 1.1508E+03 MG/ACM 1.4744E+03 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	18.96	11.90	8.09	5.52	3.61	1.82	1.15	0.79	
MASS (MILLIGRAMS)	6.61	1.04	0.55	0.83	0.16	1.47	1.64	3.10	2.76
MG/DNCM/STAGE	5.47E+02	8.35E+01	4.42E+01	6.67E+01	1.28E+01	1.18E+02	1.32E+02	2.49E+02	2.22E+02
CUM. PERCENT OF MASS SMALLER THAN D50	62.91	57.24	54.25	49.73	48.86	40.85	31.92	15.03	
CUM. (MG/ACM) SMALLER THAN D50	7.24E+02	6.59E+02	6.24E+02	5.72E+02	5.62E+02	4.70E+02	3.67E+02	1.73E+02	
CUM. (MG/DNCM) SMALLER THAN D50	9.28E+02	8.44E+02	8.00E+02	7.33E+02	7.20E+02	6.02E+02	4.71E+02	2.22E+02	
CUM. (GR/ACF) SMALLER THAN D50	3.16E-01	2.88E-01	2.73E-01	2.50E-01	2.46E-01	2.05E-01	1.61E-01	7.56E-02	
CUM. (GR/DNCF) SMALLER THAN D50	4.05E-01	3.69E-01	3.50E-01	3.20E-01	3.15E-01	2.63E-01	2.06E-01	9.69E-02	
GEC. MEAN DIA. (MICROMETERS)	3.64E+01	1.50E+01	9.81E+00	6.68E+00	4.46E+00	2.57E+00	1.45E+00	9.56E-01	5.42E-01
DM/DLOGD (MG/DNCM)	9.64E+02	4.13E+02	2.64E+02	4.01E+02	6.98E+01	3.98E+02	6.59E+02	1.55E+03	7.38E+02
DN/DLOGD (NO. PARTICLES/DNCM)	3.81E+07	2.33E+08	5.33E+08	2.57E+05	1.50E+09	4.50E+10	4.13E+11	3.38E+12	7.92E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN 81-I-A-16 2-10-81 0946

IMPACTOR FLOWRATE = 0.282 ACFM IMPACTOR TEMPERATURE = 184.0 F = 84.4 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.1 IN. OF HG STACK TEMPERATURE = 184.0 F = 84.4 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 28.68 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 5.0291E-01 GR/ACF 6.4431E-01 GR/DNCF 1.1508E+03 MG/ACM 1.4744E+03 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	19.07	12.01	8.20	5.62	3.72	1.93	1.25	0.89	
MASS (MILLIGRAMS)	6.81	1.04	0.55	0.83	0.16	1.47	1.64	3.10	2.76
MG/DNCM/STAGE	5.47E+02	8.35E+01	4.42E+01	6.67E+01	1.28E+01	1.18E+02	1.32E+02	2.49E+02	2.22E+02
CUM. PERCENT OF MASS SMALLER THAN D50	62.91	57.24	54.25	49.73	48.86	40.85	31.92	15.03	
CUM. (MG/ACM) SMALLER THAN D50	7.24E+02	6.59E+02	6.24E+02	5.72E+02	5.62E+02	4.70E+02	3.67E+02	1.73E+02	
CUM. (MG/DNCM) SMALLER THAN D50	9.28E+02	8.44E+02	8.00E+02	7.33E+02	7.20E+02	6.02E+02	4.71E+02	2.22E+02	
CUM. (GR/ACF) SMALLER THAN D50	3.16E-01	2.88E-01	2.73E-01	2.50E-01	2.46E-01	2.05E-01	1.61E-01	7.56E-02	
CUM. (GR/DNCF) SMALLER THAN D50	4.05E-01	3.69E-01	3.50E-01	3.20E-01	3.15E-01	2.63E-01	2.06E-01	9.69E-02	
GEO. MEAN DIA. (MICROMETERS)	3.65E+01	1.51E+01	9.92E+00	6.79E+00	4.57E+00	2.68E+00	1.55E+00	1.06E+00	6.33E-01
DM/DLOGD (MG/DNCM)	9.68E+02	4.16E+02	2.66E+02	4.07E+02	7.14E+01	4.14E+02	7.04E+02	1.71E+03	7.36E+02
DN/DLOGD (NO. PARTICLES/DNCM)	3.79E+07	2.29E+08	5.21E+08	2.49E+09	1.43E+09	4.13E+10	3.59E+11	2.75E+12	5.55E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #1-I-A-92 2-10-81 1400

IMPACTOR FLOWRATE = 0.331 ACFM IMPACTOR TEMPERATURE = 184.0 F = 84.4 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 184.0 F = 84.4 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.68 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 2.5478E-01 GR/ACF 3.6486E-01 GR/DNCF 6.5168E+02 MG/ACM 8.3492E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.46	10.97	7.45	5.08	3.32	1.67	1.05	0.72	
MASS (MILLIGRAMS)	3.12	1.00	1.85	1.00	1.34	0.85	1.02	1.01	1.05
MG/DNCM/STAGE	2.13E+02	6.83E+01	1.26E+02	6.83E+01	9.16E+01	5.81E+01	6.97E+01	6.90E+01	7.04E+01
CUM. PERCENT OF MASS SMALLER THAN D50	74.47	66.28	51.15	42.96	32.00	25.04	16.69	8.40	
CUM. (MG/ACM) SMALLER THAN D50	4.85E+02	4.32E+02	3.33E+02	2.80E+02	2.09E+02	1.63E+02	1.09E+02	5.49E+01	
CUM. (MG/DNCM) SMALLER THAN D50	6.22E+02	5.53E+02	4.27E+02	3.59E+02	2.67E+02	2.09E+02	1.39E+02	7.04E+01	
CUM. (GR/ACF) SMALLER THAN D50	2.12E-01	1.89E-01	1.46E-01	1.22E-01	9.11E-02	7.13E-02	4.75E-02	2.40E-02	
CUM. (GR/DNCF) SMALLER THAN D50	2.72E-01	2.42E-01	1.87E-01	1.57E-01	1.17E-01	9.14E-02	6.09E-02	3.02E-02	
GEO. MEAN DIA. (MICROMETERS)	3.50E+01	1.38E+01	9.04E+00	6.16E+00	4.11E+00	2.36E+00	1.33E+00	8.74E-01	5.12E-01
DM/DLOGD (MG/DNCM)	3.54E+02	3.38E+02	7.53E+02	4.11E+02	4.96E+02	1.95E+02	3.46E+02	4.24E+02	2.74E+02
DN/DLOGD (NO. PARTICLES/DNCM)	1.58E+07	2.43E+08	1.95E+09	3.36E+09	1.37E+10	2.84E+10	2.82E+11	1.21E+12	3.32E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #1-I-A-92 2-10-81 1400

IMPACTOR FLOWRATE = 0.331 ACFM IMPACTOR TEMPERATURE = 184.0 F = 84.4 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 184.0 F = 84.4 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 28.68 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 2.8476E-01 GR/ACF 3.6486E-01 GR/DNCF 6.5166E+02 MG/ACM 8.3492E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.59	11.07	7.56	5.19	3.43	1.76	1.15	0.82	
MASS (MILLIGRAMS)	3.12	1.00	1.85	1.00	1.34	0.85	1.02	1.01	1.03
MG/DNCM/STAGE	2.13E+02	6.83E+01	1.26E+02	6.83E+01	9.16E+01	5.81E+01	6.97E+01	6.90E+01	7.04E+01
CUM. PERCENT OF MASS SMALLER THAN D50	74.47	66.28	51.15	42.96	32.00	25.04	16.69	8.83	
CUM. (MG/ACM) SMALLER THAN D50	4.85E+02	4.32E+02	3.33E+02	2.80E+02	2.09E+02	1.63E+02	1.09E+02	5.49E+01	
CUM. (MG/DNCM) SMALLER THAN D50	6.22E+02	5.53E+02	4.27E+02	3.59E+02	2.67E+02	2.09E+02	1.39E+02	7.04E+01	
CUM. (GR/ACF) SMALLER THAN D50	2.12E-01	1.89E-01	1.46E-01	1.22E-01	9.11E-02	7.13E-02	4.75E-02	2.40E-02	
CUM. (GR/DNCF) SMALLER THAN D50	2.72E-01	2.42E-01	1.87E-01	1.57E-01	1.17E-01	9.14E-02	6.09E-02	3.08E-02	
GEC. MEAN DIA. (MICROMETERS)	3.51E+01	1.40E+01	9.15E+00	6.26E+00	4.22E+00	2.47E+00	1.43E+00	9.76E-01	5.83E-01
DM/DLOGD (MG/DNCM)	3.55E+02	3.40E+02	7.62E+02	4.18E+02	5.09E+02	2.04E+02	3.72E+02	4.72E+02	2.74E+02
DN/DLOGD (NO. PARTICLES/DNCM)	1.57E+07	2.39E+08	1.90E+09	3.25E+09	1.30E+10	2.59E+10	2.42E+11	9.70E+11	2.25E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #1-1-B-90 2-10-81 1625

IMPACTOR FLOWRATE = 0.339 ACFM IMPACTOR TEMPERATURE = 184.0 F = 84.4 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 184.0 F = 84.4 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 28.68 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.01

CALC. MASS LOADING = 2.4845E-01 GR/ACF 3.1636E-01 GR/DNCF 5.6863E+02 MG/ACM 7.2652E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.26	10.83	7.36	5.02	3.28	1.65	1.04	0.71	
MASS (MILLIGRAMS)	1.61	1.26	0.38	0.59	0.08	1.80	0.61	2.26	2.34
MG/DNCM/STAGE	1.07E+02	8.40E+01	2.53E+01	3.93E+01	5.33E+00	1.20E+02	4.07E+01	1.51E+02	1.56E+02
CUM. PERCENT OF MASS SMALLER THAN D50	85.27	73.74	70.27	64.87	64.14	47.67	42.09	21.41	
CUM. (MG/ACM) SMALLER THAN D50	4.85E+02	4.19E+02	4.00E+02	3.69E+02	3.65E+02	2.71E+02	2.39E+02	1.22E+02	
CUM. (MG/DNCM) SMALLER THAN D50	6.21E+02	5.37E+02	5.12E+02	4.73E+02	4.67E+02	3.47E+02	3.07E+02	1.56E+02	
CUM. (GR/ACF) SMALLER THAN D50	2.12E-01	1.83E-01	1.75E-01	1.61E-01	1.59E-01	1.18E-01	1.05E-01	5.32E-02	
CUM. (GR/DNCF) SMALLER THAN D50	2.71E-01	2.35E-01	2.24E-01	2.07E-01	2.04E-01	1.52E-01	1.34E-01	6.82E-02	
GEO. MEAN DIA. (MICROMETERS)	3.48E+01	1.37E+01	8.93E+00	6.08E+00	4.06E+00	2.33E+00	1.31E+00	8.62E-01	5.05E-01
DM/DLOG (MG/DNCM)	1.77E+02	4.15E+02	1.51E+02	2.36E+02	2.89E+01	4.03E+02	2.02E+02	9.24E+02	5.18E+02
DN/DLOG (NO. PARTICLES/DNCM)	8.02E+06	3.10E+08	4.05E+08	2.01E+09	8.26E+08	6.09E+10	1.71E+11	2.76E+12	7.69E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #1-1-R-90 2-10-81 1625

IMPACTOR FLOWRATE = 0.339 ACFM IMPACTOR TEMPERATURE = 184.0 F = 84.4 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 184.0 F = 84.4 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 28.68 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADINGS = 2.4849E-01 GR/ACF 3.1836E-01 GR/DNCF 5.6963E+02 MG/ACM 7.2852E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.37	10.94	7.47	5.12	3.38	1.76	1.14	0.61	
MASS (MILLIGRAMS)	1.61	1.26	0.36	0.59	0.08	1.60	0.61	2.26	2.34
MG/DNCM/STAGE	1.07E+02	8.40E+01	2.53E+01	3.93E+01	5.33E+00	1.20E+02	4.07E+01	1.51E+02	1.56E+02
CUM. PERCENT OF MASS SMALLER THAN D50	85.27	73.74	70.27	64.87	64.14	47.67	42.05	21.41	
CUM. (LB/ACM) SMALLER THAN D50	4.85E+02	4.19E+02	4.00E+02	3.69E+02	3.65E+02	2.71E+02	2.39E+02	1.22E+02	
CUM. (MG/DNCM) SMALLER THAN D50	6.21E+02	5.37E+02	5.12E+02	4.73E+02	4.67E+02	3.47E+02	3.07E+02	1.56E+02	
CUM. (GR/ACF) SMALLER THAN D50	2.12E-01	1.83E-01	1.75E-01	1.61E-01	1.59E-01	1.18E-01	1.05E-01	5.32E-02	
CUM. (GR/DNCF) SMALLER THAN D50	2.71E-01	2.35E-01	2.24E-01	2.07E-01	2.04E-01	1.52E-01	1.34E-01	6.83E-02	
GEO. MEAN DIA. (MICROMETERS)	3.49E+01	1.38E+01	9.04E+00	6.18E+00	4.16E+00	2.44E+00	1.41E+00	9.64E-01	5.76E-01
DM/DLOGD (MG/DNCM)	1.77E+02	4.18E+02	1.53E+02	2.40E+02	2.96E+01	4.21E+02	2.17E+02	1.63E+03	5.18E+02
DN/DLOGD (NO. PARTICLES/DNCM)	7.99E+06	3.05E+08	3.95E+08	1.94E+09	7.84E+08	5.55E+10	1.46E+11	2.20E+12	5.1?E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #2-1-A-16 2-11-81 1115

IMPACTOR FLOWRATE = 0.336 ACFM IMPACTOR TEMPERATURE = 177.0 F = 80.6 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 177.0 F = 80.6 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 9.1805E-02 GR/ACF 1.1419E-01 GR/DNCF 2.1006E+02 MG/ACM 2.6130E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.26	10.85	7.37	5.03	3.29	1.66	1.04	0.72	
MASS (MILLIGRAMS)	0.16	0.29	0.03	0.10	0.10	0.30	0.55	1.20	1.25
MG/DNCF/STAGE	1.18E+01	1.89E+01	1.96E+00	6.53E+00	6.53E+00	1.96E+01	3.59E+01	7.84E+01	8.17E+01
CUM. PERCENT OF MASS SMALLER THAN D50	95.50	88.25	87.50	85.00	82.50	75.00	61.25	31.25	
CUM. (MG/ACM) SMALLER THAN D50	2.01E+02	1.85E+02	1.84E+02	1.79E+02	1.73E+02	1.58E+02	1.29E+02	6.57E+01	
CUM. (MG/DNCM) SMALLER THAN D50	2.50E+02	2.31E+02	2.29E+02	2.22E+02	2.16E+02	1.96E+02	1.60E+02	8.17E+01	
CUM. (GR/ACF) SMALLER THAN D50	8.77E-02	8.10E-02	8.03E-02	7.80E-02	7.57E-02	6.89E-02	5.62E-02	2.87E-02	
CUM. (GR/DNCF) SMALLER THAN D50	1.09E-01	1.01E-01	9.99E-02	9.71E-02	9.42E-02	8.56E-02	6.99E-02	3.57E-02	
GEL. MEAN DIA. (MICROMETERS)	3.48E+01	1.37E+01	8.94E+00	6.09E+00	4.06E+00	2.33E+00	1.32E+00	8.69E-01	5.08E-01
DM/DLOGD (MG/DNCM)	1.94E+01	9.36E+01	1.17E+01	3.93E+01	3.54E+01	6.59E+01	1.79E+02	4.83E+02	2.71E+02
DN/DLOGD (NO. PARTICLES/DNCM)	8.79E+05	6.97E+07	3.12E+07	3.33E+08	1.01E+09	9.90E+09	1.50E+11	1.42E+12	7.06E+11

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN 82-I-A-16 2-11-81 1115

IMPACTOR FLOWRATE = 0.336 ACFM IMPACTOR TEMPERATURE = 177.0 F = 80.6 C SAMPLING DURATION = 2.30 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 177.0 F = 80.6 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 9.1605E-02 GR/ACF 1.1419E-01 GR/DNCF 2.1008E+02 MG/ACM 2.6130E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	SF	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.38	10.95	7.47	5.13	3.39	1.76	1.14	0.82	
MASS (MILLIGRAMS)	0.18	0.29	0.03	0.10	0.10	0.30	0.55	1.20	1.25
MG/ACM/STAGE	1.18E+01	1.89E+01	1.96E+00	6.53E+00	6.53E+00	1.96E+01	3.59E+01	7.84E+01	8.17E+01
CUM. PERCENT OF MASS SMALLER THAN D50	95.50	88.25	87.50	85.00	82.50	75.00	61.25	31.25	
CUM. (MG/ACM) SMALLER THAN D50	2.01E+02	1.85E+02	1.84E+02	1.79E+02	1.73E+02	1.58E+02	1.29E+02	6.57E+01	
CUM. (MG/DNCM) SMALLER THAN D50	2.50E+02	2.31E+02	2.29E+02	2.22E+02	2.16E+02	1.96E+02	1.60E+02	8.17E+01	
CUM. (GR/ACF) SMALLER THAN D50	8.77E-02	8.10E-02	8.03E-02	7.80E-02	7.57E-02	6.89E-02	5.62E-02	2.87E-02	
CUM. (GR/DNCF) SMALLER THAN D50	1.09E-01	1.01E-01	9.99E-02	9.71E-02	9.42E-02	8.56E-02	6.99E-02	3.57E-02	
GEO. MEAN DIA. (MICROMETERS)	3.49E+01	1.36E+01	9.04E+00	6.19E+00	4.17E+00	2.44E+00	1.42E+00	9.65E-01	5.76E-01
DM/DLOGD (MG/DNCM)	1.94E+01	9.43E+01	1.18E+01	3.99E+01	3.63E+01	6.87E+01	1.92E+02	5.36E+02	2.71E+02
DN/DLOGD (NO. PARTICLES/DNCM)	8.75E+05	6.86E+07	3.05E+07	3.22E+08	9.58E+08	9.04E+09	1.29E+11	1.14E+12	2.71E+12

NORM/L (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #2-I-R-16 2-11-81 0918

IMPACTOR FLOWRATE = 0.338 ACFM IMPACTOR TEMPERATURE = 177.0 F = 80.6 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 177.0 F = 80.6 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.01

CALC. MASS LOADING = 1.6587E-01 GR/ACF 2.0631E-01 GR/DNCF 3.7956E+02 MG/ACM 4.7211E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.23	10.81	7.35	5.01	3.28	1.65	1.04	0.72	
MASS (MILLIGRAMS)	1.21	0.51	0.30	0.31	0.17	0.11	1.03	1.86	1.77
MG/LNCM/STAGE	7.86E+01	3.31E+01	1.95E+01	2.01E+01	1.10E+01	7.14E+00	6.69E+01	1.21E+02	1.15E+02
CUM. PERCENT OF MASS SMALLER THAN D50	83.36	76.34	72.21	67.95	65.61	64.10	49.93	24.35	
CUM. (MG/ACM) SMALLER THAN D50	3.16E+02	2.90E+02	2.74E+02	2.58E+02	2.49E+02	2.43E+02	1.90E+02	9.24E+01	
CUM. (MG/DNCM) SMALLER THAN D50	3.94E+02	3.60E+02	3.41E+02	3.21E+02	3.10E+02	3.03E+02	2.36E+02	1.15E+02	
CUM. (GR/ACF) SMALLER THAN D50	1.38E-01	1.27E-01	1.20E-01	1.13E-01	1.09E-01	1.06E-01	8.28E-02	4.04E-02	
CUM. (GR/DNCF) SMALLER THAN D50	1.72E-01	1.57E-01	1.49E-01	1.40E-01	1.35E-01	1.32E-01	1.03E-01	5.02E-02	
GEO. MEAN DIA. (MICROMETERS)	3.47E+01	1.36E+01	8.91E+00	6.07E+00	4.05E+00	2.33E+00	1.31E+00	8.63E-01	5.06E-01
DM/DLOGD (MG/DNCM)	1.29E+02	1.64E+02	1.16E+02	1.21E+02	5.99E+01	2.40E+01	3.33E+02	7.44E+02	3.42E+02
DN/DLOGD (NO. PARTICLES/DNCM)	5.88E+06	1.23E+08	3.13E+08	1.03E+09	1.72E+09	3.64E+09	2.82E+11	2.21E+12	5.43E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #2-1-B-16 2-11-81 0918

IMPACTOR FLOWRATE = 0.338 ACFM IMPACTOR TEMPERATURE = 177.0 F = 80.6 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 177.0 F = 80.6 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 1.6587E-01 GR/ACF 2.0631E-01 GR/DNCF 3.7956E+02 MG/ACM 4.7211E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.33	10.91	7.45	5.11	3.38	1.75	1.14	0.61	
MASS (MILLIGRAMS)	1.21	0.51	0.30	0.31	0.17	0.11	1.03	1.86	1.77
MG/DNCM/STAGE	7.86E+01	3.31E+01	1.95E+01	2.01E+01	1.10E+01	7.14E+00	6.69E+01	1.21E+02	1.15E+02
CUM. PERCENT OF MASS SMALLER THAN D50	83.36	76.34	72.21	67.95	65.61	64.10	49.93	24.36	
CUM. (MG/ACM) SMALLER THAN D50	3.16E+02	2.90E+02	2.74E+02	2.58E+02	2.49E+02	2.43E+02	1.90E+02	9.24E+01	
CUM. (MG/DNCM) SMALLER THAN D50	3.94E+02	3.60E+02	3.41E+02	3.21E+02	3.10E+02	3.03E+02	2.36E+02	1.15E+02	
CUM. (GR/ACF) SMALLER THAN D50	1.38E-01	1.27E-01	1.20E-01	1.13E-01	1.09E-01	1.06E-01	8.29E-02	4.04E-02	
CUM. (GR/DNCF) SMALLER THAN D50	1.72E-01	1.57E-01	1.49E-01	1.40E-01	1.35E-01	1.32E-01	1.03E-01	5.02E-02	
GEO. MEAN DIA. (MICROMETERS)	3.48E+01	1.38E+01	9.02E+00	6.17E+00	4.16E+00	2.43E+00	1.41E+00	9.62E-01	5.75E-01
DM/DLOGD (MG/DNCM)	1.30E+02	1.65E+02	1.17E+02	1.23E+02	6.13E+01	2.50E+01	3.57E+02	6.26E+02	3.42E+02
DN/DLOGD (NO. PARTICLES/DNCM)	5.86E+06	1.21E+08	3.06E+08	1.00E+09	1.63E+09	3.32E+09	2.42E+11	1.77E+12	3.94E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #2-I-B-90 2-11-81 0959

IMPACTOR FLOWRATE = 0.343 ACFM IMPACTOR TEMPERATURE = 177.0 F = 80.6 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 177.0 F = 80.6 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 9.8418E-02 GR/ACF 1.2241E-01 GR/DNCF 2.2521E+02 MG/ACM 2.8013E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.10	10.73	7.29	4.97	3.25	1.64	1.03	0.71	
MASS (MILLIGRAMS)	0.01	0.11	0.11	0.31	0.41	0.25	0.50	1.33	1.35
MG/DNCM/STAGE	6.40E-01	7.04E+00	7.04E+00	1.98E+01	2.62E+01	1.60E+01	3.20E+01	8.51E+01	8.63E+01
CUM. PERCENT OF MASS SMALLER THAN D50	99.77	97.26	94.75	87.67	78.31	72.60	61.19	30.82	
CUM. (MG/ACM) SMALLER THAN D50	2.25E+02	2.19E+02	2.13E+02	1.97E+02	1.76E+02	1.64E+02	1.38E+02	6.94E+01	
CUM. (MG/DNCM) SMALLER THAN D50	2.79E+02	2.72E+02	2.65E+02	2.46E+02	2.19E+02	2.03E+02	1.71E+02	8.63E+01	
CUM. (GR/ACF) SMALLER THAN D50	9.82E-02	9.57E-02	9.33E-02	8.63E-02	7.71E-02	7.15E-02	6.02E-02	3.03E-02	
CUM. (GR/DNCF) SMALLER THAN D50	1.22E-01	1.19E-01	1.16E-01	1.07E-01	9.59E-02	8.89E-02	7.49E-02	3.77E-02	
GEC. MEAN DIA. (MICROMETERS)	3.46E+01	1.35E+01	8.85E+00	6.02E+00	4.02E+00	2.31E+00	1.30E+00	8.56E-01	5.02E-01
DM/DLOGD (MG/DNCM)	1.04E+00	3.48E+01	4.19E+01	1.19E+02	1.42E+02	5.37E+01	1.59E+02	5.23E+02	2.67E+02
DN/DLOGD (NO. PARTICLES/DNCM)	4.82E+04	2.67E+07	1.16E+08	1.04E+09	4.18E+09	8.34E+09	1.36E+11	1.60E+12	4.34E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #2-1-B-90 2-11-81 0959

IMPACTOR FLOWRATE = 0.343 ACFM IMPACTOR TEMPERATURE = 177.0 F = 80.6 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 177.0 F = 60.6 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 9.8418E-02 GR/ACF 1.2241E-01 GR/DNCF 2.2521E+02 MG/ACM 2.8013E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.20	10.83	7.39	5.07	3.35	1.74	1.13	0.81	
MASS (MILLIGRAMS)	0.01	0.11	0.11	0.31	0.41	0.25	0.50	1.33	1.35
MG/LACP/STAGE	6.40E-01	7.04E+00	7.04E+00	1.98E+01	2.62E+01	1.60E+01	3.20E+01	8.51E+01	8.63E+01
CUM. PERCENT OF MASS SMALLER THAN D50	99.77	97.26	94.75	87.67	78.31	72.60	61.19	30.82	
CUM. (MG/ACM) SMALLER THAN D50	2.25E+02	2.19E+02	2.13E+02	1.97E+02	1.76E+02	1.64E+02	1.38E+02	6.94E+01	
CUM. (MG/DNCM) SMALLER THAN D50	2.79E+02	2.72E+02	2.65E+02	2.46E+02	2.19E+02	2.03E+02	1.71E+02	8.63E+01	
CUM. (GR/ACF) SMALLER THAN D50	9.82E-02	9.57E-02	9.33E-02	8.63E-02	7.71E-02	7.15E-02	6.02E-02	3.03E-02	
CUM. (GR/DNCF) SMALLER THAN D50	1.22E-01	1.19E-01	1.16E-01	1.07E-01	9.59E-02	8.89E-02	7.49E-02	3.77E-02	
GEO. MEAN DIA. (MICROMETERS)	3.47E+01	1.36E+01	8.95E+00	6.12E+00	4.12E+00	2.41E+00	1.40E+00	9.54E-01	5.71E-01
DM/DLOGD (MG/DNCM)	1.05E+00	3.50E+01	4.24E+01	1.21E+02	1.46E+02	5.61E+01	1.71E+02	5.81E+02	2.87E+02
DN/DLOGD (NO. PARTICLES/DNCM)	4.80E+04	2.63E+07	1.13E+08	1.01E+09	3.97E+09	7.61E+09	1.19E+11	1.29E+12	2.96E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #3-T-A-16 2-11-81 1430

IMPACTOR FLOWRATE = 0.403 ACFM IMPACTOR TEMPERATURE = 175.0 F = 79.4 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.3 IN. OF HG STACK TEMPERATURE = 175.0 F = 79.4 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 7.1592E-02 GR/ACF 8.8767E-02 GR/DNCF 1.6393E+02 MG/ACM 2.0313E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	15.76	9.89	6.72	4.58	2.99	1.50	0.94	0.65	
MASS (MILLIGRAMS)	0.15	0.0	0.19	0.15	0.08	0.18	0.69	1.12	1.18
MG/DNCM/STAGE	8.15E+00	0.0	1.03E+01	8.15E+00	4.34E+00	9.78E+00	3.75E+01	6.09E+01	6.41E+01
CUM. PERCENT OF MASS SMALLER THAN D50	95.99	95.99	90.91	86.90	84.76	79.95	61.50	31.55	
CUM. (MG/ACM) SMALLER THAN D50	1.57E+02	1.57E+02	1.49E+02	1.42E+02	1.39E+02	1.31E+02	1.01E+02	5.17E+01	
CUM. (MG/DNCM) SMALLER THAN D50	1.95E+02	1.95E+02	1.85E+02	1.77E+02	1.72E+02	1.62E+02	1.25E+02	6.41E+01	
CUM. (GR/ACF) SMALLER THAN D50	6.87E-02	6.87E-02	6.51E-02	6.22E-02	6.07E-02	5.72E-02	4.40E-02	2.26E-02	
CUM. (GR/DNCF) SMALLER THAN D50	8.52E-02	8.52E-02	8.07E-02	7.71E-02	7.52E-02	7.10E-02	5.46E-02	2.80E-02	
GEC. MEAN DIA. (MICROMETERS)	3.32E+01	1.25E+01	8.15E+00	5.54E+00	3.70E+00	2.12E+00	1.19E+00	7.81E-01	4.57E-01
DM/DLOGD (MG/DNCM)	1.26E+01	0.0	6.15E+01	4.89E+01	2.35E+01	3.27E+01	1.85E+02	3.69E+02	2.13E+02
DN/DLOGD (NO. PARTICLES/DNCM)	6.56E+05	0.0	2.17E+08	5.48E+08	8.87E+08	6.56E+09	2.09E+11	1.48E+12	4.27E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #3-1-A-16 2-11-81 1430

