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EMISSION TEST REPORT

Tae Sung Phils. Co., Inc.

Duplicate Copy



CRL Calabarquez Corporation

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stack emission | ambient | WEM | IAQ | RATA | CGA | gas analysis...



CRL Calabarquez Corporation

December 3, 2014

Ms. Zenaida G. Cruz
Pollution Control Officer
Tae Sung Phils. Co., Inc.
Blk 24 Lot 3 & 5, Phase 4
CEPZ, Rosario, Cavite

Dear Ms. Cruz:

We are sending herewith the report for **Emission Test** that was conducted on November 6, 2014.

We trust that you find everything in order.

Thank you.

Very truly yours,

Walter G. Fiesta
QA/QC Manager

REPORT CERTIFICATION

EMISSION TEST REPORT

TAE SUNG PHILS. CO., INC.


Lot 3 and 5, Blk. 24, Phase 4, CEPZ, Rosario, Cavite

Laboratory Order Nos. P00002592


ling and Analysis data reflected on this report were validated and checked under my
I, and I hereby certify that, to the best of my knowledge, the test report is authentic and

by : 
Mary Kris M. Orel
QA/QC Officer

: 12/03/11

by : 
Kristin Anne C. Castillo
QA/QC Officer

: 12/22/14

Certified by : 
Walter G. Fiesta
QA/QC Manager
CRL Calabarquez Corporation

Date : 12/22/14

EMISSION TEST REPORT

Particulate Matter, Sulfur Dioxide,
Nitrogen Dioxide and Carbon Monoxide

Diesel Fired Oven

TAE SUNG PHILS. CO., INC.

Lot 3 and 5, Blk. 24, Phase 4, CEPZ, Rosario, Cavite

SUBMITTED TO : MS. ZENaida G. CRUZ
POSITION : POLLUTION CONTROL OFFICER

Prepared and Submitted by:

CRL Calabarquez Corporation

November 6, 2014



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1.0 INTRODUCTION

This testing is being undertaken jointly by Tae Sung Phils. Co., Inc. and CRL Calabarquez Corporation. CRL undertook emission testing at Tae Sung Phils. Co., Inc. on November 6, 2014 which included the measurement of compounds/parameters generated from the operation of equipment listed on *table 1.A*. This report is hereby submitted to the Environmental Management Bureau (EMB) as the official "Emission Test Report" dated November 6, 2014 subject to the DAO 2000-81 of RA 8749.

1.A Listing of equipment and Compounds/Parameters Tested

Equipment Name/Description	Compounds/Parameters Tested*
Diesel Fired Oven	PM, SO _x , NO _x , CO

*PM=Particulate Matter; SO_x=Sulfur Oxides (SO_x as SO₂); NO_x=Nitrogen Oxides (NO_x as NO₂); CO=Carbon Monoxide

1.1 REASON FOR THE TEST

The testing of equipment listed on *table 1.A* at Tae Sung Phils. Co., Inc. was undertaken by CRL Calabarquez Corporation on November 6, 2014 as part of the emission test requirement pursuant to RA 8749.

- ☒ Permit to Operate Application
☐ Inspection / Complaints
☐ Others (specify)

1.2 FACILITY OPERATING CONDITIONS DURING TEST

For the duration of the emission tests, *table 1.B* shows the operating conditions of the facility and type of fuel used during the testing period.

1.B Facility Conditions

Equipment Name/Description	Date Installed	Facility Load During Sampling	Fuel Type
Diesel Fired Oven	N/S	Normal Operation	Diesel

2. SUMMARY OF RESULTS

Table 1 presents a summary of the test results of equipment listed on *table 1.A*. The test results are compared with the National Emission Standards for Source Specific Air Pollutants (NESSAP) identified in IRR Part VII Rule XXV Table 2. A detailed description of the test run information and example calculations used to calculate the tabulated summary are attached in Attachment A.



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Table 1
Diesel Fired Oven Test Results
Tae Sung Phils. Co., Inc.

