Stack Emission Test Report

Basic Information:

Facility Name	**The Rose Dresses Ltd.,** **Islam Garments Ltd. &** **Islam Dresses Ltd.**
Facility Address	Jamgora, Diakhali, Yearpur, Zirabo, Ashulia, Savar, Dhaka – 1349.
GPS Coordinate	Latitude: 23.9413305 N | Longitude: 90.2911591 E
Facility Contact	Brigadier General M M Salehin ndc, psc (retd)
Facility Email	Monwar.salehin@islam-garments.com
Facility Tel	+880 1841-770500, +880 1713-170500
Description of Equipment	Flue gas analyzer (Brand: Kane-945)
Data Collection Date & Time	24th January, 2023, 09:30 AM-05:30 PM. (Running Condition).
Conducted By	**Md. Khairul Alam** (B.Sc. & M. Sc. in Environmental Sciences, Jahangirnagar University) **& Md. Moinul Islam** (BSS in Social Science, National University)
Reporting Date	29th January, 2023
Reference No.	PS/2223225030123

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Stack Air Emission

Stack is nothing but a chimney which is used to disperse the hot air at a great height, emissions & particulate matters that are emitted from the various types of stacks like boiler, flue gas etc. At these heights the polluted air disperses in a very large area so that concentrations at ground are within permissible limits and not harmful for humans, animals and vegetation. There are several types of flue-gas stack based on fuel injections. E.g. DG set stack, flue gas stack, process stack, furnace stack, boiler stack, chimney etc.

SOx: Sulphur oxides (SOx), the most common Sulphur oxide is Sulphur dioxide (SO_2). Sulphur trioxide (SO_3) is an intermediate product during the manufacture of sulphuric acid (contact process). Sulphur dioxide is a colorless gas with a penetrating, choking odor. It dissolves readily in water to form an acidic solution (sulphurous acid). Contribute to acid deposition which in turns affects the quality of soils and water. SOx are known as precursors for Particulate Matter Formation. Sulfur oxide affects human health when it is breathed in. It irritates the nose, throat, and airways to cause coughing, wheezing, shortness of breath, or a tight feeling around the chest.

Nitrous oxide (NOx): Nitrous oxide is a by-product of fuel combustion. When any fossil fuel is burnt, part of the nitrogen that is in the fuel and surrounding air get oxidized creating nitrous oxide emissions. NOx reacts with ammonia to form nitric acid vapor and related particles that can penetrate deeply into sensitive lung tissue and damage it, causing premature death in extreme cases. From the reaction with Volatile Organic Compounds (VOC), in the presence of sunlight, Ozone can cause adverse effects such as damage to lung tissue and reduction in lung function mostly in susceptible Populations (children, elderly, and asthmatics). Ozone can be transported by wind currents and cause health impacts far from the original sources.

Carbon dioxide (CO_2): Carbon dioxide (CO_2) is a colorless gas with a density about 60% higher than that of dry air. Carbon dioxide consists of a carbon atom covalently double bonded to two oxygen atoms. It is present in deposits of petroleum and natural gas. Carbon dioxide is odorless at normally encountered concentrations, however, at high concentrations, it has a sharp and acidic odor. Result from combustion processes where oxidation of carbon occurs. Carbon dioxide and water is the results of complete combustion of fossil fuels where carbon molecules undergo an oxidation process. Increase of anthropogenic CO_2 to the atmosphere with consequential contribution to Greenhouse Gas effect and Global Warming. Climate Change, amongst other direct effects of global temperature increase.

Carbon Monoxide (CO): Carbon Monoxide (CO), a toxic poisonous gas, is the result of incomplete combustion processes where full oxidation of carbon molecules did not occur. Carbon monoxide readily reacts with the hydroxyl radical (OH) forming a much stronger, greenhouse gas--carbon dioxide. This, in turn, increases concentrations of methane, another strong greenhouse gas, because the most common way methane is removed from the atmosphere is when it reacts with OH. So, the formation of carbon dioxide leaves fewer OH for methane to react with, thus increasing methane's concentration. Carbon monoxide affects healthy and unhealthy people. Increased levels of carbon monoxide reduce the amount of oxygen carried by hemoglobin around the body in red blood cells. The result is that vital organs, such as the brain, nervous tissues and the heart, do not receive enough oxygen to work properly.

Oxygen (O_2): Oxygen is a chemical element with symbol O and atomic number 8. It is a member of the chalcogenide group on the periodic table, a highly reactive nonmetal, and an oxidizing agent that readily forms oxides with most elements as well as with other compounds. By mass, oxygen is the third-most abundant element in the universe, after hydrogen and helium. At standard temperature and pressure, two atoms of the element bind to form dioxygen, a colorless and odorless diatomic gas with the formula O_2. Diatomic oxygen gas constitutes 20.8% of the Earth's atmosphere. As compounds including oxides, the element makes up almost half of the Earth's crust. The combustion of a carbon-based fuel consumes oxygen. The 21% oxygen content present in the combustion air that is fed to a furnace will be depleted to some lower level in the exhaust gas. The interpretation clause of IPPC licenses typically requires emission data to be reported at reference oxygen conditions that are defined according the fuel type, for example:

- Gas and liquid fuels 3% ref O_2.
- Solid fuels 6% ref O_2.
- Waste incineration 11% ref O_2.
- Other fuels (e.g., fume thermal oxidizer): The application of reference oxygen.
- Conditions will be determined on a case-by-case basis.

VOC (Volatile Organic Carbon): Volatile organic compounds (VOCs) are a large group of organic chemicals that include any compound of carbon (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate). VOCs are of interest in part because they participate in atmospheric photochemical reactions that contribute to ozone formation. Ozone (the Ozone Concentrations indicator) is formed from chemical reactions involving airborne VOCs, airborne nitrogen oxides, and sunlight. VOCs are also of interest because they play a role in formation of secondary organic

aerosols, which are found in airborne particulate matter (the Particulate Matter Concentrations indicator). Finally, VOCs are of interest because many individual VOCs are known to be harmful to human health (the Air Toxics Concentrations indicator; the Air Toxics Emissions indicator). Health effects vary by pollutant. VOCs are emitted from a variety of sources, including motor vehicles, chemical manufacturing facilities, refineries, factories, consumer and commercial products, and natural (biogenic) sources (mainly trees).

Lead (Pb): Sources of lead emissions vary from one area to another. At the national level, major sources of lead in the air are ore and metals processing and piston-engine aircraft operating on leaded aviation fuel. Other sources are waste incinerators, utilities, and lead-acid battery manufacturers. The highest air concentrations of lead are usually found near lead smelters.

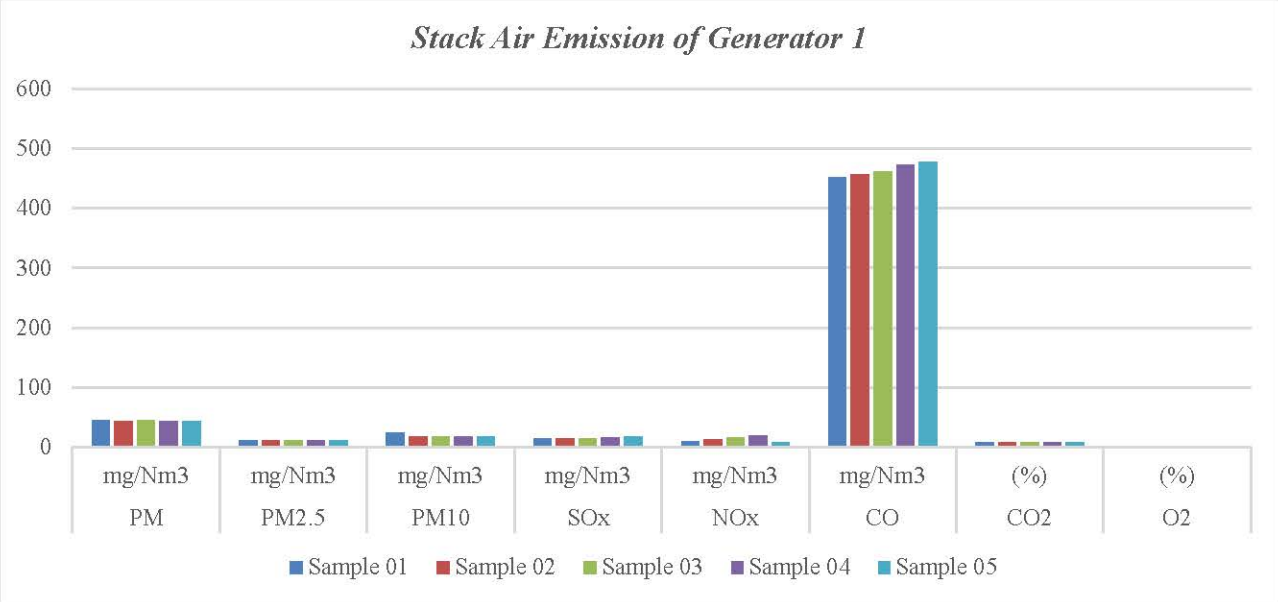
Test Result :

Descriptions of Generator 1					
Model No	:	TCG2020V16KMWM	RPM	:	1500 rpm
Serial No	:	1388772	Rated Voltage	:	415
Rated Frequency	:	50 Hz	Origin	:	GERMANY
Brand	:	CATERPILLAR	Fuel Type	:	GAS
Standby Power Rating	:	1875 KVA	Manufacturing Year	:	2014

Stack Air Emission Concentration									
Sample		PM	$PM_{2.5}$	PM_{10}	SOx	NOx	CO	CO_2	O_2
		mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	(%)	(%)
Sample 01		45	12	24	14	10	452	8.3	2.5
Sample 02		44	12	18	15	13	457	8.3	2.5
Sample 03		46	12	18	15	16	461	8.3	2.5
Sample 04		43	11	17	16	19	472	8.3	2.5
Sample 05		44	12	18	18	8	477	8.3	2.5
DoE Standard (APCR 2022, Schedule 5)	*Coal*	50 (a)	-	-	200 (a)	200 (a)	-	-	-
		100 (b)	-	-	400 (b)	400 (b)	-	-	-
	Liquid	50 (a)	-	-	200 (a)	200 (a)	-	-	-
		80 (b)	-	-	400 (b)	400 (b)	-	-	-
	NG	-	-	-	-	200 (b)	-	-	-
		-	-	-	-	400 (b)	-	-	-
	Gaseous (LPG,LNG, etc)	50	-	-	400	200	-	-	-
STeP by OEKO-TEX Standards		50	NYS	NYS	100	300	500	NYS	3
Remarks		Acceptable	-	-	Acceptable	Acceptable	Acceptable	-	Acceptable

Abbreviation: PM (Particulate Matter), $PM_{2.5}$ (Particulate Matter 2.5), PM_{10} (Particulate Matter 10), SOx (Sulphur Oxides), CO (Carbon Monoxide), NOx (Nitrogen -Oxides), CO_2 (Carbon Di Oxide), O_2 (Oxygen), DoE (Department of Environment), APCR (Air Pollution Control Rules), NYS (Not Yet Set), (a) new - installed after 2020, (b) existing - installed before 2020.

