Microbrew Bistro Private Limited
Registered Office: 308, Competent House,
F-14, Connaught Place, New Delhi 110001
T 91-11-41087888 **E** corporate@thebrewfactory.in

Proposal No. : IA/UK/IND2/98132/2019

File No. : J-11011/66/2019-IA-II(I)

Date: 26.05.2020

To,

The Director (IA Division-Industry 2)

Ministry of Environment & Forests & Climate Change

Indra Paryavaran Bhawan,

Jor Bagh Road, Ali Ganj, New Delhi-110003

Sub: Regarding Environmental Clearance for the proposed distillery plant of capacity 30 KL per day coming up at Khasra no. 933, 934, 936, 937, 938, 940, village-Mahuakheraganj, Tehsil- Kashipur, District- Udham Singh Nagar, (Uttarakhand) by Microbrew Bistro Pvt. Ltd.

Ref: Minutes of 18th Meeting of the Expert Appraisal Committee (EAC), (Industry-2 sector), held during 13th to 15th April 2020 through Video Conferencing.

Sir,

In regards to the above, we would like to submit the point wise response to the queries raised during 18th meeting of EAC (Industry-2) as under:

S. No	Query	Reply
1.	Alternate source of fresh water needs to be submitted and commitment not to use underground water.	Application for obtaining assurance of water supply from Jal Sansthan, Uttarakhand has been submitted. Receipt of the same is enclosed as **Annexure I.** Undertaking stating that no ground water will be abstracted without the prior permission of Central ground water Authority is enclosed as **Annexure II.**
2.	Revised water balance with details of total water and fresh water requirement andreduction in fresh water demand as per	As per the suggestions, the water demand will be 5 KL/ tonne of malt consumed based on global best practices. Further, system of well designed rain water harvesting

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	5 KL/KL of production. Also plan to construct RCC tank to collect rain water from the roof top.	for collection of roof top rainwater will be in place. Detailed design report is enclosed as **Annexure III.**
3.	Clarification for high PM_{10} values recorded during and plan to control/ reduce	Clarification regarding the high PM_{10} values recorded during and plan to control/ reduce the same are enclosed as **Annexure IV.**
4.	Detailed scheme for treatment spent wash need to be submitted.	Spent wash generated in the production will be directed to ETP, RO followed by MEE to achieve zero liquid discharge. Detailed scheme of treatment is enclosed as **Annexure V.**
5.	Revised prediction of GLC due to the proposed project.	Revised report for the prediction of GLC due to the proposed project is enclosed as **Annexure VI.**
6.	Commitment not to use composting and submit plan for incineration to achieve ZLD.	Incineration facility is not envisaged for the proposed project. Undertaking stating that no compositing will be allowed in proposed project is enclosed as **Annexure II**
7.	Commitment to not use coal as fuel in boiler.	Boilers envisaged for the project will be based on bio-fuels/ agro-fuels such as rice husk, etc. Coal will not be used as fuel. Undertaking in this regard along with technical specifications of boiler is enclosed as **Annexure II**

Kindly consider the same and accord us with Environmental Clearance at the earliest.

For Microbrew Bistro Pvt. Ltd

FOR MICROBREW BISTRO PVT. LTD.

Director

(Ritwik Kejriwal)

Director

Microbrew Bistro Private Limited
Registered Office: 308, Competent House,
F-14, Connaught Place, New Delhi 110001
Mob +91 9350333555 **T** 91-11-41087888
E corporate@thebrewfactory.in

दिनांक: 15-05-2020

श्रीमान अधिशाषी अभियंता

जल संस्थान

रामनगर, उत्तराखण्ड

विषय: M/s. Microbrew Bistro Pvt. Ltd द्वारा प्रस्तावित 30 केएल क्षमता के डिस्टिलरी प्लांट के परिचालन चरण के दौरान 578 केएलडी स्वच्छ जल की आपूर्ति के आश्वासन के लिए निवेदन।

महोदय,

उपरोक्त के संबंध में, बताना चाहते है की M/s. Microbrew Bistro Pvt. Ltd ने 30 केएल का माल्ट स्पिरिट डिस्टलरी प्लांट प्रस्तावित किया है जो की खसरा नं 933, 934, 936, 937, 938, 940 गॉव महुआखेड़ागंज, तहसील- काशीपुर, जिला- उधम सिंह नगर, (उत्तराखंड) मे आ रहा है । डिस्टिलरी प्लांट के संचालन हेतु 578 केएलडी (KLD) स्वच्छ जल की आवश्यकता होगी । आपसे विनम्र निवदेन है, की हमें उपरोक्त मात्रा में स्वच्छ पानी की आपूर्ति का आश्वासन प्रदान करे|

हम आपसे अनुरोध करते हैं कि कृपया हमे जल्द से जल्द स्वच्छ जल आपूर्ति का आश्वासन पत्र जारी करें।

धन्यवाद,

For Microbrew Bistro Pvt. Ltd.

