Stack Air Emission Inspection

ACS Textiles (Bangladesh) Ltd. &

ACS Towel Limited

Inspection Ref. No.: **A/S 11716**

Contact Us

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General Information		
Invoice Reference No: GB/2024/08/80		Inspection Date: 09.09.2024
Inspection Reference No: **A/S 11716**		Inspection Duration: 11am-5pm
Report Generation Date:	15.09.2024	Inspection location: Exhaust outlet
Report Submission Date:	22.09.2024	Inspection Description: Stack/Point source emission
Inspection Standards: 2004/108/EEC		
Company Name: **ACS Textiles (Bangladesh) Ltd. & ACS Towel Limited** *Address: Tetlabo, Barpa, Rupgonj, Narayangonj.*		Contact Person: **Md. Ruhul Alam Sharif** *GM, Compliance*

On Site Inspection Team	
Md. Shaharia Ahmed *Executive (Operation)* *B.Sc. in Environmental Science*	**Tanzir Hosen** *Chemist (Operation)* *B.Sc. in Chemistry*
Report Prepared by:	**Quality Checked:**
Majharul Islam *Executive (Operation)* *B.Sc. in Environmental Sciences*	**Mosharof Hossain** *Assistant Manager (Operation)* *M.Sc. & B.Sc. in Environmental Science*

Report Approved by:

Engr. Syed Tasnem Mahmood
Chief Environmental Engineer & CEO
B.Sc. & M.Sc. (Civil and Environmental Engineering)
MIEB No.: M/35960

Introduction

Air pollution is a kind of pollution that can also be a trans-boundary problem requiring agreement by governments world-wide. The Inter-Governmental Panel on Climate Change (IPCC) has predicted a possible rise in the average global temperature of 1 degree Celsius by 2025 and 3 degrees Celsius before the end of the 21st century. In the last few hundred years the rising human population and industrialization have increased the levels of gases like carbon dioxide, methane, nitrous oxide etc. in the atmosphere which is responsible for global warming. Despite the uncertainties and disputes, governments worldwide have agreed that precautions need to be taken now.

In a way, air emissions can happen by the gases and/or particulates that are released from the combination, decomposition, or combustion of materials. Stacks are the outlet of emissions from utility, machines, and other avenues for gases to escape when they are created. These emissions can be harmful to people and the environment and represent an environmental risk. Stacks from industrial processes will carry pollutants such as **SOx, NOx, particles, solvents** and **other dusts** and **gases**. These can have a detrimental effect on local air quality and for this reason such emissions are often regulated. Typically, this regulation requires measurement of the concentration of these pollutants on a regular basis, often referred to as periodic stack emission monitoring. The purpose of the monitoring will be to determine whether the emissions are below the limits.

As a process of complying with the requirement **ACS Textiles (Bangladesh) Ltd. & ACS Towel Limited** has hired GREENBUD Testing & Inspection Services Private Limited to assess its environmental performance, in terms of air pollution. This report focuses on the inspection of basic Air emission parameters according to IFC/World Bank and Department of Environment (DoE) of Bangladesh.

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 TP-GB-01 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)	Electrochemical
O_2 (Oxygen)	Electrochemical
NO_x (Oxides of Nitrogen)	Calculated
SPM (Suspended Particular Matter)	Gravimetric
Flue Temperature	Thermocouple
Flue Pressure	Pressure Sensor

Measurement Uncertainties

The following measurement uncertainties were assigned to the respected parameters:

Gases	±2%
Temperature	$\pm 2^0$C
Pressure	0.05%

Description of Utilities

Sl. No.	Brand Name	Model No	Serial No	Made By	Fuel	Capacity
Generator-01	Waukesha	VHP5904GSID	-	USA	Natural Gas	900 KW
Generator-02	Waukesha	VHP5904GSID to Conversion LTDE	-	USA	Natural Gas	900 KW
Generator-03	Waukesha	VHP5904GSID	-	USA	Natural Gas	900 KW
Generator-04	MTU	20V4000L32	-	Germany	Natural Gas	1948 KW
Generator-05	MTU	20V4000L32	-	Germany	Natural Gas	1948 KW
Generator-06	Jenbacher	JGS 320GS-NL	-	Austria	Natural Gas	1064 KW
Generator-07	Jenbacher	JGS 320GS-NL	-	Austria	Natural Gas	1064 KW
Generator-08	Waukesha	VHP5904GSID	-	USA	Natural Gas	900 KW
Generator-09	Waukesha	VHP5904GSID	-	USA	Natural Gas	900 KW
Generator-10	Jenbacher	JGS 320GS-NL	-	Austria	Natural Gas	1064 KW
Generator-11	Waukesha	VHP5904LTDE	-	USA	Natural Gas	900 KW
Generator-12	Waukesha	VHP5904 LTDE	-	USA	Natural Gas	900 KW
Boiler-01	Thermax	SM: 100DL/10.54/11E	Ba. Bo. 8672	India	Natural Gas	10 Ton/hr.
Boiler-02	Thermax	SMt 100C/10.54/27	Ba. Bo. 5966	India	Natural Gas	10 Ton/hr.
Boiler-03	Thermax	SMt 100DL/10.54/1001	Ba. Bo. 6653	India	Natural Gas	10 Ton/hr.
Boiler-04	Daelim	-	Ba. Bo. 3799	Korea	Natural Gas	6 Ton/hr.
Boiler-05 (EGB)	DDFC	-	Ba. Bo. 7511	Pakistan	Exhaust Gas	2700 kg/hr.
Boiler-06 (EGB)	Forbes Vyncke Pvt. Ltd.	-	Ba. Bo. 8325	India	Exhaust Gas	3050 kg/hr.
Boiler-07 (EGB)	Forbes Vyncke Pvt Ltd.	-	Ba. Bo. 8408	India	Exhaust Gas	3350 kg/hr.
Boiler-08 (EGB)	Forbes Vyncke Pvt Ltd.	-	Ba. Bo. 9359	India	Exhaust Gas	2700 kg/hr.

Standard Permissible limit

Relevant Standard Permissible limit for Generator air emission is shown below:

Reference of Relevant Standard			Standards for Stack Emission from Industries or Projects (Generator)		
			SPM (mg/Nm^3)	NO_x	SO_2
Air Pollution Control Rules-2022[1]	Diesel	New (Running after 2020)	**50**	**200**	**200**
		Existing (Running before 2020)	**80**	**400**	**400**
	Natural Gas	New (Running after 2020)	-	**200**	-
		Existing (Running before 2020)	-	**400**	-
	LPG, LNG etc.	-	**50**	**200**	**400**
IFC/World Bank1F[2] (mg/Nm^3)		Gas	*NYS*	**200** (spark ignition) **400** (Dual Fuel) **1600** (Compressed ignition)	*NYS*
		Liquid	*NYS*	**1460**	*NYS*
		Solid	*NYS*	*NYS*	*NYS*

[NYS= Not Yet Set]

Relevant Standard Permissible limit for Boiler air emission is shown below

Reference of Relevant Standard			Boiler of Industrial unit (Parameter Standard)		
			SPM (mg/Nm^3)	NOx (mg/Nm^3)	SO_2 (mg/Nm^3)
DoE (Air Pollution Control)[3] (mg/Nm^3)	Gas	-	**150**	**250**	
	Oil	**200**	**300**		
	Coal	**250**	**400**		
	Husk	**250**	**400**		
IFC/World Bank[4] (mg/Nm^3)	Gas	N/A	**320**	*NYS*	
	Liquid	**150**	**460**	**2000**	
	Solid	**150**	**650**	**2000**	

[NYS= Not Yet Set; N/A= Not Applicable]

STeP-OEKO TEX STANDARD PERMISSIBLE LIMIT			
For Gas/ Diesel Generator >0.3MW			
Parameter	Minimum	Advanced	Excellent
(Carbon Monoxide) CO: (mg/Nm^3)			
Gaseous Fuel	**500**	**250**	**150**
Diesel Fuel	**500**	**250**	**150**
(Nitrogen oxides) NO_X: (mg/Nm^3)			
Gaseous Fuel	**500**	**300**	**100**
Diesel Fuel	**1000**	**500**	**200**
(Sulphur Dioxide) SO_2: (mg/Nm^3)			
Gaseous Fuel	**200**	**100**	**30**
Diesel Fuel	**900**	**400**	**60**

[1] Air Pollution Control Rules (2022), Schedule-05, Department of Environment, Govt. of Bangladesh
[2] IFC (2007), Environmental, Health and Safety Guidelines: Environmental Air Emissions and Ambient Air Quality, IFC/World Bank Group
[3] Air Pollution Control Rules (2022), Schedule-05, Department of Environment, Govt. of Bangladesh
[4] IFC (2007), Environmental, Health and Safety Guidelines: Environmental Air Emissions and Ambient Air Quality, IFC/World Bank Group

Facility Operations - Equipment/Combustion. Parameters and Limit values for facilities - WHO and Globally Regulated Pollutants[5]:

ZDHC Air Emission Guidelines							
Sl. No.	Parameter	Source	Fuel Type	Foundational	Progressive	Aspirational	Concentrations Unit
1	Facility Combustion	NOx	Solid	650	300	200	mg/Nm^3
2			Liquid	460	250	85	mg/Nm^3
3			Gas	400	150	40	mg/Nm^3
4		CO	Solid	800	500	100	mg/Nm^3
5			Liquid	650	400	100	mg/Nm^3
6			Gas	500	300	100	mg/Nm^3
7		SOx	Solid	750	650	300	mg/Nm^3
8			Liquid	600	450	300	mg/Nm^3
9			Gas	400	300	100	mg/Nm^3
10		PM	Solid	500	300	100	mg/Nm^3
11			Liquid	300	100	50	mg/Nm^3
12			Gas	100	50	20	mg/Nm^3

[5] ZDHC Air Emissions Position Paper (Version 1.0) _January 2021

Stack Air Emission Inspection Results

SL. No	Obtained result from Utilities									
	SPM	**$PM_{2.5}$**	**PM_{10}**	**O_2**	**CO**	**NO**	**NO_2**	**CO_2**	**NO_x**	**SO_2**
	(mg/Nm^3)	(mg/Nm^3)	(mg/Nm^3)	(%)	(mg/Nm^3)	(mg/Nm^3)	(mg/Nm^3)	(%)	(mg/Nm^3)	(mg/Nm^3)
Generator-01	18.6	7.8	10.8	6.5	228	112	64.1	5.2	188.6	0
Generator-02	19.1	7.5	12.1	6.8	231	115	59.9	5.3	184.8	0
Generator-03	20.3	8.5	13.0	6.2	228	111	66.2	5.5	182	0
Generator-04	19.2	7.8	13.5	8.4	225.6	117	64.4	6.2	193.9	0
Generator-05	18.9	7.9	14.4	9.2	226.4	109.4	65.2	5.4	175.2	0
Generator-06	18.2	7.7	10.5	6.4	233	119.3	64.4	6.2	193.9	0
Generator-07	19.8	8.4	11.4	7.2	232	118.4	59.5	6.2	187.7	0
Generator-08	18.9	7.6	14.6	6.2	190	105.3	58.5	6.3	163.8	0
Generator-09	18.2	8.3	10.1	5.5	198	107.4	52.1	5.6	173.4	0
Generator-10	18.8	8.5	10.2	5.7	197	111.6	51.4	5.3	167.3	0
Generator-11	19.8	8.4	12.4	7.2	212	111	59.5	5	187.7	0
Generator-12	18.5	8.3	12.3	6.3	217	112	62.4	5.3	188.7	0
Boiler-01	16.1	7.5	11.1	7.2	184	85	38.3	4.7	123.3	0
Boiler-02	15.8	7.2	10.9	7.3	181	78	36.4	4.3	114.4	0
Boiler-03	15.6	7.3	11.3	6.9	180	74	35.9	4.8	109.9	0
Boiler-04	16.2	7.4	12.1	7.1	179	81	34.6	4.6	115.6	0
Boiler-05 (EGB)	15.6	7.8	9.2	5.2	180	55	37.5	4.5	155.4	0
Boiler-06 (EGB)	15.2	7.5	8.7	5	178	52	38.6	4.8	158	0
Boiler-07 (EGB)	15	7.5	8.5	5.5	172	54	38.9	4.6	157	0
Boiler-08 (EGB)	15.3	7.2	9.5	4.9	187	57.2	31.7	4.2	88.2	0

SL. No.	Flue Temperature (ºC)	Inner Diameter of Stack pipe (m)	Flow (m/s)	Running Hour (yearly)
Generator-01	414.8	0.3048	5.4	4405
Generator-02	406.7	0.3048	4.3	7961
Generator-03	395.3	0.3048	5.3	8257
Generator-04	415.4	0.4572	5.1	8405
Generator-05	412.3	0.4572	5.2	6469
Generator-06	395.3	0.3556	5.3	5163
Generator-07	421.5	0.3556	5.2	5163
Generator-08	413	0.3048	5.1	2257
Generator-09	412.8	0.3048	5.4	4612
Generator-10	405.6	0.3556	5.3	7235
Generator-11	407.6	0.3048	5.1	7958
Generator-12	411.8	0.3048	5.3	7506
Boiler-01	224	0.8128	4.6	4414
Boiler-02	221	0.8128	4.9	6146
Boiler-03	213	0.8128	4.7	5127
Boiler-04	207	0.8128	4.3	2713
Boiler-05 (EGB)	189.4	0.3048	3.9	8328
Boiler-06 (EGB)	198.2	0.3048	4.1	8328
Boiler-07 (EGB)	165.3	0.3048	4.0	8328
Boiler-08 (EGB)	173.2	0.3048	4.2	8328