IMPACTOR FLOWRATE = 0.403 ACFM IMPACTOR TEMPERATURE = 175.0 F = 79.4 C SAMPLING DURATION = 2.09 MIN

IMPACTOR PRESSURE DROP = 0.3 IN. OF HG STACK TEMPERATURE = 175.0 F = 79.4 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 7.1592E-02 GR/ACF 8.8767E-02 GR/DNCF 1.6383E+02 MG/ACM 2.0313E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	15.66	9.99	6.82	4.66	3.09	1.60	1.04	0.74	
MASS (MILLIGRAMS)	0.15	0.0	0.19	0.15	0.08	0.18	0.69	1.12	1.18
MG/LNCM/STAGE	8.15E+00	0.0	1.03E+01	8.15E+00	4.34E+00	9.78E+00	3.75E+01	6.09E+01	6.41E+01
CUM. PERCENT OF MASS SMALLER THAN D50	95.99	95.99	90.91	86.90	84.76	79.95	61.50	31.35	
CUM. (MG/ACM) SMALLER THAN D50	1.57E+02	1.57E+02	1.49E+02	1.42E+02	1.39E+02	1.31E+02	1.01E+02	5.17E+01	
CUM. (MG/DNCM) SMALLER THAN D50	1.95E+02	1.95E+02	1.85E+02	1.77E+02	1.72E+02	1.62E+02	1.25E+02	6.41E+01	
CUM. (GR/ACF) SMALLER THAN D50	6.87E-02	6.87E-02	6.51E-02	6.22E-02	6.07E-02	5.72E-02	4.40E-02	2.26E-02	
CUM. (GR/DNCF) SMALLER THAN D50	8.52E-02	8.52E-02	8.07E-02	7.71E-02	7.52E-02	7.10E-02	5.46E-02	2.80E-02	
GEO. MEAN DIA. (MICROMETERS)	3.33E+01	1.26E+01	8.25E+00	5.65E+00	3.80E+00	2.22E+00	1.29E+00	8.79E-01	5.25E-01
DM/DLOGD (MG/DNCM)	1.26E+01	0.0	6.22E+01	4.98E+01	2.41E+01	3.43E+01	2.03E+02	4.15E+02	2.13E+02
DN/DLOGD (NO. PARTICLES/DNCM)	6.50E+05	0.0	2.12E+08	5.28E+08	8.39E+08	5.94E+09	1.78E+11	1.17E+12	2.91E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #3-1-8-16 2-11-81 1410

IMPACTOR FLOWRATE = 0.348 ACFM IMPACTOR TEMPERATURE = 175.0 F = 79.4 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 175.0 F = 79.4 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 8.1755E-02 GR/ACF 1.0142E-01 GR/DNCF 1.8717E+02 MG/ACM 2.3209E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.06	10.75	7.34	5.03	3.33	1.72	1.12	0.80	
MASS (MILLIGRAMS)	0.05	0.07	0.17	0.39	0.25	0.30	0.40	0.70	1.36
MG/DNCF/STAGE	3.14E+00	4.40E+00	1.07E+01	2.45E+01	1.57E+01	1.89E+01	2.52E+01	4.40E+01	8.55E+01
CUM. PERCENT OF MASS SMALLER THAN D50	98.64	96.75	92.14	81.57	74.80	66.67	55.83	36.86	
CUM. (MG/ACM) SMALLER THAN D50	1.85E+02	1.81E+02	1.72E+02	1.53E+02	1.40E+02	1.25E+02	1.04E+02	6.90E+01	
CUM. (MG/DNCM) SMALLER THAN D50	2.29E+02	2.25E+02	2.14E+02	1.89E+02	1.74E+02	1.55E+02	1.30E+02	8.55E+01	
CUM. (GR/ACF) SMALLER THAN D50	8.07E-02	7.91E-02	7.54E-02	6.67E-02	6.12E-02	5.45E-02	4.57E-02	3.01E-02	
CUM. (GR/DNCF) SMALLER THAN D50	1.00E-01	9.81E-02	9.34E-02	8.27E-02	7.59E-02	6.76E-02	5.66E-02	3.74E-02	
GEO. MEAN DIA. (MICROMETERS)	3.48E+01	1.35E+01	8.88E+00	6.08E+00	4.09E+00	2.39E+00	1.39E+00	9.47E-01	5.66E-01
DN/DLOGD (MG/DNCM)	5.13E+00	2.19E+01	6.45E+01	1.50E+02	8.74E+01	6.62E+01	1.34E+02	3.01E+02	2.84E+02
DN/DLOGD (NO. PARTICLES/DNCM)	2.37E+05	1.69E+07	1.76E+08	1.28E+09	2.44E+09	9.20E+09	9.56E+10	6.77E+11	3.00E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #3-I-8-16 2-11-81 1410

IMPACTOR FLOWRATE = 0.348 ACFM IMPACTOR TEMPERATURE = 175.0 F = 79.4 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 175.0 F = 79.4 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 8.1755E-02 GR/ACF 1.0142E-01 GR/DNCF 1.8717E+02 MG/ACM 2.3208E+02 MG/DNCM

IMPACTOR STAGE	C1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.06	10.75	7.34	5.03	3.33	1.72	1.12	0.80	
MASS (MILLIGRAMS)	0.05	0.07	0.17	0.39	0.25	0.30	0.40	0.70	1.36
MG/TACP/STAGE	3.14E+00	4.40E+00	1.07E+01	2.45E+01	1.57E+01	1.89E+01	2.52E+01	4.40E+01	8.55E+01
CUM. PERCENT OF MASS SMALLER THAN D50	98.64	96.75	92.14	81.57	74.20	66.67	55.83	36.86	
CUM. (MG/ACM) SMALLER THAN D50	1.85E+02	1.81E+02	1.72E+02	1.53E+02	1.40E+02	1.25E+02	1.04E+02	6.90E+01	
CUM. (MG/DNCM) SMALLER THAN D50	2.29E+02	2.25E+02	2.14E+02	1.89E+02	1.74E+02	1.55E+02	1.30E+02	8.55E+01	
CUM. (GR/ACF) SMALLER THAN D50	8.07E-02	7.91E-02	7.54E-02	6.67E-02	6.12E-02	5.45E-02	4.57E-02	3.01E-02	
CUM. (GR/DNCF) SMALLER THAN D50	1.00E-01	9.81E-02	9.34E-02	8.27E-02	7.59E-02	6.76E-02	5.66E-02	3.74E-02	
GEO. MEAN DIA. (MICROMETERS)	3.46E+01	1.35E+01	8.68E+00	6.08E+00	4.09E+00	2.39E+00	1.39E+00	9.47E-01	5.66E-01
DM/DLOGD (MG/DNCM)	5.13E+00	2.19E+01	6.45E+01	1.50E+02	8.74E+01	6.62E+01	1.34E+02	3.01E+02	2.64E+02
DN/DLOGD (NO. PARTICLES/DNCM)	2.37E+05	1.69E+07	1.76E+08	1.28E+09	2.44E+09	9.20E+09	9.56E+10	6.77E+11	3.00E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN 84-I-A-90 2-11-81 1610

IMPACTOR FLOWRATE = 0.333 ACFM IMPACTOR TEMPERATURE = 165.0 F = 73.9 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 165.0 F = 73.9 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 1.7587E-01 GR/ACF 2.1463E-01 GR/DNCF 4.0248E+02 MG/ACM 4.9115E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.25	10.83	7.36	5.02	3.28	1.66	1.04	0.72	
MASS (MILLIGRAMS)	0.0	0.0	0.91	0.79	1.46	1.33	0.91	1.16	1.03
MG/DNCM/STAGE	0.0	0.0	5.89E+01	5.11E+01	9.45E+01	8.61E+01	5.89E+01	7.51E+01	6.67E+01
CUM. PERCENT OF MASS SMALLER THAN D50	100.00	100.00	88.01	77.60	58.37	40.84	28.85	13.57	
CUM. (MG/ACM) SMALLER THAN D50	4.02E+02	4.02E+02	3.54E+02	3.12E+02	2.35E+02	1.64E+02	1.16E+02	5.46E+01	
CUM. (MG/DNCM) SMALLER THAN D50	4.91E+02	4.91E+02	4.32E+02	3.81E+02	2.87E+02	2.01E+02	1.42E+02	6.67E+01	
CUM. (GR/ACF) SMALLER THAN D50	1.76E-01	1.75E-01	1.55E-01	1.36E-01	1.03E-01	7.18E-02	5.07E-02	2.39E-02	
CUM. (GR/DNCF) SMALLER THAN D50	2.15E-01	2.15E-01	1.89E-01	1.67E-01	1.25E-01	8.77E-02	6.19E-02	2.91E-02	
GEO. MEAN DIA. (MICROMETERS)	3.47E+01	1.37E+01	8.92E+00	6.08E+00	4.06E+00	2.33E+00	1.31E+00	6.69E-01	5.06E-01
DM/DLOGD (MG/DNCM)	0.0	0.0	3.51E+02	3.07E+02	5.13E+02	2.90E+02	2.94E+02	4.63E+02	2.21E+02
DN/DLOGD (NO. PARTICLES/DNCM)	0.0	0.0	9.43E+06	2.62E+05	1.46E+10	4.37E+10	2.47E+11	1.36E+12	3.22E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #4-I-A-90 2-11-81 1610

IMPACTOR FLOWRATE = 0.333 ACFM IMPACTOR TEMPERATURE = 165.0 F = 73.9 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 165.0 F = 73.9 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 1.7587E-01 GR/ACF 2.1463E-01 GR/DNCF 4.0246E+02 MG/ACM 4.9115E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.35	10.92	7.46	5.12	3.38	1.75	1.14	0.61	
MASS (MILLIGRAMS)	0.0	0.0	0.91	0.79	1.46	1.33	0.91	1.16	1.03
MG/LAOP/STAGE	0.0	0.0	5.69E+01	5.11E+01	9.45E+01	8.61E+01	5.89E+01	7.51E+01	6.67E+01
CUM. PERCENT OF MASS SMALLER THAN D50	100.00	100.00	98.01	77.60	58.37	40.84	28.85	13.57	
CUM. (MG/ACM) SMALLER THAN D50	4.02E+02	4.02E+02	3.54E+02	3.12E+02	2.35E+02	1.64E+02	1.16E+02	5.46E+01	
CUM. (MG/DNCM) SMALLER THAN D50	4.91E+02	4.91E+02	4.32E+02	3.81E+02	2.87E+02	2.01E+02	1.42E+02	6.67E+01	
CUM. (GR/ACF) SMALLER THAN D50	1.76E-01	1.76E-01	1.55E-01	1.36E-01	1.03E-01	7.18E-02	5.07E-02	2.39E-02	
CUM. (GR/DNCF) SMALLER THAN D50	2.15E-01	2.15E-01	1.89E-01	1.67E-01	1.25E-01	8.77E-02	6.19E-02	2.91E-02	
GEO. MEAN DIA. (MICROMETERS)	3.48E+01	1.36E+01	9.03E+00	6.18E+00	4.16E+00	2.43E+00	1.41E+00	9.63E-01	5.75E-01
DM/DLOGD (MG/DNCM)	0.0	0.0	3.55E+02	3.12E+02	5.25E+02	3.02E+02	3.15E+02	5.13E+02	2.21E+02
DN/DLOGD (NO. PARTICLES/DNCM)	0.0	0.0	9.22E+08	2.53E+09	1.39E+10	4.00E+10	2.13E+11	1.10E+12	2.22E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN 84-I-A-90-2 2-11-81 1635

IMPACTOR FLOWRATE = 0.344 ACFM IMPACTOR TEMPERATURE = 165.0 F = 73.9 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 165.0 F = 73.9 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 1.6416E-01 GR/ACF 2.0033E-01 GR/DNCF 3.7565E+02 MG/ACM 4.5843E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	16.96	10.66	7.24	4.94	3.23	1.63	1.03	0.71	
MASS (MILLIGRAMS)	0.35	0.94	0.07	0.29	0.60	0.40	1.51	2.11	1.04
MG/DNCM/STAGE	2.19E+01	5.90E+01	4.39E+00	1.82E+01	3.76E+01	2.51E+01	9.47E+01	1.32E+02	6.52E+01
CUM. PERCENT OF MASS SMALLER THAN D50	95.21	82.35	81.40	77.43	69.22	63.75	43.09	14.23	
CUM. (MG/ACM) SMALLER THAN D50	3.58E+02	3.09E+02	3.06E+02	2.91E+02	2.60E+02	2.39E+02	1.62E+02	5.34E+01	
CUM. (MG/DNCM) SMALLER THAN D50	4.36E+02	3.78E+02	3.73E+02	3.55E+02	3.17E+02	2.92E+02	1.98E+02	6.52E+01	
CUM. (GR/ACF) SMALLER THAN D50	1.56E-01	1.35E-01	1.34E-01	1.27E-01	1.14E-01	1.05E-01	7.07E-02	2.34E-02	
CUM. (GR/DNCF) SMALLER THAN D50	1.91E-01	1.65E-01	1.63E-01	1.55E-01	1.39E-01	1.28E-01	8.63E-02	2.85E-02	
GEO. MEAN DIA. (MICROMETERS)	3.45E+01	1.35E+01	8.76E+00	5.98E+00	3.99E+00	2.29E+00	1.25E+00	8.51E-01	4.99E-01
DM/DLOGD (MG/DNCM)	3.57E+01	2.91E+02	2.62E+01	1.09E+02	2.04E+02	8.44E+01	4.72E+02	1.15E+02	2.17E+02
DN/DLOGD (NO. PARTICLES/DNCM)	1.66E+06	2.29E+08	7.37E+07	9.77E+08	6.12E+09	1.34E+10	4.17E+11	2.53E+12	3.33E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN 84-A-A-90-2 2-11-81 1635

IMPACTOR FLOWRATE = 0.344 ACFM IMPACTOR TEMPERATURE = 165.0 F = 73.9 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 165.0 F = 73.9 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 1.6416E-01 GR/ACF 2.0033E-01 GR/DNCF 3.7565E+02 MG/ACM 4.5843E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.08	10.75	7.34	5.04	3.33	1.73	1.12	0.80	
MASS (MILLIGRAMS)	0.35	0.94	0.07	0.29	0.60	0.40	1.51	2.11	1.04
MG/DNCM/STAGE	2.19E+01	5.90E+01	4.39E+00	1.82E+01	3.76E+01	2.51E+01	9.47E+01	1.32E+02	6.52E+01
CUM. PERCENT OF MASS SMALLER THAN D50	95.21	82.35	81.40	77.43	69.22	63.75	43.08	14.23	
CUM. (MG/ACM) SMALLER THAN D50	3.58E+02	3.09E+02	3.06E+02	2.91E+02	2.60E+02	2.39E+02	1.62E+02	5.34E+01	
CUM. (MG/DNCM) SMALLER THAN D50	4.36E+02	3.78E+02	3.73E+02	3.55E+02	3.17E+02	2.92E+02	1.98E+02	6.52E+01	
CUM. (GR/ACF) SMALLER THAN D50	1.56E-01	1.35E-01	1.34E-01	1.27E-01	1.14E-01	1.05E-01	7.07E-02	2.34E-02	
CUM. (GR/DNCF) SMALLER THAN D50	1.91E-01	1.65E-01	1.63E-01	1.55E-01	1.39E-01	1.28E-01	8.63E-02	2.85E-02	
GEO. MEAN DIA. (MICROMETERS)	3.46E+01	1.36E+01	8.89E+00	6.08E+00	4.09E+00	2.40E+00	1.34E+00	9.47E-01	5.66E-01
DM/DLOGD (MG/DNCM)	3.58E+01	2.94E+02	2.65E+01	1.11E+02	2.09E+02	8.79E+01	5.06E+02	9.04E+02	2.17E+02
DN/DLOGD (NO. PARTICLES/DNCM)	1.66E+06	2.25E+08	7.21E+07	9.44E+08	5.82E+09	1.22E+10	3.59E+11	2.03E+12	2.28E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #4-1-B-16 2-11-81 1710

IMPACTOR FLOWRATE = 0.344 ACFM IMPACTOR TEMPERATURE = 165.0 F = 73.9 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 165.0 F = 73.9 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 7.3594E-02 GR/ACF 8.9612E-02 GR/DNCF 1.6841E+02 MG/ACM 2.0552E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	16.97	10.65	7.24	4.94	3.23	1.63	1.03	0.71	
MASS (MILLIGRAMS)	1.36	0.0	0.0	0.04	0.0	0.01	0.45	0.79	0.63
MG/LNCM/STAGE	8.52E+01	0.0	0.0	2.51E+00	0.0	6.27E-01	2.82E+01	4.95E+01	3.95E+01
CUM. PERCENT OF MASS SMALLER THAN D50	58.54	58.54	58.54	57.32	57.32	57.01	43.29	19.21	
CUM. (MG/ACM) SMALLER THAN D50	9.86E+01	9.86E+01	9.86E+01	9.65E+01	9.65E+01	9.60E+01	7.29E+01	3.23E+01	
CUM. (MG/DNCM) SMALLER THAN D50	1.20E+02	1.20E+02	1.20E+02	1.18E+02	1.18E+02	1.17E+02	8.90E+01	3.95E+01	
CUM. (GR/ACF) SMALLER THAN D50	4.31E-02	4.31E-02	4.31E-02	4.22E-02	4.22E-02	4.20E-02	3.19E-02	1.41E-02	
CUM. (GR/DNCF) SMALLER THAN D50	5.26E-02	5.26E-02	5.26E-02	5.15E-02	5.15E-02	5.12E-02	3.89E-02	1.73E-02	
GEO. MEAN DIA. (MICROMETERS)	3.45E+01	1.34E+01	8.78E+00	5.98E+00	3.99E+00	2.29E+00	1.29E+00	8.50E-01	4.99E-01
DM/DLOGD (MG/DNCM)	1.38E+02	0.0	0.0	1.51E+01	0.0	2.11E+00	1.40E+02	3.05E+02	1.71E+02
DN/DLOGD (NO. PARTICLES/DNCM)	6.46E+06	0.0	0.0	1.35E+08	0.0	3.34E+06	1.24E+11	9.47E+11	2.02E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #4-I-E-16 2-11-81 1710

IMPACTOR FLOWRATE = 0.344 ACFM IMPACTOR TEMPERATURE = 165.0 F = 73.9 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 165.0 F = 73.9 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 7.3594E-02 GR/ACF 8.9812E-02 GR/DNCF 1.6841E+02 MG/ACM 2.0552E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.07	10.75	7.34	5.03	3.33	1.72	1.12	0.80	
MASS (MILLIGRAMS)	1.36	0.0	0.0	0.04	0.0	0.01	0.45	3.79	0.63
MG/DNCM/STAGE	8.52E+01	0.0	0.0	2.51E+00	0.0	6.27E-01	2.82E+01	4.95E+01	3.95E+01
CUM. PERCENT OF MASS SMALLER THAN D50	58.54	58.54	58.54	57.32	57.32	57.01	43.29	19.21	
CUM. (MG/ACM) SMALLER THAN D50	9.86E+01	9.86E+01	9.86E+01	9.65E+01	9.65E+01	9.60E+01	7.29E+01	3.23E+01	
CUM. (MG/DNCM) SMALLER THAN D50	1.20E+02	1.20E+02	1.20E+02	1.18E+02	1.18E+02	1.17E+02	8.90E+01	3.95E+01	
CUM. (GR/ACF) SMALLER THAN D50	4.31E-02	4.31E-02	4.31E-02	4.22E-02	4.22E-02	4.20E-02	3.19E-02	1.41E-02	
CUM. (GR/DNCF) SMALLER THAN D50	5.26E-02	5.26E-02	5.26E-02	5.15E-02	5.15E-02	5.12E-02	3.89E-02	1.73E-02	
GEO. MEAN DIA. (MICROMETERS)	3.46E+01	1.35E+01	8.88E+00	6.08E+00	4.09E+00	2.40E+00	1.39E+00	5.47E-01	5.66E-01
DM/DLOGD (MG/DNCM)	1.39E+02	0.0	0.0	1.53E+01	0.0	2.20E+00	1.51E+02	3.38E+02	1.31E+02
DN/DLOGD (NO. PARTICLES/DNCM)	6.43E+06	0.0	0.0	1.30E+06	0.0	3.05E+08	1.07E+11	7.61E+11	1.38E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #4-I-B-90 2-11-81 1750

IMPACTOR FLOWRATE = 0.346 ACFM IMPACTOR TEMPERATURE = 165.0 F = 73.9 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 165.0 F = 73.9 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 4.9314E-02 GR/ACF 6.0161E-02 GR/DNCF 1.1285E+02 MG/ACM 1.3771E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	16.92	10.62	7.22	4.92	3.22	1.62	1.02	0.70	
MASS (MILLIGRAMS)	0.11	0.11	0.07	0.19	0.24	0.19	0.19	0.29	0.82
MG/DNCM/STAGE	6.85E+00	6.85E+00	4.36E+00	1.18E+01	1.50E+01	1.18E+01	1.18E+01	1.81E+01	5.11E+01
CUM. PERCENT OF MASS SMALLER THAN D50	95.02	90.05	86.88	78.28	67.42	58.82	50.23	37.10	
CUM. (MG/ACM) SMALLER THAN D50	1.07E+02	1.02E+02	9.60E+01	8.83E+01	7.61E+01	6.64E+01	5.67E+01	4.19E+01	
CUM. (MG/DNCM) SMALLER THAN D50	1.31E+02	1.24E+02	1.20E+02	1.08E+02	9.28E+01	8.10E+01	6.92E+01	5.11E+01	
CUM. (GR/ACF) SMALLER THAN D50	4.69E-02	4.44E-02	4.26E-02	3.86E-02	3.32E-02	2.90E-02	2.48E-02	1.83E-02	
CUM. (GR/DNCF) SMALLER THAN D50	5.72E-02	5.42E-02	5.23E-02	4.71E-02	4.06E-02	3.54E-02	3.02E-02	2.23E-02	
GEO. MEAN DIA. (MICROMETERS)	3.44E+01	1.34E+01	8.76E+00	5.96E+00	3.98E+00	2.29E+00	1.29E+00	8.49E-01	4.97E-01
DM/DLOGD (MG/DNCM)	1.11E+01	3.39E+01	2.60E+01	7.12E+01	8.11E+01	3.98E+01	5.69E+01	1.11E+02	1.70E+02
DN/DLOGD (NO. PARTICLES/DNCM)	5.21E+05	2.68E+07	7.40E+07	6.42E+08	2.46E+09	6.37E+09	5.27E+10	3.49E+11	2.64E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #4-I-B-90 2-11-81 1750

IMPACTOR FLOWRATE = 0.346 ACFM IMPACTOR TEMPERATURE = 165.0 F = 73.9 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 165.0 F = 73.9 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.22 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 4.9314E-02 GR/ACF 6.0181E-02 GR/DNCF 1.1285E+02 MG/ACM 1.3771E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.02	10.72	7.32	5.02	3.32	1.72	1.12	0.60	
MASS (MILLIGRAMS)	0.11	0.11	0.07	0.19	0.24	0.19	0.19	0.29	0.42
MG/LNCP/STAGE	6.85E+00	6.85E+00	4.36E+00	1.18E+01	1.50E+01	1.18E+01	1.18E+01	1.81E+01	5.11E+01
CUM. PERCENT OF MASS SMALLER THAN D50	95.02	90.05	86.68	78.28	67.42	56.92	50.23	37.10	
CUM. (MG/ACM) SMALLER THAN D50	1.07E+02	1.02E+02	9.80E+01	8.83E+01	7.61E+01	6.64E+01	5.67E+01	4.19E+01	
CUM. (MG/DNCM) SMALLER THAN D50	1.31E+02	1.24E+02	1.20E+02	1.08E+02	9.28E+01	8.10E+01	6.92E+01	5.11E+01	
CUM. (GR/ACF) SMALLER THAN D50	4.69E-02	4.44E-02	4.26E-02	3.86E-02	3.32E-02	2.90E-02	2.48E-02	1.83E-02	
CUM. (GR/DNCF) SMALLER THAN D50	5.72E-02	5.42E-02	5.23E-02	4.71E-02	4.06E-02	3.54E-02	3.02E-02	2.23E-02	
GEO. MEAN DIA. (MICROMETERS)	3.45E+01	1.35E+01	8.86E+00	6.06E+00	4.06E+00	2.39E+00	1.39E+00	9.44E-01	5.64E-01
DM/DLOGL (MG/DNCM)	1.12E+01	3.41E+01	2.63E+01	7.24E+01	8.31E+01	4.15E+01	6.32E+01	1.23E+02	1.70E+02
DN/DLOGD (NO. PARTICLES/DNCM)	5.18E+05	2.64E+07	7.23E+07	6.21E+08	2.33E+09	5.82E+09	4.53E+10	2.80E+11	1.60E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #5-1-A-16 2-12-81 1243

IMPACTOR FLOWRATE = 0.343 ACFM IMPACTOR TEMPERATURE = 171.0 F = 77.2 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 171.0 F = 77.2 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.43 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 2.7746E-01 GR/ACF 3.3941E-01 GR/DNCF 6.3492E+02 MG/ACM 7.7670E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.05	10.70	7.27	4.96	3.24	1.64	1.03	0.71	
MASS (MILLIGRAMS)	1.10	1.32	1.21	0.86	1.40	0.84	1.68	1.76	2.16
MG/DNCM/STAGE	6.93E+01	8.31E+01	7.62E+01	5.42E+01	8.82E+01	5.29E+01	1.06E+02	1.11E+02	1.36E+02
CUM. PERCENT OF MASS SMALLER THAN D50	91.08	80.37	70.56	63.58	52.23	45.42	31.79	17.52	
CUM. (MG/ACM) SMALLER THAN D50	5.78E+02	5.10E+02	4.48E+02	4.04E+02	3.32E+02	2.88E+02	2.02E+02	1.11E+02	
CUM. (MG/DNCM) SMALLER THAN D50	7.07E+02	6.24E+02	5.48E+02	4.94E+02	4.06E+02	3.53E+02	2.47E+02	1.36E+02	
CUM. (GR/ACF) SMALLER THAN D50	2.53E-01	2.23E-01	1.96E-01	1.76E-01	1.45E-01	1.26E-01	8.82E-02	4.86E-02	
CUM. (GR/DNCF) SMALLER THAN D50	3.09E-01	2.73E-01	2.39E-01	2.16E-01	1.77E-01	1.54E-01	1.08E-01	5.95E-02	
GEO. MEAN DIA. (MICROMETERS)	3.46E+01	1.35E+01	8.82E+00	6.01E+00	4.01E+00	2.30E+00	1.39E+00	6.55E-01	5.01E-01
DM/DLOGD (MG/DNCM)	1.13E+02	4.11E+02	4.54E+02	3.26E+02	4.78E+02	1.78E+02	5.27E+02	6.83E+02	4.52E+02
DN/DLOGD (NO. PARTICLES/DNCM)	5.23E+06	3.18E+08	1.26E+09	2.87E+09	1.42E+10	2.78E+10	4.60E+11	2.09E+12	6.85E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #5-T-A-16 2-12-81 1243

IMPACTOR FLOWRATE = 0.343 ACFM IMPACTOR TEMPERATURE = 171.0 F = 77.2 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 171.0 F = 77.2 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.43 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 2.7746E-01 GR/ACF 3.3941E-01 GR/DNCF 6.3452E+02 MG/ACM 7.7670E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.15	10.80	7.37	5.06	3.34	1.73	1.13	0.80	
MASS (MILLIGRAMS)	1.10	1.32	1.21	0.86	1.40	0.84	1.58	1.76	2.16
MG/DNCM/STAGE	6.93E+01	8.31E+01	7.62E+01	5.42E+01	8.82E+01	5.29E+01	1.06E+02	1.11E+02	1.36E+02
CUM. PERCENT OF MASS SMALLER THAN D50	91.08	80.37	70.56	63.58	52.23	45.42	31.79	17.52	
CUM. (MG/ACM) SMALLER THAN D50	5.78E+02	5.10E+02	4.48E+02	4.04E+02	3.32E+02	2.88E+02	2.02E+02	1.11E+02	
CUM. (MG/DNCM) SMALLER THAN D50	7.07E+02	6.24E+02	5.48E+02	4.94E+02	4.06E+02	3.53E+02	2.47E+02	1.36E+02	
CUM. (GR/ACF) SMALLER THAN D50	2.53E-01	2.23E-01	1.96E-01	1.76E-01	1.45E-01	1.26E-01	8.82E-02	4.86E-02	
CUM. (GR/DNCF) SMALLER THAN D50	3.09E-01	2.73E-01	2.39E-01	2.16E-01	1.77E-01	1.54E-01	1.08E-01	5.95E-02	
GEO. MEAN DIA. (MICROMETERS)	3.47E+01	1.36E+01	8.93E+00	6.11E+00	4.11E+00	2.41E+00	1.40E+00	9.52E-01	5.69E-01
DM/DLOGD (MG/DNCM)	1.13E+02	4.14E+02	4.60E+02	3.31E+02	4.90E+02	1.86E+02	5.65E+02	7.58E+02	4.52E+02
DN/DLOGD (NO. PARTICLES/DNCM)	5.21E+06	3.13E+08	1.23E+09	2.78E+09	1.35E+10	2.54E+10	3.96E+11	1.68E+12	4.70E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #5-1-B-16 2-12-81 1005