Sampling Date		November 6, 2014				DENR Standard
Begin Sampling Time		1030H	1150H	1315H		
End Sampling Time		1137H	1257H.	1422H		
Equipment Rated Capacity		652 KW				
Equipment Actual Load During Sampling		Normal Operation				
Equipment Tested		Diesel Fired Oven				
Parameters	Units	Run 1	Run 2	Run 3	Average Results	
Stack Temperature	°C	280.22	288.44	282.89	283.85	--
CO ₂ in stack gas	% _{v/v}	4.00	4.00	4.00	4.00	--
O ₂ in stack gas	% _{v/v}	15.00	15.00	15.00	15.00	--
Stack gas moisture content	% _{v/v}	4.73	4.83	5.36	4.97	--
Flue gas velocity	m/s	5.26	5.30	5.28	5.28	--
Wet (Actual) volumetric flowrate	m ³ /min	28.39	28.61	28.50	28.50	--
Dry volumetric flowrate at STP	dm ³ /min	14.47	14.35	14.35	14.39	--
Particulate Matter	mg/Nm ³	6	8	5	6	150
Emission Rate	kg/h	0.005	0.007	0.004	0.005	--
Sulfur Dioxide	mg/Nm ³	6	5	5	6	700
Emission Rate	kg/hr	0.005	0.005	0.005	0.005	--
Nitrogen Dioxide	mg/Nm ³	69	33	51	51	500
Emission Rate	kg/hr	0.060	0.029	0.044	0.044	--
Carbon Monoxide	mg/Nm ³	70	38	55	54	500
Emission Rate	kg/hr	0.061	0.033	0.047	0.047	--

Parameter at STP = Corrected to 25 deg Celsius and 760 mm Hg

Parameter at STP = Corrected to 25 deg Celsius and 760 mmHg

Test runs were performed to collect compounds listed on *table 1.A*. The raw field data used to prepare the summary reports in Attachment A are included in Attachment B. Emissions have been corrected to standard conditions of 25°C and 760mmHg on a dry basis (unless otherwise indicated).

A description of any method deviations and quality assurance assessment is included in Sections 4 and 5 of this report. Based on a review of the sampling data, facility operating information, test method description and quality assurance results, the concentration values presented in Table 1 are judged to be representative of the source and suitable for comparison with the regulatory limits.

2.1 CONCLUSION

Table 2.A below shows test results conclusions in accordance with the average emissions of each corresponding equipment:

2.A Test Results Conclusion

Equipment Name/Description	Compounds/Parameters*			
	PM	SOx	NOx	CO
Diesel Fired Oven	✓	✓	✓	✓

✓ Complies with the Applicable Standards

✗ Exceeds the Applicable Standards

☒ Not Applicable

*PM=Particulate Matter; SOx=Sulfur Oxides (SOx as SO₂); NOx=Nitrogen Oxides (NOx as NO₂); CO=Carbon Monoxide

3. PROCESS DESCRIPTION AND OPERATION

Tae Sung Phils. Co., Inc. maintains and operates equipment Emission Source Installation (ESI). *Table 3.A* shows how the equipment is being utilized within the facility. *Table 3.A* also shows the equipment's approximate percentage load during the test.

3.A Process Description and Equipment Load

Equipment Name/Description	Process Description	Rated Capacity	% Load
Diesel Fired Oven	Provides heat requirement of the process	652 kW	Normal Operation

4. SAMPLING AND ANALYTICAL PROCEDURES

All sampling was undertaken with USEPA standard methods, viz:

- Method 1 Sample and Velocity Traverse Point Locations
- Method 2 Stack Gas Velocity and Volumetric Flow Rate
- Method 3 Gas Analysis for Determination of Dry Molecular Weight
- Method 4 Determination of Moisture Content in Stack Gas
- Method 5 Determination of Particulate Matter Emissions from Stationary Sources
- Method 6/8 Determination of Sulfur Dioxide Emissions from Stationary Sources
- Method 7 Determination of Nitrogen Dioxide Emissions from Stationary Sources
- Method 10 Determination of Carbon Monoxide Emissions from Stationary Sources

