CATALYST

AIR MANAGEMENT, INC.

February 20, 2000

Mr. William Grimley
Emission Measurement Center (MD-19)
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

Re: Submittal of Speciated Mercury Test Report - Tractebel Power, Inc. - Kline Township Cogeneration Plant Unit 1 - Catalyst Air Management, Inc. Report 103-010

Dear Mr. Grimley:

Catalyst Air Management, Inc. (Catalyst) is pleased to submit Report 103-010 dated February 20, 2000. This report contains the results of the speciated mercury emissions tests performed at Tractebel Power, Inc., Kline Township Cogeneration Plant Unit 1. The testing was conducted October 28 and 29, 1999.

This report includes field data, laboratory analytical results and computer generated results of the test program. Every attempt has been made to present this information in a format that is readily discernible and suitable for your continued use.

On behalf of Tractebel Power, Inc., *Catalyst* has attempted to cooperate with the U.S. EPA in the planning, execution and reporting of this test program. If you have any questions regarding this report please call me at (423) 927-6603.

Sincerely,

Michael J. Taylor
President

cc Jim Wetzel – Tractebel Power, Inc.

Fairview Technology Center
11020 Solway School Road, Suite 108
Knoxville, Tennessee 37931
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1531 Wyngate Drive
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ATALYST

AIR MANAGEMENT, INC.

AIR QUALITY TESTING SERVICES

TRACTEBEL POWER, INC.
KLINE TOWNSHIP COGENERATION PLANT
UNIT 1

ELECTRIC UTILITY STEAM GENERATING UNIT MERCURY TEST PROGRAM
TEST REPORT

Catalyst Air Management, Inc.
Report Number 103-010

February 20, 2000

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CATALYST

AIR MANAGEMENT, INC.

TRACTEBEL POWER, INC.
KLINE TOWNSHIP COGENERATION PLANT
UNIT 1

SPECIAL MERCURY EMISSIONS TEST REPORT
EPA PROJECT

CATALYST AIR MANAGEMENT, INC.
REPORT NUMBER 103-010

FEBRUARY 20, 2000

Prepared for
Mr. Jim Wetzel
Tractebel Power, Inc.
PO Box 7
McAdoo, Pennsylvania 18237

CATALYST

AIR MANAGEMENT, INC.

STATEMENT OF VALIDITY

Tractebel Power, Inc.
Catalyst Report 103-010
February 20, 2000

To the extent practical, information and data provided in this test report has been verified as true and correct.

Michael J. Taylor
President

PROJECT FACT SHEET

NAME OF SOURCE OWNER:	Tractebel Power Inc.
SOURCE IDENTIFICATION:	Kline Township Cogeneration Facility Unit 1
LOCATION OF SOURCE:	Schuykill County McAdoo, PA
TYPE OF OPERATION:	Fluidized Bed Steam Generating Unit
TYPES OF TESTS PERFORMED:	Traverses-EPA Method 1 Velocity-EPA Method 2 Oxygen/Carbon Dioxide-EPA Method 3 Moisture-EPA Method 4 Mercury-Ontario Hydro Method
TEST COMPANY:	Catalyst Air Management, Inc. 11020 Solway School Road, Suite 108 Knoxville, TN 37931
SITE SUPERVISOR:	Mike Taylor - Principal
TEST PERSONNEL:	Jeff Ferguson - Principal George Albright- Senior Technician Josh Nicely - Technician Terry Jones - Technician
TEST DATES:	October 28 and 29, 1999
OWNERS REPRESENTATIVE:	Jim Wetzel
TEST OBSERVER:	

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1.0 Introduction

Catalyst Air management, Inc. (Catalyst) was contracted by Tractebel Power, Inc. to perform speciated mercury emissions testing for Unit 1 at the Kline Township Cogeneration facility in McAdoo, PA. The purpose of the testing was to provide the United States Environmental Protection Agency (EPA) information on mercury emissions from electric utility steam generating units. The pollutants tested during the program were elemental, oxidized, particle-bound and total mercury utilizing the procedures outlined in the Ontario Hydro Method – Standard Test Method for Elemental, Oxidized, Particle-Bound and Total Mercury in Flue Gas Generated from Coal-Fired Stationary Sources. The testing was conducted at the inlet to the baghouse and stack sampling locations.

The sampling program was conducted October 28 and 29, 1999. The testing was performed by Catalyst personnel, with the assistance of personnel assigned by Tractebel Power, Inc. Mr. Jim Wetzel of Tractebel Power coordinated plant operation during the testing.