IMPACTOR FLOWRATE = 0.333 ACFM IMPACTOR TEMPERATURE = 171.0 F = 77.2 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 171.0 F = 77.2 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.43 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 2.5705E-01 GR/ACF 3.1445E-01 GR/DNCF 5.6622E+02 MG/ACM 7.1957E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.32	10.87	7.39	5.04	3.30	1.66	1.05	0.72	
MASS (MILLIGRAMS)	0.66	1.44	0.40	1.26	0.26	0.28	2.39	2.54	1.85
MG/LNCM/STAGE	4.29E+01	9.35E+01	2.60E+01	8.18E+01	1.69E+01	1.82E+01	1.55E+02	1.65E+02	1.20E+02
CUM. PERCENT OF MASS SMALLER THAN D50	94.04	61.05	77.44	66.06	63.72	61.19	39.62	16.70	
CUM. (MG/ACM) SMALLER THAN D50	5.53E+02	4.77E+02	4.55E+02	3.89E+02	3.75E+02	3.60E+02	2.33E+02	9.82E+01	
CUM. (MG/DNCM) SMALLER THAN D50	6.77E+02	5.83E+02	5.57E+02	4.75E+02	4.58E+02	4.40E+02	2.85E+02	1.20E+02	
CUM. (GR/ACF) SMALLER THAN D50	2.42E-01	2.08E-01	1.99E-01	1.70E-01	1.64E-01	1.57E-01	1.02E-01	4.29E-02	
CUM. (GR/DNCF) SMALLER THAN D50	2.96E-01	2.55E-01	2.44E-01	2.08E-01	2.00E-01	1.92E-01	1.25E-01	5.25E-02	
GEO. MEAN DIA. (MICROMETERS)	3.48E+01	1.37E+01	8.96E+00	6.10E+00	4.07E+00	2.34E+00	1.32E+00	9.69E-01	5.10E-01
DM/DLOGD (MG/DNCM)	7.07E+01	4.62E+02	1.55E+02	4.92E+02	9.16E+01	6.12E+01	7.74E+02	1.02E+03	3.99E+02
DN/DLOGD (NO. PARTICLES/DNCM)	3.20E+06	3.42E+08	4.11E+08	4.14E+09	2.59E+09	9.11E+09	6.43E+11	2.96E+12	5.74E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #5-I-B-16 2-12-81 1005

IMPACTOR FLOWRATE = 0.333 ACFM IMPACTOR TEMPERATURE = 171.0 F = 77.2 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 171.0 F = 77.2 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.43 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 2.5705E-01 GR/ACF 3.1445E-01 GR/DNCF 5.8822E+02 MG/ACM 7.1957E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.42	10.97	7.49	5.14	3.39	1.76	1.14	0.82	
MASS (MILLIGRAMS)	0.66	1.44	0.40	1.26	0.26	0.28	2.39	2.54	1.65
MG/DNCF/STAGE	4.29E+01	9.35E+01	2.60E+01	8.18E+01	1.69E+01	1.82E+01	1.55E+02	1.65E+02	1.20E+02
CUM. PERCENT OF MASS SMALLER THAN D50	94.04	81.05	77.44	66.06	63.72	61.19	39.62	16.70	
CUM. (MG/ACM) SMALLER THAN D50	5.53E+02	4.77E+02	4.55E+02	3.89E+02	3.75E+02	3.60E+02	2.33E+02	9.82E+01	
CUM. (MG/DNCM) SMALLER THAN D50	6.77E+02	5.83E+02	5.57E+02	4.75E+02	4.58E+02	4.40E+02	2.85E+02	1.20E+02	
CUM. (GR/ACF) SMALLER THAN D50	2.42E-01	2.08E-01	1.99E-01	1.70E-01	1.64E-01	1.57E-01	1.02E-01	4.29E-02	
CUM. (GR/DNCF) SMALLER THAN D50	2.96E-01	2.55E-01	2.44E-01	2.08E-01	2.00E-01	1.92E-01	1.25E-01	5.25E-02	
GEO. MEAN DIA. (MICROMETERS)	3.49E+01	1.38E+01	9.06E+00	6.20E+00	4.18E+00	2.44E+00	1.42E+00	9.66E-01	5.77E-01
DN/DLOGD (MG/DNCM)	7.10E+01	4.66E+02	1.57E+02	5.00E+02	9.36E+01	6.38E+01	8.29E+02	1.13E+03	3.99E+02
DN/DLOGD (NO. PARTICLES/DNCM)	3.18E+06	3.37E+08	4.02E+08	4.00E+09	2.46E+09	8.34E+09	5.54E+11	2.39E+12	3.96E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #5-I-8-90 2-12-81 1125

IMPACTOR FLOWRATE = 0.321 ACFM IMPACTOR TEMPERATURE = 171.0 F = 77.2 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 171.0 F = 77.2 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.43 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 2.6258E-01 GR/ACF 3.2121E-01 GR/DNCF 6.0086E+02 MG/ACM 7.3504E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	SR	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.63	11.07	7.52	5.13	3.36	1.69	1.07	0.74	
MASS (MILLIGRAMS)	0.52	1.29	1.13	1.16	0.61	1.45	1.60	2.22	0.94
MG/DNCM/STAGE	3.50E+01	8.68E+01	7.61E+01	7.81E+01	4.11E+01	9.76E+01	1.08E+02	1.49E+02	6.33E+01
CUM. PERCENT OF MASS SMALLER THAN D50	95.24	83.42	73.08	62.45	56.87	43.59	28.94	6.61	
CUM. (MG/ACM) SMALLER THAN D50	5.72E+02	5.01E+02	4.39E+02	3.75E+02	3.42E+02	2.62E+02	1.74E+02	5.17E+01	
CUM. (MG/DNCM) SMALLER THAN D50	7.00E+02	6.13E+02	5.37E+02	4.59E+02	4.18E+02	3.20E+02	2.13E+02	6.33E+01	
CUM. (GR/ACF) SMALLER THAN D50	2.50E-01	2.19E-01	1.92E-01	1.64E-01	1.49E-01	1.14E-01	7.60E-02	2.26E-02	
CUM. (GR/DNCF) SMALLER THAN D50	3.06E-01	2.68E-01	2.35E-01	2.01E-01	1.83E-01	1.40E-01	9.30E-02	2.76E-02	
GEO. MEAN DIA. (MICROMETERS)	3.51E+01	1.40E+01	9.12E+00	6.21E+00	4.15E+00	2.39E+00	1.35E+00	8.87E-01	5.21E-01
DM/DLOGD (MG/DNCM)	5.85E+01	4.29E+02	4.54E+02	4.70E+02	2.23E+02	3.29E+02	5.38E+02	9.25E+02	2.10E+02
DN/DLOGD (NO. PARTICLES/DNCM)	2.57E+06	3.01E+06	1.14E+09	3.74E+09	5.95E+09	4.63E+10	4.21E+11	2.53E+12	2.69E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #5-1-B-90 2-12-81 1125

IMPACTOR FLOWRATE = 0.321 ACFM IMPACTOR TEMPERATURE = 171.0 F = 77.2 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 171.0 F = 77.2 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.43 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 2.625BE-01 GR/ACF 3.2121E-01 GR/DNCF 6.0086E+02 MG/ACM 7.3504E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	SH	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.73	11.17	7.62	5.23	3.46	1.79	1.16	0.83	
MASS (MILLIGRAMS)	0.52	1.29	1.13	1.16	0.61	1.45	1.60	2.22	0.94
MG/LAST/STAGE	3.50E+01	8.68E+01	7.61E+01	7.81E+01	4.11E+01	9.76E+01	1.08E+02	1.49E+02	6.33E+01
CUM. PERCENT OF MASS SMALLER THAN D50	95.24	83.42	73.08	62.45	56.87	43.59	28.94	8.61	
CUM. (MG/ACM) SMALLER THAN D50	5.72E+02	5.01E+02	4.39E+02	3.75E+02	3.42E+02	2.62E+02	1.74E+02	5.17E+01	
CUM. (MG/DNCM) SMALLER THAN D50	7.00E+02	6.13E+02	5.37E+02	4.59E+02	4.18E+02	3.20E+02	2.13E+02	6.33E+01	
CUM. (GR/ACF) SMALLER THAN D50	2.50E-01	2.19E-01	1.92E-01	1.64E-01	1.49E-01	1.14E-01	7.60E-02	2.26E-02	
CUM. (GR/DNCF) SMALLER THAN D50	3.06E-01	2.68E-01	2.35E-01	2.01E-01	1.83E-01	1.40E-01	9.30E-02	2.76E-02	
GEO. MEAN DIA. (MICROMETERS)	3.52E+01	1.41E+01	9.23E+00	6.31E+00	4.25E+00	2.49E+00	1.44E+00	9.84E-01	5.88E-01
DM/DLOGD (MG/DNCM)	5.87E+01	4.32E+02	4.59E+02	4.77E+02	2.28E+02	3.42E+02	5.75E+02	1.02E+03	2.10E+02
DN/DLOGD (NO. PARTICLES/DNCM)	2.56E+06	2.96E+06	1.12E+09	3.62E+09	5.67E+09	4.24E+10	3.65E+11	2.05E+12	1.97E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #6-1-A-90 2-12-81 1220

IMPACTOR FLOWRATE = 0.333 ACFM IMPACTOR TEMPERATURE = 171.0 F = 77.2 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 171.0 F = 77.2 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.43 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 77.53 O2 = 19.40 H2O = 1.00

CALC. MASS LOADING = 3.2041E-01 GR/ACF 3.9195E-01 GR/DNCF 7.3320E+02 MG/ACM 8.9693E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.30	10.86	7.38	5.03	3.29	1.66	1.05	0.72	
MASS (MILLIGRAMS)	0.04	0.86	1.30	0.47	1.38	1.83	2.99	1.99	2.98
MG/ACM/STAGE	2.59E+00	5.57E+01	8.42E+01	3.05E+01	8.94E+01	1.19E+02	1.94E+02	1.29E+02	1.93E+02
CUM. PERCENT OF MASS SMALLER THAN D50	99.71	93.50	84.10	80.71	70.74	57.51	35.91	21.53	
CUM. (MG/ACM) SMALLER THAN D50	7.31E+02	6.86E+02	6.17E+02	5.92E+02	5.19E+02	4.22E+02	2.63E+02	1.59E+02	
CUM. (MG/DNCM) SMALLER THAN D50	8.94E+02	8.39E+02	7.54E+02	7.24E+02	6.34E+02	5.16E+02	3.22E+02	1.93E+02	
CUM. (GR/ACF) SMALLER THAN D50	3.19E-01	3.00E-01	2.69E-01	2.59E-01	2.27E-01	1.84E-01	1.15E-01	6.90E-02	
CUM. (GR/DNCF) SMALLER THAN D50	3.91E-01	3.66E-01	3.30E-01	3.16E-01	2.77E-01	2.25E-01	1.41E-01	8.44E-02	
GEO. MEAN DIA. (MICROMETERS)	3.48E+01	1.37E+01	8.95E+00	6.09E+00	4.07E+00	2.34E+00	1.32E+00	8.68E-01	5.09E-01
DM/DLOGD (MG/DNCM)	4.27E+00	2.75E+02	5.02E+02	1.83E+02	4.85E+02	3.99E+02	5.66E+02	7.96E+02	8.42E+02
DN/DLOGD (NO. PARTICLES/DNCM)	1.94E+05	2.04E+08	1.34E+09	1.55E+09	1.37E+10	5.97E+10	8.06E+11	2.32E+12	9.28E+12

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #6-I-A-90 2-12-81 1220

IMPACTOR FLOWRATE = 0.333 ACFM IMPACTOR TEMPERATURE = 171.0 F = 77.2 C SAMPLING DURATION = 2.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 171.0 F = 77.2 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.43 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 77.53 O2 = 19.40 H2O = 1.00

CALC. MASS LOADING = 3.2041E-01 GR/ACF 3.9195E-01 GR/DNCF 7.3320E+02 MG/ACM 8.9693E+02 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.40	10.96	7.48	5.13	3.39	1.76	1.14	0.82	
MASS (MILLIGRAMS)	0.04	0.86	1.30	0.47	1.38	1.83	2.99	1.99	2.98
MG/DNCF/STAGE	2.59E+00	5.57E+01	8.42E+01	3.05E+01	8.94E+01	1.19E+02	1.94E+02	1.29E+02	1.93E+02
CUM. PERCENT OF MASS SMALLER THAN D50	99.71	93.50	84.10	80.71	70.74	57.51	35.91	21.53	
CUM. (MG/ACM) SMALLER THAN D50	7.31E+02	6.86E+02	6.17E+02	5.92E+02	5.19E+02	4.22E+02	2.63E+02	1.58E+02	
CUM. (MG/DNCM) SMALLER THAN D50	8.94E+02	8.39E+02	7.54E+02	7.24E+02	6.34E+02	5.16E+02	3.22E+02	1.93E+02	
CUM. (GR/ACF) SMALLER THAN D50	3.19E-01	3.00E-01	2.69E-01	2.59E-01	2.27E-01	1.84E-01	1.15E-01	6.90E-02	
CUM. (GR/DNCF) SMALLER THAN D50	3.91E-01	3.66E-01	3.30E-01	3.16E-01	2.77E-01	2.25E-01	1.41E-01	8.44E-02	
GEO. MEAN DIA. (MICROMETERS)	3.49E+01	1.38E+01	9.05E+00	6.20E+00	4.17E+00	2.44E+00	1.42E+00	9.65E-01	5.77E-01
DM/DLOGD (MG/DNCM)	4.29E+00	2.78E+02	5.08E+02	1.86E+02	4.97E+02	4.16E+02	1.04E+03	8.82E+02	6.42E+02
DN/DLOGD (NO. PARTICLES/DNCM)	1.93E+05	2.01E+08	1.31E+09	1.50E+09	1.31E+10	5.46E+10	6.94E+11	1.87E+12	6.38E+11

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUANE LTD. ROCKWOOD, TENN. 10-12 FEB 1981 CONTRACT 1-618-019
RHO= 1.00 GM/CC

INTERVAL	DIAMETER (MICRONS)	MEAN MASS CUMULATIVE CONCENTRATION (MG/ACM)	UPPER CONFIDENCE LIMIT (MG/ACM)	LOWER CONFIDENCE LIMIT (MG/ACM)
1	2.50E-01	2.80E-01	4.27E-01	1.33E-01
2	2.71E-01	5.71E-01	8.07E-01	3.36E-01
3	2.95E-01	9.89E-01	1.32E+00	6.62E-01
4	3.20E-01	1.59E+00	2.02E+00	1.16E+00
5	3.47E-01	2.45E+00	3.00E+00	1.90E+00
6	3.77E-01	3.68E+00	4.38E+00	2.99E+00
7	4.09E-01	5.43E+00	6.30E+00	4.55E+00
8	4.45E-01	7.87E+00	8.96E+00	6.78E+00
9	4.83E-01	1.12E+01	1.26E+01	9.87E+00
10	5.24E-01	1.60E+01	1.79E+01	1.42E+01
11	5.69E-01	2.26E+01	2.49E+01	2.02E+01
12	6.18E-01	3.10E+01	3.39E+01	2.80E+01
13	6.71E-01	4.15E+01	4.52E+01	3.78E+01
14	7.28E-01	5.44E+01	5.90E+01	4.96E+01
15	7.91E-01	6.98E+01	7.55E+01	6.40E+01
16	8.58E-01	8.75E+01	9.45E+01	8.05E+01
17	9.32E-01	1.07E+02	1.16E+02	9.89E+01
18	1.01E+00	1.28E+02	1.38E+02	1.18E+02
19	1.10E+00	1.48E+02	1.59E+02	1.37E+02
20	1.19E+00	1.67E+02	1.79E+02	1.55E+02
21	1.29E+00	1.83E+02	1.96E+02	1.70E+02
22	1.41E+00	1.97E+02	2.11E+02	1.84E+02
23	1.53E+00	2.09E+02	2.23E+02	1.95E+02
24	1.66E+00	2.19E+02	2.33E+02	2.04E+02
25	1.80E+00	2.27E+02	2.41E+02	2.12E+02
26	1.95E+00	2.34E+02	2.49E+02	2.19E+02
27	2.12E+00	2.40E+02	2.55E+02	2.25E+02
28	2.30E+00	2.45E+02	2.60E+02	2.30E+02
29	2.50E+00	2.50E+02	2.65E+02	2.35E+02
30	2.71E+00	2.55E+02	2.70E+02	2.39E+02
31	2.95E+00	2.60E+02	2.75E+02	2.44E+02
32	3.20E+00	2.65E+02	2.80E+02	2.49E+02
33	3.47E+00	2.70E+02	2.86E+02	2.54E+02
34	3.77E+00	2.75E+02	2.91E+02	2.60E+02
35	4.09E+00	2.81E+02	2.97E+02	2.65E+02
36	4.45E+00	2.86E+02	3.02E+02	2.70E+02
37	4.83E+00	2.91E+02	3.08E+02	2.75E+02
38	5.24E+00	2.97E+02	3.13E+02	2.81E+02
39	5.69E+00	3.03E+02	3.19E+02	2.86E+02
40	6.18E+00	3.09E+02	3.26E+02	2.92E+02
41	6.71E+00	3.15E+02	3.32E+02	2.99E+02
42	7.28E+00	3.22E+02	3.39E+02	3.05E+02
43	7.91E+00	3.28E+02	3.45E+02	3.11E+02
44	8.58E+00	3.35E+02	3.52E+02	3.17E+02
45	9.32E+00	3.41E+02	3.58E+02	3.24E+02
46	1.01E+01	3.48E+02	3.65E+02	3.30E+02
47	1.10E+01	3.54E+02	3.71E+02	3.36E+02
48	1.19E+01	3.60E+02	3.78E+02	3.42E+02
49	1.29E+01	3.66E+02	3.84E+02	3.48E+02
50	1.41E+01	3.73E+02	3.91E+02	3.55E+02
51	1.53E+01	3.79E+02	3.97E+02	3.61E+02
52	1.66E+01	3.85E+02	4.03E+02	3.66E+02
53	1.80E+01	3.90E+02	4.09E+02	3.72E+02
54	1.95E+01	3.95E+02	4.14E+02	3.77E+02

RCANE LTD. ROCKWOOD, TENN. 10-12 FEB 1981 CONTRACT 1-618-019
RHO= 1.00 GM/CC

INTERVAL	DIAMETER	RECORDS EXCLUDED FROM MEAN CUMULATIVE MASS CONCENTRATION
1	2.50E-01	32
2	2.71E-01	32
3	2.95E-01	32
4	3.20E-01	32
5	3.47E-01	32
6	3.77E-01	32
7	4.09E-01	32
8	4.45E-01	32
9	4.83E-01	32
10	5.24E-01	NONE
11	5.69E-01	NONE
12	6.18E-01	NONE
13	6.71E-01	NONE
14	7.28E-01	NONE
15	7.91E-01	NONE
16	8.58E-01	NONE
17	9.32E-01	NONE
18	1.01E+00	NONE
19	1.10E+00	NONE
20	1.19E+00	NONE
21	1.29E+00	NONE
22	1.41E+00	NONE
23	1.53E+00	NONE
24	1.66E+00	NONE
25	1.80E+00	NONE
26	1.95E+00	NONE
27	2.12E+00	NONE
28	2.30E+00	22
29	2.50E+00	22
30	2.71E+00	10 22
31	2.95E+00	10 22 28
32	3.20E+00	10 22 28
33	3.47E+00	10 22 28
34	3.77E+00	22 28
35	4.09E+00	22
36	4.45E+00	22
37	4.83E+00	NONE
38	5.24E+00	NONE
39	5.69E+00	NONE
40	6.18E+00	NONE
41	6.71E+00	NONE
42	7.28E+00	NONE
43	7.91E+00	NONE
44	8.58E+00	NONE
45	9.32E+00	NONE
46	1.01E+01	NONE
47	1.10E+01	NONE
48	1.19E+01	NONE
49	1.29E+01	22
50	1.41E+01	22
51	1.53E+01	22
52	1.66E+01	22
53	1.80E+01	NONE
54	1.95E+01	NONE

RCANE LTD. ROCKWOOD, TENN. 10-12 FEB 1981 CONTRACT 1-618-019
RHO= 1.00 GM/CC

INTERVAL	DIAMETER (MICRONS)	MEAN CUMULATIVE MASS CONCENTRATION (PERCENT)	UPPER CONFIDENCE LIMIT (PERCENT)	LOWER CONFIDENCE LIMIT (PERCENT)
1	2.50E-01	7.00E-02	1.07E-01	3.33E-02
2	2.71E-01	1.43E-01	2.02E-01	8.40E-02
3	2.95E-01	2.47E-01	3.29E-01	1.65E-01
4	3.20E-01	3.97E-01	5.05E-01	2.89E-01
5	3.47E-01	6.13E-01	7.51E-01	4.74E-01
6	3.77E-01	9.20E-01	1.09E+00	7.46E-01
7	4.09E-01	1.36E+00	1.57E+00	1.14E+00
8	4.45E-01	1.97E+00	2.24E+00	1.69E+00
9	4.83E-01	2.81E+00	3.16E+00	2.47E+00
10	5.24E-01	4.00E+00	4.47E+00	3.54E+00
11	5.69E-01	5.64E+00	6.23E+00	5.04E+00
12	6.18E-01	7.74E+00	8.48E+00	6.99E+00
13	6.71E-01	1.04E+01	1.13E+01	9.43E+00
14	7.28E-01	1.36E+01	1.48E+01	1.24E+01
15	7.91E-01	1.74E+01	1.89E+01	1.60E+01
16	8.58E-01	2.19E+01	2.36E+01	2.01E+01
17	9.32E-01	2.68E+01	2.89E+01	2.47E+01
18	1.01E+00	3.20E+01	3.44E+01	2.95E+01
19	1.10E+00	3.70E+01	3.98E+01	3.43E+01
20	1.19E+00	4.17E+01	4.47E+01	3.86E+01
21	1.29E+00	4.58E+01	4.90E+01	4.25E+01
22	1.41E+00	4.93E+01	5.27E+01	4.59E+01
23	1.53E+00	5.22E+01	5.57E+01	4.87E+01
24	1.66E+00	5.47E+01	5.82E+01	5.11E+01
25	1.80E+00	5.67E+01	6.03E+01	5.30E+01
26	1.95E+00	5.84E+01	6.21E+01	5.47E+01
27	2.12E+00	5.99E+01	6.36E+01	5.61E+01
28	2.30E+00	6.12E+01	6.50E+01	5.74E+01
29	2.50E+00	6.24E+01	6.62E+01	5.86E+01
30	2.71E+00	6.36E+01	6.75E+01	5.98E+01
31	2.95E+00	6.49E+01	6.88E+01	6.10E+01
32	3.20E+00	6.62E+01	7.01E+01	6.23E+01
33	3.47E+00	6.75E+01	7.15E+01	6.36E+01
34	3.77E+00	6.88E+01	7.28E+01	6.49E+01
35	4.09E+00	7.01E+01	7.42E+01	6.61E+01
36	4.45E+00	7.15E+01	7.55E+01	6.74E+01
37	4.83E+00	7.28E+01	7.69E+01	6.87E+01
38	5.24E+00	7.42E+01	7.83E+01	7.01E+01
39	5.69E+00	7.57E+01	7.96E+01	7.15E+01
40	6.18E+00	7.72E+01	8.14E+01	7.30E+01
41	6.71E+00	7.88E+01	8.30E+01	7.46E+01
42	7.28E+00	8.04E+01	8.46E+01	7.62E+01
43	7.91E+00	8.20E+01	8.63E+01	7.78E+01
44	8.58E+00	8.36E+01	8.79E+01	7.93E+01
45	9.32E+00	8.52E+01	8.96E+01	8.09E+01
46	1.01E+01	8.68E+01	9.12E+01	8.25E+01
47	1.10E+01	8.84E+01	9.28E+01	8.40E+01
48	1.19E+01	9.00E+01	9.44E+01	8.55E+01
49	1.29E+01	9.15E+01	9.60E+01	8.70E+01
50	1.41E+01	9.31E+01	9.76E+01	8.86E+01
51	1.53E+01	9.46E+01	9.92E+01	9.01E+01
52	1.66E+01	9.61E+01	1.01E+02	9.16E+01
53	1.80E+01	9.75E+01	1.02E+02	9.29E+01
54	1.95E+01	9.88E+01	1.03E+02	9.41E+01

RCANE LTE. ROCKWOOD, TENN. 10-12 FEB 1981 CONTRACT 1-618-019
RHO= 1.00 GM/CC

INTERVAL	DIAMETER	MEAN CHANGE IN MASS CONCENTRATION (MG/DNM3)	STANDARD DEVIATION (MG/DNM3)	UPPER CONFIDENCE LIMIT (MG/DNM3)	LOWER CONFIDENCE LIMIT (MG/DNM3)
1	2.50E-01	8.41E+00	1.10E+01	1.34E+01	3.37E+00
2	2.95E-01	1.74E+01	1.72E+01	2.52E+01	9.54E+00
3	3.47E-01	3.58E+01	2.60E+01	4.77E+01	2.40E+01
4	4.09E-01	7.21E+01	4.00E+01	9.03E+01	5.39E+01
5	4.83E-01	1.38E+02	6.46E+01	1.67E+02	1.08E+02
6	5.69E-01	2.59E+02	1.19E+02	3.12E+02	2.07E+02
7	6.71E-01	4.09E+02	1.81E+02	4.88E+02	3.29E+02
8	7.91E-01	5.80E+02	2.72E+02	6.99E+02	4.60E+02
9	9.32E-01	7.17E+02	3.74E+02	8.61E+02	5.53E+02
10	1.10E+00	6.13E+02	3.23E+02	7.60E+02	4.66E+02
11	1.29E+00	5.27E+02	3.58E+02	6.85E+02	3.70E+02
12	1.53E+00	3.73E+02	2.80E+02	4.96E+02	2.50E+02
13	1.80E+00	2.58E+02	2.09E+02	3.50E+02	1.66E+02
14	2.12E+00	1.89E+02	1.73E+02	2.65E+02	1.13E+02
15	2.50E+00	1.65E+02	1.54E+02	2.35E+02	9.45E+01
16	2.95E+00	1.79E+02	1.37E+02	2.47E+02	1.11E+02
17	3.47E+00	1.86E+02	1.46E+02	2.61E+02	1.15E+02
18	4.09E+00	1.79E+02	1.70E+02	2.57E+02	1.01E+02
19	4.83E+00	1.86E+02	1.54E+02	2.56E+02	1.20E+02
20	5.69E+00	2.09E+02	1.48E+02	2.74E+02	1.44E+02
21	6.71E+00	2.23E+02	1.62E+02	2.94E+02	1.52E+02
22	7.91E+00	2.25E+02	1.69E+02	2.99E+02	1.51E+02
23	9.32E+00	2.23E+02	1.76E+02	3.01E+02	1.46E+02
24	1.10E+01	2.19E+02	1.79E+02	2.96E+02	1.39E+02
25	1.29E+01	2.23E+02	1.75E+02	3.03E+02	1.43E+02
26	1.53E+01	2.12E+02	1.73E+02	2.91E+02	1.33E+02
27	1.80E+01	1.83E+02	1.70E+02	2.58E+02	1.08E+02

ROANE LTD. ROCKWOOD, TENN. 10-12 FEB 1981 CONTRACT 1-618-019
RHO= 1.00 GM/CC

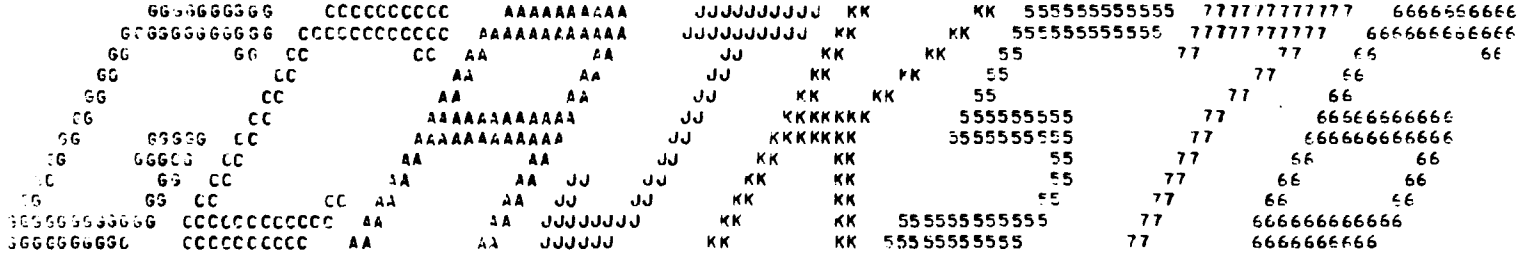
INTERVAL	DIAMETER	RECORDS EXCLUDED FROM MEAN CHANGE IN MASS CONTRATION
1	2.50E-01	32
2	2.95E-01	32
3	3.47E-01	32
4	4.09E-01	32
5	4.83E-01	32
6	5.69E-01	NONE
7	6.71E-01	NONE
8	7.91E-01	NONE
9	9.32E-01	NONE
10	1.10E+00	2
11	1.29E+00	NONE
12	1.53E+00	NONE
13	1.80E+00	NONE
14	2.12E+00	NONE
15	2.50E+00	22
16	2.95E+00	10 22 28
17	3.47E+00	10 22 28
18	4.09E+00	22
19	4.83E+00	NONE
20	5.69E+00	NONE
21	6.71E+00	NONE
22	7.91E+00	NONE
23	9.32E+00	NONE
24	1.10E+01	NONE
25	1.29E+01	22
26	1.53E+01	22
27	1.80E+01	NONE

