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

3R ENVIRONMENTAL CONSULTING

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At
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Sampling Date	May 05, 2018
Sampling Time	12:30 p.m.-01:00 p.m.
Reporting Date	May 08, 2018

Basic Information of Generator	
Location	Ground Floor, Utility Building
Brand	PERKINS
Model	P350
Serial Number	D5396A/001
Fuel Type	Diesel (Light Oil)
Capacity	350 KVA
RPM	1500
Voltage	400 V
Frequency	50 Hz
Manufacturing Date	Not Found
Last Servicing Date	15/01/2018
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 (0_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_2S):	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	2^0C
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	141	502	2.9	90	134	136	14.02
02	135	499	2.7	94	136	138	14.01
03	142	505	2.8	95	132	134	14.02
Run-02							
01	140	472	2.9	91	139	141	14.05
02	138	480	2.9	85	143	146	14.03
03	144	469	2.7	97	148	151	14.03
Run-03							
01	143	475	2.9	89	147	149	14.08
02	146	483	3.0	99	142	144	14.06
03	139	486	2.9	87	137	139	14.08

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, NO_x, SO_2, NO, CO, O_2 and CO_2 to evaluate the effect of the plant's emission while running on 100% **Diesel (Light Oil)** on the air environment. From the analysis, it has been observed that the factory emission SPM, SO_2, CO, O_2 and CO_2 is within the standard limit of 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**
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Generator Stack Air Emission Picture	Generator Stack Air Emission Picture
	
Generator Stack Air Emission Picture	**Generator Stack Air Emission Picture**