******Abbreviations and Acronyms:*** *CO = Carbon monoxide; CO_2 = Carbon dioxide; O_2 = Oxygen; SO_2= Sulfur dioxide; SPM = Suspended Particulate Matter, $PM_{2.5}$= Particulate Matter 2.5, PM_{10}= Particulate Matter 10, NOx = Oxides of Nitrogen, NO_2 = Nitrogen Dioxide, mg/Nm^3 = milligram per normal cubic meter*

Mass Emission rate[6] (Hourly):

SL./No	Pollutants				
	SPM (Kg/hr.)	**NO_x** (Kg/hr.)	**SO_2** (Kg/hr.)	**CO** (Kg/hr.)	**CO_2** (Kg/hr.)
Generator-01	There will be no emission as all the generators are connected through EGB Boilers				
Generator-02					
Generator-03					
Generator-04					
Generator-05					
Generator-06					
Generator-07					
Generator-08					
Generator-09					
Generator-10					
Generator-11					
Generator-12					
Boiler-01	0.07525	0.58430	0	0.87339	431.15241
Boiler-02	0.07914	0.58099	0	0.92074	422.73510
Boiler-03	0.07618	0.54416	0	0.89273	460.07791
Boiler-04	0.07328	0.53022	0	0.82236	408.42463
Boiler-05 (EGB)	0.00934	0.09437	0	0.10949	52.89852
Boiler-06 (EGB)	0.00939	0.09898	0	0.11170	58.21122
Boiler-07 (EGB)	0.00972	0.10316	0	0.11320	58.50902
Boiler-08 (EGB)	0.01023	0.05977	0	0.12694	55.09956

[6]*https://www.researchgate.net/post/How_can_I_calculate_estimation_of_air_pollutants_load_per_year_in_tons_for_the_Stack_emission*

Mass Emission rate[7] (Yearly):

SL./No	Pollutants				
	SPM (Kg/yr.)	**NO_x** (Kg/ yr.)	**SO_2** (Kg/ yr.)	**CO** (Kg/ yr.)	**CO_2** (Kg/yr.)
Generator-01	There will be no emission as all the generators are connected through EGB Boilers				
Generator-02					
Generator-03					
Generator-04					
Generator-05					
Generator-06					
Generator-07					
Generator-08					
Generator-09					
Generator-10					
Generator-11					
Generator-12					
Boiler-01	332.14352	2579.10524	0	3855.13635	1903106.74610
Boiler-02	486.38941	3570.74741	0	5658.84260	2598129.92966
Boiler-03	390.58240	2789.92062	0	4577.01771	2358819.43127
Boiler-04	198.81700	1438.47534	0	2231.07182	1108056.03095
Boiler-05 (EGB)	77.80920	785.89307	0	911.80272	440538.89844
Boiler-06 (EGB)	78.21398	824.33541	0	930.21385	484783.02988
Boiler-07 (EGB)	80.95275	859.10469	0	942.73758	487263.15689
Boiler-08 (EGB)	85.16588	497.79308	0	1057.15292	458869.15724

[7] *https://www.researchgate.net/post/How_can_I_calculate_estimation_of_air_pollutants_load_per_year_in_tons_for_the_Stack_emission*

Discussion and Recommendation

ACS Textiles (Bangladesh) Ltd. & ACS Towel Limited have hired GREENBUD Testing & Inspection Services Private Limited to inspect their stack air emissions of Twelve generators, Four Natural Gas Boilers and Four EGB boilers. GREENBUD has inspected all the required air quality parameter according to the Air Pollution Control Rules-2022, ZDHC Air Emission Guidelines'2021 where parameters were found in progressive level, STeP BY OEKO-TEX and the IFC/World Bank emission standard. According to the inspection result the findings are given below:

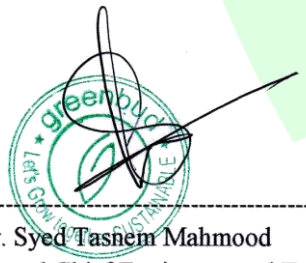
- Oxides of Nitrogen, Sulphur Dioxide & Carbon Monoxide emission from the generators and boilers have been found within the Air Pollution Control Rules-2022, ZDHC Air Emission Guidelines'2021, STeP BY OEKO-TEX, IFC/World Bank standard emission limit.

However, the proponent needs to consider that the concentration of parameters presented in this report is instantaneous data which had been found during inspection and may vary over the period of time.

Obtaining above results, for further improvement recommendations are given below:

- ✓ Periodic maintenance of utilities according to manufacturer's instruction
- ✓ Installation of on-site abatement measures to control the emission level.
- ✓ Control air-fuel mixing ratio and excess air to reduce the nitrogen oxides emission.
- ✓ Factory must check Air emission quality periodically.

