

Test Report
On
Stack Air Emission Analysis of Boiler

Prepared

For

Vertex RMG Division

Vertex Wear Limited, Dress World Limited, Neo Fashion Limited

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

Report No. XSB-3RECL-2017-1224



Prepared by



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At

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|-----------------------|------------------------|
| Report No. | XSB-3RECL-2017-1224 |
| Sampling Date | November 26, 2017 |
| Sampling Time | 02:00 p.m.- 02:30 p.m. |
| Reporting Date | November 27, 2017 |

| Basic Information of Boiler | |
|------------------------------------|--|
| Location | Production Building, , 1 st Floor |
| Brand | MEL |
| Model | N/F |
| Boiler Registration No | বাঃ বঃ 9439 |
| Serial Number | 500TL-0199 |
| Manufacturing Date | 2017 |
| Fuel Type | Diesel (Light Oil) |
| Capacity (kg/hr or ton/hr) | 500 Kg |
| Operating Pressure | 5.5 kg |
| Design Pressure | 7 kg |
| Last Servicing Date | New Installation |
| Physical Structure | Vertical Landed |

| Environmental Conditions | |
|---------------------------------|---------------------------|
| Temperature | 28.1°C |
| Humidity | 52% RH |
| Visibility/Season | Winter & 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 \pm 0.3% of reading |
| Inlet Temperature | 0.1° (C/F) | 0-600°C 0-999°F | 1.0 ° C \pm 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 | \pm 0.5% Full Scale |
| Carbon dioxide (CO ₂) ^{*2} | 0.1% | 0 – Fuel Value | \pm 0.3% |
| Efficiency ^{*2} | 0.1% | 0-100% | \pm 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 Particular 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
- ❖ **Mohammad Faridul Islam** (BSc & MSc in Environment Science)
Lab Analyst, 3R Environmental Consulting Limited
- ❖ **Mohammad Mosarof Hossain**
Assistant Technical officer, 3R Environmental Consulting Limited

Results of Analysis

The 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 | 45 | 9 | 7.4 | 13 | 74 | 76 | 11.9 |
| 02 | 34 | 8 | 7.4 | 12 | 76 | 77 | 12.1 |
| 03 | 41 | 7 | 7.3 | 14 | 70 | 73 | 11.9 |
| Run-02 | | | | | | | |
| 01 | 38 | 11 | 7.1 | 16 | 75 | 79 | 12.3 |
| 02 | 36 | 9 | 7.0 | 14 | 71 | 73 | 11.8 |
| 03 | 39 | 9 | 7.3 | 16 | 72 | 75 | 12.2 |
| Run-03 | | | | | | | |
| 01 | 39 | 7 | 7.2 | 13 | 72 | 75 | 11.7 |
| 02 | 42 | 8 | 7.1 | 15 | 70 | 72 | 12.3 |
| 03 | 39 | 9 | 7.2 | 12 | 71 | 73 | 11.8 |

| 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) |

Expert Comments and Recommendations

The Stack Emission from the stack point of the BOILER 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% **Diesel (Light Oil)** 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 of DoE and IFC/World Bank.

*NYS= Not Yet Set

Prepared by

Checked by

Approved by

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| <p align="center">Boiler Stack Air Emission Picture</p> | <p align="center">Boiler Stack Air Emission Picture</p> |
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| <p align="center">Boiler Stack Air Emission Picture</p> | <p align="center">Boiler Stack Air Emission Picture</p> |
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