2.0 Summary of Test Results

A summary of test results developed by this source sampling program is presented in Tables 1 through 5. The summary tables are presented as follows:

TABLE 1
SUMMARY OF SPECIATED Hg EMISSIONS
Kline Township Unit 1

Speciated Hg Parameter	Avg µg/dscm Baghouse Inlet	Avg µg/dscm Stack	Avg lb/hr Baghouse Inlet	Avg lb/hr Stack	Removal Efficiency %
Particle bound	45.93	0.005	3.25E-02	2.98E-06	99.99
Oxidized	0.08	0.053	5.63E-05	3.17E-05	43.69
Elemental	0.41	0.043	2.92E-04	2.58E-05	91.16
Total	46.42	0.097	3.28E-02	6.05E-05	99.82

TABLE 2

SUMMARY OF EMISSION TEST DATA

Method/ Component	Units	Baghouse Inlet				Stack			
		Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average
Method Ontario-Hydro									
particle									
bound Hg	lb/hr	3.27E-02	3.06-E02	3.41E-02	3.25E-02	3.01E-06	3.04E-06	2.89E-06	2.98E-06
oxidized Hg	lb/hr	8.44E-05	4.36E-05	4.11E-05	5.63E-05	2.86E-05	3.04E-05	3.62E-05	3.17E-05
elemental Hg	lb/hr	3.32E-04	2.81-E04	2.58E-04	2.92E-04	2.97E-05	2.90E-05	1.88E-05	2.58E-05
total Hg	lb/hr	3.32E-02	3.10E-02	3.44E-002	3.28E-02	6.13E-05	6.25E-05	5.78E-05	6.05E-05
removal efficiency	%					99.8	99.8	99.8	99.8
Method 3									
O_2	%	2.4	2.4	2.1	2.3	5.2	5.2	5.2	5.2
CO_2	%	17.6	17.8	17.8	17.7	14.7	14.7	14.7	14.7
Coal									
Hg	lb/hr	0.87	1.35	0.99	1.07				
Cl	ppm	300	200	200	233				
Method 24									
°F	%	370	366	373	370	344	345	346	345
% Moisture	%	6.4	7.4	6.4	6.73	6.9	6.9	6.1	6.63
Flow		189598	183204	192238	188347	168200	163830	162965	164998

TABLE 3
ISOKINETIC SAMPLING SUMMARY - Hg
Draft Ontario Hydro Method

Client: **TRACTEBEL POWER, INC.**
Plant: **Kline Township Unit 1**
Location: **Baghouse Inlet**

Run Number:		**1-Hg-Inlet**	**2-Hg-Inlet**	**3-Hg-Inlet**
Date:		10/28/99	10/28/99	10/29/99
Run Time:	Start	8:35	13:02	8:51
	End	11:45	15:54	11:44
DN - Nozzle Diameter:		0.188	0.188	0.188
Pbar - Barometric Pressure:		29.66	29.66	29.81
TT - Sampling Time:		150	150	150
VM - Meter Volume:		58.955	56.16	62.252
TM - Avg. Meter Temp(F):		69	79	79
PM - Avg. Delta H (in. of H2O):		0.526	0.500	0.537
Y - Meter Calibration Factor:		1.02	1.02	1.02
VMSTD - Std. Gas Volume (SCF):		59.541	55.709	61.991
Vlc - Volume Water Collected:		87	94	90
%M - Percent Moisture:		6.4	7.4	6.4
Bws - Mole Fraction, Dry:		0.064	0.074	0.064
%CO2 - Carbon Dioxide, Dry:		17.6	17.6	17.8
%O2 - Oxygen, Dry:		2.4	2.4	2.1
MD - Dry Molecular Weight:		30.91	30.91	30.93
MS - Wet Molecular Weight:		30.08	29.96	30.10
A - Stack Area, SQ.FT:		92.71	92.71	92.71
PS - Static Press. (in. of Hg):		29.11	29.11	29.26
TS - Stack Temp. (F):		370	366	373
CP - Pitot Coefficient:		0.84	0.84	0.84
VS - Stack Gas Velocity (AFPS):		58.9	57.3	59.7
QS - Stack Gas Volume (DSCFM):		189,894	183,532	192,536
QA - Stack Gas Volume (ACFM):		327,840	318,497	331,862
%I - Isokinetic Ratio:		100.6	97.4	103.3
LBS/HR - Emission Rate:				
	Particle bound	3.27E-02	3.06E-02	3.41E-02
	Oxidized	8.44E-05	4.36E-05	4.11E-05
	Elemental	3.37E-04	2.81E-04	2.58E-04
	Total	3.32E-02	3.10E-02	3.44E-02
AVG				
	Particle bound		**3.25E-02**	
	Oxidized		**5.63E-05**	
	Elemental		**2.92E-04**	
	Total		**3.28E-02**	