Mass Emission Calculation			
Item	Flue Temperature (°C)	Ambient Temperature (°C)	Flow Rate (m/s)
Generator-1	257.6	39.7	11.80

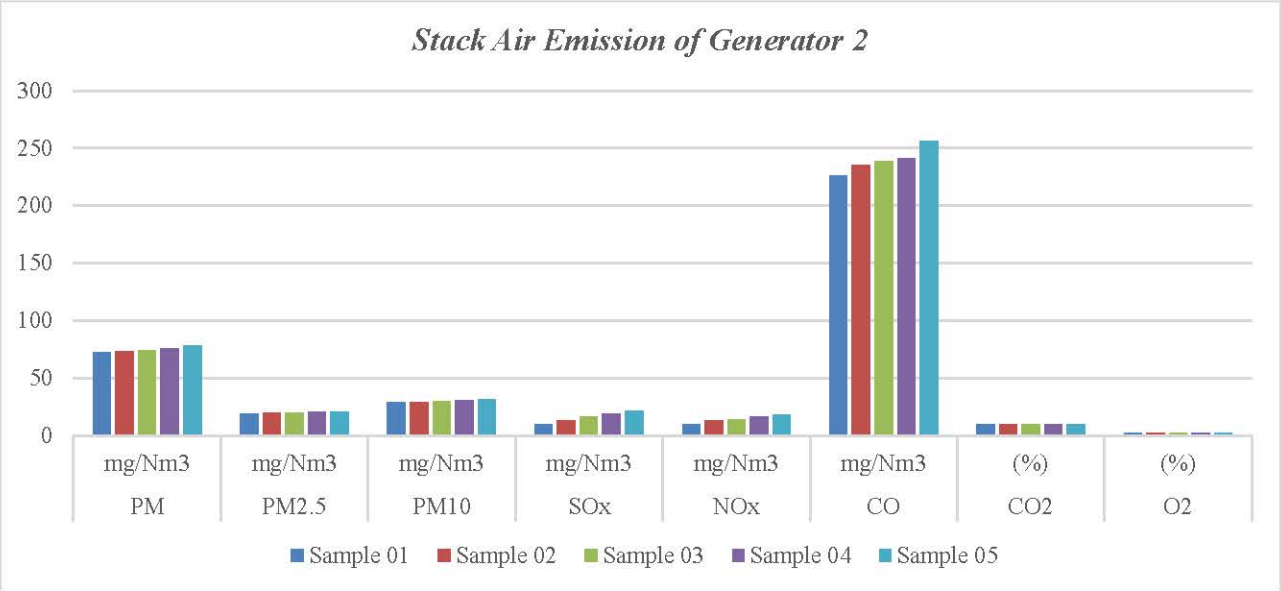


Descriptions of Generator 2					
Model No	:	HCI544E1	RPM	:	1500 rpm
Serial No	:	0262257/014	Rated Voltage	:	400
Rated Frequency	:	50 Hz	Origin	:	UK
Brand	:	Perkins	Fuel Type	:	Diesel
Standby Power Rating	:	600 KVA	Manufacturing Year	:	2015

Stack Air Emission Concentration									
Sample		PM	$PM_{2.5}$	PM_{10}	SOx	NOx	CO	CO_2	O_2
		mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	(%)	(%)
Sample 01		72	19	29	10	10	226	9.4	2.3
Sample 02		73	19	29	13	13	235	9.4	2.3
Sample 03		74	20	30	16	14	239	9.4	2.3
Sample 04		76	20	30	19	16	241	9.4	2.3
Sample 05		78	21	31	21	18	256	9.4	2.3
DoE Standard (APCR 2022, Schedule 5)	*Coal*	50 (a)	-	-	200 (a)	200 (a)	-	-	-
		100 (b)	-	-	400 (b)	400 (b)	-	-	-
	Liquid	50 (a)	-	-	200 (a)	200 (a)	-	-	-
		80 (b)	-	-	400 (b)	400 (b)	-	-	-
	NG	-	-	-	-	200 (b)	-	-	-
		-	-	-	-	400 (b)	-	-	-
	Gaseous (LPG,LNG, etc)	50	-	-	400	200	-	-	-
STeP by OEKO-TEX Standards		150	NYS	NYS	900	1000	500	NYS	3
Remarks		Acceptable	-	-	Acceptable	Acceptable	Acceptable	-	Acceptable

Abbreviation: PM (Particulate Matter), $PM_{2.5}$ (Particulate Matter 2.5), PM_{10} (Particulate Matter 10), SOx (Sulphur Oxides), CO (Carbon Monoxide), NOx (Nitrogen -Oxides), CO_2 (Carbon Di Oxide), O_2 (Oxygen), DoE (Department of Environment), APCR (Air Pollution Control Rules), NYS (Not Yet Set), (a) new - installed after 2020, (b) existing - installed before 2020.

Mass Emission Calculation			
Item	Flue Temperature (°C)	Ambient Temperature (°C)	Flow Rate (m/s)
Generator-2	231.5	37.2	10.40

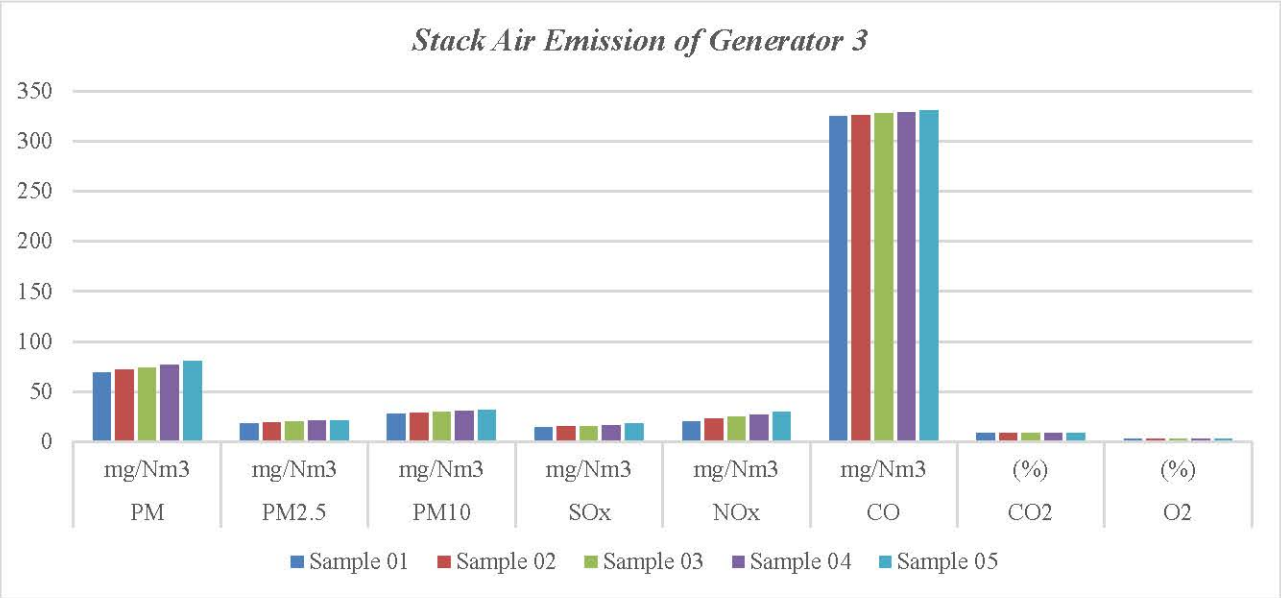


Descriptions of Generator 3					
Model No	:	HC1544D1	RPM	:	1500 rpm
Serial No	:	X12J432618	Rated Voltage	:	400
Rated Frequency	:	50 Hz	Origin	:	UK
Brand	:	Perkins	Fuel Type	:	Diesel
Standby Power Rating	:	550 KVA	Manufacturing Year	:	2019

Stack Air Emission Concentration									
Sample		PM	$PM_{2.5}$	PM_{10}	SOx	NOx	CO	CO_2	O_2
		mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	(%)	(%)
Sample 01		69	18	28	14	20	325	8.3	2.4
Sample 02		72	19	29	15	23	326	8.3	2.4
Sample 03		74	20	30	15	25	328	8.3	2.4
Sample 04		77	21	31	16	27	329	8.3	2.4
Sample 05		80	21	32	18	30	331	8.3	2.4
DoE Standard (APCR 2022, Schedule 5)	*Coal*	50 (a)	-	-	200 (a)	200 (a)	-	-	-
		100 (b)	-	-	400 (b)	400 (b)	-	-	-
	Liquid	50 (a)	-	-	200 (a)	200 (a)	-	-	-
		80 (b)	-	-	400 (b)	400 (b)	-	-	-
	NG	-	-	-	-	200 (b)	-	-	-
		-	-	-	-	400 (b)	-	-	-
	Gaseous (LPG,LNG, etc)	50	-	-	400	200	-	-	-
STeP by OEKO-TEX Standards		150	NYS	NYS	900	1000	500	NYS	3
Remarks		Acceptable	-	-	Acceptable	Acceptable	Acceptable	-	Acceptable

Abbreviation: PM (Particulate Matter), $PM_{2.5}$ (Particulate Matter 2.5), PM_{10} (Particulate Matter 10), SOx (Sulphur Oxides), CO (Carbon Monoxide), NOx (Nitrogen -Oxides), CO_2 (Carbon Di Oxide), O_2 (Oxygen), DoE (Department of Environment), APCR (Air Pollution Control Rules), NYS (Not Yet Set), (a) new - installed after 2020, (b) existing - installed before 2020.