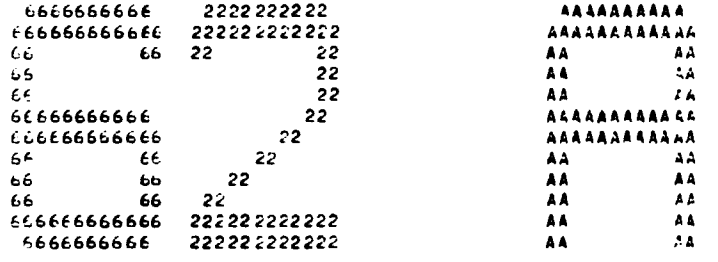
ROANL LTC. ROCKWOOD, TENN. 10-12 FEB 1981 CONTRACT 1-618-019
RHO= 1.00 GM/CC

INTERVAL	DIAMETER	MEAN CHANGE IN NUMBER CONCENTRATION (NO/DNM3)	STANDARD DEVIATION (NO/DNM3)	UPPER CONFIDENCE LIMIT (NO/DNM3)	LOWER CONFIDENCE LIMIT (NO/DNM3)
1	2.50E-01	1.03E+12	1.35E+12	1.64E+12	4.12E+11
2	2.95E-01	1.30E+12	1.28E+12	1.88E+12	7.12E+11
3	3.47E-01	1.63E+12	1.19E+12	2.17E+12	1.09E+12
4	4.09E-01	2.01E+12	1.11E+12	2.51E+12	1.50E+12
5	4.83E-01	2.34E+12	1.10E+12	2.84E+12	1.84E+12
6	5.69E-01	2.69E+12	1.24E+12	3.23E+12	2.14E+12
7	6.71E-01	2.59E+12	1.15E+12	3.09E+12	2.08E+12
8	7.91E-01	2.24E+12	1.05E+12	2.70E+12	1.78E+12
9	9.32E-01	1.69E+12	8.62E+11	2.08E+12	1.30E+12
10	1.10E+00	8.83E+11	4.65E+11	1.10E+12	6.71E+11
11	1.29E+00	4.64E+11	3.15E+11	6.02E+11	3.25E+11
12	1.53E+00	2.00E+11	1.50E+11	2.66E+11	1.34E+11
13	1.80E+00	8.46E+10	6.85E+10	1.15E+11	5.45E+10
14	2.12E+00	3.79E+10	3.46E+10	5.31E+10	2.26E+10
15	2.50E+00	2.02E+10	1.84E+10	2.88E+10	1.15E+10
16	2.95E+00	1.34E+10	1.02E+10	1.85E+10	8.31E+09
17	3.47E+00	8.56E+09	6.67E+09	1.19E+10	5.25E+09
18	4.09E+00	4.98E+09	4.74E+09	7.15E+09	2.82E+09
19	4.83E+00	3.19E+09	2.62E+09	4.34E+09	2.03E+09
20	5.69E+00	2.16E+09	1.53E+09	2.84E+09	1.49E+09
21	6.71E+00	1.41E+09	1.02E+09	1.86E+09	9.65E+08
22	7.91E+00	8.70E+08	6.54E+08	1.16E+09	5.83E+08
23	9.32E+00	5.27E+08	4.15E+08	7.09E+08	3.44E+08
24	1.10E+01	3.13E+08	2.57E+08	4.27E+08	2.00E+08
25	1.29E+01	1.96E+08	1.54E+08	2.66E+08	1.26E+08
26	1.53E+01	1.14E+08	9.28E+07	1.56E+08	7.14E+07
27	1.80E+01	6.00E+07	5.57E+07	8.45E+07	3.55E+07

RUANE LTD. ROCKWOOD, TENN. 10-12 FEB 1981 CONTRACT 1-618-019
RHO= 1.00 GM/CC

INTERVAL	DIAMETER	RECORDS EXCLUDED FROM MEAN CHANGE IN NUMBER CONCENTRATION
1	2.50E-01	32
2	2.95E-01	32
3	3.47E-01	32
4	4.09E-01	32
5	4.83E-01	32
6	5.69E-01	NONE
7	6.71E-01	NONE
8	7.91E-01	NONE
9	9.32E-01	NONE
10	1.10E+00	2
11	1.29E+00	NONE
12	1.53E+00	NONE
13	1.80E+00	NONE
14	2.12E+00	NONE
15	2.50E+00	22
16	2.95E+00	10 22 28
17	3.47E+00	10 22 28
18	4.09E+00	22
19	4.83E+00	NONE
20	5.69E+00	NONE
21	6.71E+00	NONE
22	7.91E+00	NONE
23	9.32E+00	NONE
24	1.10E+01	NONE
25	1.29E+01	22
26	1.53E+01	22
27	1.80E+01	NONE





APPENDIX D-2

CASCADE IMPACTOR DATA REDUCTION SYSTEM PRINTOUTS
BAGHOUSE OUTLET

RUN #1-C-A 2-10-81 0916

IMPACTOR FLOWRATE = 0.314 ACFM IMPACTOR TEMPERATURE = 165.0 F = 73.9 C SAMPLING DURATION = 240.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 165.0 F = 73.9 C

ASSUMED PARTICLE DENSITY = 1.00 GM/(CU.CM. STACK PRESSURE = 29.80 IN. OF HG MAX. PARTICLE DIAMETER = 20.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 1.9770E-03 GR/ACF 2.3657E-03 GR/DNCF 4.5241E+00 MG/ACM 5.4136E+00 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.76	11.15	7.58	5.17	3.38	1.71	1.08	0.74	
MASS (MILLIGRAMS)	1.84	0.76	1.48	1.44	1.38	1.17	1.59	0.51	1.43
MG/DNCM/STAGE	8.59E-01	3.55E-01	6.91E-01	6.72E-01	6.44E-01	5.46E-01	7.42E-01	2.38E-01	6.67E-01
CUM. PERCENT OF MASS SMALLER THAN D50	84.14	77.59	64.83	52.41	40.52	30.43	16.72	12.33	
CUM. (MG/ACM) SMALLER THAN D50	3.81E+00	3.51E+00	2.93E+00	2.37E+00	1.83E+00	1.38E+00	7.57E-01	5.58E-01	
CUM. (MG/DNCM) SMALLER THAN D50	4.55E+00	4.20E+00	3.51E+00	2.84E+00	2.19E+00	1.65E+00	9.05E-01	6.67E-01	
CUM. (GR/ACF) SMALLER THAN D50	1.66E-03	1.53E-03	1.28E-03	1.04E-03	8.01E-04	6.02E-04	3.31E-04	2.44E-04	
CUM. (GR/DNCF) SMALLER THAN D50	1.99E-03	1.84E-03	1.53E-03	1.24E-03	9.59E-04	7.20E-04	3.96E-04	2.92E-04	
GEO. MEAN DIA. (MICROMETERS)	3.53E+01	1.41E+01	9.19E+00	6.26E+00	4.18E+00	2.40E+00	1.36E+00	8.96E-01	5.26E-01
DM/DLOGD (MG/DNCM)	1.44E+00	1.75E+00	4.12E+00	4.04E+00	3.50E+00	1.84E+00	3.71E+00	1.48E+00	2.22E+00
DN/DLOGD (NO. PARTICLES/DNCM)	6.28E+04	1.20E+06	1.01E+07	3.15E+07	9.14E+07	2.53E+08	2.83E+09	3.92E+09	2.98E+10

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #1-C-A 2-10-81 0916

IMPACTOR FLOWRATE = 0.314 ACFM IMPACTOR TEMPERATURE = 165.0 F = 73.9 C SAMPLING DURATION = 240.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 165.0 F = 73.9 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.80 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 1.9770E-03 GR/ACF 2.3657E-03 GR/DNCF 4.5241E+00 MG/ACM 5.4136E+00 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.85	11.24	7.67	5.27	3.48	1.80	1.17	0.84	
MASS (MILLIGRAMS)	1.84	0.76	1.48	1.44	1.38	1.17	1.59	0.51	1.43
MG/LACM/STAGE	8.53E-01	3.55E-01	6.91E-01	6.72E-01	6.44E-01	5.46E-01	7.42E-01	2.34E-01	6.67E-01
CUM. PERCENT OF MASS SMALLER THAN D50	84.14	77.59	64.83	52.41	40.52	30.43	16.78	10.33	
CUM. (MG/ACM) SMALLER THAN D50	3.81E+00	3.51E+00	2.93E+00	2.37E+00	1.83E+00	1.38E+00	7.57E-01	5.59E-01	
CUM. (MG/DNCM) SMALLER THAN D50	4.55E+00	4.20E+00	3.51E+00	2.84E+00	2.19E+00	1.65E+00	9.05E-01	6.67E-01	
CUM. (GR/ACF) SMALLER THAN D50	1.66E-03	1.53E-03	1.28E-03	1.04E-03	8.01E-04	6.02E-04	3.31E-04	2.44E-04	
CUM. (GR/DNCF) SMALLER THAN D50	1.99E-03	1.84E-03	1.53E-03	1.24E-03	9.59E-04	7.20E-04	3.96E-04	2.92E-04	
GEO. MEAN DIA. (MICROMETERS)	3.54E+01	1.42E+01	9.29E+00	6.36E+00	4.28E+00	2.51E+00	1.45E+00	9.91E-01	5.92E-01
DM/DLOGD (MG/DNCM)	1.45E+00	1.77E+00	4.16E+00	4.11E+00	3.58E+00	1.91E+00	3.96E+00	1.63E+00	2.22E+00
DN/DLOGD (NO. PARTICLES/DNCM)	6.25E+04	1.19E+06	9.92E+06	3.05E+07	8.72E+07	2.33E+08	2.46E+08	3.20E+09	2.04E+10

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #1-C-B 2-10-81 0916 HRS

IMPACTOR FLOWRATE = 0.321 ACFM IMPACTOR TEMPERATURE = 165.0 F = 73.9 C SAMPLING DURATION = 288.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 165.0 F = 73.9 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.68 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 1.0734E-03 GR/ACF 1.2896E-03 GR/DNCF 2.4562E+00 MG/ACM 2.9510E+00 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.56	11.04	7.50	5.12	3.35	1.69	1.07	0.74	
MASS (MILLIGRAMS)	0.44	0.44	0.39	0.59	0.66	0.77	0.79	1.18	1.16
MG/DNCM/STAGE	2.02E-01	2.02E-01	1.79E-01	2.71E-01	3.03E-01	3.54E-01	3.63E-01	5.42E-01	5.33E-01
CUM. PERCENT OF MASS SMALLER THAN D50	93.15	86.29	80.22	71.03	60.75	46.75	36.45	15.07	
CUM. (MG/ACM) SMALLER THAN D50	2.29E+00	2.12E+00	1.97E+00	1.74E+00	1.49E+00	1.20E+00	8.95E-01	4.44E-01	
CUM. (MG/DNCM) SMALLER THAN D50	2.75E+00	2.55E+00	2.37E+00	2.10E+00	1.79E+00	1.44E+00	1.08E+00	5.33E-01	
CUM. (GR/ACF) SMALLER THAN D50	1.00E-03	9.26E-04	8.61E-04	7.62E-04	6.52E-04	5.23E-04	3.91E-04	1.94E-04	
CUM. (GR/DNCF) SMALLER THAN D50	1.20E-03	1.11E-03	1.03E-03	9.16E-04	7.83E-04	6.29E-04	4.70E-04	2.33E-04	
GEO. MEAN DIA. (MICROMETERS)	3.51E+01	1.39E+01	9.10E+00	6.20E+00	4.14E+00	2.38E+00	1.34E+00	6.86E-01	5.20E-01
DM/DLOGD (MG/DNCM)	3.37E-01	1.00E+00	1.07E+00	1.63E+00	1.65E+00	1.19E+00	1.91E+00	3.36E+00	1.77E+00
DN/DLOGD (NO. PARTICLES/DNCM)	1.49E+04	7.06E+05	2.71E+06	1.31E+07	4.43E+07	1.69E+08	1.43E+09	9.23E+09	2.40E+10

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #1-C-6 2-10-81 0916 HRS

IMPACTOR FLOWRATE = 0.321 ACFM IMPACTOR TEMPERATURE = 165.0 F = 73.9 C SAMPLING DURATION = 268.00 MIN

IMPACTOR PRESSURE DROP = 0.2 IN. OF HG STACK TEMPERATURE = 165.0 F = 73.9 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.68 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 1.0734E-03 GR/ACF 1.2696E-03 GR/DNCF 2.4562E+00 MG/ACM 2.9510E+00 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	17.68	11.14	7.60	5.22	3.45	1.79	1.16	0.83	
MASS (MILLIGRAMS)	0.44	0.44	0.39	0.59	0.66	0.77	0.79	1.11	1.16
MG/ACM/STAGE	2.02E-01	2.02E-01	1.79E-01	2.71E-01	3.03E-01	3.54E-01	3.63E-01	5.42E-01	5.33E-01
CUM. PERCENT OF MASS SMALLER THAN D50	93.15	86.29	80.22	71.03	60.75	46.75	36.45	11.07	
CUM. (MG/ACM) SMALLER THAN D50	2.29E+00	2.12E+00	1.97E+00	1.74E+00	1.49E+00	1.20E+00	8.95E-01	4.44E-01	
CUM. (MG/DNCM) SMALLER THAN D50	2.75E+00	2.55E+00	2.37E+00	2.10E+00	1.79E+00	1.44E+00	1.08E+00	5.33E-01	
CUM. (GR/ACF) SMALLER THAN D50	1.00E-03	9.26E-04	8.61E-04	7.62E-04	6.52E-04	5.23E-04	3.91E-04	1.94E-04	
CUM. (GR/DNCF) SMALLER THAN D50	1.20E-03	1.11E-03	1.03E-03	9.16E-04	7.83E-04	6.29E-04	4.70E-04	2.33E-04	
GEO. MEAN DIA. (MICROMETERS)	3.52E+01	1.40E+01	9.20E+00	6.30E+00	4.24E+00	2.46E+00	1.44E+00	9.81E-01	5.86E-01
DM/DLOGD (MG/DNCM)	3.38E-01	1.01E+00	1.08E+00	1.66E+00	1.69E+00	1.24E+00	1.94E+00	3.71E+00	1.77E+00
DN/DLOGD (NO. PARTICLES/DNCM)	1.47E+04	6.96E+05	2.65E+06	1.27E+07	4.23E+07	1.55E+08	1.24E+09	7.59E+09	1.69E+10

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN 42-C-A 2-11-81 1200

IMPACTOR FLOWRATE = 0.420 ACFM IMPACTOR TEMPERATURE = 134.0 F = 56.7 C SAMPLING DURATION = 285.00 MIN

IMPACTOR PRESSURE DROP = 0.3 IN. OF HG STACK TEMPERATURE = 134.0 F = 56.7 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.60 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 2.1982E-03 GR/ACF 2.5167E-03 GR/DNCF 5.0303E+00 MG/ACM 5.7592E+00 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	15.07	9.46	6.43	4.38	2.86	1.44	0.91	0.62	
MASS (MILLIGRAMS)	2.85	1.19	1.67	1.67	3.16	2.45	1.48	1.92	0.84
MG/DNCM/STAGE	9.53E-01	3.98E-01	5.58E-01	5.58E-01	1.06E+00	8.19E-01	4.95E-01	6.42E-01	2.81E-01
CUM. PERCENT OF MASS SMALLER THAN D50	83.46	76.55	66.66	57.17	38.83	24.61	16.02	4.68	
CUM. (MG/ACM) SMALLER THAN D50	4.20E+00	3.85E+00	3.36E+00	2.88E+00	1.95E+00	1.24E+00	8.06E-01	2.45E-01	
CUM. (MG/DNCM) SMALLER THAN D50	4.81E+00	4.41E+00	3.85E+00	3.29E+00	2.24E+00	1.42E+00	9.23E-01	2.81E-01	
CUM. (GR/ACF) SMALLER THAN D50	1.83E-03	1.68E-03	1.47E-03	1.26E-03	8.54E-04	5.41E-04	3.52E-04	1.07E-04	
CUM. (GR/DNCF) SMALLER THAN D50	2.10E-03	1.93E-03	1.68E-03	1.44E-03	9.77E-04	6.19E-04	4.03E-04	1.23E-04	
GEO. MEAN DIA. (MICROMETERS)	3.25E+01	1.19E+01	7.80E+00	5.31E+00	3.54E+00	2.03E+00	1.14E+00	7.51E-01	4.39E-01
DM/DLOG (MG/DNCM)	1.43E+00	1.97E+00	3.33E+00	3.35E+00	5.72E+00	2.75E+00	2.45E+00	3.81E+00	9.33E-01
DN/DLOG (NO. PARTICLES/DNCM)	7.96E+04	2.20E+06	1.34E+07	4.29E+07	2.46E+08	6.25E+08	3.14E+09	1.77E+10	2.10E+10

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #2-C-A 2-11-81 1200

IMPACTOR FLOWRATE = 0.420 ACFM IMPACTOR TEMPERATURE = 134.0 F = 56.7 C SAMPLING DURATION = 269.00 MIN

IMPACTOR PRESSURE DROP = 0.3 IN. OF HG STACK TEMPERATURE = 134.0 F = 56.7 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.60 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 2.1982E-03 GR/ACF 2.5167E-03 GR/DNCF 5.0303E+00 MG/ACM 5.7592E+00 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	15.17	9.55	6.52	4.47	2.96	1.53	1.00	0.71	
MASS (MILLIGRAMS)	2.65	1.19	1.67	1.67	3.16	2.45	1.48	1.92	0.54
MG/DNCM/STAGE	9.53E-01	3.98E-01	5.58E-01	5.58E-01	1.06E+00	8.19E-01	4.95E-01	6.42E-01	2.61E-01
CUM. PERCENT OF MASS SMALLER THAN D50	83.46	76.55	66.86	57.17	38.83	24.61	16.02	4.88	
CUM. (MG/ACM) SMALLER THAN D50	4.20E+00	3.85E+00	3.36E+00	2.88E+00	1.95E+00	1.24E+00	8.06E-01	2.45E-01	
CUM. (MG/DNCM) SMALLER THAN D50	4.81E+00	4.41E+00	3.85E+00	3.29E+00	2.24E+00	1.42E+00	9.23E-01	2.81E-01	
CUM. (GR/ACF) SMALLER THAN D50	1.83E-03	1.68E-03	1.47E-03	1.26E-03	8.54E-04	5.41E-04	3.52E-04	1.07E-04	
CUM. (GR/DNCF) SMALLER THAN D50	2.10E-03	1.93E-03	1.68E-03	1.44E-03	9.77E-04	6.19E-04	4.03E-04	1.23E-04	
GEO. MEAN DIA. (MICROMETERS)	3.26E+01	1.20E+01	7.85E+00	5.40E+00	3.64E+00	2.13E+00	1.23E+00	8.40E-01	5.92E-01
DM/DLOGE (MG/DNCM)	1.43E+00	1.98E+00	3.37E+00	3.41E+00	5.87E+00	2.87E+00	2.64E+00	4.37E+00	9.33E-01
DN/DLOGE (NO. PARTICLES/DNCM)	7.92E+04	2.17E+06	1.31E+07	4.14E+07	2.33E+08	5.69E+08	2.68E+09	1.41E+10	1.41E+10

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN #2-C-B 2-11-81 1200

IMPACTOR FLOWRATE = 0.660 ACFM IMPACTOR TEMPERATURE = 134.0 F = 56.7 C SAMPLING DURATION = 288.00 MIN

IMPACTOR PRESSURE DROP = 0.8 IN. OF HG STACK TEMPERATURE = 134.0 F = 56.7 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.60 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 1.9256E-04 GR/ACF 2.2046E-04 GR/DNCF 4.4065E-01 MG/ACM 5.0450E-01 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	12.01	7.53	5.11	3.48	2.27	1.13	0.70	0.47	
MASS (MILLIGRAMS)	0.13	0.23	0.30	0.13	0.31	0.28	0.34	0.18	0.47
MG/LACM/STAGE	2.77E-02	4.90E-02	6.39E-02	2.77E-02	6.60E-02	5.96E-02	7.24E-02	3.83E-02	1.00E-01
CUM. PERCENT OF MASS SMALLER THAN D50	94.51	84.81	72.15	66.67	53.59	41.77	27.43	19.83	
CUM. (MG/ACM) SMALLER THAN D50	4.16E-01	3.74E-01	3.18E-01	2.94E-01	2.36E-01	1.84E-01	1.21E-01	8.74E-02	
CUM. (MG/DNCM) SMALLER THAN D50	4.77E-01	4.28E-01	3.64E-01	3.36E-01	2.70E-01	2.11E-01	1.38E-01	1.00E-01	
CUM. (GR/ACF) SMALLER THAN D50	1.82E-04	1.63E-04	1.39E-04	1.28E-04	1.03E-04	8.04E-05	5.28E-05	3.82E-05	
CUM. (GR/DNCF) SMALLER THAN D50	2.08E-04	1.87E-04	1.59E-04	1.47E-04	1.18E-04	9.21E-05	6.05E-05	4.37E-05	
GEO. MEAN DIA. (MICROMETERS)	2.90E+01	9.51E+00	6.20E+00	4.22E+00	2.81E+00	1.60E+00	8.93E-01	5.77E-01	3.34E-01
DM/DLOGD (MG/DNCM)	3.61E-02	2.41E-01	3.79E-01	1.66E-01	3.55E-01	1.97E-01	3.51E-01	2.21E-01	3.32E-01
DN/DLOGD (NO. PARTICLES/DNCM)	2.83E+03	5.36E+05	3.04E+06	4.22E+06	3.06E+07	9.17E+07	9.44E+08	2.20E+09	1.70E+10

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #2-C-B 2-11-81 1200

IMPACTOR FLOWRATE = 0.660 ACFM IMPACTOR TEMPERATURE = 134.0 F = 56.7 C SAMPLING DURATION = 288.00 MIN

IMPACTOR PRESSURE DROP = 0.8 IN. OF HG STACK TEMPERATURE = 134.0 F = 56.7 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.60 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 1.9256E-04 GR/ACF 2.2046E-04 GR/DNCF 4.4065E-01 MG/ACM 5.0450E-01 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	12.10	7.62	5.20	3.57	2.36	1.22	0.79	0.56	
MASS (MILLIGRAMS)	0.13	0.23	0.30	0.13	0.31	0.28	0.34	0.16	0.47
MG/DNCM/STAGE	2.77E-02	4.90E-02	6.39E-02	2.77E-02	6.60E-02	5.96E-02	7.24E-02	3.83E-02	1.00E-01
CUM. PERCENT OF MASS SMALLER THAN D50	94.51	84.81	72.15	66.67	53.59	41.77	27.43	19.63	
CUM. (MG/ACM) SMALLER THAN D50	4.16E-01	3.74E-01	3.18E-01	2.94E-01	2.36E-01	1.84E-01	1.21E-01	8.74E-02	
CUM. (MG/DNCM) SMALLER THAN D50	4.77E-01	4.28E-01	3.64E-01	3.36E-01	2.70E-01	2.11E-01	1.38E-01	1.00E-01	
CUM. (GR/ACF) SMALLER THAN D50	1.82E-04	1.63E-04	1.39E-04	1.28E-04	1.03E-04	8.04E-05	5.28E-05	3.82E-05	
CUM. (GR/DNCF) SMALLER THAN D50	2.08E-04	1.87E-04	1.59E-04	1.47E-04	1.18E-04	9.21E-05	6.05E-05	4.37E-05	
GEO. MEAN DIA. (MICROMETERS)	2.91E+01	9.60E+00	6.30E+00	4.31E+00	2.90E+00	1.70E+00	9.83E-01	6.67E-01	3.97E-01
DM/DLOGD (MG/DNCM)	3.63E-02	2.44E-01	3.85E-01	1.69E-01	3.67E-01	2.08E-01	3.85E-01	2.56E-01	3.32E-01
DN/DLOGD (NO. PARTICLES/DNCM)	2.81E+03	5.26E+05	2.99E+06	4.04E+06	2.87E+07	8.15E+07	7.74E+08	1.65E+09	1.01E+10

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

RUN 83-3-A 2-12-81 0945

IMPACTOR FLOWRATE = 0.350 ACFM IMPACTOR TEMPERATURE = 133.0 F = 56.1 C SAMPLING DURATION = 288.00 MIN

IMPACTOR PRESSURE DROP = 0.3 IN. OF HG STACK TEMPERATURE = 133.0 F = 56.1 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.80 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 3.1460E-03 GR/ACF 3.5716E-03 GR/DNCF 7.1952E+00 MG/ACM 8.1731E+00 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	15.46	9.70	6.59	4.50	2.94	1.48	0.93	0.64	
MASS (MILLIGRAMS)	2.62	1.89	2.59	2.45	2.62	2.90	2.99	2.70	2.66
MG/EACH/STAGE	9.14E-01	6.60E-01	9.04E-01	8.55E-01	9.14E-01	1.01E+00	1.04E+00	9.42E-01	9.28E-01
CUM. PERCENT OF MASS SMALLER THAN D50	48.81	80.74	69.68	59.22	48.04	35.65	22.89	11.34	
CUM. (MG/ACM) SMALLER THAN D50	6.39E+00	5.81E+00	5.02E+00	4.26E+00	3.46E+00	2.57E+00	1.65E+00	8.19E-01	
CUM. (MG/DNCM) SMALLER THAN D50	7.26E+00	6.60E+00	5.70E+00	4.84E+00	3.93E+00	2.91E+00	1.87E+00	9.29E-01	
CUM. (GR/ACF) SMALLER THAN D50	2.79E-03	2.54E-03	2.19E-03	1.86E-03	1.51E-03	1.12E-03	7.20E-04	3.57E-04	
CUM. (GR/DNCF) SMALLER THAN D50	3.17E-03	2.88E-03	2.49E-03	2.12E-03	1.72E-03	1.27E-03	8.17E-04	4.06E-04	
GEO. MEAN DIA. (MICROMETERS)	3.27E+01	1.22E+01	6.70E+00	5.45E+00	3.64E+00	2.09E+00	1.17E+00	7.73E-01	4.93E-01
DM/DLOG (MG/DNCM)	1.39E+00	3.26E+00	5.39E+00	5.14E+00	4.96E+00	3.40E+00	5.19E+00	5.77E+00	3.07E+00
DN/DLOG (NO. PARTICLES/DNCM)	7.46E+04	3.39E+06	2.01E+07	6.08E+07	1.37E+08	7.14E+08	6.10E+09	2.39E+10	6.34E+10

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.

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

RUN #3-[illegible] 2-12-81 0:45

IMPACTOR FLOWRATE = 0.349 ACFM IMPACTOR TEMPERATURE = 133.0 F = 56.1 C SAMPLING DURATION = 28[illegible].00 MIN

IMPACTOR PRESSURE DROP = 0.2 [illegible] IN. OF HG STACK TEMPERATURE = 133.0 F = 56.1 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.80 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.00 O2 = 0.00 N2 = 78.31 H2O = 19.60 SO2 = 1.00

CYCLONE MASS LOADING = 3.1460[illegible]-03 GM/ACF 3.5716E-03 GM/DSCF 7.19[illegible]+00 MG/ACM 8.1731E+00 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	15.[illegible]	7.79	[illegible]	4.59	3.03	1.37	1.00	0.73	
MASS (MILLIGRAMS)	2.88	1.35	2.[illegible]	2.45	2.00	2.50	2.[illegible]	2.70	2.46
MG/ACM/STAGE	9.14E-01	4.60 E-01	8.[illegible]E-01	8.55E-01	2.14E+ [illegible]	1.01 +00	1.0[illegible]E+00	[illegible].42E-01	9.2[illegible]E-01
CUM. PERCENT OF MASS SMALLER THAN D50	[illegible].1	40.74	[illegible]	[illegible]	49.04	75.65	92.[illegible]	11.36	
CUM. (G/ACF) SMALLER THAN D50	3.[illegible]E-03	3.[illegible]E-03	5.02E+00	4.26 +00	3.46E+[illegible]	[illegible].57 +00	1.65E+00	[illegible].1[illegible]-01	
CUM. (G/ACM) SMALLER THAN D50	7.[illegible]E+00	8.[illegible]E+00	5.70E+00	4.54[illegible]+00	3.8[illegible]+00	2.91 +00	1.[illegible]E+00	[illegible].2[illegible]-01	
CUM. (G/SCF) SMALLER THAN D50	2.79E-03	2.84[illegible]-03	2.19E-03	1.86 -03	1.[illegible]E-03	1.10 -03	7.[illegible]-04	8.57[illegible]-04	
CUM. (G/DSCF) SMALLER THAN D50	3.[illegible]E-03	[illegible] -03	[illegible]-03	[illegible]-03	1.[illegible]E-03	1.[illegible]-03	[illegible].1[illegible]-04	4.[illegible]-04	
[illegible] MASS DIAM (MICROMETERS)	[illegible]+01	1.[illegible] +01	[illegible] +	+04 +00	[illegible]+	[illegible]+00	1.[illegible] +00	[illegible]-01	[illegible].[illegible]-01
DM/DLOG (MG/DLOG)	1.4[illegible]E+[illegible]	[illegible]+[illegible]	[illegible]+00	8.23 +00	[illegible] +	[illegible]+00	[illegible].[illegible]+00	[illegible]+00	3.[illegible]+00
DN/DLOG (NO. PARTICLES/DLOG)	7.44E+04	[illegible]+04	1.[illegible]+07	5.6[illegible] +07	1.[illegible]+	[illegible]+04	[illegible].[illegible]+04	1.01 +10	4.[illegible]+10

[illegible] (PIEZOELECTRIC STANDARD) CALIBRATIONS ARE [illegible] [illegible] [illegible].