Factory is suggested to assess the Air Emission Quality at least annually if all other setups are constant.



Engr. Syed Tasnem Mahmood
CEO and Chief Environmental Engineer
GREENBUD
MIEB No.: M/35960
ISO 14001 certification Number.: EA/15/IN/16050
ISO 50001 certification Number.: ENMS/16/IN/533

APPENDIX

Figure: Stack Air Emission Sampling

Inspection Instrument

Air Pollution contamination of the atmosphere caused by the discharge, accidental or deliberates of a wide range of toxic substances. Often the amount of the released substance is relatively high in a certain locality, so the harmful effects are more noticeable. The major sources of air pollution are transportation engines, power and heat generation, industrial processes and the burning of solid waste. A new source of air pollution is an increasing 'hole' in the ozone layer in the atmosphere above Antarctica, coupled with growing evidence of global ozone depletion. Air pollution has also long been known to have an adverse effect on human beings, plants, livestock and aquatic ecosystem through acid rain. Recently as in other parts of the world air pollution has received priority among environmental issues in Asia. This problem is acute in Dhaka, the capital of Bangladesh and also the hub of commercial activity.

GREENBUD Testing & Inspection Service Private Limited high-quality equipment is available to assess stack emission air quality. Now most of the customers are committed to environmental aspect. As a result, Air Quality test is a vital requirement of customers. So GREENBUD is also committed to assess Stack Air Emission Quality with transparency & Quality. To assess this stack air emission, we have to follow some standards, such as ECR, 1997, WHO, DoE, World Bank etc. GREENBUD has stack air emission quality testing machine from Testo and the model's name is Testo-340. To measure the particulate matter in the flue gas, GREENBUD Testing & Inspection Service Private Limited use a well-known versatile ESS-100 air quality sampler by Echotech.

Instrument Description

Parameter	Resolution	Accuracy	Range
Temp Measurement			
Flue Temperature	0.1°C/F	+2.0°C +0.3% reading	0-1200°C/32 -2200°F
Inlet Temperature	0.1°C/F	+1°C +0.3% reading	with suitable probe 0-50°C/32-122°F
Gas Measurement			
Oxygen	0.1%	+0.2%*1	0-25%
Carbon Monoxide,	1 ppm	+20ppm <400ppm*1 +5% <5000ppm +10% >5000ppm	0-100000ppm
Nitric Oxide (optional)	1 ppm	+5ppm <100ppm*1 +5% >100ppm	0-5000ppm
Nitrogen Dioxide (optional)	1 ppm	+3ppm<20ppm +5ppm<100ppm	100ppm
Sulphur Dioxide (optional)	1 ppm	+5ppm<100ppm +5%>100ppm	0-5000ppm
Pressure	0.1mbar	+0.5% full scale	150 mbar
Carbon Dioxide	0.1%	+0.3% reading	0-99.9%
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%
CO/CO2 ratio*2	0.0001	+0.0001	0-0.9999
Poison Index *2	0.01%	+0.01	0-99.99
Ambient Operating Range		-5^{0}C to +50^{0}C/10% to 90% RH non condensing	

High Volume Sampler:

Parameter	Measuring Range
SPM	0 – 1000 mg
PM_{10}	0 – 1000 mg
$PM_{2.5}$	0 – 1000 mg
Air flow	0-40 lpm
Flue Temperature	0-650°C

STANDARD CALIBRATION SERVICE PRIVATE LIMITED

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ISO/IEC :17025 Accredited Laboratory

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CERTIFICATE of CALIBRATION

Certificate No. 02411064307
Issue Date 08/04/2024

Customer Details:

Name: Greenbud
Address: Level:14, Building No:02, Confidence Center, Kha-09, Shyhjadpur, Gulshan, Dhaka-1212, Bangladesh.

Details of Unit Under Calibration (UUC):

Description	Flue Gas Analyzer
Manufacturer	Testo
Model/Type	testo 340
Serial Number	62762298/404
ID No.	GB-100-010-001
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	06/04/2024
Suggested Due Date	05/04/2025
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 to 4.
Conclusion	For the status of measurements please refer to the guidance notes.