TABLE 4
ISOKINETIC SAMPLING SUMMARY - Hg
Draft Ontario Hydro Method

Client: **TRACTEBEL POWER, INC.**
Plant: **Kline Township unit 1**
Location: **Stack**

Run Number:		1-Hg-Stack	2-Hg-Stack	3-Hg-Stack
Date:		10/28/99	10/28/99	10/29/99
Run Time:	Start	8:35	13:02	8:51
	End	11:38	14:53	11:54
DN - Nozzle Diameter:		0.217	0.217	0.217
Pbar - Barometric Pressure:		29.66	29.66	29.81
TT - Sampling Time:		150	150	150
VM - Meter Volume:		144.045	141.795	147.870
TM - Avg. Meter Temp(F):		49	59	60
PM - Avg. Delta H (in. of H2O):		3.000	2.858	3.054
Y - Meter Calibration Factor:		0.99	0.99	0.99
VMSTD - Std. Gas Volume (SCF):		147.638	142.574	149.069
Vlc - Volume Water Collected:		233	225	204
%M - Percent Moisture:		6.9	6.9	6.1
Bws - Mole Fraction, Dry:		0.069	0.069	0.061
%CO2 - Carbon Dioxide, Dry:		14.7	14.7	14.8
%O2 - Oxygen, Dry:		5.2	5.2	5.2
MD - Dry Molecular Weight:		30.56	30.56	30.58
MS - Wet Molecular Weight:		29.69	29.69	29.81
A - Stack Area, SQ.FT:		44.18	44.18	44.18
PS - Static Press. (in. of Hg):		30.03	30.03	30.27
TS - Stack Temp. (F):		344	345	346
CP - Pitot Coefficient:		0.84	0.84	0.84
VS - Stack Gas Velocity (AFPS):		103.4	100.9	98.8
QS - Stack Gas Volume (DSCFM):		168,200	163,830	162,965
QA - Stack Gas Volume (ACFM):		274,004	267,494	261,849
%I - Isokinetic Ratio:		100.7	99.9	105.0

LBS/HR - Emission Rate:

Particle bound	3.01E-06	3.04E-06	2.89E-06
Oxidized	2.86E-05	3.04E-05	3.62E-05
Elemental	2.97E-05	2.90E-05	1.88E-05
Total	6.13E-05	6.25E-05	5.78E-05

AVG

Particle bound	**2.98E-06**
Oxidized	**3.17E-05**
Elemental	**2.58E-05**
Total	**6.05E-05**

3.0 Results of Testing

The individual test run results are shown in Tables 3 and 4, and are tabulated in Appendix 1. The results indicate that Hg emissions entering the baghouse are greater than 98% particle bound Hg. The particle bound Hg emissions at the stack are less than 5% of the total Hg emissions. The reduction of the particle bound Hg is due to the particulate removal efficiency of the baghouse, which is 99.9%.

4.0 Description Of Combustion Unit

The Tractebel Power, Inc., Kline Township Cogeneration facility is a waste anthracite coal (culm) fired cogeneration facility located near McAdoo in Schuykill County, Pennsylvania. This facility uses a circulating fluidized bed boiler to produce steam used to generate electricity and process steam for heating. The turbine-generator is rated at approximately 50 MWs. The exhaust from this boiler passes through a baghouse before entering the exhaust stack.

The testing was performed with the unit and control equipment operating at normal full load steady state conditions. The fluidized bed was operated under normal conditions to maintain SO_2 emissions within the permit limits. The baghouse was operated automatically to maintain the proper pressure drop under normal conditions. The coal feed rate was approximately 70 tons per hour.

4.1 Control Equipment

The emissions (SO_2) are controlled by the limestone circulating fluidized bed. The lime stone feed rate is used to control the SO_2 emissions within the boiler. Particulate emissions are controlled by the baghouse.

4.2 Stack Sampling Locations

Four (4) test ports are at an approximate height of 140 ft above grade. The diameter of the stack at the test location is 7.5 ft. This sampling location is 125'-8" above the exhaust gas duct entrance. A twelve point traverse was performed for each test run, each point was sampled for 12.5 minutes for a total run time of 150 minutes.

4.3 Baghouse Inlet Sampling Locations

Six (6) test ports are located across the top of the baghouse inlet duct. The duct is 75 x 178 inches. A thirty point traverse will be performed for each test run (6x5 matrix), each point will be sampled for 5 minutes for a total run time of 150 minutes.