AERODYNAMIC DIAMETERS ARE CALCULATED FOR UNIT DENSITY PARTICLES.

RUN 43-C-B 2-12-81 0945

IMPACTOR FLOWRATE = 0.407 ACFM IMPACTOR TEMPERATURE = 133.0 F = 56.1 C SAMPLING DURATION = 240.00 MIN

IMPACTOR PRESSURE DROP = 0.3 IN. OF HG STACK TEMPERATURE = 133.0 F = 56.1 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.CM. STACK PRESSURE = 29.80 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 O2 = 0.00 N2 = 78.31 H2O = 19.60 H2O = 1.00

CALC. MASS LOADING = 8.158E-04 GR/ACF 5.242E-04 GR/DSCF 1.867E+00 MG/ACM 2.119E+00 MG/DSCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	15.30	9.60	6.53	4.45	2.91	1.47	0.93	0.63	
MASS (MILLIGRAMS)	0.76	0.30	0.21	0.75	0.26	1.40	0.75	0.75	1.00
MG/ACM/STAGE	2.68E-01	1.06E-01	7.41E-02	2.64E-01	9.24E-02	4.93E-01	2.64E-01	2.64E-01	3.52E-01
CUM. PERCENT OF MASS SMALLER THAN D50	47.40	68.58	73.19	87.10	92.90	40.30	20.02	10.13	
CUM. (MG/ACM) SMALLER THAN D50	1.01E+00	1.54E+00	1.94E+00	1.28E+00	1.17E+	7.83E-01	5.27E-01	3.01E-01	
CUM. (MG/DSCM) SMALLER THAN D50	1.07E+00	1.75E+00	1.66E+00	1.42 +00	1.33E+	8.95E-01	5.9 E-01	3.42E-01	
CUM. (GR/ACF) SMALLER THAN D50	7.12E-04	4.74E-04	6.47E-04	5.47 -04	5.13E-	3.42 -04	2.30E-04	1.32E-04	
CUM. (GR/DSCF) SMALLER THAN D50	8.13E-04	7.66E-04	7.39E-04	6.21 -04	5.85E-	3.91E-04	2.62E-04	1.49E-04	
CUM. % OF D50 (MICROMETERS)	5.87E+01	1.21E+1	7.42E+	5.39 +00	2.0 E+	1.07 +00	1.18E+00	7.64E-01	4.4 E-1
DM/DLOG (MG/DSCM)	4.41E-01	5.07E-1	4.24E-01	1.54 +0	4.3 E-	1.71 +0	1.27E+00	1.67 +00	1.14E+00
DN/DLOG (NO. PARTICLES/ACM)	2.61E+04	9.4 E+	1.3 E+	1.6 E+07	1.1 E+	7.49E+0	1.9 E+	1.71+0	2.42E+10

NORMAL (1 DIGERI G STANDARD) CONDITIONS ARE 21 DEG C AND 760 MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED ACCORDING TO THE FLOW REGIME IN EACH STAGE.

RUN 83-[illegible]-8 2-12-81 0945

IMPACTOR FLOWRATE = 0.407 ACFM IMPACTOR TEMPERATURE = 133.0 F = 56.1 C SAMPLING DURATION = 288.00 MIN

IMPACTOR PRESSURE DROP = 0.3 IN. OF HG STACK TEMPERATURE = 133.0 F = 56.1 C

ASSUMED PARTICLE DENSITY = 1.00 GM/CU.C. STACK PRESSURE = 29.80 IN. OF HG MAX. PARTICLE DIAMETER = 70.0 MICROMETERS

GAS COMPOSITION (PERCENT) CO2 = 1.09 CO = 0.00 N2 = 78.31 O2 = 19.60 H2O = 1.00

CALC. MASS LOADING = 6.158[illegible]-04 GR/ACF 9.2625E-04 GR/DNCF 1.8670E+00 MG/ACM 2.1196E+00 MG/DNCM

IMPACTOR STAGE	S1	S2	S3	S4	S5	S6	S7	S8	FILTER
STAGE INDEX NUMBER	1	2	3	4	5	6	7	8	9
D50 (MICROMETERS)	15.39	9.69	6.62	4.54	3.03	1.55	1.01	0.72	
MASS (MILLIGRAMS)	0.79	0.30	0.21	0.75	0.26	1.40	0.75	0.75	1.60
MG/ACM/STAGE	2.67E-01	1.03E-01	7.1[illegible]E-02	2.56 -01	8.89E-02	4.79E-01	2.56E-01	2.56E-01	3.42E-01
CUM. PERCENT OF MASS SMALLER THAN D50	87.42	82.58	79.19	67.10	62.90	40.32	28.23	16.13	
CUM. (MG/ACM) SMALLER THAN D50	1.63E+00	1.54E+00	1.48E+00	1.25E+00	1.17E+00	7.53E-01	5.27E-01	3.01E-01	
CUM. (MG/DNCM) SMALLER THAN D50	1.85E+00	1.75E+00	1.68E+00	1.42E+00	1.33E+00	8.55E-01	5.98E-01	3.42E-01	
CUM. (GR/ACF) SMALLER THAN D50	7.13E-04	6.74E-04	6.46E-04	5.47E-04	5.13E-04	3.29E-04	2.30E-04	1.32E-04	
CUM. (G/DSCF) SMALLER THAN D50	8.10E-04	7.66E-04	7.34E-04	6.21E-04	5.83E-04	3.73E-04	2.61E-04	1.49E-04	
GEO. MEAN DIA. (MICROMETERS)	3.2[illegible]E+01	1.22E+01	5.[illegible]E+00	5.48E+00	3.69E+00	2.16E+00	1.25E+00	8.53E-01	5.09E-01
DN/DLOGD (MG/DNCM)	4.35E-01	3.11E-01	4.33E-01	1.57E+00	4.94E-01	1.69E+00	1.37E+00	1.70E+00	1.14E+00
DN/DLOGD (NO. PARTICLES/DNCM)	2.19E+04	5.3[illegible]E+05	1.61E+06	1.82E+07	1.[illegible]E+07	3.1[illegible]E+08	1.33E+[illegible]	5.37E+09	1.64E+10

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760 MM HG.

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO ALPCET.

ROANE LTD. ROCKWOOD, TENN. 10-12 FEB 1981 CONTRACT 1-618-019
RHO= 1.00 GM/CC

INTERVAL	DIAMETER (MICRONS)	MEAN CUMULATIVE MASS CONCENTRATION (MG/ACM)	UPPER CONFIDENCE LIMIT (MG/ACM)	LOWER CONFIDENCE LIMIT (MG/ACM)
1	2.50E-01	3.87E-03	5.93E-03	1.81E-03
2	2.71E-01	6.85E-03	1.04E-02	3.27E-03
3	2.95E-01	1.09E-02	1.64E-02	5.43E-03
4	3.20E-01	1.65E-02	2.45E-02	8.46E-03
5	3.47E-01	2.41E-02	3.55E-02	1.27E-02
6	3.77E-01	3.44E-02	5.02E-02	1.86E-02
7	4.09E-01	4.53E-02	6.28E-02	2.78E-02
8	4.45E-01	5.67E-02	7.64E-02	3.70E-02
9	4.83E-01	7.03E-02	9.28E-02	4.78E-02
10	5.24E-01	8.69E-02	1.13E-01	6.09E-02
11	5.69E-01	1.10E-01	1.40E-01	7.87E-02
12	6.16E-01	1.45E-01	1.93E-01	9.81E-02
13	6.71E-01	2.00E-01	2.64E-01	1.37E-01
14	7.28E-01	2.66E-01	3.47E-01	1.85E-01
15	7.91E-01	3.44E-01	4.41E-01	2.46E-01
16	8.58E-01	4.31E-01	5.46E-01	3.16E-01
17	9.32E-01	5.24E-01	6.55E-01	3.94E-01
18	1.01E+00	6.18E-01	7.61E-01	4.75E-01
19	1.10E+00	7.10E-01	8.63E-01	5.57E-01
20	1.19E+00	7.99E-01	9.60E-01	6.38E-01
21	1.29E+00	8.84E-01	1.05E+00	7.16E-01
22	1.41E+00	9.64E-01	1.14E+00	7.91E-01
23	1.53E+00	1.04E+00	1.22E+00	8.62E-01
24	1.66E+00	1.11E+00	1.30E+00	9.31E-01
25	1.80E+00	1.18E+00	1.37E+00	9.95E-01
26	1.95E+00	1.25E+00	1.43E+00	1.06E+00
27	2.12E+00	1.31E+00	1.50E+00	1.12E+00
28	2.30E+00	1.37E+00	1.56E+00	1.18E+00
29	2.50E+00	1.43E+00	1.63E+00	1.23E+00
30	2.71E+00	1.49E+00	1.69E+00	1.29E+00
31	2.95E+00	1.56E+00	1.76E+00	1.35E+00
32	3.20E+00	1.63E+00	1.94E+00	1.42E+00
33	3.47E+00	1.70E+00	1.92E+00	1.48E+00
34	3.77E+00	1.78E+00	2.00E+00	1.55E+00
35	4.09E+00	1.86E+00	2.09E+00	1.63E+00
36	4.45E+00	1.94E+00	2.16E+00	1.70E+00
37	4.83E+00	2.02E+00	2.26E+00	1.78E+00
38	5.24E+00	2.11E+00	2.35E+00	1.86E+00
39	5.69E+00	2.19E+00	2.44E+00	1.94E+00
40	6.18E+00	2.27E+00	2.53E+00	2.02E+00
41	6.71E+00	2.35E+00	2.61E+00	2.09E+00
42	7.28E+00	2.43E+00	2.69E+00	2.16E+00
43	7.91E+00	2.50E+00	2.77E+00	2.23E+00
44	8.58E+00	2.57E+00	2.85E+00	2.30E+00
45	9.32E+00	2.64E+00	2.92E+00	2.36E+00
46	1.01E+01	2.70E+00	2.96E+00	2.42E+00
47	1.10E+01	2.76E+00	3.05E+00	2.46E+00
48	1.19E+01	2.82E+00	3.11E+00	2.54E+00
49	1.29E+01	2.88E+00	3.17E+00	2.59E+00
50	1.41E+01	2.93E+00	3.22E+00	2.64E+00
51	1.53E+01	2.98E+00	3.28E+00	2.69E+00
52	1.66E+01	3.03E+00	3.33E+00	2.74E+00
53	1.80E+01	3.08E+00	3.37E+00	2.78E+00
54	1.95E+01	3.12E+00	3.41E+00	2.82E+00

RCAAS LTD. ROCKWOOD, TENN. 10-12 FEB 1981 CONTRACT 1-618-019
RHO= 1.00 GM/CC

INTERVAL	DIAMETER	RECORDS EXCLUDED FROM MEAN CUMULATIVE MASS CONCENTRATION
1	2.50E-01	2
2	2.71E-01	2
3	2.95E-01	2
4	3.20E-01	2
5	3.47E-01	2
6	3.77E-01	2
7	4.09E-01	2 10
8	4.45E-01	2 10
9	4.83E-01	10
10	5.24E-01	10
11	5.69E-01	10
12	6.18E-01	NONE
13	6.71E-01	NONE
14	7.28E-01	NONE
15	7.91E-01	NONE
16	8.58E-01	NONE
17	9.32E-01	NONE
18	1.01E+00	NONE
19	1.10E+00	NONE
20	1.19E+00	NONE
21	1.29E+00	NONE
22	1.41E+00	NONE
23	1.53E+00	NONE
24	1.66E+00	NONE
25	1.80E+00	NONE
26	1.95E+00	NONE
27	2.12E+00	NONE
28	2.30E+00	NONE
29	2.50E+00	NONE
30	2.71E+00	NONE
31	2.95E+00	NONE
32	3.20E+00	NONE
33	3.47E+00	NONE
34	3.77E+00	NONE
35	4.09E+00	NONE
36	4.45E+00	NONE
37	4.83E+00	NONE
38	5.24E+00	NONE
39	5.69E+00	NONE
40	6.18E+00	NONE
41	6.71E+00	NONE
42	7.28E+00	NONE
43	7.91E+00	NONE
44	8.58E+00	NONE
45	9.32E+00	NONE
46	1.01E+01	NONE
47	1.10E+01	NONE
48	1.19E+01	NONE
49	1.29E+01	NONE
50	1.41E+01	NONE
51	1.53E+01	NONE
52	1.66E+01	NONE
53	1.80E+01	NONE
54	1.95E+01	NONE

RLANE LTL. ROCKWOOD, TENN. 10-12 FEB 1981 CONTRACT 1-618-019
RHO= 1.00 GM/CC

INTERVAL	DIAMETER (MICRONS)	MEAN CUMULATIVE MASS CONCENTRATION (PERCENT)	UPPER CONFIDENCE LIMIT (PERCENT)	LOWER CONFIDENCE LIMIT (PERCENT)
1	2.50E-01	1.08E-01	1.65E-01	5.04E-02
2	2.71E-01	1.91E-01	2.91E-01	9.11E-02
3	2.95E-01	3.04E-01	4.58E-01	1.51E-01
4	3.20E-01	4.60E-01	6.84E-01	2.36E-01
5	3.47E-01	6.72E-01	9.90E-01	3.54E-01
6	3.77E-01	9.60E-01	1.40E+00	5.19E-01
7	4.09E-01	1.26E+00	1.75E+00	7.75E-01
8	4.45E-01	1.58E+00	2.13E+00	1.03E+00
9	4.83E-01	1.96E+00	2.59E+00	1.33E+00
10	5.24E-01	2.42E+00	3.15E+00	1.70E+00
11	5.69E-01	3.05E+00	3.91E+00	2.19E+00
12	6.18E-01	4.06E+00	5.38E+00	2.73E+00
13	6.71E-01	5.58E+00	7.36E+00	3.81E+00
14	7.28E-01	7.42E+00	9.67E+00	5.18E+00
15	7.91E-01	9.58E+00	1.23E+01	6.85E+00
16	8.58E-01	1.20E+01	1.52E+01	8.80E+00
17	9.32E-01	1.46E+01	1.83E+01	1.10E+01
18	1.01E+00	1.72E+01	2.12E+01	1.33E+01
19	1.10E+00	1.98E+01	2.41E+01	1.55E+01
20	1.19E+00	2.23E+01	2.68E+01	1.78E+01
21	1.29E+00	2.46E+01	2.93E+01	2.00E+01
22	1.41E+00	2.69E+01	3.17E+01	2.20E+01
23	1.53E+00	2.90E+01	3.40E+01	2.40E+01
24	1.66E+00	3.10E+01	3.61E+01	2.60E+01
25	1.80E+00	3.29E+01	3.81E+01	2.78E+01
26	1.95E+00	3.47E+01	4.00E+01	2.95E+01
27	2.12E+00	3.65E+01	4.18E+01	3.12E+01
28	2.30E+00	3.82E+01	4.36E+01	3.28E+01
29	2.50E+00	3.99E+01	4.54E+01	3.44E+01
30	2.71E+00	4.17E+01	4.72E+01	3.61E+01
31	2.95E+00	4.35E+01	4.92E+01	3.78E+01
32	3.20E+00	4.54E+01	5.13E+01	3.95E+01
33	3.47E+00	4.74E+01	5.35E+01	4.14E+01
34	3.77E+00	4.96E+01	5.58E+01	4.33E+01
35	4.09E+00	5.18E+01	5.82E+01	4.53E+01
36	4.45E+00	5.41E+01	6.07E+01	4.74E+01
37	4.83E+00	5.64E+01	6.32E+01	4.96E+01
38	5.24E+00	5.87E+01	6.56E+01	5.18E+01
39	5.69E+00	6.11E+01	6.81E+01	5.40E+01
40	6.18E+00	6.34E+01	7.05E+01	5.62E+01
41	6.71E+00	6.56E+01	7.29E+01	5.83E+01
42	7.28E+00	6.77E+01	7.51E+01	6.03E+01
43	7.91E+00	6.98E+01	7.73E+01	6.22E+01
44	8.58E+00	7.17E+01	7.93E+01	6.41E+01
45	9.32E+00	7.36E+01	8.13E+01	6.58E+01
46	1.01E+01	7.54E+01	8.32E+01	6.75E+01
47	1.10E+01	7.71E+01	8.50E+01	6.92E+01
48	1.19E+01	7.87E+01	8.67E+01	7.07E+01
49	1.29E+01	8.03E+01	8.83E+01	7.22E+01
50	1.41E+01	8.17E+01	8.99E+01	7.36E+01
51	1.53E+01	8.32E+01	9.13E+01	7.50E+01
52	1.66E+01	8.45E+01	9.27E+01	7.63E+01
53	1.80E+01	8.58E+01	9.40E+01	7.75E+01
54	1.95E+01	8.69E+01	9.52E+01	7.86E+01

ROANE LTC. ROCKWOOD, TENN. 10-12 FEB 1981 CONTRACT 1-618-019
RHO= 1.00 GM/CC

INTERVAL	DIAMETER	MEAN CHANGE IN MASS CONCENTRATION (MG/DNM3)	STANDARD DEVIATION (MG/DNM3)	UPPER CONFIDENCE LIMIT (MG/DNM3)	LOWER CONFIDENCE LIMIT (MG/DNM3)
1	2.50E-01	8.13E-02	6.75E-02	1.46E-01	1.62E-02
2	2.95E-01	1.52E-01	1.37E-01	2.84E-01	2.07E-02
3	3.47E-01	2.84E-01	2.65E-01	5.40E-01	2.80E-02
4	4.09E-01	5.15E-01	4.73E-01	9.72E-01	5.87E-02
5	4.83E-01	4.59E-01	3.68E-01	8.14E-01	1.04E-01
6	5.69E-01	1.27E+00	1.15E+00	2.23E+00	3.16E-01
7	6.71E-01	1.95E+00	1.62E+00	3.30E+00	6.02E-01
8	7.91E-01	2.68E+00	2.13E+00	4.46E+00	9.07E-01
9	9.32E-01	3.06E+00	2.33E+00	5.00E+00	1.12E+00
10	1.10E+00	2.93E+00	2.07E+00	4.65E+00	1.21E+00
11	1.29E+00	2.69E+00	1.84E+00	4.22E+00	1.16E+00
12	1.53E+00	2.42E+00	1.59E+00	3.75E+00	1.09E+00
13	1.80E+00	2.14E+00	1.33E+00	3.25E+00	1.03E+00
14	2.12E+00	1.99E+00	1.19E+00	2.98E+00	9.96E-01
15	2.50E+00	2.00E+00	1.29E+00	3.08E+00	9.22E-01
16	2.95E+00	2.16E+00	1.67E+00	3.55E+00	7.71E-01
17	3.47E+00	2.41E+00	2.06E+00	4.12E+00	6.92E-01
18	4.09E+00	2.62E+00	2.13E+00	4.39E+00	8.50E-01
19	4.83E+00	2.73E+00	1.97E+00	4.37E+00	1.08E+00
20	5.69E+00	2.71E+00	1.90E+00	4.29E+00	1.13E+00
21	6.71E+00	2.53E+00	1.85E+00	4.08E+00	9.94E-01
22	7.91E+00	2.32E+00	1.76E+00	3.79E+00	8.50E-01
23	9.32E+00	2.12E+00	1.67E+00	3.51E+00	7.31E-01
24	1.10E+01	1.95E+00	1.57E+00	3.25E+00	6.37E-01
25	1.29E+01	1.78E+00	1.47E+00	3.00E+00	5.56E-01
26	1.53E+01	1.61E+00	1.36E+00	2.75E+00	4.81E-01
27	1.80E+01	1.40E+00	1.12E+00	2.33E+00	4.69E-01

ROANE LTD. ROCKWOOD, TENN. 10-12 FEB 1981 CONTRACT 1-618-019
RHO= 1.00 GM/CC

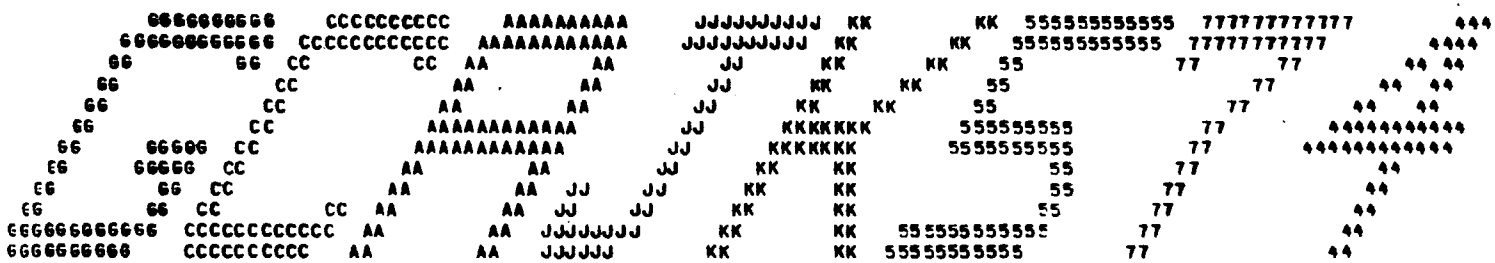
INTERVAL	DIAMETER	RECORDS EXCLUDED FROM MEAN CHANGE IN MASS CONTRATION
1	2.50E-01	2
2	2.95E-01	2
3	3.47E-01	2
4	4.09E-01	2
5	4.83E-01	10
6	5.69E-01	NONE
7	6.71E-01	NONE
8	7.91E-01	NONE
9	9.32E-01	NONE
10	1.10E+00	NONE
11	1.29E+00	NONE
12	1.53E+00	NONE
13	1.80E+00	NONE
14	2.12E+00	NONE
15	2.50E+00	NONE
16	2.95E+00	NONE
17	3.47E+00	NONE
18	4.09E+00	NONE
19	4.83E+00	NONE
20	5.69E+00	NONE
21	6.71E+00	NONE
22	7.91E+00	NONE
23	9.32E+00	NONE
24	1.10E+01	NONE
25	1.29E+01	NONE
26	1.53E+01	NONE
27	1.80E+01	NONE

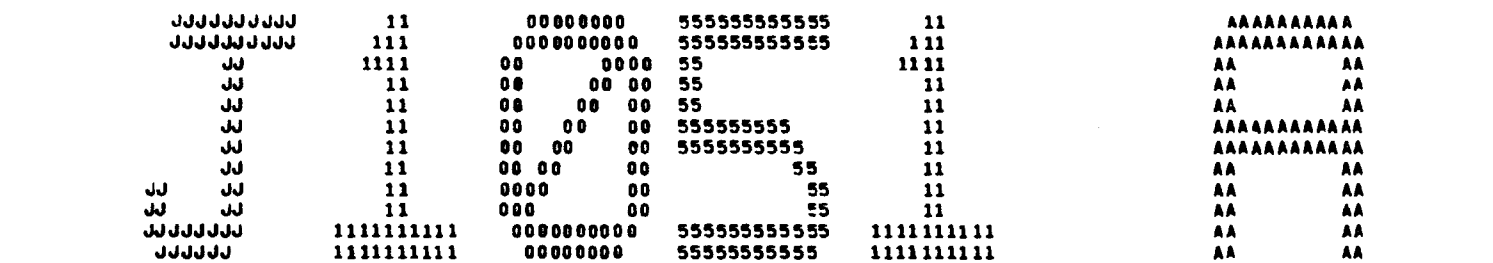
ROANE LTC. ROCKWOOD, TENN. 10-12 FEB 1981 CONTRACT 1-618-019
RHO= 1.00 GM/CC

INTERVAL	DIAMETER	MEAN CHANGE IN NUMBER CONCENTRATION (NO/DNM3)	STANDARD DEVIATION (NO/DNM3)	UPPER CONFIDENCE LIMIT (NO/DNM3)	LOWER CONFIDENCE LIMIT (NO/DNM3)
1	2.50E-01	9.94E+09	8.25E+09	1.79E+10	1.98E+09
2	2.95E-01	1.14E+10	1.02E+10	2.12E+10	1.55E+09
3	3.47E-01	1.29E+10	1.21E+10	2.46E+10	1.28E+09
4	4.09E-01	1.43E+10	1.32E+10	2.70E+10	1.63E+09
5	4.83E-01	7.79E+09	6.24E+09	1.38E+10	1.77E+09
6	5.69E-01	1.32E+10	1.19E+10	2.31E+10	3.28E+09
7	6.71E-01	1.24E+10	1.03E+10	2.09E+10	3.81E+09
8	7.91E-01	1.04E+10	8.24E+09	1.72E+10	3.51E+09
9	9.32E-01	7.22E+09	5.50E+09	1.18E+10	2.64E+09
10	1.10E+00	4.22E+09	2.98E+09	6.70E+09	1.74E+09
11	1.29E+00	2.37E+09	1.62E+09	3.72E+09	1.02E+09
12	1.53E+00	1.30E+09	8.56E+08	2.01E+09	5.87E+08
13	1.80E+00	7.00E+08	4.37E+08	1.06E+09	3.37E+08
14	2.12E+00	3.98E+08	2.38E+08	5.96E+08	1.99E+08
15	2.50E+00	2.44E+08	1.58E+08	3.76E+08	1.13E+08
16	2.95E+00	1.61E+08	1.24E+08	2.65E+08	5.76E+07
17	3.47E+00	1.10E+08	9.38E+07	1.88E+08	3.15E+07
18	4.09E+00	7.29E+07	5.91E+07	1.22E+08	2.37E+07
19	4.83E+00	4.63E+07	3.35E+07	7.42E+07	1.84E+07
20	5.69E+00	2.81E+07	1.97E+07	4.45E+07	1.17E+07
21	6.71E+00	1.60E+07	1.17E+07	2.58E+07	6.29E+06
22	7.91E+00	8.96E+06	6.82E+06	1.46E+07	3.29E+06
23	9.32E+00	5.01E+06	3.94E+06	8.29E+06	1.72E+06
24	1.10E+01	2.80E+06	2.26E+06	4.69E+06	9.17E+05
25	1.29E+01	1.56E+06	1.29E+06	2.64E+06	4.89E+05
26	1.53E+01	8.67E+05	7.30E+05	1.48E+06	2.58E+05
27	1.80E+01	4.59E+05	3.66E+05	7.64E+05	1.54E+05

ROANE LTC. ROCKWOOD, TENN. 10-12 FEB 1981 CONTRACT 1-618-019
RHO= 1.00 GM/CC

INTERVAL	DIAMETER	RECORDS EXCLUDED FROM MEAN CHANGE IN NUMBER CONCENTRATION
1	2.50E-01	2
2	2.95E-01	2
3	3.47E-01	2
4	4.09E-01	2
5	4.83E-01	10
6	5.69E-01	NONE
7	6.71E-01	NONE
8	7.91E-01	NONE
9	9.32E-01	NONE
10	1.10E+00	NONE
11	1.29E+00	NONE
12	1.53E+00	NONE
13	1.80E+00	NONE
14	2.12E+00	NONE
15	2.50E+00	NONE
16	2.95E+00	NONE
17	3.47E+00	NONE
18	4.09E+00	NONE
19	4.83E+00	NONE
20	5.69E+00	NONE
21	6.71E+00	NONE
22	7.91E+00	NONE
23	9.32E+00	NONE
24	1.10E+01	NONE
25	1.29E+01	NONE
26	1.53E+01	NONE
27	1.80E+01	NONE





APPENDIX E-1

CASCADE IMPACTOR FIELD DATA SHEETS

ANDERSEN IMPACTOR FIELD DATA

Plant ROANE Time 14:00 Nozzle Dia. 0.116

Location Rockwood TN Run No. I-1-A-102* Avg. ΔP 1.4

Operator Vay / Hobbs Impactor Location Inlet-A 102 Traverse Pt. A-102 *

Date 2/10/81 D.G.M. No. V2 Pb 29.00

Andersen Imp No. II D.G.M. Y _____ Static "Hg 5.1" H_2O

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	166	167	168	169	170	171	172	173	B135	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
877.996	0:0	0.11	38	42			
878.105	0:30	0.11	38	42	0.7		
878.29	1:00	0.11	38	42	0.7		
878.38	1:30	0.0	38	42	0.7		
878.517	2:00	0.0	38	42	0.7		
				* 102 = 92" into duct			

No visible leaks on filter

Initial leak check 0.014 ft^3/min @ 5+" Hg 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 Vane Time 0946 Nozzle Dia. 0.116 in.