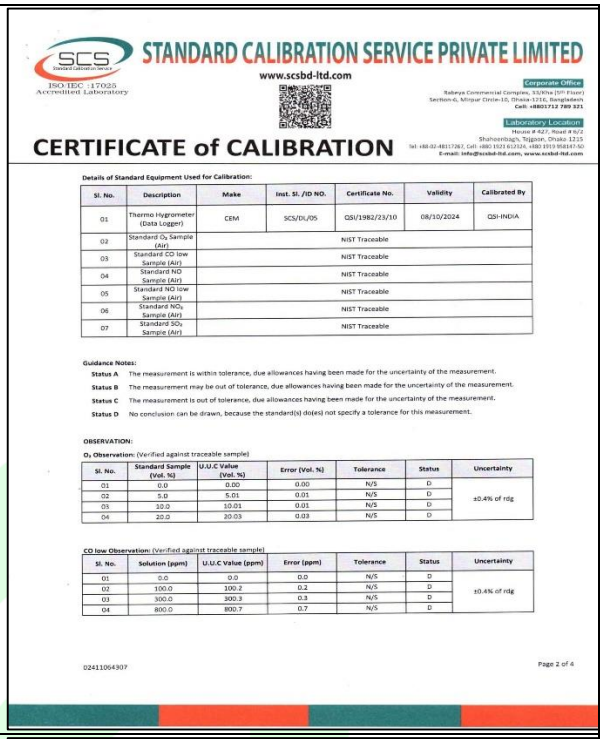
Environment: (certified against calibrated digital temperature & humidity meter)

Temperature (°C)	23±3
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.

02411064307 Page 1 of 4



STANDARD CALIBRATION SERVICE PRIVATE LIMITED

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ISO/IEC :17025 Accredited Laboratory

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Laboratory Location

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CERTIFICATE of CALIBRATION

Details of Standard Equipment Used for Calibration:

Sl. No.	Description	Make	Inst. Sl. /ID NO.	Certificate No.	Validity	Calibrated By
01	Thermo Hygrometer (Data Logger)	CEM	SCS/DL/05	QSI/1982/23/10	08/10/2024	QSI-INDIA
02	Standard O_2 Sample (Air)	NIST Traceable				
03	Standard CO low Sample (Air)	NIST Traceable				
04	Standard NO Sample (Air)	NIST Traceable				
05	Standard NO low Sample (Air)	NIST Traceable				
06	Standard NO_2 Sample (Air)	NIST Traceable				
07	Standard SO_2 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 (Vol. %)	U.U.C Value (Vol. %)	Error (Vol. %)	Tolerance	Status	Uncertainty
01	0.0	0.00	0.00	N/S	D	±0.4% of rdg
02	5.0	5.01	0.01	N/S	D	
03	10.0	10.01	0.01	N/S	D	
04	20.0	20.03	0.03	N/S	D	

CO low Observation: (Verified against traceable sample)

Sl. No.	Solution (ppm)	U.U.C Value (ppm)	Error (ppm)	Tolerance	Status	Uncertainty
01	0.0	0.0	0.0	N/S	D	±0.4% of rdg
02	100.0	100.2	0.2	N/S	D	
03	300.0	300.3	0.3	N/S	D	
04	800.0	800.7	0.7	N/S	D	

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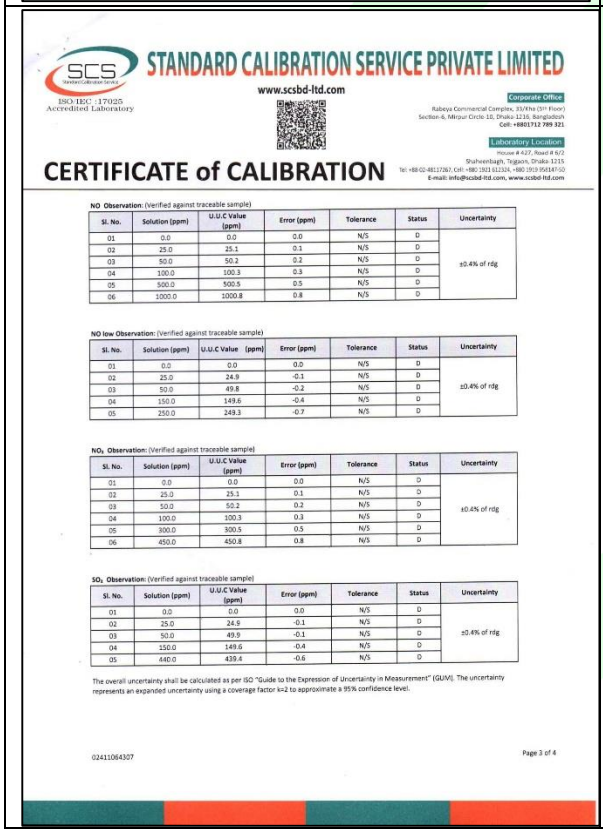

STANDARD CALIBRATION SERVICE PRIVATE LIMITED

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ISO/IEC :17025 Accredited Laboratory

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

NO Observation: (Verified against traceable sample)