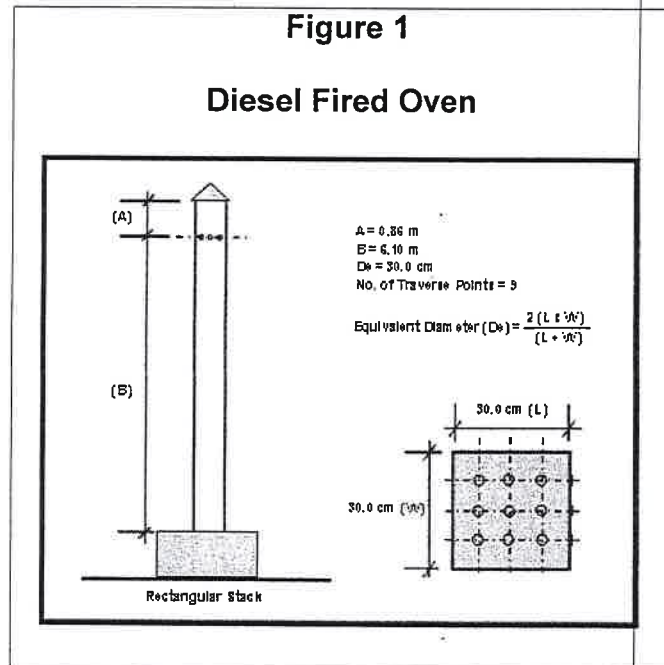
4.1 METHODS 1 AND 2 - STACK VELOCITY

4.1.1 SAMPLING POINTS

For the equipment tested, the number and location of the sampling was determined in accordance with the procedures of USEPA Method 1. Figure 1 presents the test location of the equipment listed on *table 4.A* below. *Table 4.A* shows the number of test ports, total points for cyclonic flow and points on each axes of each equipment tested. Details of the number and location of sample points are included in the field data sheets in Attachment B.

4.A Sampling Points

Equipment Name/Description	No. of Test Ports	Total Points Cyclonic Flow	Points on each Port	No. of Sampling Port/Adjacency
Diesel Fired Oven	3	9	3	3/equidistant



4.1.2 CYCLONIC FLOW VERIFICATION

For each sampling point, the rotation angle was determined using a pitot tube assembly, liquid manometer and angle finder were used in accordance with section 11.4 (Verification of Absence of Cyclonic Flow) of USEPA Method 1. (For pitot tube type used for each equipment, see *table 5.A*)

The rotation angle was measured at each traverse point. The average absolute value of the rotation angle was less than the 20 degrees criterion of Method 1.

4.1.3 FLUE GAS VELOCITY

The procedures of USEPA Method 2 were employed to determine the flue gas velocity and volumetric flow rate using pitot tubes in making velocity head measurements (ΔP). The pitot tubes conform to the geometric specifications of Method 2 and have therefore been assigned a corresponding coefficient. An inclined manometer built in to the meter box was used to measure differential pressures and flue gas temperatures were measured with chromel-alumel thermocouples equipped with digital response readouts. (For pitot tube type and corresponding coefficient used for each equipment, see *table 5.A*)

4.2 METHOD 3 - FLUE GAS COMPOSITION

USEPA Method 3 procedures were used to determine the flue gas composition and molecular weight. A gas sample was extracted from the stack using Fyrite flue gas analyzer during each Method 5 sampling run to collect an integrated flue gas sample into a tedlar bag. The content of each tedlar bag was then analyzed to determine the concentration of oxygen and carbon dioxide in the sample. The same bag sample was also used for the carbon monoxide analysis by Method 10.

4.3 METHOD 4 - FLUE GAS MOISTURE CONTENT

The moisture content of the flue gas was determined using USEPA Method 4 procedures in conjunction with Method 5.

4.4 METHOD 5/6 PARTICULATE MATTER AND SULFUR OXIDES

4.4.1 SAMPLE COLLECTION

A USEPA Method 5 sampling train was used to extract samples isokinetically from the stack. The sampling train comprised the following elements:

- a stainless steel nozzle
- a heated stainless steel probe with a pitot tube (For pitot tube type used for each equipment, see *table 5.A*)
- a compact glass fibre filter Teflon support frit maintained at $120^{\circ}\text{C} \pm 14^{\circ}\text{C}$
- an unheated Teflon sample line
- four chilled glass impingers (Groonburg-Smith)
 - 1 and 2 containing 100mL of 3% H_2O_2 (Modified and Standard tip)
 - 3 left empty (Modified tip); and
 - 4 containing a measured quantity of silica-gel (Modified tip) and
- a metering console

Each of the impingers was labelled and weighed. A glass (borosilicate) probe liner was used. The liner was rinsed in the CRLC facilities prior to being used in the project to remove any potential contamination.