Mass Emission Calculation			
Item	Flue Temperature (°C)	Ambient Temperature (°C)	Flow Rate (m/s)
Generator-3	236.5	39.7	9.65

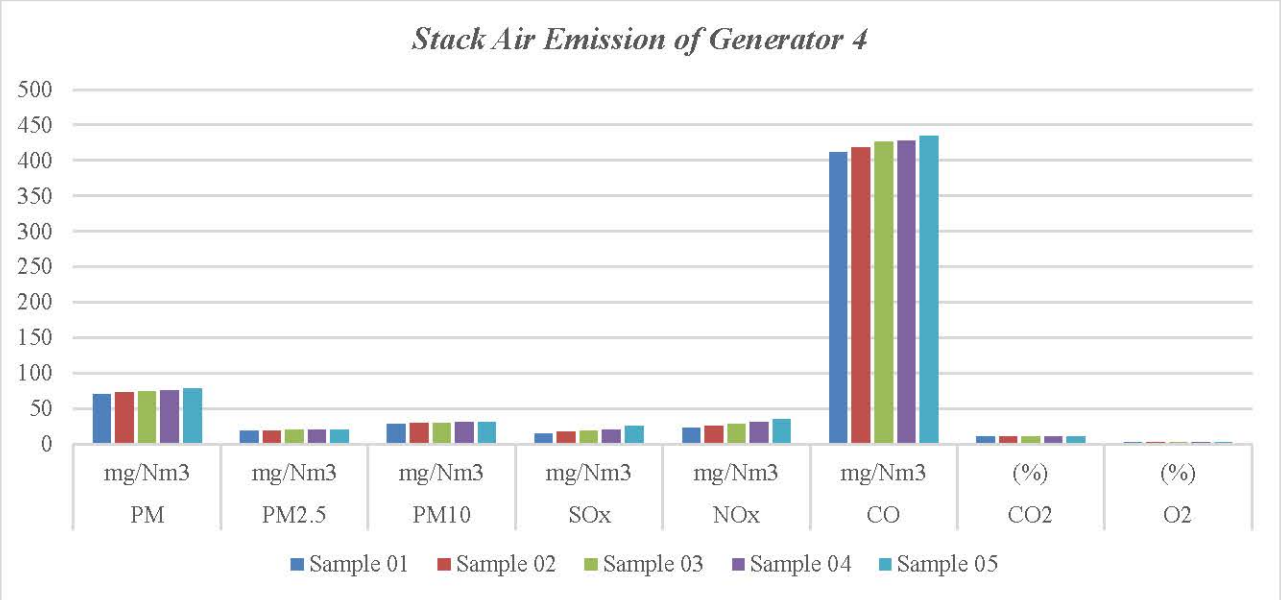


Descriptions of Generator 4					
Model No	:	ECO38-3LN	RPM	:	1500 rpm
Serial No	:	2206A-E13TAG2	Rated Voltage	:	400
Rated Frequency	:	50 Hz	Origin	:	UK
Brand	:	Perkins	Fuel Type	:	Diesel
Standby Power Rating	:	400 KVA	Manufacturing Year	:	2018

Stack Air Emission Concentration									
Sample		PM	$PM_{2.5}$	PM_{10}	SOx	NOx	CO	CO_2	O_2
		mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	(%)	(%)
Sample 01		70	19	28	15	23	412	11.3	2.3
Sample 02		73	19	29	18	26	418	11.3	2.3
Sample 03		74	20	30	19	28	426	11.3	2.3
Sample 04		76	20	30	20	31	428	11.3	2.3
Sample 05		78	21	31	26	35	435	11.3	2.3
DoE Standard (APCR 2022, Schedule 5)	*Coal*	50 (a)	-	-	200 (a)	200 (a)	-	-	-
		100 (b)	-	-	400 (b)	400 (b)	-	-	-
	Liquid	50 (a)	-	-	200 (a)	200 (a)	-	-	-
		80 (b)	-	-	400 (b)	400 (b)	-	-	-
	NG	-	-	-	-	200 (b)	-	-	-
		-	-	-	-	400 (b)	-	-	-
	Gaseous (LPG,LNG, etc)	50	-	-	400	200	-	-	-
STeP by OEKO-TEX Standards		150	NYS	NYS	900	1000	500	NYS	3
Remarks		Acceptable	-	-	Acceptable	Acceptable	Acceptable	-	Acceptable

Abbreviation: PM (Particulate Matter), $PM_{2.5}$ (Particulate Matter 2.5), PM_{10} (Particulate Matter 10), SOx (Sulphur Oxides), CO (Carbon Monoxide), NOx (Nitrogen -Oxides), CO_2 (Carbon Di Oxide), O_2 (Oxygen), DoE (Department of Environment), APCR (Air Pollution Control Rules), NYS (Not Yet Set), (a) new - installed after 2020, (b) existing - installed before 2020.

Mass Emission Calculation			
Item	Flue Temperature (°C)	Ambient Temperature (°C)	Flow Rate (m/s)
Generator-4	232.6	38.1	9.78



Descriptions of Generator 5 (Currently Inactive)					
Model No	:	431PSL1264	RPM	:	1500 rpm
Serial No	:	LM 221483-0497	Rated Voltage	:	400/230
Rated Frequency	:	50 Hz	Origin	:	USA
Brand	:	Magna Plus	Fuel Type	:	Diesel
Standby Power Rating	:	125 KVA	Manufacturing Year	:	2018

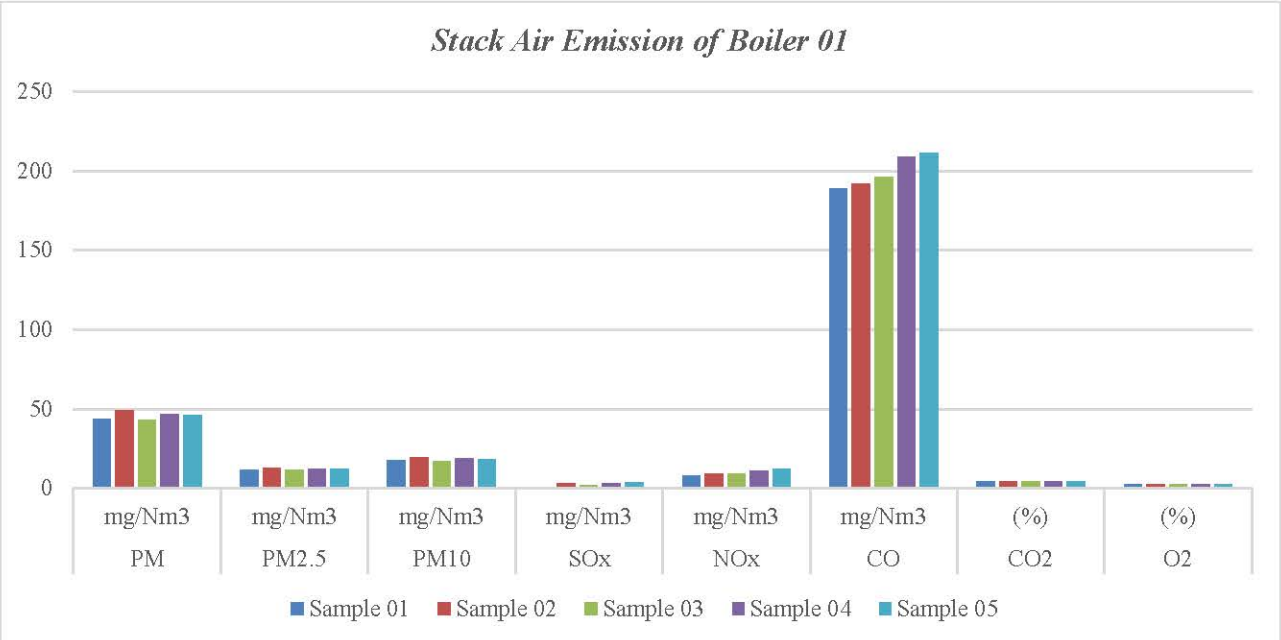
Comment: Test result for stack air emission of the facility shows concentrations are under acceptable limit.