Sl. No.	Solution (ppm)	U.U.C Value (ppm)	Error (ppm)	Tolerance	Status	Uncertainty
01	0.0	0.0	0.0	N/S	D	±0.4% of rdg
02	25.0	25.1	0.1	N/S	D	
03	50.0	50.2	0.2	N/S	D	
04	100.0	100.3	0.3	N/S	D	
05	500.0	500.5	0.5	N/S	D	
06	1000.0	1000.8	0.8	N/S	D	

NO low Observation: (Verified against traceable sample)

Sl. No.	Solution (ppm)	U.U.C Value (ppm)	Error (ppm)	Tolerance	Status	Uncertainty
01	0.0	0.0	0.0	N/S	D	±0.4% of rdg
02	25.0	24.9	-0.1	N/S	D	
03	50.0	49.8	-0.2	N/S	D	
04	150.0	149.6	-0.4	N/S	D	
05	250.0	249.3	-0.7	N/S	D	

NO_2 Observation: (Verified against traceable sample)

Sl. No.	Solution (ppm)	U.U.C Value (ppm)	Error (ppm)	Tolerance	Status	Uncertainty
01	0.0	0.0	0.0	N/S	D	±0.4% of rdg
02	25.0	25.1	0.1	N/S	D	
03	50.0	50.2	0.2	N/S	D	
04	100.0	100.3	0.3	N/S	D	
05	300.0	300.5	0.5	N/S	D	
06	450.0	450.8	0.8	N/S	D	

SO_2 Observation: (Verified against traceable sample)

Sl. No.	Solution (ppm)	U.U.C Value (ppm)	Error (ppm)	Tolerance	Status	Uncertainty
01	0.0	0.0	0.0	N/S	D	±0.4% of rdg
02	25.0	24.9	-0.1	N/S	D	
03	50.0	49.9	-0.1	N/S	D	
04	150.0	149.6	-0.4	N/S	D	
05	440.0	439.4	-0.6	N/S	D	

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.

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CERTIFICATE of CALIBRATION

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. Mobinul Islam
(Sr. Calibration Engineer)

Issued By:

Md. Ayman Ahmed Roby
(Technical Manager)

End of Calibration Certificate

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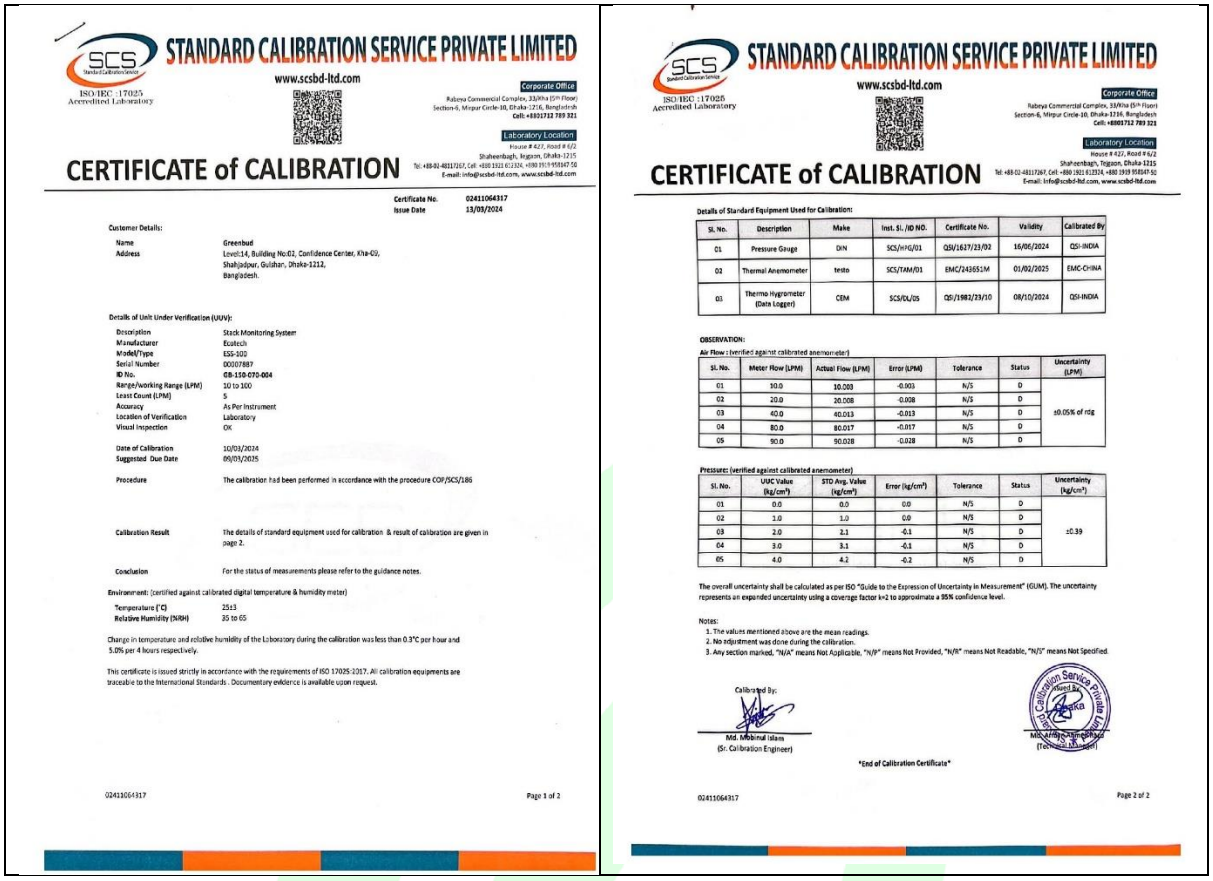