Location Rockwood TN. Run No. I-1-A-16 Avg. ΔP 1.4" TS= 210

Operator Vay / Hobbs Impactor Location Inlet, A-16" Traverse Pt. A-16

Date 3/10/81 D.G.M. No. V2 Pb 29.00

Andersen Imp No. 2I D.G.M. Y ____ Static "Hg -5.1 "H_2O

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	150	151	152	153	154	155	156	157	B133	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
877.395	0	0.11	34	38			
877.41	0:30	0.11	33	38			
877.56	1:00	0.11	33	38			
877.67	1:30	0.11	33	38			
877.832	2:00	0.11	33	38			

Initial leak check 0.04 ft @ >5 "Hg, 1 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 Roane | Time 1625 | Nozzle Dia. 3.0 mm

Location Rockwood | Run No. I-90 B | Avg. ΔP ΔP=21.4

Operator Vay/Hobbs | Impactor Location 90 B | Traverse Pt. 90B

Date 2/10/87 | D.G.M. No. V2 | Pb 29.00

Andersen Imp No. 2I | D.G.M. Y ___ | Static "Hg -5.1

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	070	071	072	073	074	075	076	077	B123	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
900.296	0	0.11	37	40			
900.45	0:30	0.11	37	40	0.9		
900.56	1:00	0.11	37	40	0.9		
900.69	1:30	0.11	37	40	0.9		
900.827	2:00	0.11	37	40	0.9		

Initial leak check 0.014 ft^3/min @ 5" Hg

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 ROANE LIMITED Time 1115 Nozzle Dia. 3.0

Location ROCKWOOD, TN. Run No. 2IA16 Avg. ΔP 1.4

Operator Vaz/Hobbs Impactor Location INLET, A Traverse Pt. A-16

Date 2/11/81 D.G.M. No. V2 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.	222	223	224	225	226	227	228	229	B142	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. "Hg	Impactor Temp	Traverse Point
902.318	0:0	0.11	12	17	1.		
902.45	0:30	0.11	12	16	1.00		
902.57	1:00	0.11	12	16	1.00		
902.70	1:30	0.11	12	17	1.00		
902.824	2:00	0.11					

Initial leak check 0.014 ft^3/min @ 5" Hg

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 ROANE LIMITED Time 0959 Nozzle Dia. 0.

Location Rockwood, TN. Run No. 2-I-B-90 Avg. ΔP

Operator [illegible] Impactor Location Port B INLET Traverse Pt. 2I B 90

Date 2/11/81 D.G.M. No. Pb 29.60

Andersen Imp No. 2I D.G.M. Y Static "Hg -5.1"

Stage No.	0	1	2	3	4	5	6	7	F	I
Substrate No.	206	207	208	209	210	211	212	213	B-149	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice Δ.P. - "Hg	Impactor Temp	Traverse Point
901.693	0.0	2.11	16	19			
901.82	0:30	2.11	15	19	1.1		
902.05	1:00	2.11	15	20	1.1		
902.09	1:30	2.11	14	19			
902.215	2:00	2.11					

Initial Leak check 0.014 cfm @ 5" Hg 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 ROANE LIMITED Time 1:18 Nozzle Dia. 0.116 3Dmm

Location ROCKWOOD, TN. Run No. 2-I-B-16 Avg. ΔP 1.4

Operator Jerry Hobbs Impactor Location Traverse Pt. 2I B 16

Date 2/11/91 D.G.M. No. V2 Pb 29.6

Andersen Imp No. 1I D.G.M. Y Static "H_2 -5.1

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	086	087	088	089	090	091	092	093	B-125	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice ΔP "H_2	Impactor Temp	Traverse Point
901.099	0:00	0.11	19	20	1.0		
901.22	0:30	"	17	20	1.0		
901.34	1:00	"	16	20	1.0		
901.47	1:30	"	16	20	1.0		
901.613	2:00	"	16	21			

Initial leak check 0.01 ft^3 @ >5" Hg, 1 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 ROANE LIMITED Time around 2:30 pm. Nozzle Dia. 3.0mm=0.116"

Location ROCKWOOD, TN. Run No. 3I B #16 Avg. ΔP 1.4"

Operator Hobbs/Vg Impactor Location 2IB#16 3IB16 Traverse Pt. B #16

Date 2/11/81 D.G.M. No. V-2 Pb 29.60

Andersen Imp No. 12 D.G.M. Y Static "Hg -5.1"

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	230	231	232	233	234	235	236	237	B143	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice ΔP "Hg	Impactor Temp	Traverse Point
903.054	0	0.11	10	15	1.0		
903.18	030	0.11	10	15	1.0		
903.31	1:00	0.11	10	15	1.0		
903.441	1:30	0.11	10	15	1.0		
903.578	2:00	0.11	10	15	1.0		
	DNP						

Initial leak check 0.016 cfm @ 5" Hg

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 ROANE LIMITED Time 14:30 Nozzle Dia. 0.116

Location Rockwood, TN. Run No. S-I-A-16 Avg. ΔP 1.4

Operator W. H[illegible] Impactor Location Traverse Pt. A-16

Date 2/11/81 D.G.M. No. V2 Pb 29.6

Andersen Imp No. II D.G.M. Y Static "Hg -5.1

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	262	263	264	265	266	267	268	269	B147	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice [illegible] "Hg	Impactor Temp	Traverse Point
903.672	0	0.11	10	15			
903.79	0:26	0.11	10	15	1.1		
903.92	1:05	0.11	10	15	1.1		
904.05	1:30	0.11	10	15	1.1		
904.28	2:00	0.11					

Initial leak check 0.009 ft³ @ >5 "Hg ; 1 min. U-Gel initial

Final leak check U-Gel final

Total H_2O Collected in Flask Net

Total H_2O Collected

ANDERSEN IMPACTOR FIELD DATA

Plant ROANE LIMITED Time 16:10 Nozzle Dia. 0.116

Location ROCKWOOD, TN. Run No. 4 I A 90 Avg. ΔP 1.4

Operator VAY/HOBBS Impactor Location " Traverse Pt. A 90

Date 2/11/81 D.G.M. No. V2 Pb 29.60

Andersen Imp No. 2I D.G.M. Y Static "Hg -5.1

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	062	063	064	065	066	067	068	069	B-122	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
704.309	0:00	0.11	10	14			
704.43	0:30	0.1	9	13	1.1		
704.57	1:00	0.11	9	14	1.1		
704.69	1:30	0.1	9	14	1.1		
704.817	2:00	0.1					

Initial leak check 0.012 ft³/min @ 5" Hg

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 ROANE LIMITED Time 1635 Nozzle Dia. .116

Location ROCKWOOD, TN. Run No. 4IA90-2 Avg. ΔP 1.4

Operator [illegible] Impactor Location AT A90-2 Traverse Pt. A90

Date 2/11/81 D.G.M. No. U2 Pb 29.60

Andersen Imp No. I D.C.M. Y Static "H_2 -5.1

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	102	103	104	105	106	107	108	109	B127	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice ΔP "H_2	Impactor Temp	Traverse Point
904.879	0.0	0.11	10	13	1.0		
905.00	0:36	0.11	9	13	1.0		
905.14	1:07	0.11	9	14	1.0		
905.27	1:30	0.11	10	14	1.0		
905.404	2:03	0.11	10	14	1.0		

Second one, same front.

Initial leak check 0.006 cf/min @ 5" Hg

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 ROANE LIMITED Time 1710 Nozzle Dia. .116

Location ROCKWOOD, TN. Run No. 4-I-B-16 Avg. ΔP 1.4

Operator VAY/HOBBS Impactor Location I-B 16 Traverse Pt. B-16

Date 2/11/81 D.G.M. No. V2 Pb 29.60

Andersen Imp No. 2I D.G.M. Y Static "Hg -5.1

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	238	239	240	241	242	243	244	245	B-144	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice [illegible] "Hg	Impactor Temp	Traverse Point
905.474	0	~~[illegible]~~	9	14	~~[illegible]~~		
	0 30	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~	~~[illegible]~~		
	1:00		8				
	1:30						
	2:00						
905.625	0	0.11	9	14	1.2		
905.77	0 30	0.11	9	14	1.2		
905.90	1.00	0.11	9	14	1.2		
906.02	1 30	0.11	9	14	1.2		
906.153	2:00	0.11	8	14	1.2		
	0.15	ft drawn while nozzel was					
	taped	at every low flow rate					
	impactor	was removed ~~and~~ from duct and					
	tape	removed then run for 2 min					

Initial leak check 0.010 ft^3/min @ 5 Hg 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 ROANE LIMITED Time 17.50 Nozzle Dia. 0.116

Location ROCKWOOD, TN. Run No. 4E13GC Avg. ΔP 1.4

Operator Joel/Bobby Impactor Location IBGC Traverse Pt. 13.90

Date 2/11/91 D.G.M. No. V2 Pb 29.60

Andersen Imp No. 1 I D.G.M. Y Static "Hg -510"

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	214	215	216	217	218	219	220	221	8-14	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice [illegible] "Hg	Impactor Temp	Traverse Point
906.270	0:00	2.11	8	13	1.0		
906.35	0:30	0.11	8	13	0.8		
906.48	1:00	0.11	8	13	0.8		
906.61	1:30	0.11	8	13	0.8		
906.743	2:00	0.11	8	13	0.8		

Initial leak check 2.714 2 ± 2/min @ 5" Hg

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 ROANE LIMITED Time 13:37 Nozzle Dia. 2 FILTERS

Location ROCKWOOD, TN. Run No. 5-I-A-90 BLANK Avg. ΔP

Operator Jay Hobbs Impactor Location I-A-90 Traverse Pt.

Date 2/12/81 D.G.M. No. V2 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.	038	039	040	041	042	043	044	045	B119	

Blank run

BLANK RUN - INLET, 2 Prefilters

Dry Gas Meter Reading	Elapsed Time min	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice "Hg	Impactor Temp	Traverse Point
908.826	0	0.60	12	18	3.2		
910.01	2	0.60	12	17	4.6		
910.991	3:50	0.55	12	17	5.0		

Spots visible

possible leak around 2 filters preceding imp.

body tape could have leaked

Sent Part Size & C-Harris Blanks

Initial leak check 0.008 ft³/min @ 7.5" Hg 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 ROANE LIMITED Time ~~[illegible]~~ 12:43 Nozzle Dia. .116

Location ROCKWOOD, TN. Run No. 5-I-A-16 Avg. ΔP

Operator Vail / Hobbs Impactor Location I-A-16 Traverse Pt.

Date 3/12/81 D.G.M. No. V2 Pb

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

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	990	991	992	993	994	995	996	997	B-113	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
908.010	0	0.1	10	16	1.1		
908.14	0.30	0.11	10	16	1.1		
908.27	1.00	0.11	10	16	1.1		
908.40	1.30	0.11	10	16	1.2		
908.532	2.00	0.11	10	14	1.2		

Cyclone catch high due to dead bug caught in cup.

Initial leak check 0.012 cfm @ > 5 Hg

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 ROANE LIMITED Time 10:05 Nozzle Dia. 0.116

Location Rockwood, TN. Run No. 5-I-B-16 Avg. ΔP

Operator Vay/Hobbs Impactor Location I-B-16 Traverse Pt.

Date 2/12/81 D.G.M. No. V2 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.	078	079	080	081	082	083	084	085	B-129	

COPY

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice [illegible] "Hg	Impactor Temp	Traverse Point
906.822	0	0.11	2	8	1.05		
906.95	0:30	0.11	2	8	1.0		
907.08	1:00	0.11	2	8	1.0		
907.19	1:30	0.11	2	8	1.0		
907.318	2:00	0.11	2	8	1.0		

Initial leak check 0.012 ft^3/min @ 5" Hg

Final leak check

Total H_2O Collected in Flask

Total H_2O Collected

U-Gel initial

U-Gel final

Net

ANDERSEN IMPACTOR FIELD DATA

Plant ROANE LIMITED Time 11:25 Nozzle Dia. 0.116

Location ROCKWOOD, TN. Run No. 5-I-B-90 Avg. ΔP

Operator Vay/Hobbs Impactor Location I-B-90 Traverse Pt.

Date 2/12/81 D.G.M. No. V2 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.	030	031	032	033	034	035	036	037	B-118	

COPY

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice Δ P "Hg	Impactor Temp	Traverse Point
907.443	0	0.11	6	10	0.9		
907.57	0:30	0.11	6	10	0.9		
907.68	1:00	0.11	6	10	0.9		
907.79	1:30	0.11	6	10	0.9		
907.923	2:00	0.11	6	10	0.9		

Initial leak check 0.012 cf3/min @5" Hg 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 ROANE LIMITED Time 1125 Nozzle Dia. _____

Location ROCKWOOD, TN. Run No. 5IB-90 Avg. ΔP _____

Operator Vay / Hollis Impactor Location IB Traverse Pt. _____

Date 2/12/81 D.G.M. No. V2 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.	078	079	080	081	082	083	084	085	B-124	

original

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. "Hg	Impactor Temp	Traverse Point
901.443	0	0.11	6	10	0.9		
901.57	0:30	0.11	6	10	0.9		
901.68	1:00	0.11	6	10	0.9		
901.99	1:30	0.11	6	10	0.9		
902.123	2:00	0.11	6	10	0.9		

V.V. .79

this data sheet is mixed with the data sheet for 5I-B-90-2 I- impactor.

Initial leak check 0.02 34" min @ 5 Hg 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 ROANE LIMITED Time 10:45 Nozzle Dia. .316

Location ROCKWOOD, TN. Run No. 5-I-B-16 Avg. ΔP

Operator [illegible] Impactor Location – B Traverse Pt.

Date 2/12/91 D.G.M. No. [illegible] Pb

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

WICKS

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	030	031	032	033	034	035	036	037	B-118	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. – "Hg	Impactor Temp	Traverse Point
100.522	0	[illegible]	[illegible]	[illegible]	1.05		
106.95	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
[illegible].05	[illegible]	[illegible]	[illegible]	[illegible]	1.0		
107.19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
101.318	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		

Original

this data sheet was mixed with 5 I B 90 data sheet for 1 I impactor

NOTE: Nozzle was turned into flow approx. 10 sec. into run.

Initial leak check 0.02 ft³/min. @ 5" Hg 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 ROANE LIMITED Time 12:20 Nozzle Dia. .116

Location ROCKWOOD, TN. Run No. 6 I - A 90 Avg. ΔP

Operator Vay / Beaton Impactor Location I-A-90 Traverse Pt.

Date 2/12/81 D.G.M. No. V2 Pb

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

Stage No.	0	1	2	3	4	5	6	7	F	I
Substrate No.	134	135	136	137	138	139	140	141	8131	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
911.064	0 30	0.11	15	20	1.2		
911.20	1.00	0.11	15	20	1.2		
911.33	1.30	0.11	15	20	1.2		
911.46	2.00	0.11	15	20	1.2		
911.578		0.11	15	20	1.2		
	total time			2.0 Min			

Initial leak check 0.01 ft^3/min @ 5" Hg

Final leak check

Total H_2O Collected in Flask

Total H_2O Collected

Si-Gel initial

Si-Gel final

Net

0.10

142

ANDERSEN IMPACTOR FIELD DATA

Plant ROANE Limited Time 9:16 stopped 10? Nozzle Dia. 1L

Location Rockwood, TN Run No. 1-0-A (St. 145) Avg. ΔP <0.002

Operator K Meeks Impactor Location #8/5/4 Traverse Pt. Compared 8, 5, 4

Date 2-10-81 D.G.M. No. V3 Pb 29.75 to 29.60

Andersen Imp No. 460-A D.G.M. Y _____ Static "Hg + 0.10

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	142	143	144	145	146	147	148	149	B132	

V3

Stat D

C.A-460-A

Dry Gas Meter Reading	Elapsed Time		Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
724.727	0		0.10	88	88	0		
728.60	15		0.1	90	96	0		
732.500	30		0.1	96	100	0		(Sunrise 2 stat dwn)
733.8	34.6		0.1	96	100	0	(stop -	~~adjust~~)
736.52	45		0.1	98	106	0		
736.710	45.5		0.1	98	106	.01	(stop - Jet pulse)	
739.450	~~0~~ 558		0.1			stop- Furnace - stat dwn		
740.50	60		0.1	78	80	.01 switch to # 5		
744.40	75		0.1	88	82			
748.40	90		0.1	88	82			
750.10	96		0.1	88	82	stop- Furnace stat dwn (2:30)		
~~750.12~~	~~0~~	~~111~~						#5
754.70	15	111	0.1	88	82			
758.10	30	126	0.1	88	82			
758.80		129	0.1	84	82	(stop	Jet pulse)	
762.10	45	141	0.1	98	82			

Contd

Initial leak check 0.000

Final leak check ———

Total H_2O Collected in Flask ———

Total H_2O Collected ———

Si-Gel initial ———

Si-Gel final ———

Net ———

ANDERSEN IMPACTOR FIELD DATA

Contd from pg 81

Plant ROANE LIMITED Time _____ Nozzle Dia. _____

Location ROCKWOOD, TN. Run No. 10A Contd Avg. ΔP _____

Operator K. Mosesso Impactor Location 8/5/4 Traverse Pt. _____

Date 2/10/81 D.G.M. No. V3 Pb _____

Andersen Imp No. 460-A D.G.M. Y Static "H2O _____

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	142	143	141	144	146	147	145	149	132	

V3

Continuation

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice ΔP "H2O	Impactor Temp	Traverse Point
766.10	156/60	0.1	72	66	0		
769.91	171/75	0.1	72	66	0	switch to #8	
773.91	186/90		78	72	0		
775.560	192/96		end for 2/10/81				
2/11/81 775.565	0	0.1	52	46	0	start run 2/11/81	compos #4
779.80	15	0.1	52	46	0		
782.912	26.7	0.1	52	46	0	stop. Furnace shut down	
784.45	30	0.1	50	42	0		
788.72	45	0.1	80	42	0		
792.30	60	0.1	50	46	0		
796.60	75	0.1	52	48	0		
800.150	90	0.1	58	54			
~~796.250~~	96						
801.542							
			#3 filter rotated 5°, on #2 screen observed by filter.			25% of holes	

Initial leak check _____ Pre-Cal Initial _____

Final leak check _____ Pre-Cal Final _____

Total H_2O Collected in Flask _____ Net _____

Total H_2O Collected _____

(9,11 coupled and run down)

ANDERSEN IMPACTOR FIELD DATA

Plant ROANE 4D | Time 9:16 | Nozzle Dia. 2L

Location ROCKWOOD TN | Run No. 1-0-B | Avg. ΔP <0.002

Operator K Meserve | Impactor Location (on) 7/6 | Traverse Pt. 7/6/9

Date 2/10/81 | D.G.M. No. V4 | Pb 29.75 - 29.60

Andersen Imp No. 4B | D.G.M. Y | Static "Hg +0.10

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	110	111	112	113	114	115	116	117	[illegible]	[illegible]

Box # V4

Impactor # 4B

0-128

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
691.542	0	0.10	90	88			
695.70	15	0.1	98	98	.4		
699.30	30	0.1	100	100	"		(Furnace shut down)
700.50	34.1	0.1	100	100	"	Stop - [illegible]	
702.00	39.7	0.1	100	100	"	stop - Jet pulse	
706.16	~~555~~	0.1	"	"		stop - Furnace shut down	
707.35	60	0.1	82	72	.4		
711.83	75	0.1	94	92	.4		
714.50	90	0.0	94	92	.4		complete 1 pt 6
716.400	96	0.1	90	92	.4		
721.01	111	0.10	92	90	.4		
724.16	126	0.1	88	84	.4		
726.40	~~131~~/134	0.1	88	84	.4	shut down -	Jet pulse
728.02	141	0.1	78	74	.4		
732.10	156	0.1	78	74	.4		
735.65	171	0.1	78	74	.4		

Initial leak check 0.01

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 ROANE LIMITED Time _____ Nozzle Dia. _____

Location ROCKWOOD, TN. Run No. 1-0-B cont'd Avg. ΔP _____

Operator K Moore Impactor Location 7/6/9 Traverse Pt. _____

Date 2/10/81 D.G.M. No. _____ Pb _____

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

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	110	111	112	113	114	115	116	117	3W	

V4

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice [illegible] "Hg	Impactor Temp	Traverse Point
[illegible]/397.1	186	0.10	80	80	.5		
741.045	192		end 80	2/10/81			
2/11/81 741.052	0	0.1	52	52	.5		#9
745.10	15	0.1	52	52	.5		
748.330	26.7	0.1	52	52	.5	(Shift down - Forward Shift off)	
749.80	30	0.1	50	46	.5		
753.85	45	0.1	50	46	.5		
758.10	60	0.1	50	48	.5		
762.60	75	0.1	50	48	.5		
766.30	90	0.1	58	56	.5		
768.257	96						

Initial leak check _____ f-Gel initial _____

Final leak check _____ Si Gel final _____

Total H_2O Collected in Flask _____ Net _____

Total H_2O Collected _____

ANDERSEN IMPACTOR FIELD DATA

Plant ROANE LIMITED Time 2:00 Nozzle Dia. 1L

Location ROCKWOOD TN. Run No. 2-0-A Avg. ΔP <0.002

Operator K MESERVE Impactor Location 3/2/1 Traverse Pt.

Date 2/11/81 D.G.M. No. V3 Pb 29.60

Andersen Imp No. ~~1698~~ 1698 D.G.M. Y Static "H2O +0.10

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	127	127	128	129	130	131	132	133	B130	

comparison #3

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice Δp "H2O	Impactor Temp	Traverse Point
80.615	0	0.19	56	46	.5		
807.82	15	0.19	52	40	.5		
813.61	30	0.19	42	40	.5		
814.63	34.7	0.14	42	40	stop - Furnace shut down.		
818.60	45	0.19	42	40			
823.1	60	0.14	42	40			
824.40	62.4	0.14	42	40	stop Furnace shut down.		
829.16	75	0.19	48	38			
834.17	90	0.19	47	37	stop - Furnace down		
836.305	96						
836.312	0	0.19	44	36	0.6		#2
843.74	~~15~~ 20	0.19	44	36	0.6		
847.30	30	0.14	44	36	0.6		
852.60	45	"	"	"	"		
857.81	60	"	"	"	"		
862.078	~~75~~ 74.7	"	"	"	"	stop - Furnace down	

Initial leak check Pi-Col initial

Final leak check Pi-Col final

Total H_2O Collected in Flask Net

Total H_2O Collected

ANDERSEN IMPACTOR FIELD DATA

Plant ROANE LIMITED Time 12:00 Nozzle Dia. 1.1

Location ROCKWOOD TN. Run No. 2-0-A Avg. ΔP <0.002

Operator KMESERVE Impactor Location 3/2/1 Traverse Pt.

Date 2-11-81 D.G.M. No. V3 Pb 29.60

Andersen Imp No. 460A D.G.M. Y Static "Hg +0.10

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	~~127~~	~~128~~	~~129~~	~~130~~	~~131~~	~~132~~	~~133~~	~~134~~	~~B130~~	

126 127 128 129 130 131 132 133 B130

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice [illegible] "Hg	Impactor Temp	Traverse Point
868.32	90	0.19	42	36	.6		
870.796	96						
870.796	0	0.14	42	36	.6		#1
872.91	15	"	36	30	"		
874.6	30	"	"	"			
876.81	45	"	28	32	"		
879.21	60	"	"	"	"		
881.6	75	"	"	"	"		
903.7	83.4	"	"	"	"	Start down - Forward 1/2	
103.5	90	"	"	"	"		
905.240	96	"	"	"			

Filter Shifted, looks on first filter - one side of filter bad indication (Fuzzed)

filter 133 - only 50% covered w/ spots

Initial leak check

Final leak check

Total H_2O Collected in Flask

Total H_2O Collected

Final initial

Final final

Net

ANDERSEN IMPACTOR FIELD DATA

Plant ROANE LIMITED Time 12 Nozzle Dia. 2L

Location ROCKWOOD TN. Run No. 2nd B Avg. ΔP <0.002

Operator KMESERVE Impactor Location 10/11/2 Traverse Pt.

Date 2/11/81 D.G.M. No. V4 Pb 29.60

Andersen Imp No. #48 D.G.M. Y Static "H$_2$O +0.10

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	246	247	248	249	250	251	252	253	8145	

#48

#10

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H$_2$O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice ΔP "H$_2$O	Impactor Temp	Traverse Point
709.154	0	0.19	60	52	0.7		
774.48	15	0.19	52	50	0.7		
780.71	30	0.19	48	48	0.7		
781.600	34.2	0.19	48	48	0.7	stop- Pump shut down	
785.5	45	0.19	48	48	0.7		
791.594	62.2	0.19	48	42	0.7	stop- Pump shut down	
796.10	75	0.19	48	44	0.7		
801.15	90	0.19	46	42	0.7	stop - Pump down	
803.435	96						
803.457	0	0.19	44	44	0.7		#11
811.1	~~15~~ 20	0.19	44	44	0.7		
814.40	30	0.19	44	44	0.7		
819.84	45	"	"	"	"		
824.77	60	"	"	"	"		
82.993	~~75~~ 74.3	"	"	"	"		
835.40	90	"	"	"	"		

Initial leak check

Final leak check

Total H_2O Collected in Flask

Total H_2O Collected

(Particulate-look OK good loading)

Si-Gel initial

Si-Gel final

Net

ANDERSEN IMPACTOR FIELD DATA

Plant ROANE LIMITED Time 12 Nozzle Dia.

Location ROCKWOOD, TN. Run No. 10/11/12 Avg. ΔP

Operator KMESERVE Impactor Location Traverse Pt.

Date 2-11-81 D.G.M. No. V4

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

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.										

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice [illegible] "Hg	Impactor Temp	Traverse Point
837.620	96	0.19	44	42	0.7		
837.620	0	.19	44	42	0.7		#12
8438	15	"	30	30	0.7		
848.40	30	"	"	"	"		
853.61	45	"	30	28	"		
858.95	60	"	28	26	"		
864.15	75	"	"	"	"		
867.2	~~90~~ 82.4	"	"	"	"		stop - furnace shut down
870.00	~~96~~ 90	"	"	"	"		
871.632	96						

Initial leak check Pitot initial

Final leak check Pitot final

Total H_2O Collected in Flask Net

Total H_2O Collected

ANDERSEN IMPACTOR FIELD DATA

Plant ROANE LIMITED Time 9:45 Nozzle Dia. ?L

Location ROCKWOOD, TN. Run No. 3-0-A Avg. ΔP

Operator KYLE SOLLY Impactor Location 11 Traverse Pt.

Date 2/28 D.G.M. No. V4 Pb

Andersen Imp No. 4601A D.G.M. Y Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	054	055	056	057	058	059	060	061	B121	

V4

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice [illegible] "Hg	Impactor Temp	Traverse Point
871.751	0	0.19	60	57	.5		
877.64	15	0.19	60	56	.5		
881.83	~~30~~ 28.4	0.19	"	"	5 hg.	Furnace shut down	
887.55	45	0.19	64	60	.5		
893.15	60	0.19	60	60	.5		
898.30	75	"	"	"	.5		
903.20	90	"	"	"	"		
906.521	96	"	"	"	"		
906.51	0	"	"	"	"		
910.645	~~45~~ 14.9	"	"	"	"		
~~921.35~~	30	0.19			"		
921.35	45	0.19	68	74	"		
926.50	60	0.19	"	"	"		
931.90	75	0.19	"	"	"		
937.55	90	"	"	"	"		
939.348	96	"	"	"	"		

#11

#10

Initial leak check .008 [illegible] Pi-Gel initial

Final leak check Pi-Gel final

Total H_2O Collected in Flask Net

Total H_2O Collected

ANDERSEN IMPACTOR FIELD DATA

Plant ROANE LIMITED Time 150 Nozzle Dia. ?L

Location ROCKWOOD, TN. Run No. 3-0-A Avg. ΔP

Operator KMESFAR Impactor Location 11/10/9 Traverse Pt.

Date 2-12-81 D.G.M. No. V4 Pb

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

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	054	055	056	057	058	059	060	061	B121	

#9

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice [illegible] "Hg	Impactor Temp	Traverse Point
949.348	0	0.19	66	60	0.6		
~~944.54~~	15	0.19	58	50			
950.200	30	0.19	58	50			
955.41	45	0.19	48	40			
961.25	60	0.19	"	"			
964.07	~~70~~	0.19	"	"			
971.38	90	"	"	"			
973.110	96						

Initial leak check

Final leak check

Total H_2O Collected in Flask

Total H_2O Collected

[illegible]-Gel initial

[illegible]-Gel final

Net

ANDERSEN IMPACTOR FIELD DATA

Plant ROANE LIMITED Time 9:45 Nozzle Dia. ? L

Location ROCKWOOD, TN. Run No. 3-0-B Avg. ΔP

Operator K Moore Impactor Location 2/3/4 Traverse Pt.

