

Test Report
On
Stack Air Emission Analysis of Generator
Prepared For
Vertex RMG Division
Vertex Wear Limited, Dress World Limited, Neo Fashion Limited

Varari, Rajfulbaria, Tetuljhora, Hemayetpur, Savar, Dhaka, Bangladesh.

Report No. XSG-3RECL-2018-1053



Prepared by



**Stack Air Emission Analysis of Generator
At
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Sampling Date	May 05, 2018
Sampling Time	11:00 a.m.-11:30 a.m.
Reporting Date	May 08, 2018

Basic Information of Generator	
Location	Ground Floor, Utility Building
Brand	CATERPILLAR
Model	G3516
Serial Number	PZBA00678
Fuel Type	Natural Gas
Capacity	1287 KVA
RPM	1500
Voltage	440 V
Frequency	50 Hz
Manufacturing Date	2007
Last Servicing Date	15/02/2018
Physical Structure	Horizontal Landed

Environmental Conditions	
Temperature	29.5°C
Humidity	61.2% RH
Visibility/Season	Summer & Sunny Atmosphere

Description of Instruments

A calibrated direct reading instrument designed to measure the stack parameters was used with following specifications.

Temp Measurement	Resolution	Range	Accuracy
Flue Temperature	0.1° (C/F)	0-1100°C 32-2140°F	1.0° C ±0.3% of reading
Inlet Temperature	0.1° (C/F)	0-600°C 0-999°F	1.0° C ±0.3% of reading
Gas Measurement ^{*1}	Resolution	Range	Accuracy
Oxygen (O ₂):	0.01%	-	-0.1% +0.2%
Carbon monoxide (CO): (standard: H compensated)	1ppm	<100ppm >100ppm <2000ppm >2000ppm <4000ppm	+/-5ppm +/-5% of reading +/-10% reading
Nitric oxide (NO): (high range0)	1ppm	<100ppm >100ppm <1000ppm >1000ppm <5000ppm	+/-5ppm +/-5% of reading +/-10% reading
Nitric oxide (NO) (low range)	1ppm	<100ppm >100ppm <300ppm	+/-5ppm +/-10% of reading
Nitrogen dioxide (NO ₂):	1ppm	<100ppm >100ppm <1000ppm	+/-5ppm +/-10% of reading
Sulphur dioxide (SO ₂) (low range):	1ppm	<100ppm >100ppm <500ppm	+/-5ppm +/-10% of reading
Sulphur dioxide (SO ₂) (high range):	1ppm	<100ppm >100ppm <2000ppm >2000ppm <5000ppm	+/-5ppm +/-5% of reading +/-10% reading
Hydrogen sulphide (H ₂ S):	1ppm	<100ppm >100ppm <200ppm >200ppm <300ppm	+/-5ppm +/-5% reading +/-10% of reading
Gas Measurement ^{*1}	Resolution	Range	Accuracy
Pressure	0.01mbar	0-150 mbar	± 0.5% Full Scale
Carbon dioxide (CO ₂) ^{*2}	0.1%	0 – Fuel Value	± 0.3%
Efficiency ^{*2}	0.1%	0-100%	± 1%
Ambient operating range		-10°C to + 55°C/< 85% RH non condensing	

^{*1} using dry test gases at STP

^{*2} calculated

Method of Sampling

Analysis of the exhaust flue was done using direct reading instruments. So, there was no separate sampling used for this analysis. During the analysis, a standard work instruction stated in the SWI-03 was followed.

Method of Analysis

The following methods were used to analyze the stack emission parameters.

Parameters	Methods
SO ₂ (Sulfur Dioxide)	Electrochemical
CO (Carbon Monoxide)	Electrochemical
CO ₂ (Carbon Dioxide)	Calculated
O ₂ (Oxygen)	Electrochemical
NO _x (Oxides of Nitrogen)	Calculated
SPM (Suspended Particulate Matter)	Laser
Flue Temperature	Thermocouple
Flue Pressure	Pressure Sensor

Measurement Uncertainties

The following measurement uncertainties were assigned to the respected parameters.