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E-mail: info@scsbd-ltd.com, www.scsbd-ltd.com

CERTIFICATE of CALIBRATION

Certificate No. 02411064317
Issue Date 13/09/2024

Customer Details:

Name	Greenbud
Address	Level:14, Building No:02, Confidence Center, Kha-09, Shahjadpur, Gulshan, Dhaka-1212, Bangladesh.

Details of Unit Under Verification (UUV):

Description	Stack Monitoring System
Manufacturer	Ecotech
Model/Type	ESS-100
Serial Number	00007887
ID No.	GB-150-070-004
Range/working Range (LPM)	10 to 100
Least Count (LPM)	5
Accuracy	As Per Instrument
Location of Verification	Laboratory
Visual Inspection	OK
Date of Calibration	10/03/2024
Suggested Due Date	09/03/2025
Procedure	The calibration had been performed in accordance with the procedure COP/SCS/186
Calibration Result	The details of standard equipment used for calibration & result of calibration are given in page 2.
Conclusion	For the status of measurements please refer to the guidance notes.

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

Temperature (°C)	25±3
Relative Humidity (%RH)	35 to 65

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.

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CERTIFICATE of CALIBRATION

Details of Standard Equipment Used for Calibration:

Sl. No.	Description	Make	Inst. Sl. /ID NO.	Certificate No.	Validity	Calibrated By
01	Pressure Gauge	DIN	SCS/MFG/01	QSI/1627/23/02	16/06/2024	QSI-INDIA
02	Thermal Anemometer	testo	SCS/TAM/01	EMC/243651M	01/02/2025	EMC-CHINA
03	Thermo Hygrometer (Data Logger)	CEM	SCS/DL/05	QSI/1982/23/10	08/10/2024	QSI-INDIA

OBSERVATION:

Air Flow : (verified against calibrated anemometer)

Sl. No.	Meter Flow (LPM)	Actual Flow (LPM)	Error (LPM)	Tolerance	Status	Uncertainty (LPM)
01	10.0	10.003	-0.003	N/S	D	±0.05% of rdg
02	20.0	20.008	-0.008	N/S	D	
03	40.0	40.013	-0.013	N/S	D	
04	80.0	80.017	-0.017	N/S	D	
05	90.0	90.028	-0.028	N/S	D	

Pressure: (verified against calibrated anemometer)

Sl. No.	UMC Value (kg/cm²)	STD Avg. Value (kg/cm²)	Error (kg/cm²)	Tolerance	Status	Uncertainty (kg/cm²)
01	0.0	0.0	0.0	N/S	D	±0.39
02	1.0	1.0	0.0	N/S	D	
03	2.0	2.1	-0.1	N/S	D	
04	3.0	3.1	-0.1	N/S	D	
05	4.0	4.2	-0.2	N/S	D	

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.

Calibrated By:

Md. Mobinul Islam
(Sr. Calibration Engineer)

Md. Arifur Rahman
(Technical Manager)

End of Calibration Certificate

02411064317 Page 2 of 2

GLOBAL ACCEPTANCE
BAB
BANGLADESH ACCREDITATION BOARD

ACCREDITATION CERTIFICATE

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

GREENBUD Testing & Inspection Services
14A, Level-14, Building 2, Confidence center
Kha-09, Sahajadpur, Gulshan, 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	:	05.003.18
Accreditation Date	:	28 June 2018
Date of Issuance	:	18 Aug 2024 (2nd Renewal)
Date of Expiration	:	27 June 2027

CERT. NO. 05.003.18
BAB
BANGLADESH ACCREDITATION BOARD
Accredited for ISO/IEC 17020:2012

GLOBAL BAB ACCREDITED ACCEPTANCE

18. 08. 2024
Md. Anwarul Alam
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.