Descriptions of Boiler 01					
License No.	:	B.B. 7422	Boiler Power	:	NF
Model No	:	MEL 500TL-100N1	Rated Frequency	:	50Hz
Serial No	:	500TL-083	Origin	:	BD
Brand	:	MORDEN ERECTION	Fuel Type	:	GAS
Capacity	:	500 KG/HR	Manufacturing Year	:	2013

Stack Air Emission Concentration									
Sample		PM	$PM_{2.5}$	PM_{10}	SOx	NOx	CO	CO_2	O_2
		mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	(%)	(%)
Sample 01		44	12	18	1	8	189	4.6	2.6
Sample 02		49	13	20	3	9	192	4.6	2.6
Sample 03		43	11	17	2	9	196	4.6	2.6
Sample 04		47	13	19	3	11	209	4.6	2.6
Sample 05		46	12	18	4	12	211	4.6	2.6
DoE Standard (APCR 2022, Schedule 7)	*Coal*	250	-	-	250	400	-	-	-
	Gas	-	-	-		150	-	-	-
	Liquid	200	-	-		300	-	-	-
	Charcoal/ Husk/others	250	-	-		400	-	-	-
STeP by OEKO-TEX Standards		50	NYS	NYS	100	300	500	NYS	3
Remarks		Acceptable	-	-	Acceptable	Acceptable	Acceptable	-	Acceptable

Abbreviation: PM (Particulate Matter), $PM_{2.5}$ (Particulate Matter 2.5), PM_{10} (Particulate Matter 10), SOx (Sulphur Oxides), CO (Carbon Monoxide), NOx (Nitrogen -Oxides), CO_2 (Carbon Di Oxide), O_2 (Oxygen), DoE (Department of Environment), APCR (Air Pollution Control Rules), NYS (Not Yet Set).

Mass Emission Calculation			
Item	Flue Temperature (°C)	Ambient Temperature (°C)	Flow Rate (m/s)
Boiler 01	241.3	39.8	9.45

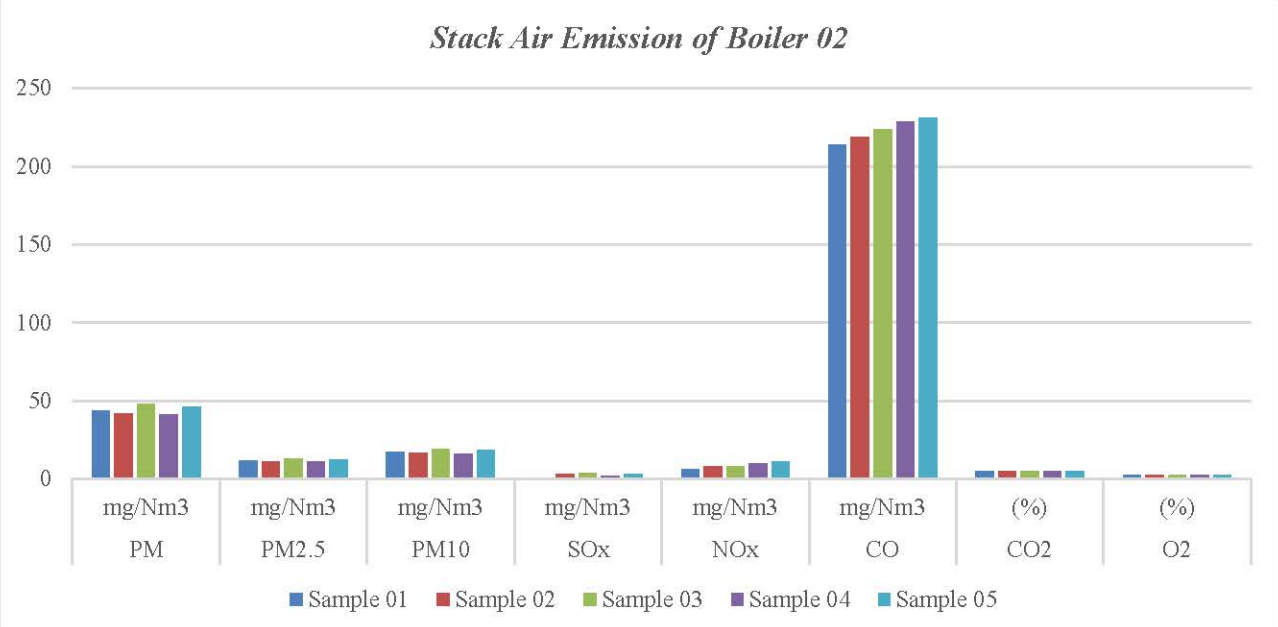


Descriptions of Boiler 02					
License No.	:	B.B. 6673	Boiler Power	:	NF
Model No	:	MEL500TL-100N1	Rated Frequency	:	50Hz
Serial No	:	500TL-034	Origin	:	BD
Brand	:	MORDEN ERECTION	Fuel Type	:	GAS
Capacity	:	500 KG/HR	Manufacturing Year	:	2011

Stack Air Emission Concentration									
Sample		PM	$PM_{2.5}$	PM_{10}	SOx	NOx	CO	CO_2	O_2
		mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	(%)	(%)
Sample 01		44	12	18	1	6	214	5.1	2.3
Sample 02		42	11	17	3	8	219	5.1	2.3
Sample 03		48	13	19	4	8	224	5.1	2.3
Sample 04		41	11	16	2	10	229	5.1	2.3
Sample 05		46	12	18	3	11	231	5.1	2.3
DoE Standard (APCR 2022, Schedule 7)	*Coal*	250	-	-	250	400	-	-	-
	Gas	-	-	-		150	-	-	-
	Liquid	200	-	-		300	-	-	-
	Charcoal/ Husk/others	250	-	-		400	-	-	-
STeP by OEKO-TEX Standards		50	NYS	NYS	100	300	500	NYS	3
Remarks		Acceptable	-	-	Acceptable	Acceptable	Acceptable	-	Acceptable

Abbreviation: PM (Particulate Matter), $PM_{2.5}$ (Particulate Matter 2.5), PM_{10} (Particulate Matter 10), SOx (Sulphur Oxides), CO (Carbon Monoxide), NOx (Nitrogen -Oxides), CO_2 (Carbon Di Oxide), O_2 (Oxygen), DoE (Department of Environment), APCR (Air Pollution Control Rules), NYS (Not Yet Set).

Mass Emission Calculation			
Item	Flue Temperature (°C)	Ambient Temperature (°C)	Flow Rate (m/s)
Boiler 2	198.5	40.1	9.21

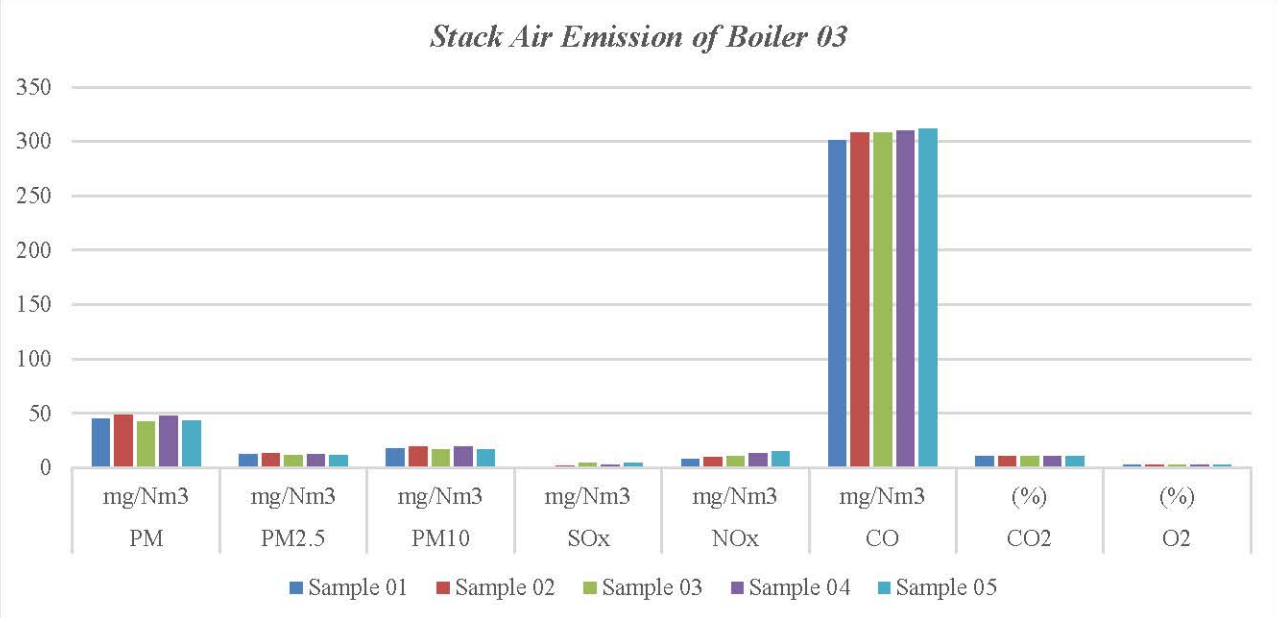


Descriptions of Boiler 03					
License No.	:	B.B. 8608	Boiler Power	:	NF
Model No	:	MEL 500TL-100N1	Rated Frequency	:	50Hz
Serial No	:	500TL-174	Origin	:	BD
Brand	:	MORDEN ERECTION	Fuel Type	:	GAS
Capacity	:	500 KG/HR	Manufacturing Year	:	2016

Stack Air Emission Concentration									
Sample		PM	$PM_{2.5}$	PM_{10}	SOx	NOx	CO	CO_2	O_2
		mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	(%)	(%)
Sample 01		45	12	18	1	8	301	10.4	2.5
Sample 02		49	13	20	2	10	308	10.4	2.5
Sample 03		42	11	17	4	11	308	10.4	2.5
Sample 04		48	13	19	3	13	310	10.4	2.5
Sample 05		43	11	17	4	15	312	10.4	2.5
DoE Standard (APCR 2022, Schedule 7)	*Coal*	250	-	-	250	400	-	-	-
	Gas	-	-	-		150	-	-	-
	Liquid	200	-	-		300	-	-	-
	Charcoal/ Husk/others	250	-	-		400	-	-	-
STeP by OEKO-TEX Standards		50	NYS	NYS	100	300	500	NYS	3
Remarks		Acceptable	-	-	Acceptable	Acceptable	Acceptable	-	Acceptable

Abbreviation: PM (Particulate Matter), $PM_{2.5}$ (Particulate Matter 2.5), PM_{10} (Particulate Matter 10), SOx (Sulphur Oxides), CO (Carbon Monoxide), NOx (Nitrogen -Oxides), CO_2 (Carbon Di Oxide), O_2 (Oxygen), DoE (Department of Environment), APCR (Air Pollution Control Rules), NYS (Not Yet Set).