Date 2-12-81 D.G.M. No. V3 Ph

Andersen Imp No. 40 D.G.M. Y Static "Hg

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	94	95	96	97	98	~~99~~	100	101	B626	

V3

(compartment #2)

Dry Gas Meter Reading	Elapsed Time	Orifice ΔH "H_2O	Meter temperature Inlet	Meter temperature Outlet	Orifice [illegible] "Hg	Impactor Temp	Traverse Point
905.440	0	0.19	57	57	0.6		
911.500	15	0.19	57	57	0.6		
915.73	~~30~~ 26.4	0.19	"	"	0.6	stop - furnace off	
921.600	45	0.19	54	60	0.6		
927.51	60	0.19	51	60			
932.80	75	0.19	"	"	"		
937.90	90	"	"	"	"		
939.950	96	"	"	"	"		
939.950	0						
945.251	15						
	30						
955.90	45	0.19	60	64	0.6		
958.755	52.9					shut down - furnace off	
961.11	60	"	"	"	"		
966.62	75	"	"	"	"		
97220	90	"	"	"	"		

Initial leak check 0.00 [illegible] initial

Final leak check [illegible] final

Total H_2O Collected in Flask Net

Total H_2O Collected

ANDERSEN IMPACTOR FIELD DATA

Plant ROANE LIMITED Time _____ Nozzle Dia. ? L

Location ROCKWOOD, TN. Run No. 3-0-B Avg. ΔP _____

Operator _____ Impactor Location 2/3/4 Traverse Pt. _____

Date 2-12-81 D.G.M. No. V3 Pb _____

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

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	94	95	96	97	98	99	100	101	B126	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice [illegible] "Hg	Impactor Temp	Traverse Point
974.100	96	0.19	58	48			
974.100	0		"	"			
979.50	15		40	50			
994.75	30		40	50			
989.4	45		44	36			
995.2	60		"	"			
999.021	70		"	"			
0063	90		"	"			
008.174	96						

Initial Leak check _____ Vac. Initial _____

Final Leak check _____ Vac. Final _____

Total H_2O Collected in Flask _____ Net _____

Total H_2O Collected _____

ANDERSEN IMPACTOR FIELD DATA

Plant ROANE LIMITED Time [redacted] 1610 Nozzle Dia. _____

Location ROCKWOOD, TN. Run No. outlet Blanks ΔP _____

Operator _____ Impactor Location #2 Traverse Pt. _____

Date 2/10/81 D.G.M. No. V3 Pb _____

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

Stage No.	0	1	2	3	4	5	6	7	F	T
Substrate No.	046	047	048	049	050	051	052	053	B-120	

Dry Gas Meter Reading	Elapsed Time	Orifice Δh "H_2O	Meter Temperature Inlet	Meter Temperature Outlet	Orifice S.P. - "Hg	Impactor Temp	Traverse Point
~~911.882~~	~~0~~		~~22~~	~~32~~	~~2.5~~		
008.217	0	1.0	36	42	4.0		
016.64	10	1.0	36	43	4.2		
025.33	20	1.0	37	44	4.4		
033.90	30	1.0	38	45	4.6		
042.73	40	1.0	38	46	4.65		
051.57	50	1.0	38	46	4.65		
060.369	60	1.0	40	46	4.7		

Initial leak check ~~0.004~~ 0.010 cf+3/min @ >5 "Hg T-Gel Initial _____

Final leak check _____ T-Gel Final _____

Total H_2O Collected in Flask _____ Net _____

Total H_2O Collected _____

APPENDIX E-2

VISIBLE EMISSION OBSERVER FIELD DATA SHEETS

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

VISIBLE EMISSION OBSERVATION FORM

Page 1 of 4

Date 2/11/81

Company Name Roane Electric Fce. Co.

Observer Sandra Beaton

Location Rockwood, TN

U.S. EPA Region

Source: BAGHOUSE ROOF MONITOR

Source Height:	075 ft
Distance from Source:	~ 300 ft
Direction from Source:	W
Wind Direction: WSW	Speed: 0-5 mph
Background(s) Used: (1)	
(2)	(3)
Colors of Background(s): (1)	
(2)	(3)
Color of Emissions: (1)	
(2)	(3)
Ambient Temperature:	20 °F
Relative Humidity: <50% ☒	>50% ☐
Reading Conditions: EX ☐ GD ☒ FR ☐ PR ☐	

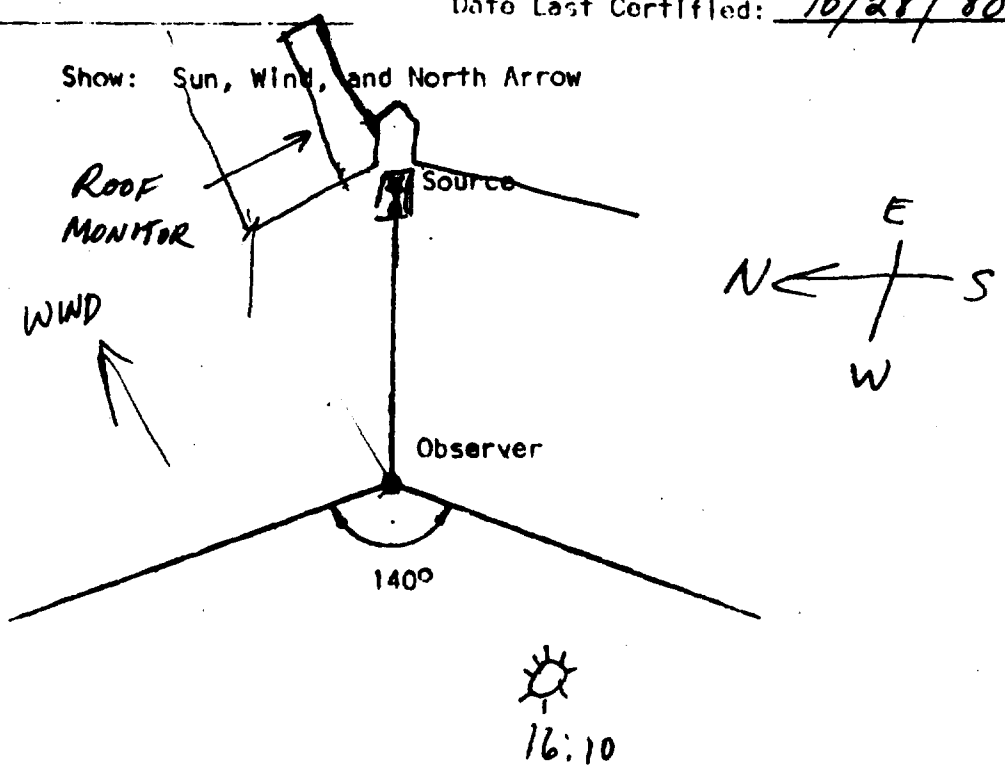
Comments: (Include Contacts)

Observation Point: ON A SMALL HILL IN FRONT OF COAL PILES

Signature: Sandra Beaton

Date Last Certified: 10/28/80

Show: Sun, Wind, and North Arrow



GCA

COMPANY: ROANE ELECTRIC ELEC Co
LOCATION: ROCKWOOD, TN.

OBSERVER: S. Beaton
DATE: 2/11/81

CAST:

Time (M)	0	15	30	45	Proc.	Loca.	Color
0							
1							
2							
3							
4							
5							
6							
7							
8							
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			

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	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: 50% cloudy

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

COMPANY: Roane Electric Fce. Co.
LOCATION: Rockwood, TN

OBSERVER: S. Beaton
DATE: 2/11/81

CAST:

Time (M)	0	15	30	45	Proc.	Loca.	Color
17 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			

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	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	5	5	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.

COMPANY: Roane Electric Fce. Co.
LOCATION: Rockwood, TN.
OBSERVER: S. Beaton
DATE: 2/11/81

~~CAST:~~

Time (M)	0	15	30	45	Proc.	Loca.	Color
18 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							
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							
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 2/12/81

Company Name Roane Electric Fce. Co.

Observer Sandra Beaton

Location Rockwood, TN.

U.S. EPA Region

Source: Furnace Bldg. Roof Monitors

Source Height:	~ 75 ft
Distance from Source:	~ 200 ft
Direction from Source:	ESE
Wind Direction: NE	Speed: 0-5 mph
Background(s) Used: (1)	Sky
(2)	(3)
Colors of Background(s): (1)	Blue
(2)	(3)
Color of Emissions: (1)	Red.
(2)	(3)
Ambient Temperature:	10 - 15 ° °F
Relative Humidity: <50% ☒	>50% ☐
Reading Conditions: EX ☒ GD ☐ FR ☐ PR ☐	

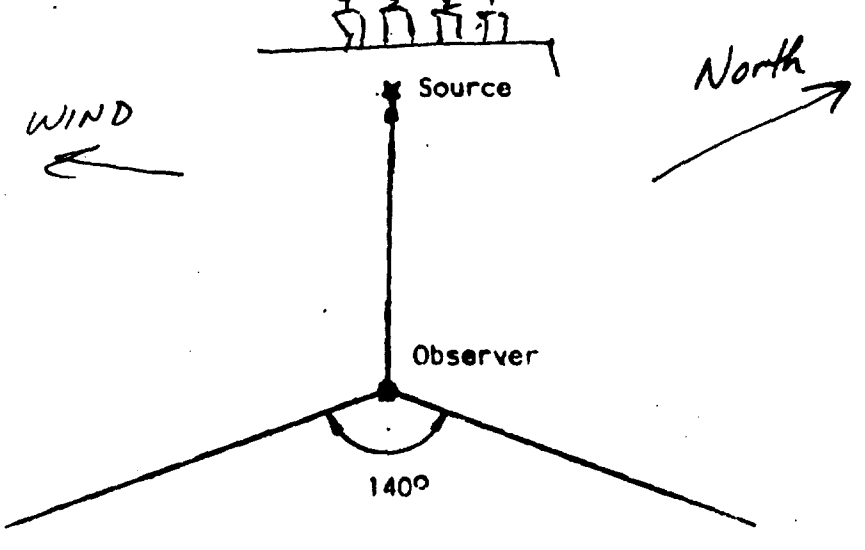
Comments: (Include Contacts)

Observation Point: on ground in front of a baghouse

Signature: Sandra Beaton

Date Last Certified: 10/28/80

Show: Sun, Wind, and North Arrow



9:30

GCA

COMPANY: Roane Electric Fdg. Co
LOCATION: Rockwood, T.N.

OBSERVER: Sandra Beaton
DATE: 2/12/81

~~CAST:~~

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							
36							
37							
38							
39							
40							
41							
42							
9 43			5	5			
44	5	5	10	10		3	Red.
45	15	15	5	10			
46	10	10	5	5			
47	5	5	5	5			
48	5	15	15	10			
49	25	10	15	20			
50	20	15	15	10			
51	5	5	5	5			
52	5	5	15	25			
53	25	5	15	20			
54	15	5	10	10			
55	10	15	5	10			
56	5	5	5	5			
57	5	5	5	5			
58	5	0	0	0			
59	0	0	5	5			

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.

COMPANY: Roane Electric Fce. Co

LOCATION: Rockwood, TN

OBSERVER: S. Beaton

DATE: 2/12/81

~~EAST:~~

Time (M)	0	15	30	45	Proc.	Loca.	Color
10 0	5	10	10	5		3	Red
1	5	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			

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	5	5	5		3	Red.
39	5	5	10	5		3	
40	10	5	5	0		3	
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	5	5	5		3	Red.
49	5	5	5	5			
50	5	5	5	5			
51	5	5	5	5			
52	5	10	15	10		2+3	Red.
53	5	5	5	5		3	
54	5	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.

GCA

COMPANY: Roane Electric Fcg. Co.
LOCATION: Rockwood, TN

OBSERVER: S. Beaton 4/4
DATE: 2/12/81

~~CAST:~~

Time (M)	0	15	30	45	Proc.	Loca.	Color
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			

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	5	5		3	Red
38	5	5	5	5			
39	5	0	0	0			
40	0	0	0	0			
41	0	0	0	0			
42	0	0	0	0			
43	0	0	0	0			
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.

1.

open

#4

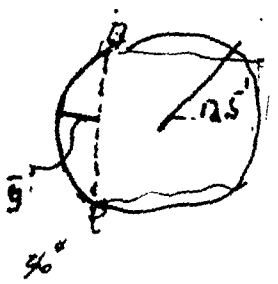
41" x 20'

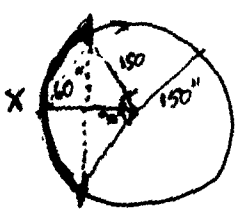
43" x 163"

41 x 240 = 1840 in² ①

195
43
58 5
780

= 8385 in² ②





x = 36" = ③

#3

41" x 20' } 19,680 in²
41" x 20' }

plus ③ from above

144 sq"
1 sq ft

APPENDIX E-3

PROCESS OBSERVER FIELD DATA SHEETS

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Roane Limited, Rockwood, TN
EPA Contract No. 68-02-3157 Technical Directive 009

OBSERVER: Sandra Boator + Tom Epstein
DATE: 2/11/81

CONTROL ROOM DATA

Time	9:15	9:52	10:42	11:15	11:57	12:30	13:05	13:30
FCO 3								
Total MW	28688.6	28718.9	DOWN	28767.9	28804.8	28834.6	28862.6	28880.4
MWH	49.8	80.0	↓	23.7	60.6	90.5	7.8	25.5
Chart MW	10.4	10.4	↓	10.3	10.2	10.3	10.4	0
FCO 4								
Total MW	84853.5	84881.9	84923.8	84950.4	84985.9	85010.0	85036.6	85053.4
MWH	13.9	42.3	83.8	110.4	27.0	50.9	77.2	94.3
MW CHART	9.7	10.2	9.6	9.6	10.5	10.2	10.0	9.50

GCA/TECHNOLOGY DIVISION

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INHALABLE PARTICULATE [illegible] SAMPLING PROGRAM
Roane Limited, Rockwood, TN
EPA Contract No. 68-02-[illegible] Technical Directive 009

OBSERVER: Tom Epstein
DATE: 2/11/81

CONTROL ROOM DATA

Time	1400	1430	1502	1537	1600	1630	1702	1730	1803
Fce 3									
Total MW	28907.6	28932.4	28957.0	DOWN	28967.3	28992.9	29018.1	29043.6	29071.8
MWH	52.8	77.6	102.2	↓	2.7	28.3	53.5	79.1	107.4
CHART	10.4	10.8	10.2	↓	10.5	10.4	10.5	10.6	10.6
Fce 4.									
Total MW	85078.5	85101.6	85126.0	85154.6	85171.8	85196.1	85219.3	85244.0	85269.3
MWH	12.0	35.2	59.6	88.2	1.6	26.0	49.2	73.9	99.0
CHART	0/8.5	9.6	9.8	9.9	10.0	10.1	10.5	10.6	9.9

GCA TECHNOLOGY DIVISION

5.3-B

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Roane Limited, Rockwood, TN
EPA Contract No. 68-02-3157 Technical Directive 009

CONTROL ROOM DATA

OBSERVER: TEpstein
DATE: 2/12/81

Time	0937	1000	1030	1100	1130	1200	1232	1300
FCE3 total MW	29,865.8	29,885.6	29,912.3	29,939.1	29,962.4	29,987.0	30014.2	30,038.1
MWH	39.8	59.0	85.8	1.9	~~25.0~~ 25.0	50.7	76.8	100.8
Chart ~~Rot~~	10.4	10.4	10.4	10.4	10.5	10.5	10.4	10.1
FCE4 total MW	85,993.2	86011.9	~~86030.6~~ 86030.6	86,035.6	86056.6	86081.1	86108.3	86,129.9
MWH	74.1	92.8	99	14.8	35.9	60.3	87.6	10.2
Chart	10.5	10.5	10.0	0 (down)	9.8	10.1	9.7	9.9

GCA TECHNOLOGY DIVISION

16 C 0 C-B

INHALABLE FARTICULATE FIELD SAMPLING PROGRAM
Roane Limited, Rockwood, TN
EPA Contract No. 68-02-3157 **Technical Directive** 009

OBSERVER: TEpstein
DATE: 2/12/81

CONTROL ROOM DATA

1401 ~~1430~~

Time	1330	1401 ~~30088.7~~ ~~30,088.7~~	1430	1500	1532	1600	1630	1700	1715
#3 FCE total MW	30063.9	30088.7 ~~41.2~~	30114.4	30139.6	30167.7	30,192.4	30216.3	30,244.4	30258.0
mwH	16.3	41.2 ~~10.3~~	66.8	92.0	3.0	27.5	53.7	79.8	93.5
chart	10.4	10.3 ~~86174.5~~	10.3	10.2	10.2	10.5	9.9	10.4	10.4
#4 FCE total MW	86154.2	86179.5 ~~59.8~~	86203.6	86226.7	86241.7	86265.8	86290.1	86314.5	86327.1
mwH	34.4	59.8 ~~9.7~~	83.9	3.0	18.0	42.1	66.4	90.8	6.5
chart	10.0	9.7	10.0	9.6	10.2	10.4	9.7	9.5	9.6

GCA/TECHNOLOGY DIVISION

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Roane Limited, Rockwood, TN
EPA CONTRACT No. 68-02-3157 Technical Directive 009

OBSERVER: S. Beaton
DATE: 2/11/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
0915	fce 3+4 Smelting	9:15 →		3 Total MW 28688.6 4 Total MW - 84853.5
				3 MWH 49.8 4 MWH - 13.9
				3 Chart 10.4 4 Chart - 9.7
0930-35				testing w/ I-P train.
9:49	MINOR BLOW	FCE 3		
10:00				testing at Inlet.
10:07	- Burning the taphole out	H/RED		With O2 lance - Fce 3.
10:10	← TAPPING		<50	VHE/Red - along runner + ladle <50% Capture of Tapping Emissions
10:16	STOKING Fce 4.			
10:18	END STOKING			
10:22	PLUGGING Fce 4.	end -	→ LE.	
10:29	SHUT DOWN Fce 3.			To SLIP ELECTRODE

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
Roane Limited, Rockwood, TN
EPA CONTRACT No. 68-02-3157 Technical Directive 009

OBSERVER: S. Beaton
PROCESS DATA DATE: 2/11/81

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
10:30	STOKING FCE. 3.			≥ 1 to 2.0 mins.
10.53	Power BACK ON FCE 3			
1055	O_2 Lance; Taphole	Fce. 4 H/Red	60%	there a flaze that exters from furnace. ≈ 6 ft., in progress ≥ 2.0 mins.
	11	VH/Red	<50% → at time	
1106	Tapping	ON No. 4.		
11:23	END TAPPING	No 4		
11:24	small blow	Fce. 4.		
11:26	STOKING	Fce. 4.		
11:37	Fce. 4 off for 10 secs.			power dropped down to 8.0.
11:39	HARD BLOW	Fce. 3		
11:50	power dipped again ≥ 5 secs.			
11:52	power dipped again.			

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
Roane Limited, Rockwood, TN
EPA CONTRACT No. 68-02-3157 Technical Directive 009

OBSERVER: S. Beaton
DATE: 2/11/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
12:27:30	Fce. 4 DOWN			
12:30:30	Fce Back on.			
12:40	TAPPING FCE. 3.			
12:55	END TAPPING			
12:58	Both fces Down			
13:00	fces back on line.			
13:16	MINOR BLOW Fce. 4.			
13:10	STOKING Fce. 4			
13:11	end stoking			
13:25	TAPPING Fce 4.			
13:28	Fce 3 DOWN			
13:30	Fce 3 Back on			

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
Roane Limited, Rockwood, TN
EPA CONTRACT No. 68-02-3157 Technical Directive 009

OBSERVER: T Epstein
PROCESS DATA DATE: 2/11/81

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
1343	plugging PCR. #4	Fairly significant amount of fume from carbon plug being pulled into furnace		
1346	staking Fce #4	(about 2 min)		
1400	FCE 4 down for 30 sec			
1406:45	staking #4 for 30sec.			
1447:30	tapping #3	VH orange red emissions 20-60% at level of control room	50% (initially lower)	50% capture / hitherto very heavy refers to low emissions characteristic of most of the tap period.
1457	FCE 3 down for 2 min.			computer shut it down due to excess power, usage.
1504:30	FCE 3 down			slipping electrodes one electrode failed to slip for some time
1508:50	plugging and tapping			
1536	tapping #4	moderate white emissions mostly from holes	60% capture	
1551:30	restart #3			
1555	end tapping			
1557	Furnace 4 down for slipping			

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

5 of 7 C

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Roane Limited, Rockwood, TN
EPA CONTRACT No. 68-02-3157 Technical Directive 009

OBSERVER: T Epsten
DATE: 2/11/91

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
1559	restart #4			
1607	light blow on #4			
1610:30	stoking #4			
1610	one mix chute on fce 3 jamked and not feeding mix to electrode then there is a little extra fume coming from one electrode area			
1612:15	end #4 stoking			
1612:30	Stoking #3			
1613:45	1610 problem corrected, #3			
1614	end, stoking, #3			
1649:50	Furnace 4 down 30 sec.			
1650:30	stoking #3			
1651:15	end stoking 3			
1651:25	stoking #4, 1 min 30 sec			

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

687c

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Roane Limited, Rockwood, TN
EPA CONTRACT No. 68-02-3157 Technical Directive 009

OBSERVER: Tepstein
DATE: 2/11/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
1657	both furnaces down, first of when 3 is number			computer lock-out
1700:10	both furnaces restarted			
1703	removed blockage on one of the #3 furnace chutes			
1736	light hard blow on #3			
1738:00	stoking #4 1 min			
1739:15	stoking #3 1 min 15 sec			end of hard blow, #3
1745	stoking #3 30 sec			
1745	tapping #3	heavy orange red emissions	70%	used hammer, then O_2 lance
1748	tapping #4	moderate while emitting	60%	used hammer (heavy orange emissions from 1st ladle, 10% capture
1752	continue tapping, #3	heavy orange red emissions from 1st ladle	5%	heavy emissions when metal first flowed into 1st ladle.
1756	heavy blow on #3			
1758:10	#4 furnace down			

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

1

191C

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Roane Limited, Rockwood, TN
EPA CONTRACT No. 68-02-3157 Technical Directive 009

OBSERVER: T Epstein
DATE: 2/11/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
1754 1:20	stoking #3, ended heavy blow			
1800:00	#4 restarted			
1806:05	#4 stopped, only 15sec			
1807	end tappings, #4			
1812	end tappings, #3			

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

180

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Roane Limited, Rockwood, TN
EPA CONTRACT No. 68-02-3157 Technical Directive 009

OBSERVER: T Epstein
PROCESS DATA
DATE: 2/12/81

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
0935 ~~0936~~	both furnaces running normally			
0953	tapping #4	moderate white emissions	60%	bulk of emissions are from the ladle
1009	end tapping			
1010:30	FCE 4 down for electrode slip.			
1013:00	restart FCE #4			
1016	casting in front of #3	moderate white VE's		exiting from monitor over #3 furnace also drifting through shop
1021	end casting			
1016	FCE 4 down			computer lockout
1021:30	FCE 4 back on			
1033	tapping #3	moderate heavy when metal first flows	50%	O_2 lance, emissions drifting through shop; ladle emissions moderate; 11 min. till Hot metal flow
1036	FCE #4 down, water leak			
1057	end tapping, #3			

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

296 D

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Roane Limited, Rockwood, TN
EPA CONTRACT No. 68-02-3157 Technical Directive 009

OBSERVER: T Epstein
DATE: 2/12/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
1058	light blow #3			
1102 3	Casting #3 metal in front of #2			emissions drifting through shop toward the [redacted] north
1105	FCE #4 back on			
1109	emissions leaking from laphole	moderate	80%	repaired 6 min. later.
1110	stoking #3 30 sec.			
1111	FCE #3 down for slip			
1113:45	FCE #3 back up.			
1117	light blow #4			
1120	light blow #4			
1133	light blow #3			
1227	FCE #3 down			computer lockout
12:30:00	FCE #3 back up.			

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

3g6D

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Roane Limited, Rockwood, TN
EPA CONTRACT No. 68-02-3157 Technical Directive 009

OBSERVER: T Epstein
DATE: 2/12/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
1232	tapping, #4	moderate	~~50%~~ 70%	
1245	end tapping, #4			Note: 1 choke on #3 is clogged due to freezing conditions, unclogged ~ 1330
1245	tapping, #3	moderate to heavy	40-60%	O_2 lance emissions drifting north through shop
1251	metal flow, #3			
1245	hard blow, #3			
1254	moderate blow, #3			
1307	end tapping #3			
1310	Furnace #3 down			1st plug did not hold
1311	Furn. #3 back up			replussed.
1319	hard blow on #3			
1326	hard blow on #3			
1333	stoking # 4 1 min.			

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
Roane Limited, Rockwood, TN
EPA CONTRACT No. 68-02-3157 Technical Directive 009

OBSERVER: T Epstein
DATE: 2/12/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
1348	hard blow #3			
1351	hard blow #3			
1358:20	#3 down			computer lockout
1400:00	#3 back up			
1412	moderate blow, #3			
1439	tapping #4	light to moderate	75% of taphole emissions	hammer moderate hood emissions
1441	light blow, #3 30 sec.			
1454:40	end tap, #4			
1458	moderate blow, #3			
1502	tapping #3	moderate-heavy during O_2 lancing	25%-50% capture	hammer, then O_2 lance 5 min. till metal flow moderate hood emissions during throat slop
1508:00	Furnace #4 shut down			slipping electrodes
1509:30	staking #4			clearing a pathway to the electrode.

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

5960

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Roane Limited, Rockwood, TN
EPA CONTRACT No. 68-02-3157 Technical Directive 009

OBSERVER: T Epstein
DATE: 2/12/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
1513:20	~~stoking~~ #3			
1522:~~00~~	restart #4			
1527:30	end, tapping #3			
~~1534~~	~~3 other #3~~			
1547:45	stoking #3 30sec			knocked closed mix pipe.
1551:30	hard blow on #3			
1554	~~tight~~ blow heavy on #4			
1600:00	#4 shut down, 20 sec			computer lockout
1601	heavy blow, #3			
1604	stoking #3 20sec.			
1609	hard blow, #3			used stoking cart to * force back down, 3 min
1614	hard blow #3			same as above

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

6 y 6 D

FUGITIVE PARTICULATE FIELD SAMPLING PROGRAM
Roane Limited, Rockwood, TN
EPA CONTRACT No. 68-02-3157 Technical Directive 009

OBSERVER: T Rpstein
DATE: 2/12/81

PROCESS DATA

Time	Process	Magnitude of Emissions	Percent Capture By Hood	Comments
1621	hard blow, #3			excessive flaming 1 minute,
1629	heavy blow, #4			
1634	heavy blow, #3			used stoking car, 30 sec
1639	heavy blow, #3			" " " , 20 sec
1644	heavy blow, #3			
1652:20	tapping #4	moderate	50%	O_2 lance dirt on tip of runner fell into stream, metal flow, 2 min 20 sec moving sparks and heavy emissions
1705:10	tapping #3			hammer metal flow 40 sec.
1706	end tapping, #4	moderate	70%	moderate light emissions drifting north through shop
1710	heavy blow, #3			Note- heavy blows due to the mix "hanging up"; not calling properly through the furnace (possibly cold metal)?