4.4.2 SAMPLE RECOVERY

The filter was removed from the filter holder and placed in a glass petri dish and each of the impingers weighed to determine the mass of water vapour collected.

The nozzle, probe, and front-half of the filter holder were rinsed with acetone and the interior of the probe and nozzle were rinsed and brushed repeatedly to remove any particulate matter adhering to the inside surface. All rinses were collected into a 250mL glass amber bottle.

The contents of impingers 1, 2 and 3 were transferred to a 1000 ml glass amber sample bottle and silica gel was returned to the provided container after weighing. The flexible sample line between the heated filter holder and the first impinger, the three impingers and connecting glassware were all rinsed with distilled water into the sample recovery bottle. For SO₂ sample, it is kept in the cooler full of ice preserved below 5°C. The filter paper was secured in the provided field desiccator cabinet then shipped to laboratory for the analysis.

4.4.3 SAMPLE ANALYSIS

The filter and sample bottles together with blank samples of the acetone and water were submitted to CRL Environmental Corporation Laboratory.

The mass of filterable particulate matter collected on the filter and in the acetone rinse was determined in accordance with USEPA Method 5 analytical procedures.

The mass of sulphur oxides in the impinger contents and rinse water was determined in accordance with USEPA Method 6 analytical procedures.

4.5 METHOD 7 NITROGEN OXIDES

4.5.1 SAMPLE COLLECTION

Sampling of the flue gas to determine the concentration of nitrogen oxides was undertaken in accordance with USEPA Method 7 using a nominal 1L glass collection flask containing 25ml of NO_x absorbing reagent connected to a heated stainless steel probe with a glass wool filter in the tip.

During the Method 7 testing, a flask was evacuated to 75 mmHg absolute pressure or less; and the initial flask temperature and pressure readings were recorded. The probe was inserted into the stack, connected to the flask and, after purging the probe, a sample was drawn into the flask. The flask was then shaken for five minutes. This procedure was carried out three times for each of the three test runs resulting in the collection of nine samples.

4.5.2 SAMPLE RECOVERY

The NO_x flasks were allowed to stand for at least 16 hours, shaken for two minutes and then the final flask temperature and pressure were measured. The contents of each flask were rinsed into a glass amber bottles and the pH adjusted to between 9 and 12 by the addition of NaOH.

4.5.3 SAMPLE ANALYSIS

The sample preparation procedures of USEPA Method 7 were applied and each sample was then subjected to colorimetric analysis at CRL Environmental Corporation Laboratory.

4.6 METHOD 10- CARBON MONOXIDE

4.6.1 SAMPLE COLLECTION

The integrated sample that was collected for the determination of flue gas composition (see section 4.2 above) was used for the determination of CO in accordance with USEPA Method 10.

4.6.2 SAMPLE RECOVERY

The tedlar bag was sealed and transferred to CRL Calabarez Corporation Laboratory.

4.6.3 SAMPLE ANALYSIS

The sample was analyzed using a nondispersive infrared (NDIR) analyzer. The analyzer was flushed with nitrogen and calibrated. The tedlar bag containing the sample was attached to sample input and the gas sample was introduced at a flow rate of about 0.5L/min by applying gentle pressure to the tedlar bag. When the concentration indicated on the display was seen to stabilize it was recorded.

SECTION 5.0

QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

The USEPA "Quality" Assurance Handbook for Air Pollution Measurement Systems: Volume III Stationary Source – Specific Methods was used as a guide to achieve the quality assurance objectives of producing data that are complete, representative and of known precision and accuracy.

5.1 PARTICULATE MATTER

5.1.1 SAMPLING PROCEDURE

USEPA Method 5 was employed to determine the concentration of particulate matter in the gas stream. This method requires the use of Methods 1 to 4 to determine sampling port locations, sample points within the stack, the flow gas flow rate and the molecular weight and moisture content of the flue gas.