Mass Emission Calculation			
Item	Flue Temperature (°C)	Ambient Temperature (°C)	Flow Rate (m/s)
Boiler 03	187.8	39..8	8.90

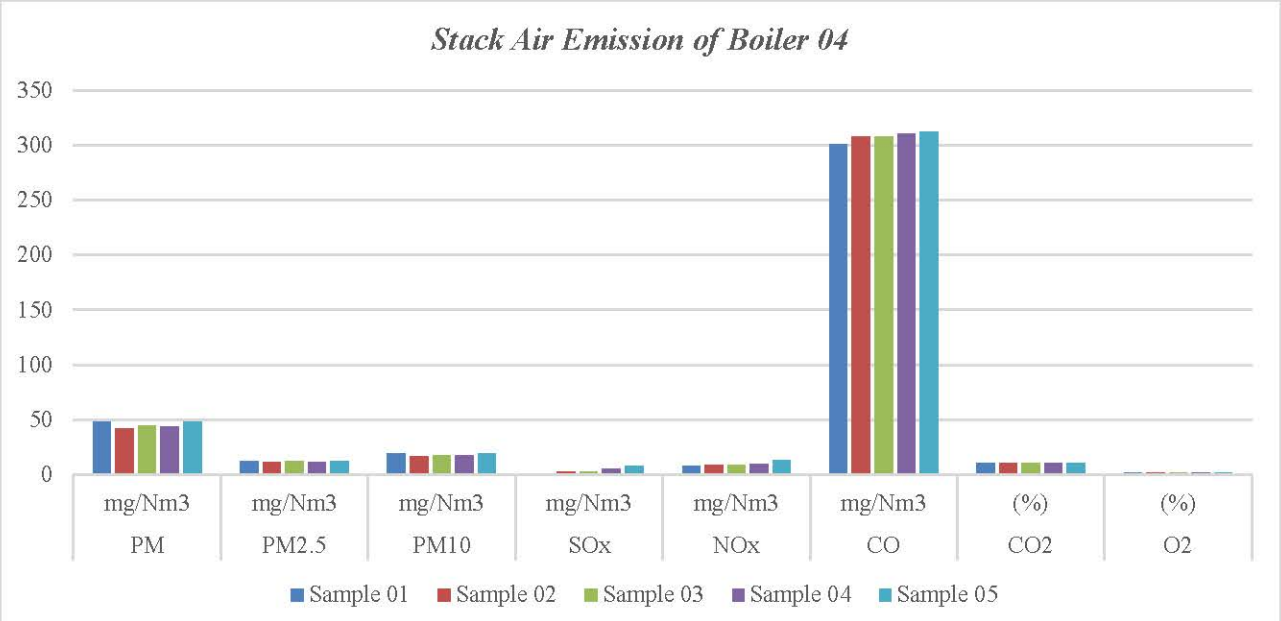


Descriptions of Boiler 04					
License No.	:	B.B. 7673	Boiler Power	:	NF
Model No	:	MEL 500TL-100N1	Rated Frequency	:	50Hz
Serial No	:	500TL-096	Origin	:	BD
Brand	:	MORDEN ERECTION	Fuel Type	:	GAS
Capacity	:	500 KG/HR	Manufacturing Year	:	2013

Stack Air Emission Concentration									
Sample		PM	$PM_{2.5}$	PM_{10}	SOx	NOx	CO	CO_2	O_2
		mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	(%)	(%)
Sample 01		48	13	19	1	8	301	10.4	2.2
Sample 02		42	11	17	3	9	308	10.4	2.2
Sample 03		45	12	18	3	9	308	10.4	2.2
Sample 04		44	12	18	5	10	310	10.4	2.2
Sample 05		48	13	19	8	13	312	10.4	2.2
DoE Standard (APCR 2022, Schedule 7)	*Coal*	250	-	-	250	400	-	-	-
	Gas	-	-	-		150	-	-	-
	Liquid	200	-	-		300	-	-	-
	Charcoal/ Husk/others	250	-	-		400	-	-	-
STeP by OEKO-TEX Standards		50	NYS	NYS	100	300	500	NYS	3
Remarks		Acceptable	-	-	Acceptable	Acceptable	Acceptable	-	Acceptable

Abbreviation: PM (Particulate Matter), $PM_{2.5}$ (Particulate Matter 2.5), PM_{10} (Particulate Matter 10), SOx (Sulphur Oxides), CO (Carbon Monoxide), NOx (Nitrogen -Oxides), CO_2 (Carbon Di Oxide), O_2 (Oxygen), DoE (Department of Environment), APCR (Air Pollution Control Rules), NYS (Not Yet Set).

Mass Emission Calculation			
Item	Flue Temperature (°C)	Ambient Temperature (°C)	Flow Rate (m/s)
Boiler 04	178.4	38.2	4.90

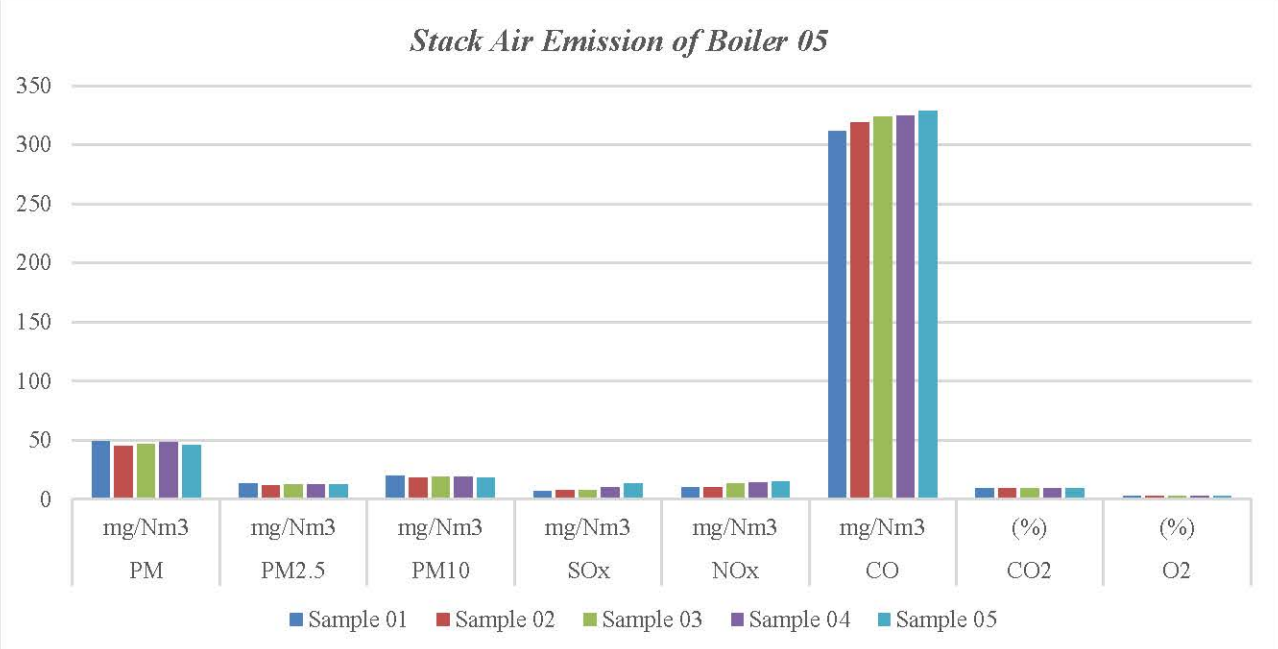


Descriptions of Boiler 05					
License No.	:	B.B. 6409	Boiler Power	:	NF
Model No	:	MEL 500TL-100N1	Rated Frequency	:	50Hz
Serial No	:	500TL-027	Origin	:	BD
Brand	:	MORDEN ERECTION	Fuel Type	:	GAS
Capacity	:	500 KG/HR	Manufacturing Year	:	2010

Stack Air Emission Concentration									
Sample		PM	$PM_{2.5}$	PM_{10}	SOx	NOx	CO	CO_2	O_2
		mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	(%)	(%)
Sample 01		49	13	20	7	10	312	9.5	2.8
Sample 02		45	12	18	8	10	319	9.5	2.8
Sample 03		47	13	19	8	13	324	9.5	2.8
Sample 04		48	13	19	10	14	325	9.5	2.8
Sample 05		46	12	18	13	15	329	9.5	2.8
DoE Standard (APCR 2022, Schedule 7)	*Coal*	250	-	-	250	400	-	-	-
	Gas	-	-	-		150	-	-	-
	Liquid	200	-	-		300	-	-	-
	Charcoal/ Husk/others	250	-	-		400	-	-	-
STeP by OEKO-TEX Standards		50	NYS	NYS	100	300	500	NYS	3
Remarks		Acceptable	-	-	Acceptable	Acceptable	Acceptable	-	Acceptable

Abbreviation: PM (Particulate Matter), $PM_{2.5}$ (Particulate Matter 2.5), PM_{10} (Particulate Matter 10), SOx (Sulphur Oxides), CO (Carbon Monoxide), NOx (Nitrogen -Oxides), CO_2 (Carbon Di Oxide), O_2 (Oxygen), DoE (Department of Environment), APCR (Air Pollution Control Rules), NYS (Not Yet Set).