5.0 Sampling Program Procedures

The following test methods were utilized during the test program:

Ontario Hydro — Standard Test method for Elemental, Oxidized, Particle-Bound and Total Mercury from Coal-Fired Stationary Sources

Test runs were conducted in triplicate with each being atleast120 minutes in duration.

5.1 Draft Ontario Hydro Method - Elemental, Oxidized, Particle-Bound and Total Hg

The trace metals emissions were determined in accordance with procedures outlined in the Draft Ontario Hydro Method dated July 7, 1999. The flue gas sample is extracted isokinetically from the gas stream. The probe and filter were instack (Method 17 configuration) and therefore maintained at stack temperature. The sampling train consists of the following equipment connected in series:

Glass nozzle and glass thimble holder with quartz fiber thimble

Glass lined probe with heater

Heated umbilical

Two (2) modified Greenburg-Smith impingers containing 100 ml of 1N KCl

A Greenburg-Smith impinger containing 100 ml of 1N KCl

A modified Greenburg-Smith impinger containing 100 ml of 5% HNO_3/10% H_2O_2

Two (2) modified Greenburg-Smith impingers containing 100 ml of 4% $KmnO_4$/10% H_2SO_4

A Greenburg-Smith impinger containing 100 ml of a 4% $KMnO_4$/10% H_2SO_4 solution

A modified Greenburg-Smith impinger containing 250g of silica gel

The sample volume is measured by passing it through a calibrated dry gas meter. An S-type pitot tube is attached to the probe to measure stack gas velocity and to maintain isokinetic sampling. A K-type thermocouple is also attached to the probe to measure the gas temperature.

After each run, the nozzle thimble holder, probe and umbilical are rinsed with 0.1N HNO_3. The filter and rinse are retained for analysis. The contents of impingers 1 through 3 are measured for increase in volume and are retained with the 0.1N HNO_3 rinses of the impingers and back half of the filter housing. Impinger 4 is measured for volume increase and rinsed with 100 ml of 0.1N HNO_3. The content and rinse are retained for analysis. Impingers 5 through 7 are measured for volume increase and rinsed with 100 ml of 0.1N HNO_3. The content and rinse are retained for analysis. Any residue left in impingers 5 through 7 is removed with a wash of 8N HCl and retained for analysis. The silica gel is returned to the original tared container and weighed to determine moisture gain.

The O_2 and CO_2 concentrations were determined simultaneously with each of the test runs by EPA Method 3. An integrated bag sample was collected during each run. An Orsat was utilized to measure the O_2 and CO_2 concentrations.

6.0 Operating Conditions

Tractebel Power personnel monitored operating conditions throughout the duration of the sampling program. The testing was performed October 28 and 29, 1999 with the unit operating at approximately 50 MW during all the testing. Plant operating data is contained in Appendix 2.

7.0 Quality Assurance Procedures

The quality assurance procedures followed during the testing activities followed guidelines set forth by the previous mentioned methods and the EPA Quality Assurance Handbook for Source Sampling. The specific procedures for this test program are listed below.

7.1 Isokinetic Equipment

The sample nozzles were visually inspected and measured across three different diameters to determine the appropriate nozzle diameter.

The S-type pitot tubes were visually inspected and measured to meet the design specifications of EPA Method 2 for a 0.84 pitot coefficient.

Both legs of the pitot tube were leaked checked before and after each sample run.

The stack thermocouples were calibrated prior to the testing and a post-test check was performed after the testing project.

The manometer was leveled and zeroed before each sample run.

The dry gas meter is fully calibrated annually using an EPA intermediate standard. Post - test dry gas meter checks were completed to verify the accuracy of the meter Yi.

Pre-test and post-test leak checks were completed and were less than 0.02 cfm at the highest sampling vacuum.

8.0 Discussion

8.1 Chain of Custody

All the field samples were collected, sealed and transported to the Philip Analytical Services in Reading, PA under the supervision of M.J. Taylor. The samples were labeled to identify the following:

Client and source
Date
Type of Sample
Run number
Sample location
Sample fraction

8.2 Sampling Conditions and Concerns

A cyclonic flow check at the baghouse inlet showed that the sampling location met the criteria of an average resultant angle of 20 degrees, however, the average angle was 16 degrees. This high resultant flow angle could cause a high bias in the velocity measurements, volumetric flow and emission rate determination. The measured volumetric flow was approximately 14% higher at the baghouse inlet sampling location than the stack location.