LE = Light emissions; 5 to 25 percent opacity

ME = Moderate emissions; 30 to 60 percent opacity

HE = Heavy emissions; 65 to 100 percent opacity

Pg. 143E

Test 7 & 8

ROANE

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM

~~Interlake Inc., ALAMET, Selma, AL~~

EPA Contract No. 68-02-3157, Technical Directive 008

Recorder BAGHOUSE DATA RUN 1 AM

OBSERVER: GRONBERG

DATE: 2/10/81

Time	Comp OFF for Cleaning	Temp °F	Pressure "H_2O	Gauge Pressure "H_2O	FAN AMB.			
0920	#1/0	180 ~~150~~	7.7 ~~6.8~~	6.8	265	FCE's unstable & shut down.		
0945	#3	190	8.0	7.5	265	TEST STOPPED	ABOUT 1000	→
1415	#3	180	7.2	7.2	265	RESTART TEST @ 1400	TEMP STOP @	140
1507	2	170	7.2	7.0	265			
1555	12	170	7.6	7.0	270			
Run 2 - Comp 9 & 4 limit, 2/11/81						all Comps on.		
0940	#-3	165	6.2	6.2	265	Note - Lost Pin Baghouse about 1030		
1035	#2	155	6.5	7.0	265			
1130	2	168	6.6	6.7	260			
1210	11	170	6.4	~~7.0~~ 7.0	260			

GCA/TECHNOLOGY DIVISION

2 of 3 E

ROANE

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM

~~Interlake Inc., ALAMET, Selma, AL~~

EPA Contract No. 68-02-3157, Technical Directive 008

OBSERVER: GRANBERG

DATE: 2/11/81

BAGHOUSE DATA Run 3

Time	Comp off for clean	Temp °F	Press recorder "H2O	Press gauge "H2O	Fan Amps	Comments		
1330		155	5.6	6.2	270			
1410	#9	170	5.6	6.5	265			
1500	#9	120	4.5	4.5	265	— #3 down, not tested.		
2/12/81								
1055	#4	125	6.2	5.8	265			
1130	none	118	6.8	6.8	265			
13:55	#1	183	8.5	8.1	268			
1620	10	185	8.5	8.5	270			

GCA/TECHNOLOGY DIVISION

393 E

INHALABLE PARTICULATE FIELD SAMPLING PROGRAM
Roane Limited, Rockwood, TN
EPA Contract No. 68-02-3157 Technical Directive 009

OBSERVER: Joe Vay
DATE: 2/12/81

BAGHOUSE DATA

Time	12	11	10	9	8	7	4	
10.50	~~2.1~~	2.4	5.2	1.6	X	2.2	6	
	~~-3.3~~	-3.3	-2.8	-3.2	X	-3.7	6	
ΔH =		5.7	6.0	4.8		5.9		
	6	5	3	2	1			
	1.8	2.5	2.8	2	1.3			
	-2.5	-3.3	-3	-2.1	-1.4			
ΔH =	4.3	5.8	5.8	4.1	2.7			

GCA TECHNOLOGY DIVISION

APPENDIX E-4

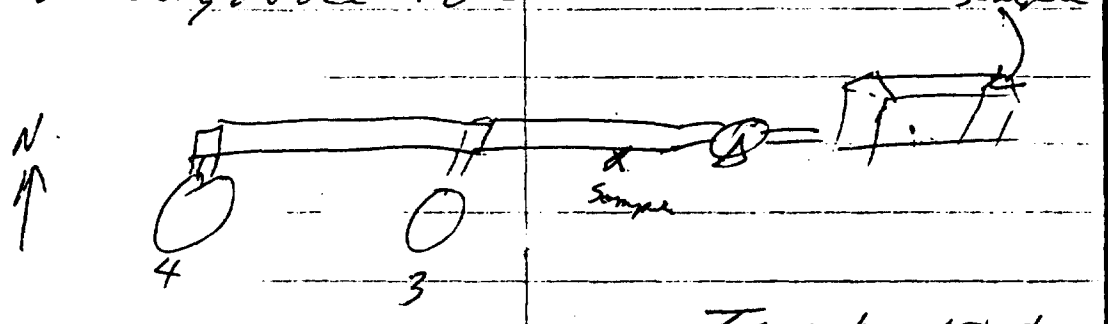
PROCESS OBSERVER DATA SHEETS BY RTI

Roane Ltd, Rockwood Tn 2/9/81

P.O. Box 298

Rockwood, TN 37854

Fce 3 + 4 feeding into common duct to bag house 162



Tap at a 10 pt

10 MW fce

Prebaked electrodes

Typical mix order

Batches/shift 95

Material	Wt. /batch	
Moma Two'n	730	High iron Mn ore
Wessels	200	Mn ore low Fe
B.W. Coke	220	
Ala gravel	30	
Broken Hill	70	Mn ore low Fe
Std ferro	20	Fe-Mn
Std smelts	500	

Typical Metal Analysis

C Si Mn Fe

Slag typical Analysis

Be careful of Megawatt meter readings! it looks like there a multiplying factor

111 Divide Meter Reading by 5 (five)

Last digit of MW H is tenths - I didn't put in decimal pt usually

2/10/81 Boone

at 8:13 Am

Fce 3 275610 mwh Total

65,8 MW point

Fce 4

838324 mwh Total

75,6 MW points

Fce 3 10.3 MW operating chart

Fce 4 10.4 MW " "

9:07

Fce 3 27561,3 total

10,3 MW OPTS

Fce 4 838969.3 total

9,2 MW 4.7 pts

Fce 4 had a boil over @ 9:03 Am

But fce stable now

Test start @ 9:14 Am

Stop 9:15 Baghouse fan stop

Staking fce #4 at 9:15

Stop Staking at 9:17

(3) Baghouse Back on - Caused by losing radio in baghouse control room

2/10/81

9:19 A fce #4 at 10 mw
electrodes near lower limit - may have to
slip electrode takes ~ 5 minutes
water leak on fce #4 - moderate

9:22

fce 3 2754.0 total
10.4 mw 13.6 pts
fce 4 8385.0 total
10.0 mw 17.3 pts
top gas temp fce #3 220°F
top gas temp meter #4 not working
fume or fume capture 100%

	Fce #4	Mix order
	11-7 (grave yard shift	7-3
	120 trips at	115
MAMA TWAN	mona twon 730	730
WESSELS	wesalle 200	200
Buckwheat coke	BW coke 220	220
Alabama Gravel	Ala gravel 30	30
Broken Hill	Broken Hill 70	70
standard (Fe mn) Fines	Std fines 20	20
standard (Fe mn) remelts	STD remelts 50	50

1

~~Ice #2~~ 2/10

Coiler Ice #2

11-7 shift power

at 11 pm 3394.12 ← operator misread meter should be 3412.4

at 7 AM 3377.72

Slag analysis 17.5% MnO

31.4 % SiO_2

32.67 CaO

6.45 MgO

from operator log

Ice #3

Mix order ~~#~~

11-7		7-3
140 trips at		105
mana + WAN	730	730
Wessels	200	200
Bin coke	210	210
Blue gum	~~200~~ 30	30
Brakpan Hill	70	70
STD fine	20	20
STD remelt	50	50

Power

at 11 pm 27045.0

at 7 pm 27457.9

fce #3 Slag
15.3 % MnO, 32.24 SiO_2, 34.75 CaO
7.36 MgO

9:46 A
fce #3 27595.4 total
10.4 mW 35.0 pts
top gas 210°F
fce #4 Cap Center chute on fce #3 9:47
Shorted cause no charge infeeding

9:47A fce #4
@ 39029 total
10.2 mW 38.3 pts

fce #4 Shut down at 9:51 testing
Stopped
9:55 resume fce operation resumed test
at 9:57

fce #3 10:01
27608.3 total
10.4 mW 47.9 pts

fce #4

10:02 @ 39/2.7 tab

9.2 MW 45.1 pts

10.03 Manually trying to free up mix chute on #3

fce #4 8.6 mw at 10:05 steady have disconnect power because electrode holder too close to mix + can't get more electrode in. Will slip electrode when tap

fce 4 9 mw at 10:05

9.6 MW at 10:14

Staking of 10:16 @ 10.4 MW

power on fce 4 erratic during staking

8.5 → 10 mw cycling

furnace #3 shut down 10:17 AM

testing stopped

fce #4 also go down - boil over

fce down from ~11 til 11:45 for repair of water leak + electrode slip

by 12:30 both fce running good called test crew and advised return to plant

Tap fce 4 at 1:42 pm

2/10

2:05 pm

Fce 3 — 27762.3 total mwh
10.4 MW — 89.2 PTS

Fce 4 — 840574 Total mwh
8.5 MW — 106.0 PTS
fce 4 steel Tapping flume capture 60% light flume

→ 2:09

2:07 pm Stoking fce 4
Tap closed on fce 4 at 2:03 Tapt 4-7
Tap opened on fce 3 at 2:10
Tap flume collecting @ 60 %

2:15 pm
fce 3 10.4 MW — 27776.3
fce 4 9 MW — 840696

2:26 fce 4 shut down to
manually stoke electrode #2 (slip electrode)

2:30
fce 3 — 27788.2 total
10.3 MW — 115.4 PTS

(3)

2:30 fce 4 $4076.8 total
0 MW 18.2 PTS
furnace #3 shutdown at 2:31
to slip electrode
#3 plugged 2:33 & back on
power on to #4 at 2:44
coal slopping on fce 3 at 2:46
#3 back on at 2:47
Both furnaces running smoothly
3100 psm # samples started
Fce 3 27811/2 total
10.4 MW 21.7 pts
Fce 4 $40890 total
9.2 MW 30.5 pts

These are normal occurances

at 3:01:38 short blow on fce 3 (one electrode)
last about 10 sec. Mix fell in and it restabilized
short blow on #3 3:04:20 lasted 15 sec
3:09-3:11 stoking on fce #3
also short blow on one electrode ~20 sec
3:12-3:14 stoking # 4 (right)
3:17 short blow fce 3 last about 2 min
3:28:44 right blow on fce 3 last 40 sec

2/10

3:32

Fce #3 27339.2 Total
10.4 mW 50.0 pts

Fce #4 84113.4 Total
9.0 mW 54.9 pts

3:41 light low on fce 4 last about 30 sec

3:42 Staking fce #4

Hand blow on fce 3 at 3:43 (knee)

Stake fce #3 at 3:44 – 3:45

at 3:45

fce 4 9.3 mw

fce 3 10.3 mW

fce #4 Kick off at 3:47 – wear off about 10 sec – Quick operator response

4:08 pm

Fce 3 27963 Total
10.3 mW 76.1 pts

Fce 4 84136.4 Total
9.0 mW 78 pts

4:18 Tap open on fce 4

4:22 Tap open on fce 3

4:30

Jar 4 — 84157.9 Total

8.2 mW — 99.4 pts

Jar 3 — 27891.0 Total

10.2 mW — 101.7 pts

Roane 2/11/81

7 AM Operation Readings

Fce 3 28568.4 Total

Fce 4 8488034 Total

Fce 4 down at 7:46

Start back at 9:02

Tapping Schedule

4 - 1	11:05 pm	3 - 1	11:55
- 2	1:15 A	2	2:00 A
- 3	3:20	3	3:55
- 4	5:20	4	5:57
- 5	7:30	5	8:08
- 6	11:10	6	10:10
7	1:30	7	12:40
~~- 7~~ 8	3:27	8	2:50

Down time #3

6:12 Am → 6:18 Slip 1φ7", 2φ8", 3φ7"

8:30 → 8:38 Slip 2φ9, 3φ8

10:31 → 10:55 Slip 1φ10, 2φ6

Mix order

11-7 | 7-3

125 Batches | 110

Mama Thea 730 →
Wessels 200 →
BW Cable 220 →
Ala 30 →
Bunker Hill 70 →
Std Perm 20 →
Std Ronelts 50 →

Same mix order on #4
11-7 shift 105 mixes, 7-3 130 mixes

Slag/metal ratio roughly 1.06

For 2/10/81
Fce #3

Shift	Si	Mn	Mn ~~SiO2~~	SiO2 ~~CaO~~ ~~MgO~~ MgO	B
11-7	16	78.80	15.20	32.28	
7-3	16	78.80	21.50	33.76	
3-11	.79	77.60	19.70	34.96	
Avg		18.18 ~~15.50~~	33.67	30.14	2.06 1.10
2/11					
11-7	.34	78.50 (13)	17.80	33.08	

Check process sheets

1.

2/11/81

fce #4

2/10/81

	Si	Mn	Mn	SiO_2	CaO	MgO	B
11-7	15	78.70	1450	3012			
~~3~~-3	15	7830	24.00	2740			
3-11	.09	77.40	26.30	29.60			
Avg 2/11			23.27	29.04	28.60	6.96	1.22
11-7	.24	76.70	22.40	30.88			

at 2:23

fce 4 85096.2 Mwh Total

9.2 MW 29.9 pts

at 2:26

fce 3 28928.9

9.6 MW 74.1 pts

Logged in by operator at about 3:00 pm

Shift change reading

fce 3 28950.9

fce 4 85220

Both fce are 25' dia 8' deep

at 6:15 pm

Fce 4 85278.8 9.8 MW

Fce 3 29051.7 total 10.2 MW

(14)

93 minutes out time on pce 3
between 8:30 Am and 6:15 pm

7 minutes out time on pce 4 between
3:59 and 6:15 26 minutes out time between
7:46 and 9:02 (AM)

from operator log

Boone
pce 4
7-3

Boone 2/12/51

11:00 pm (11-7)

fee 4 ~~7 AM~~ Operator reading

855119

7-3 (7:00) 858596

Mix order on fee 4

11-7		7-3
10⅝ batches	(105)	16
Magma Tan	730	3650
Cresols	200	1000
BW Cake	210	1050
AHA gravel	20	100
Speaker Hill	70	350
3/4 fines	20	100
STA results	50	250

fee 3 11-7 reading for 11 pm

29315.0

7-3 for 7 AM 29735.7

On fee 3 Mix order same on 3/4 except BW Cake was 220

fed 135 batches on 11-7 shift

1

7-3 shift fee 3

	Baldwin 3	end 14
Mama Tuna	3650	3650
Weasels	1000	1000
BW Cake	1100	1050 ✓
Alagnard	150	100 ✓
Baker Hill	350	350
Std Lenin	100	100
Std Venetta	250	250

9:53 Top opened on fee 4 at 954

10:10 Shut down #4 to slip electrode

10:13 Start #4 back up.

fee #4 down at 10:17 for ~~2 min~~ (Kicked off) computer lockout

fee #4 back on at 10:22

10:32

fee 3 299317 total

10.3 MW 57.2 pts

fee 4 860320 total

9.7 MW 11.3 pts

Top fee 3 at 10:33

fee 4 Shut down at 10:37 - repair water leak

1

11:05 reading

fce 3 — 29739.3

10.3 MW — 1.6 pts

fce 4 (down) — 86035.6

0 MW — 14.6 pts

fce #4 Back on at 11:05

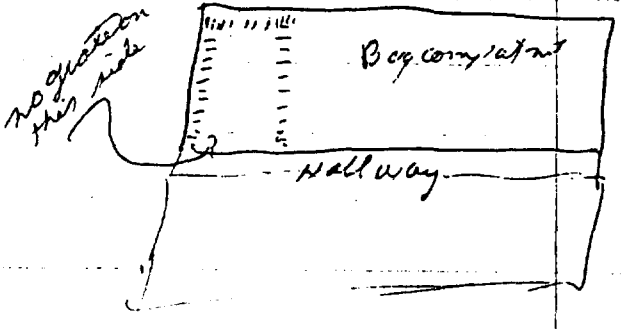
fce 3 off at 11:13 (electrode slip)

fce 3 back on at 11:15

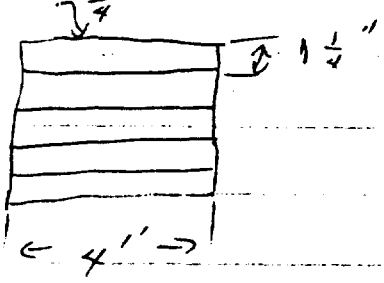
Sampling has been stopped since 10:27

Sampling to restart at 11:20

grates inside lower compartment of doghouse - Grates on three sides



grates are 17" wide made of $\frac{1}{4}$" x 1" stock spaced $1\frac{1}{4}$" apart in one direction + 4" cross in the other



(18)

Electrodes are 3.5" diameter

12:03 One minute on #3 jombed
operator freed it up - a little
extra flame but not much

12:10 readings
fce 3 29948.0 total
10.2 MW 60.7 pts
fce-4 86090.0 total
9.5 MW 69.3 pts

Very hard blow on #3 at 12:46
last about 1 minute

Rained on Tuesday (2/10)
Snowed on Wendsday (2/11)
Very cold (10-20°F) on 2/12
Mix frozen on 2/12

2/12/57

3:00 pm Reading

fce 3 30/39.5

10.0 MW 92.0 pts

fce 4 86-26.4 Tabl

9.5 MW 2.6 pts

Total down time from 9:05 till 3 pm on fce 3 9 minutes

Total down time on fce 4 from 9:03 am till 3 pm 41 minutes

Tap schedule

Fce 4		Fce 3	
Time	Tap no	Time	Tap no
7:45	4-4	8:28	3-5
9:55	4-5	10:45	3-6
12:30	4-6	12:55	3-7
2:40	4-7	3:08	3-8

Fce 4 shutdown at 3:10
for electrode slip
Back on at 3:22
(plant record 14 min down)

12 minute down time

APPENDIX E-5

DUAL CYCLONE SAMPLER FIELD DATA SHEETS

Cyclone

IP ~~IMPACTOR~~ FIELD DATA

Plant Name ROANE | Nozzle # 3.5mm | Diameter 3.5mm

Location Rockwood | Av. ΔP 1.4" | Stack T 200

Date 2/10/81 | Barom P 29.00 | Static P -5.1"

Operator Hobb / Vaughn | Start Time 14:57 | Meter # V2 Y =

IP Sampler # TDL-34 | Impactor Location 16"-B

Run No. 16"-B1 | % Moisture 2 | Leak Check 0.002 ft^3/mn @ 5" Hg

Filter # C-22 | X Part. Bottle# | III Part. Bottle#

DGM Reading	Elapsed Time	Orifice Δh("H2O)	Meter Temperature Inlet	Meter Temperature Outlet	Orifice SP-"Hg	Comments
878.575	0:00	0.22	37	40	0,85	
882.70	10:00	0.22	38	41	1.10	
885.56	20.00	0.22	37	41	1.50	
889.20	30:00	0.22	37	41	1.85	
892.69	40:00	0.22	38	40	2.2	
896.29	50	0,22	37	40	2.7	
900.064	60:40	0.22	37	40	2.9	
21.489						

III cyclone body was tipped during recovery

backup filter was heavily coated

III cyclone was loose. ~½ gram. per cup

#3

IP IMPACTOR FIELD DATA

Plant Name Ronne Ltr | Nozzle # 4.0 rm | Diameter 0.157

Location Rockwood Tenn | Av. ΔP 1.04" | Stack T 200°F

Date 2-11-81 | Barom P 29.6 | Static P -5.1

Operator Sue B | Start Time 1:20 pm | Meter # V1 Y =

IP Sampler # TDL-35 | Impactor Location Port B 75" (24 min) then pulled to 16"

Check → Run No. 3-75"-16" | % Moisture 2 | Leak Check <0.01

Filter # NOT USED | X Part. Bottle# | III Part. Bottle#

DGM Reading	Elapsed Time	Orifice Δh("H2O)	Meter Temperature		Orifice SP-"Hg	Comments
			Inlet	Outlet		
260.435	0	0.60	60	54	.80	75"
263.05	4	0.60	63	54	.80	75"
264.53	8	0.60	64	54	.80	75"
265.285	12	0.60	64	54	.80	SHUTOFF - #3 down 1:30 pm
265.285	12	0.60	64	54	.80	START UP 1:33 pm
266.62	16	0.60	64	54	.80	75"
268.59	20	0.60	64	54	.80	75"
270.54	24	0.60	64	54	.80	75"
272.48	28	0.60	64	54	.90	16"
274.43	32	0.60	63	54	.90	16"
276.40	36	0.60	62	54	.90	16"
278.33	40	0.60	63	53	.90	16"
280.60	44	0.60	64	54	.90	16"
282.25	48	0.60	64	54	.90	16"
283.823	51	0.60	64	54	.90	16"
283.823	0	0.60	64	54	1.00	75" START 2:13 PM
285.55	4	0.60	64	54	1.00	75"
287.50	8	0.60	65	55	1.00	75"
289.42	12	0.60	65	55	1.00	75"
291.35	16	0.60	65	55	1.00	75"
293.29	20	0.60	66	55	1.00	75"

Port B ↓ Port A

IP IMPACTOR FIELD DATA

Plant Name Rome LH Nozzle # 40 Diameter 0.157

Location Rockwood Tenn Av. ΔP Stack T 200°F

Date 2-11-81 Barom P Static P -5.1

Operator Sue B Start Time Meter # V1 Y =

IP Sample # Impactor Location Port A 75"(24min) 16"(24min)

Run No. 3-75"-16" % Moisture 2 Leak Check <0.01

Filter # no filter X Part. Bottle# III Part. Bottle#

DGM Reading	Elapsed Time	Orifice Δh("H_2O)	Meter Temperature		Orifice SP-"Hg	Comments
			Inlet	Outlet		
295.21	24	0.60	65	55	1.00	75" Port A
297.13	28	0.60	65	55	1.00	16"
299.08	32	0.60	64	55	1.00	16"
301.09	36	0.60	64	55	1.00	16"
302.90	40	0.60	64	55	1.00	16"
X 304.85	44	0.60	64	55	1.00	16"
306.79	48	0.60	64	55	1.00	16" STOP 2:57
306.79	[redacted] 48					16" START 303 pm
308.652	52	0.60	64	55	1.00	16"
308.652	0	0.60	58	57	1.00	75" START 4:08 Port A
310.58	4	0.60	58	56	1.00	75"
312.50	8	0.60	59	56	1.00	75"
314.39	12	0.60	60	57	1.00	75"
316.28	16	0.60	60	57	1.00	75"
318.18	20	0.60	60	57	1.00	75"
320.04	24	0.60	60	57	1.00	75"
321.95	28	0.60	61	57	1.00	16"
323.90	32	0.60	62	56	1.00	16"
325.71	36	0.60	62	56	1.00	16"
327.61	40	0.60	63	56	1.10	16"
329.50	44	0.60	64	56	1.10	16"

IP IMPACTOR FIELD DATA

Plant Name Reno CH Nozzle # _____ Diameter 0.157

Location Rockwood Tenn Av. ΔP _____ Stack T 200°F

Date 2-11-81 Parom P _____ Static P -5.1

Operator Sue B Start Time _____ Meter # _____ Y = _____

IP Sampler # _____ Impactor Location Port A 75"ε16" Port B 75"ε16"

Run No. 3-75"-16" % Moisture 2 Leak Check <0.01

Filter # _____ X Part. Bottle# _____ III Part. Bottle# _____

DGM Reading	Elapsed Time	Orifice Δh("H2O)	Meter Temperature		Orifice SP-"Hg	Comments
			Inlet	Outlet		
331.38	48	0.60	65	57	1.10	16"
333.49	52	0.60	65	57	1.10	16"
333.49	0	0.60	64	58	1.10	75" start time -5:04
335.17	4	0.60	63	58	1.00	75"
337.14	8	0.60	63	57	1.00	75"
339.13	12	0.60	64	57	1.05	75"
341.10	16	0.60	64	57	1.10	75"
343.09	20	0.60	64	57	1.10	75"
345.10	24	0.60	64	58	1.10	75"
347.04	28	0.60	65	58	1.00	16"
349.02	32	0.60	65	58	1.00	16"
351.02	36	0.60	65	58	1.05	16"
353.00	40	0.60	66	58	1.05	16"
354.97	44	0.60	67	58	1.10	16"
356.93	48	0.60	66	58	1.10	16"
359.328	52	0.60	66	60	1.10	16"

Port A

Port B

IP IMPACTOR FIELD DATA

Plant Name Roane LH | Nozzle # 4.0mm | Diameter 0.138"

Location Rockwood Tenn | Av. ΔP 1.4" H2O | Stack T 200

Date 2-12-81 | Barom P | Static P -5.1"

Operator Sue B | Start Time 10:16 AM | Meter # V1 Y =

IP Sampler # TDL-35 | Impactor Location Port B (75"/24min)(16"/24min)

Run No. 4-75"-16" | % Moisture | Leak Check 0.13 cub ft >5"Hg

Filter # no A/H | X Part. Bottle# | III Part. Bottle#

Dial Reading	Elapsed Time	Orifice Δh("H2O)	Meter Temperature Inlet	Meter Temperature Outlet	Orifice SP-"Hg	Comments
359.701	→				→	Pump run too early- ½ cubic ft ran before start time (warm up period)
360.343	0	0.60	42	26	0.80	START TIME → 10:16AM Port B 75" STOP → 10:17AM
361.544	[redacted]					RUN 1 min furnace down RESTART TIME → 10:25AM
361.544	1[redacted]	0.60	42	26	0.80	75"
363.52	4	0.60	50	28	0.80	75"
364.91	8	0.60	50	28	0.80	75"
366.80	12	0.60	53	28	0.80	75" SHUT 10:37 furnace down
367.412	13[redacted] STOP	0.60	53	28	0.80	75"
367.412	[redacted] 13 START	0.60	53	28	0.80	75" RE START → 11:25AM
368.89	16[redacted]	0.60	62	48	0.80	75"
371.10	20	0.60	62	48	0.80	75"
372.91	24	0.60	60	48	0.80	75"
374.81	[redacted]28	0.60	60	48	0.80	16"
376.81	32	0.60	60	48	0.80	16"
378.71	[redacted]36	0.60	61	48	0.80	16"
380.61	40	0.60	62	48	0.80	16"
382.51	44	0.60	64	48	0.80	16"
384.41	48	0.60	65	48	0.80	16"
386.920	52	0.60	67	48	0.80	16"

Port B

IP IMPACTOR FIELD DATA

Plant Name Roane Ltt Nozzle # _____ Diameter _____

Location Rockwood Tenn Av. ΔP _____ Stack T _____

Date 2-12-81 Barom P _____ Static P _____

Operator Sue B Start Time 12:06 pm Meter # V1 Y = _____

IP Sampler # _____ Impactor Location Port A (75"/24min)(16"/24min)

Run No. 4-75"-16" % Moisture _____ Leak Check 0.13 cub ft >5" Hg

Filter # no Filter X Part. Bottle# _____ III Part. Bottle# _____

DGM Reading	Elapsed Time	Orifice Δh("H2O)	Meter Temperature		Orifice SP-"Hg	Comments
			Inlet	Outlet		
386.920	0	0.60	67	49	1.00	75" START TIME 1206pm PORT A
388.91	4	0.60	68	49	0.80	75"
390.81	8	0.60	68	49	0.80	75"
392.71	12	0.60	68	49	0.80	75"
394.60	16	0.60	70	50	0.90	75"
396.51	20	0.60	70	50	0.90	75"
398.364	24 STOP	0.60	70	50	0.90	75" SHUT DOWN 1232pm
398.364	28 START	0.60	70	54	1.00	16" START UP 1232pm
400.21	28	0.60	70	56	1.00	16" SAMPLER TURNED
402.05	32	0.60	70	56	0.90	16" AWAY FROM FLOW
403.92	36	0.60	69	57	0.90	16"
405.81	40	0.60	70	58	0.90	16"
407.70	44	0.60	70	57	0.90	16"
409.57	48	0.60	70	58	0.90	16"
411.641	52	0.60	70	62	0.90	16"
411.641	0	0.60	70	62	1.00	START 1:05pm 75"
413.84	4	0.60	67	62	1.00	75" STOP 1:10 pm FURNACE DOWN
413.84	5	0.60	67	63	1.00	75" START 1:15 pm
415.71	8	0.60	67	63	1.00	75"
417.68	12	0.60	68	62	1.00	75"

PORT A

IMPACTOR FIELD DATA

Plant Name Roane Ltt Nozzle # _____ Diameter _____

Location Rockwood Tenn Av. ΔP _____ Stack T _____

Date 2-12-81 Barom P _____ Static P _____

Operator Sue B Start Time _____ Meter # V1 Y = _____

IP Sampler # _____ Impactor Location Port A (75"/24min)(16"/24min)

Run No. 4-75"-16" % Moisture _____ Leak Check 0.13 cub ft >5" Hg

Filter # no filter X Part. Bottle# _____ III Part. Bottle# _____

DGM Reading	Elapsed Time	Orifice Δh("H_2O)	Meter Temperature		Orifice SP-"Hg	Comments
			Inlet	Outlet		
419.46	16	0.60	68	62	1.00	75" Port A
421.34	20	0.60	69	62	1.00	75"
423.21	24	0.60	69	62	1.00	75"
425.07	28	0.60	70	62	1.00	16"
426.94	32	0.60	69	62	1.00	16"
428.71	36	0.60	69	62	1.00	16"
430.67	40	0.60	70	62	1.10	16"
432.53	44	0.60	70	62	1.10	16"
434.39	48	0.60	70	62	1.10	16"
436.24	52	0.60	70	62	1.10	16"
438.11	56	0.60	73	63	1.20	75"
439.93	60	0.60	74	62	1.30	75"
441.75	64	0.60	74	62	1.30	75"
443.63	68	0.60	74	66	1.40	75"
445.54	72	0.60	72	66	1.50	75"
447.49	76	0.60	70	66	1.60	75"
449.37	80	0.60	70	66	1.60	75"
450.125	81.5	0.60	70	66	1.60	75" Port A DELAYED REMOVAL
450.125	0	0.60	70	66	1.60	75" START → 2:33 PM Port B
452.12	4	0.60	70	66	1.70	75"
454.04	8	0.60	68	66	1.90	75"

Port A

Port A

Port B

IP IMPACTOR FIELD DATA

Plant Name Roane Lt Nozzle # _____ Diameter _____ 4

Location Rockwood Tenn Av. ΔP _____ Stack T _____ 84

Date 2-12-81 Barom P _____ Static P _____

TD 35

Operator Sue B Start Time [redacted] Meter # V1 Y = _____

IP Sampler # 4-75"-16" Impactor Location Port B (75'/24 min)(16"/24 min)

Run No. 4-75"-16" % Moisture _____ Leak Check 0.13 cu ft @ 5" Hg

Filter # No Filter X Part. Bottle# _____ III Part. Bottle# _____

	DCM Reading	Elapsed Time	Orifice Δh("H2O)	Meter Temperature Inlet	Meter Temperature Outlet	Orifice SP-"Hg	Comments
2	455.94	12	0.60	68	66	1.80	75" Port B
1	457.85	16	0.60	67	66	2.00	75"
3	459.75	20	0.60	66	66	2.20	75"
9	461.62	24	0.60	67	67	2.20	75"
5	463.45	28	0.50	66	66	2.40	16"
23	465.48	32	0.60	67	66	2.20	16" SHUT OFF 3:08 FURNACE DOWN
2	467.012	35	0.60	67	66	2.20	16"
	467.012	35	0.60	67	66	2.20	16" START UP 3:35
	463.80 [redacted]	36	0.60	68	67	2.30	16"
7	470.11	40	0.60	68	67	2.40	16"
8	472.14	44	0.60	68	67	2.40	16"
1	474.14	48	0.60	69	67	2.50	16"
1	476.792	53	0.60	69	67	2.50	16"

Port B

PORT B