Mass Emission Calculation			
Item	Flue Temperature (°C)	Ambient Temperature (°C)	Flow Rate (m/s)
Boiler 05	165.1	38..4	6.80

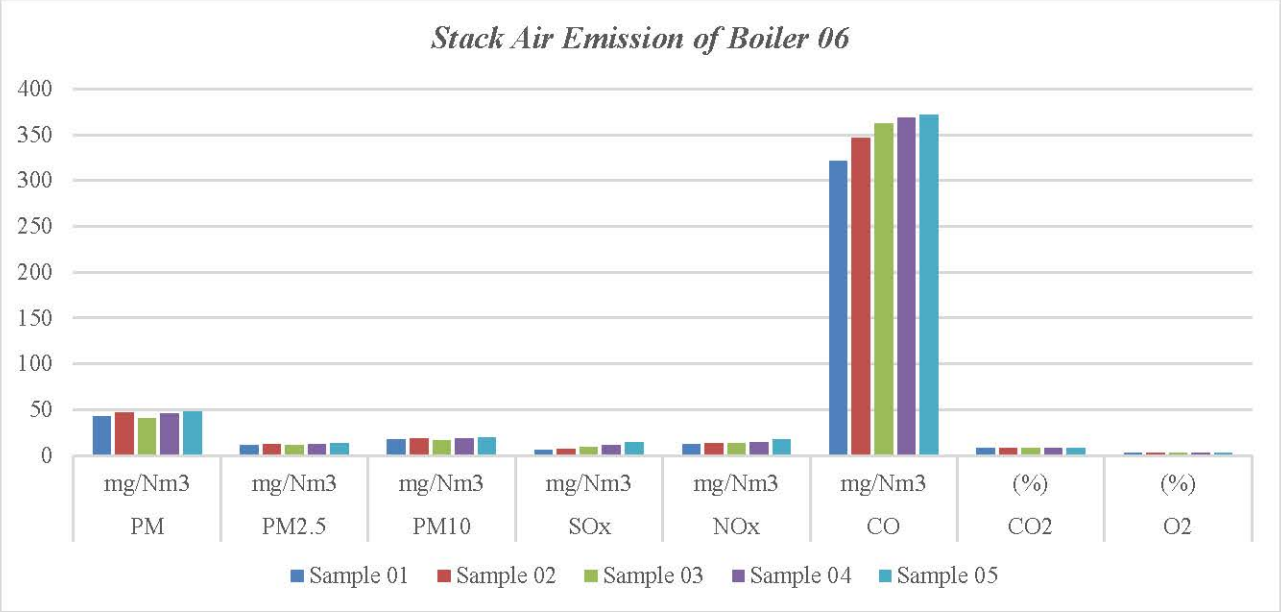


Descriptions of Boiler 06					
License No.	:	B.B. 9896	Boiler Power	:	NF
Model No	:	MEL 500TL-100N1	Rated Frequency	:	50Hz
Serial No	:	500TL-214	Origin	:	BD
Brand	:	MORDEN ERECTION	Fuel Type	:	GAS
Capacity	:	500 KG/HR	Manufacturing Year	:	2017

Stack Air Emission Concentration									
Sample		PM	$PM_{2.5}$	PM_{10}	SOx	NOx	CO	CO_2	O_2
		mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	(%)	(%)
Sample 01		43	11	17	6	12	321	8.4	2.3
Sample 02		47	13	19	7	13	346	8.4	2.3
Sample 03		41	11	16	9	13	362	8.4	2.3
Sample 04		46	12	18	11	14	368	8.4	2.3
Sample 05		48	13	19	14	17	371	8.4	2.3
DoE Standard (APCR 2022, Schedule 7)	*Coal*	250	-	-	250	400	-	-	-
	Gas	-	-	-		150	-	-	-
	Liquid	200	-	-		300	-	-	-
	Charcoal/ Husk/others	250	-	-		400	-	-	-
STeP by OEKO-TEX Standards		50	NYS	NYS	100	300	500	NYS	3
Remarks		Acceptable	-	-	Acceptable	Acceptable	Acceptable	-	Acceptable

Abbreviation: PM (Particulate Matter), $PM_{2.5}$ (Particulate Matter 2.5), PM_{10} (Particulate Matter 10), SOx (Sulphur Oxides), CO (Carbon Monoxide), NOx (Nitrogen -Oxides), CO_2 (Carbon Di Oxide), O_2 (Oxygen), DoE (Department of Environment), APCR (Air Pollution Control Rules), NYS (Not Yet Set).

Mass Emission Calculation			
Item	Flue Temperature (°C)	Ambient Temperature (°C)	Flow Rate (m/s)
Boiler 06	188.7	38.7	7.84

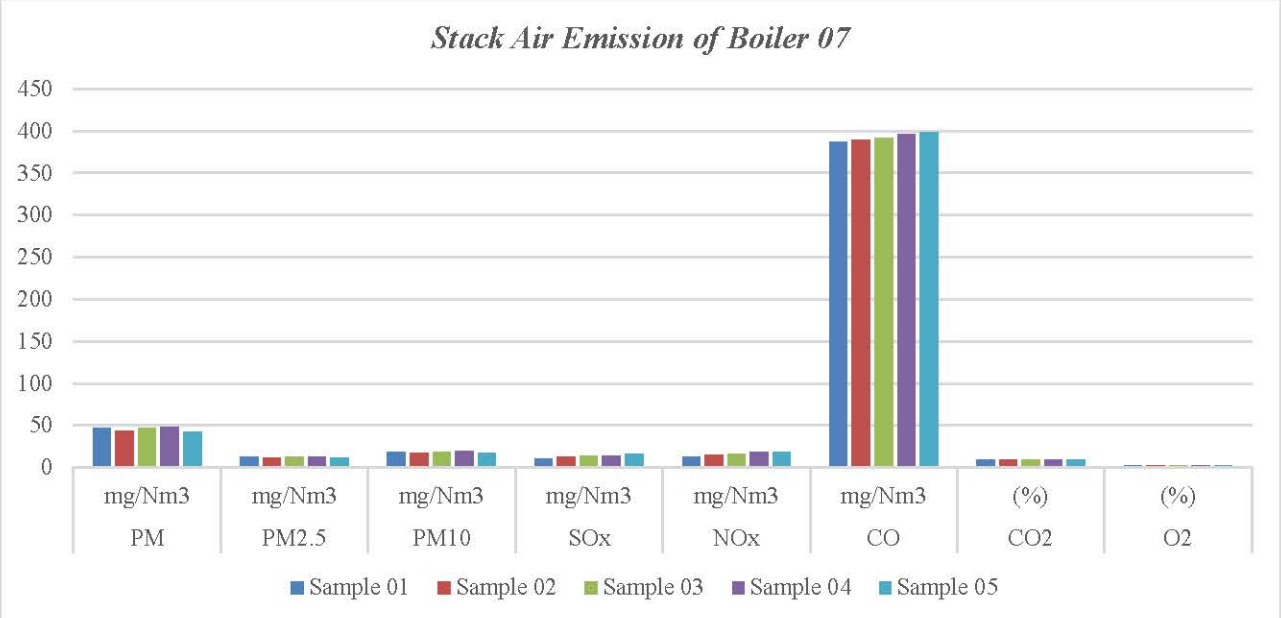


Descriptions of Boiler 07					
License No.	:	B.B. 7418	Boiler Power	:	NF
Model No	:	MEL 500TL-100N1	Rated Frequency	:	50Hz
Serial No	:	500TL-071	Origin	:	BD
Brand	:	MORDEN ERECTION	Fuel Type	:	GAS
Capacity	:	500 KG/HR	Manufacturing Year	:	2013

Stack Air Emission Concentration									
Sample		PM	$PM_{2.5}$	PM_{10}	SOx	NOx	CO	CO_2	O_2
		mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	(%)	(%)
Sample 01		47	13	19	11	13	387	9.7	2.3
Sample 02		43	11	17	13	15	389	9.7	2.3
Sample 03		47	13	19	14	16	392	9.7	2.3
Sample 04		48	13	19	14	18	396	9.7	2.3
Sample 05		42	11	17	16	18	398	9.7	2.3
DoE Standard (APCR 2022, Schedule 7)	*Coal*	250	-	-	250	400	-	-	-
	Gas	-	-	-		150	-	-	-
	Liquid	200	-	-		300	-	-	-
	Charcoal/ Husk/others	250	-	-		400	-	-	-
STeP by OEKO-TEX Standards		50	NYS	NYS	100	300	500	NYS	3
Remarks		Acceptable	-	-	Acceptable	Acceptable	Acceptable	-	Acceptable

Abbreviation: PM (Particulate Matter), $PM_{2.5}$ (Particulate Matter 2.5), PM_{10} (Particulate Matter 10), SOx (Sulphur Oxides), CO (Carbon Monoxide), NOx (Nitrogen -Oxides), CO_2 (Carbon Di Oxide), O_2 (Oxygen), DoE (Department of Environment), APCR (Air Pollution Control Rules), NYS (Not Yet Set).