The quality of the emission test was assured by:

- Ensuring that the test port is located sufficiently distant from both upstream and downstream flow disturbance (such as bends and changes in stack diameter)
- Ensuring that stack gas flow is essentially parallel to the stack walls by conducting a cyclonic flow check
- Determination of representative stack gas velocity by the selection of sampling test points appropriate to the stack diameter in accordance with the Method
- Leak testing of the sampling train before and after each sampling run
- Testing and calibration of the dry gas meter, thermocouples, temperature displays, pitot tubes, nozzles and manometer assembly
- Ensuring that the temperature of impinger systems is maintained below 20°C
- Maintaining the filter and sampling probe temperature at 120°C (+/- 14°C)
- Collection of an integrated tedlar bag sample for determination of oxygen, carbon dioxide and carbon monoxide
- Collection and analyses of representative "blank" samples of reagents used in the emission tests; and sampling at between 90-110% of the actual gas stream velocity (isokinetic sampling)

5.1.2 SAMPLING EQUIPMENT

Copies of various calibration and test certificates are included in Attachment E.

5.1.2.1 BAROMETER

A calibrated aneroid barometer was used to measure atmospheric pressure at the platform level. An inter-comparison was conducted between CRL Calabarez Corporation's barometer and a reference barometer at the Instrumentation Research and Development Unit in PAGASA.

5.1.2.2 PROBE NOZZLES

Probe nozzles were calibrated by the manufacturer and were inspected and checked for roundness before use to ensure that they met the specifications of the Method.

5.1.2.3 PITOT TUBES

All pitot tubes used to test each equipment listed on *table 5.A*, meet the USEPA Method 2 design specifications and were therefore assigned a baseline of corresponding coefficient (see *table 5.A*). After each test the pitot tube was visually inspected for damage.

5.A Pitot Tubes Used on Testing

Equipment Name/Description	Type of Pitot Tube used	Coefficient Factor
Diesel Fired Oven	type "S"	0.84

5.1.2.4 DRY GAS METER CALIBRATION AND METERING SYSTEM

The meter box was leak checked. An initial calibration was carried using a wet test meter and later calibrations using five critical orifices in accordance with USEPA Method 5.

5.1.2.5 POST TEST METER CALIBRATION

A post test meter calibration was made using the data collected for each of the test runs in accordance with the procedures set out in USEPA ALT-009.

5.1.2.6 TEMPERATURE SENSORS

Calibrated mercury in glass thermometer was used to calibrate thermocouples at approximately 0°C in iced water, ambient temperature and approximately 100°C in boiling water. At the completion of each test, thermocouples were compared to the mercury in glass thermometer at ambient temperature and a continuity check performed to ensure that the thermocouple read-out trended in the correct direction when subjected to a temperature change.

5.1.3 PARTICULATE MATTER ANALYSIS

Filters and acetone used in the emission test met the required specifications and Method 5 analytical procedures were employed using a properly calibrated analytical balance.

5.2 OXYGEN AND CARBON DIOXIDE

Several replicate analyses were undertaken on the oxygen and carbon dioxide samples collected in tedlar bags using Fyrite analyzer.

5.3 SULFUR OXIDES

The procedure for sampling sulfur oxides (SO_x) was combined with USEPA Method 5 as described in Section 4.4. The quality of the test was assured by:

- The use of fresh chemical solutions
- Care in the recovery of the sample
- Attention to detail in the analysis of samples in accordance with the USEPA Method
- The analysis of audit samples
- The collection and analysis of representative "blank" samples
- Proper calibration and QA/QC checks of all elements of the sampling system

5.4 NITROGEN OXIDES

The procedure for sampling nitrogen oxides (NOx) is described in section 4.5. The quality of the test was assured by:

- The use of chemical solutions
- Care in the recovery of the sample
- Attention to detail in the analysis of samples in accordance with the USEPA Method
- Calibration and verification of linearity of the spectrophotometer; and proper calibration and QA/QC checks of all elements of the sampling system

5.5 CARBON MONOXIDE

The procedure for sampling carbon monoxide (CO) is described in Section 4.6. The quality of the test was assured by:

- Care in the collection of the gas samples to ensure their representativeness of the emission
- Maintenance of a leak free bag at all stages of sampling and analysis
- Calibration of the NDIR instrument prior to analysis; and attention to detail in the analysis of samples in accordance with the USEPA Method 10