Gases	±2%
Temperature	2°C
Pressure	0.05%

Team

All the experiments and reporting have been done under the supervision of **Mohammad Kabir Hossain** (MSc in Environment & Sustainable Technology, Manchester, UK).

Team members involved in field experiments and reporting:

- ❖ **Md. Sarwar Kabir** (BSc in Electrical and Electronics Engineering)
Chief Technical officer, 3R Environmental Consulting Limited
- ❖ **Md. Golam Rabbani** (BSc & MSc in Environmental Science)
Lab Analyst, 3R Environmental Consulting Limited
- ❖ **Mohammad Mosarof Hossain**
Assistant Technical officer, 3R Environmental Consulting Limited

Results of Analysis

Result of analysis is expressed in the following table:

Observations	Parameters						
	SPM	CO	CO ₂	SO ₂	NO	NO _x	O ₂
	µg/m ³	mg/m ³	%	mg/m ³	mg/m ³	mg/m ³	%
Run-01							
01	87	490	7.4	0	136	139	7.99
02	89	470	7.2	0	131	133	8.00
03	85	481	7.2	0	133	135	7.98
Run-02							
01	86	480	7.4	0	134	136	7.90
02	88	467	7.3	0	137	139	7.88
03	90	475	7.4	0	135	138	7.90
Run-03							
01	84	495	7.4	0	136	137	7.90
02	86	510	7.4	0	130	132	7.90
03	89	483	7.3	0	134	137	7.93

Reference Standards					
Parameters	SPM	CO	CO ₂	SO ₂	NO _x
Units	µg/m ³	mg/m ³	mg/m ³	mg/m ³	mg/m ³
DOE Standard (National)	100 (Gas) 300 (Oil)	NYS	NYS	NYS	150 (Gas) 300 (Oil)
World Bank/ IFC Standard (International)	NYS (Gas) 50 (Liquid)	NYS	NYS	NYS (Gas) 2000 (Liquid)	320 (Gas) 460 (Liquid)

***NYS= Not Yet Set**

Expert's Comments and Recommendations

The Stack Emission from the stack point of the GENERATOR has been analyzed for the parameter of SPM, CO, CO₂, SO₂, NO, NO_x and O₂ to evaluate the effect of the plant's emission while running on 100% **Natural Gas** on the air environment. From the analysis, it has been observed that the factory emission of SPM, CO, CO₂, SO₂, NO, NO_x and O₂ is within the standard limit DoE or IFC/World Bank. To meet up all standards, proper and timely maintenance of Generator is highly recommended. Use of better quality fossil fuel, Installment of proper and enough ventilation system (Exhaust Fan) will surely help to reduce emission.

Prepared by

Checked by

Approved by

<p>Generator Stack Air Emission Picture</p>	<p>Generator Stack Air Emission Picture</p>
 <p>A large yellow CAT generator is shown in an industrial setting. The generator is the central focus, with various pipes and mechanical components visible. The CAT logo is clearly visible on the side of the generator. The background shows a well-lit industrial interior with high ceilings and structural elements.</p>	 <p>A worker wearing a high-visibility safety vest is standing next to a large yellow CAT generator. The worker appears to be inspecting or working on the machine. The generator is prominently displayed, and the CAT logo is visible. The scene is set in an industrial facility with overhead lighting.</p>
<p>Generator Stack Air Emission Picture</p>	<p>Generator Stack Air Emission Picture</p>
 <p>Two workers in high-visibility safety vests are positioned near a large yellow CAT generator. One worker is kneeling on the floor, possibly handling equipment or materials, while the other stands nearby. The generator is the central element, and the CAT logo is visible. The industrial environment is well-lit.</p>	 <p>A worker in a high-visibility safety vest is holding a clipboard and looking towards a large yellow CAT generator. Another person is partially visible in the background. The generator is the main focus, with the CAT logo clearly shown. The setting is an industrial plant.</p>