Mass Emission Calculation			
Item	Flue Temperature (°C)	Ambient Temperature (°C)	Flow Rate (m/s)
Boiler 07	178.8	38.7	9.21

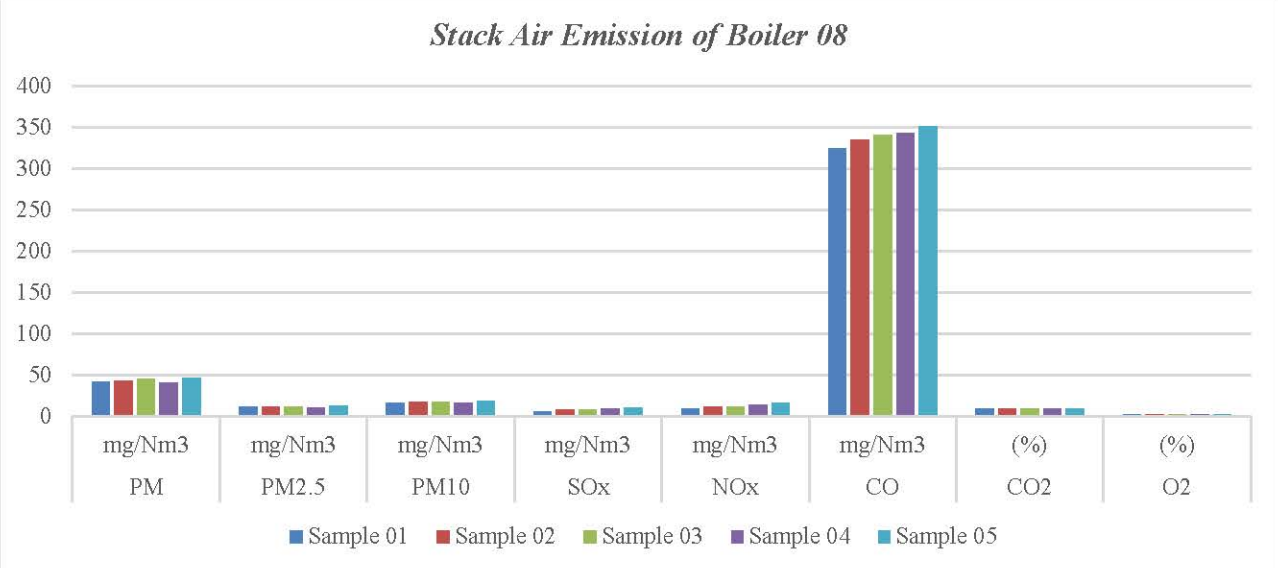


Descriptions of Boiler 08					
License No.	:	B.B. 7419	Boiler Power	:	NF
Model No	:	MEL 500TL-100N1	Rated Frequency	:	50Hz
Serial No	:	500TL-067	Origin	:	BD
Brand	:	MORDEN ERECTION	Fuel Type	:	GAS
Capacity	:	500 KG/HR	Manufacturing Year	:	2013

Stack Air Emission Concentration									
Sample		PM	$PM_{2.5}$	PM_{10}	SOx	NOx	CO	CO_2	O_2
		mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	(%)	(%)
Sample 01		42	11	17	6	9	324	9.5	2.8
Sample 02		43	11	17	8	12	335	9.5	2.8
Sample 03		45	12	18	8	12	341	9.5	2.8
Sample 04		41	11	16	9	14	343	9.5	2.8
Sample 05		47	13	19	11	17	351	9.5	2.8
DoE Standard (APCR 2022, Schedule 7)	*Coal*	250	-	-	250	400	-	-	-
	Gas	-	-	-		150	-	-	-
	Liquid	200	-	-		300	-	-	-
	Charcoal/ Husk/others	250	-	-		400	-	-	-
STeP by OEKO-TEX Standards		50	NYS	NYS	100	300	500	NYS	3
Remarks		Acceptable	-	-	Acceptable	Acceptable	Acceptable	-	Acceptable

Abbreviation: PM (Particulate Matter), $PM_{2.5}$ (Particulate Matter 2.5), PM_{10} (Particulate Matter 10), SOx (Sulphur Oxides), CO (Carbon Monoxide), NOx (Nitrogen -Oxides), CO_2 (Carbon Di Oxide), O_2 (Oxygen), DoE (Department of Environment), APCR (Air Pollution Control Rules), NYS (Not Yet Set).

Mass Emission Calculation			
Item	Flue Temperature (°C)	Ambient Temperature (°C)	Flow Rate (m/s)
Boiler 08	189.7	38.4	8.33

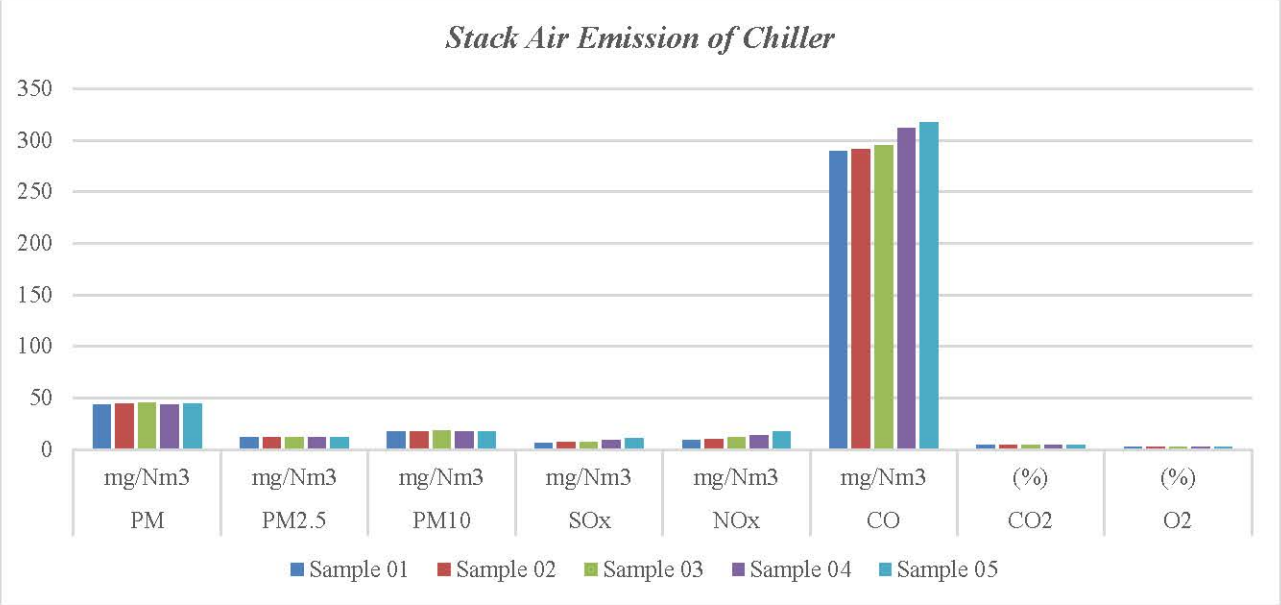


Comment: Test result for stack air emission of the facility shows concentrations are under acceptable limit.

Descriptions of Chiller					
Model No	:	HAU-F-230S	RPM	:	NF
Serial No	:	13/ABS/MPC/2K21-50	Rated Voltage	:	NF
Rated Frequency	:	50 Hz	Origin	:	India & Malaysia
Brand	:	VOLTAS LTD(KALTIMEX)	Fuel Type	:	Flue Gas from Gas Generator
Capacity	:	250 RT	Manufacturing Year	:	2022

Stack Air Emission Concentration								
Sample	PM	$PM_{2.5}$	PM_{10}	SOx	NOx	CO	CO_2	O_2
	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	mg/Nm³	(%)	(%)
Sample 01	43	11	17	6	9	289	4.2	2.1
Sample 02	44	12	18	7	10	291	4.2	2.1
Sample 03	45	12	18	7	12	295	4.2	2.1
Sample 04	43	11	17	9	14	312	4.2	2.1
Sample 05	44	12	18	11	17	317	4.2	2.1

Abbreviation: PM (Particulate Matter), $PM_{2.5}$ (Particulate Matter 2.5), PM_{10} (Particulate Matter 10), SOx (Sulphur Oxides), CO (Carbon Monoxide), NOx (Nitrogen -Oxides), CO_2 (Carbon Di Oxide), O_2 (Oxygen).



Comment: Test result for stack air emission of the facility shows concentrations are satisfactory.

Inspection Instrument: Pollution Solution Limited will always follow standards such as- DoE, WHO, World Bank, ECR, 1997etc. Pollution Solution Limited has updated the Environment inspection instrument for testing Stack Air Emissions such as SPM, SOx, NOx, NO, CO, CO2, CO, O2, Fuel Gas Temperature, Ambient Temperature.

KANE-945

Instrument Description:

Parameter	Re-solution	Accuracy	Range
Temperature Measurement			
Fuel Temperature	0.1^{0}C/F	+2.0^0 C+3.0^0 % reading	0-1200^{0}C/32-2200^{0}F
Inlet Temperature	0.1^{0}C/F	+1.0^0 C+3.0^0 % reading	0-50^{0}C/32-122^{0}F
Gas Measurement			
Oxygen (O_2)	0.1%	+0.2%*1	0-25%
Carbon Monoxide (CO)	1ppm	+20ppm<400ppm*1 +5%<500ppm +10%>500ppm	0-100000ppm
Carbon Dioxide (CO_2)	0.1%	+0.3% reading	0-99.9%
Nitric Oxide (NO_x)	1ppm	+5ppm<100ppm*1 +5%>100ppm	0-5000ppm
Nitrogen Dioxide (NO_2)	1ppm	+3ppm<20ppm +5ppm<100ppm	100ppm
Sulphur Dioxide (SO_2)	1ppm	+5ppm<100ppm +5%>100ppm	0-5000ppm
Pressure	0.1mbar	+0.5% full scale	150 mbar
Losses	0.1%	+1.0% reading	0-99.9%
Efficiency	0.1%	+1.0% reading	0-99.9%
Excess Air	0.1%	+0.2%	0-2885.0%
Ratio = CO/CO_2	0.0001	+0.0001	0-0.9999
Poison Index	0.01%	+0.01	0-99.99
Ambient Operating Range		**-5^{0}C to +50^{0}C / 10% to 90% RH non condensing**	

ISO/IEC : 17025
Accredited Laboratory

STANDARD CALIBRATION SERVICE PRIVATE LIMITED

www.scsbd-ltd.com

Corporate Office
Rabeya Commercial Complex, 33/Kha (5th Floor)
Section-6, Mirpur Circle-10, Dhaka-1216, Bangladesh
Cell: +8801712 789 321

Laboratory Location
House # 427, Road # 6/2
Shaheenbagh, Tejgaon, Dhaka-1215
Tel: +88-02-48117267, Cell: +880 1921 612324, +880 1919 958147-50
E-mail: info@scsbd-ltd.com, www.scsbd-ltd.com

CERTIFICATE of CALIBRATION

Certificate No. 02224032507
Issue Date 24/03/2022

Customer Details:

Name	**Pollution Solution Ltd.**
Address	Assure M N Tower, F # B-1, Plot # H/1, N-S Road, Aftab Nagar, Bangladesh.
Tel	+880 1912 262733
E-mail	hafiz@pollution-solution.net

Details of Unit Under Calibration (UUC):

Description	Flue Gas Analyzer
Manufacturer	Kane International Ltd, UK
Model/Type	Kane 945
Serial Number	053319451
ID No.	**N/P**
Range/working Range	Ref. On Obs.
Least Count	Ref. On Obs.
Accuracy	As Per Instrument
Location of Calibration	Laboratory
Visual Inspection	OK
Date of Calibration	24/03/2022
Suggested Due Date	23/03/2023
Calibration Procedure	The calibration had been performed in accordance with calibration procedure COP/SCS/411 (Procedure based on Comparison Method).
Calibration Result	The details of standard equipment used for calibration & result of calibration are given in page 2 & 3.
Conclusion	For the status of measurements please refer to the guidance notes.

Environment: (certified against calibrated digital temperature & humidity meter)

Temperature (°C)	20±1
Relative Humidity (%RH)	40 to 60

Change in temperature and relative humidity of the Laboratory during the calibration was less than 0.3°C per hour and 5.0% per 4 hours respectively.

This certificate is issued strictly in accordance with the requirements of ISO 17025:2017. All calibration equipments are traceable to the International Standards . Documentary evidence is available upon request.

ISO/IEC : 17025
Accredited Laboratory

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E-mail: info@scsbd-ltd.com, www.scsbd-ltd.com

CERTIFICATE of CALIBRATION

Details of Standard Equipment Used for Calibration:

Sl. No.	Description	Make	Inst. Sl. /ID NO.	Certificate No.	Validity	Calibrated By
01	RTD with Indicator	Eurotherm/ Tempsens	SCS/RTD/01	QSI/0683/21/12	22/12/2022	QSI-INDIA
02	Pneumatic Digital Pressure Gauge	N/P	SCS/PG/02	QSI/0362/22/02	13/02/2023	QSI-INDIA
03	Standard O_2 Sample (Air)	NIST Traceable				
04	Standard CO Sample (Air)	NIST Traceable				
05	Standard NO Sample (Air)	NIST Traceable				
06	Standard NO2 Sample (Air)	NIST Traceable				
07	Standard SO2 Sample (Air)	NIST Traceable				

Guidance Notes:

Status A The measurement is within tolerance, due allowances having been made for the uncertainty of the measurement.

Status B The measurement may be out of tolerance, due allowances having been made for the uncertainty of the measurement.

Status C The measurement is out of tolerance, due allowances having been made for the uncertainty of the measurement.

Status D No conclusion can be drawn, because the standard(s) do(es) not specify a tolerance for this measurement.

OBSERVATION:

O_2 Observation: (Verified against traceable sample)

Sl. No.	Standard Sample (%)	U.U.C Value (%)	Error (%)	Tolerance	Status	Uncertainty
01	5.0	5.0	0.0	N/S	D	±0.4% of rdg
02	10.0	10.1	0.1	N/S	D	
03	15.0	14.8	-0.2	N/S	D	
04	20.0	19.7	-0.3	N/S	D	

CO Observation: (Verified against traceable sample)

Sl. No.	Solution (ppm)	U.U.C Value (ppm)	Error (ppm)	Tolerance	Status	Uncertainty
01	500	500	0	N/S	D	±0.4% of rdg
02	1000	1001	1	N/S	D	
03	2000	2002	2	N/S	D	
04	4000	4002	2	N/S	D	

NO Observation: (Verified against traceable sample)

Sl. No.	Standard Sample (ppm)	U.U.C Value (ppm)	Error (ppm)	Tolerance	Status	Uncertainty
01	1000	999	-1	N/S	D	±0.4% of rdg
02	3000	2998	-2	N/S	D	
03	5000	4997	-3	N/S	D	

ISO/IEC : 17025
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CERTIFICATE of CALIBRATION

NO2 Observation: (Verified against traceable sample)

Sl. No.	Standard Sample (ppm)	U.U.C Value (ppm)	Error (ppm)	Tolerance	Status	Uncertainty
01	500	500	0	N/S	D	±0.4% of rdg
02	800	799	-1	N/S	D	
03	950	949	-1	N/S	D	

SO2 Observation: (Verified against traceable sample)

Sl. No.	Standard Sample (ppm)	U.U.C Value (ppm)	Error (ppm)	Tolerance	Status	Uncertainty
01	1000	1001	1	N/S	D	±0.4% of rdg
02	3000	3002	2	N/S	D	
03	5000	5003	3	N/S	D	

Pressure Observation: (Verified against traceable sample)

Sl. No.	UUC Value (mbar)	STD Avg. Value (mbar)	Error (mbar)	Tolerance	Status	Uncertainty (bar)
01	0.0	0.00	0.00	N/S	D	±0.39
02	10.0	10.01	-0.01	N/S	D	
03	20.0	20.01	-0.01	N/S	D	
04	50.0	50.02	-0.02	N/S	D	
05	100.0	100.04	-0.04	N/S	D	

Temperature: (verified against calibrated equipment)

Sl. No.	U.U.C. Value (°C)	Standard Value (°C)	Error (°C)	Tolerance	Status	Uncertainty (°C)
01	0	0.00	0.00	N/S	D	±0.30
02	50	50.29	0.29	N/S	D	
03	100	100.51	0.51	N/S	D	
04	300	300.78	-0.78	N/S	D	±2.5
05	500	501.24	-1.24	N/S	D	
06	700	701.51	-1.51	N/S	D	±3.0

The overall uncertainty shall be calculated as per ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level.

Notes:
1. The values mentioned above are the mean readings.
2. No adjustment was done during the calibration.
3. Any section marked, "N/A" means Not Applicable, "N/P" means Not Provided, "N/R" means Not Readable, "N/S" means Not Specified.
4. Each sample is collected by drawing a known volume of air into a five-layer gas sampling bag.

Calibrated By:

Md. Zihad Ahmed
(Calibration Engineer)

Issued By

Md. Arman Ahmed Razu
(Asst. Technical Manager)

End of Calibration Certificate

02224032507

BANGLADESH ACCREDITATION BOARD

ACCREDITATION CERTIFICATE

Issued under the authority of Bangladesh Accreditation Act, 2006
by Bangladesh Accreditation Board (BAB), Ministry of Industries to

Pollution Solution Limited

Assure M N Tower, Flat # B1, Plot# H/1, Block # H

Aftabnagar, Dhaka-1212, Bangladesh

This is to certify that this

Inspection Body(Type-A)
is accredited in accordance with the international standard

ISO/IEC 17020:2012
in respect of the associated scope, subject to the terms and conditions governing the relevant conformity assessment body (CAB) accreditation.

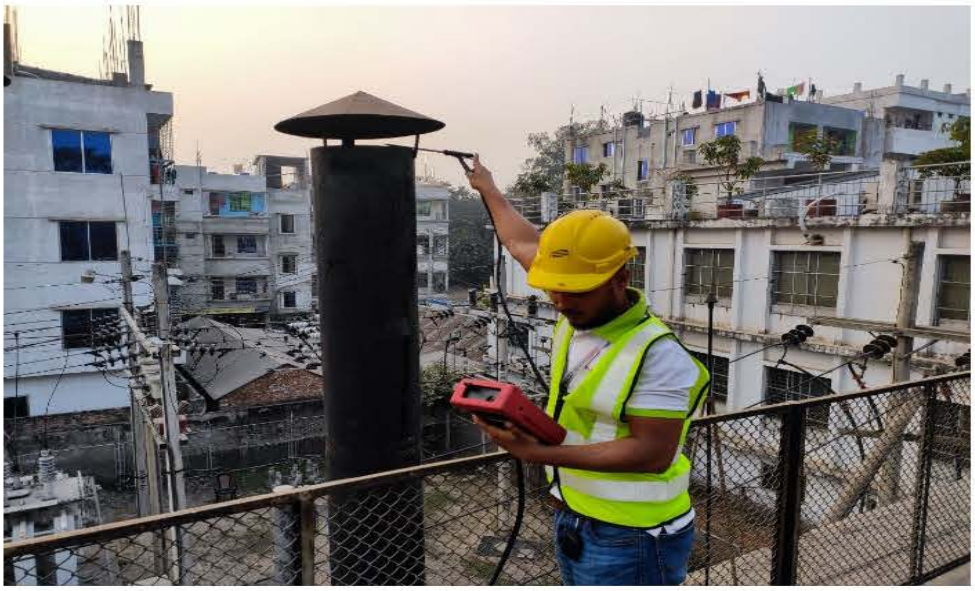
Certificate Number	:	**05.012.21**
Accreditation Date	:	**28 June 2021**
Date of Issuance	:	**28 June 2021**
Date of Expiration	:	**27 June 2024**

CERT. NO. 05.012.21
BAB
BANGLADESH ACCREDITATION BOARD
Accredited for ISO/IEC 17020:2012

GLOBAL ACCEPTANCE
BAB ACCREDITED
GLOBAL ACCEPTANCE

Md. Monwarul Islam
Director General

This certificate must be returned on request; reproduction must follow BAB guidelines. For the specific scopes to which this accreditation applies, please refer to the Directory of CABs at BAB website.

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