Authorized Signatory

RV
10/5/2020

Microbrew Bistro Private Limited
Registered Office: 308, Competent House,
F-14, Connaught Place, New Delhi 110001
T 91-11-41087888 **E** corporate@thebrewfactory.in

Undertaking

I, Ritwik Kejriwal, S/o Sh. Anil Kejriwal, Director of Microbrew Bistro Pvt. Ltd, do solemnly undertake as under:-

1. That, I am responsible for establishing the proposed malt based distillery plant of capacity 30 KLD at Khasra no. 933, 934, 936, 937, 938, 940, village- Mahuakheraganj, Tehsil- Kashipur, District- Udham Singh Nagar, (Uttarakhand) by Microbrew Bistro Pvt. Ltd.
2. That, ground water will not be abstracted without the prior permission of Central Ground Water Authority, New Delhi.
3. That, there will be no compositing of spent grain in proposed project.
4. That, coal will not be used as fuel in boiler.

For MICROBREW BISTRO PVT. LTD.

Director

(Ritwik Kejriwal)
Director
Microbrew Bistro Pvt. Ltd.

INDUSTRIAL BOILERS LTD.

79-80, Satkar,
Nehru Place,
NEW DELHI - 110 019 (INDIA)
Tel: + 91 11 26453194/95
Fax: + 91 11 26453197
e mail: delhi@indboilers.com

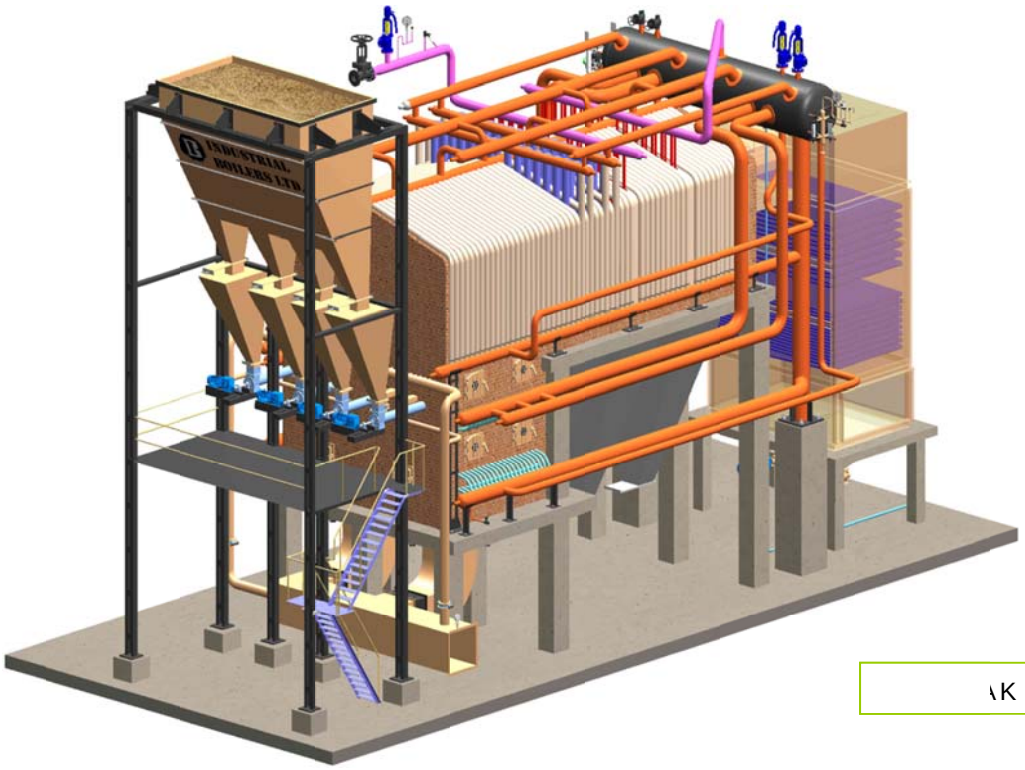
Ref: IB/D/105/20
Dt : 07th January 2020

Mr Rishav Arora
M/s MBEV SPIRITS PVT. LTD.,
F-28/5, Okhla Indl Area, Phase – II,
New Delhi – 110020

Dear Sir,

We are pleased to attach herewith our offer for INDUSTRIAL, Single Drum, Fluidised Bed Combustion, Water Tube Boiler fired on Rice Husk, Model AGROPAK-SD / 150 as follows :-

Maximum Evaporation Capacity	15000 Kg/hr (From & at 100^{o}C)
Safety Valve Set Pressure	21 Kg/cm^{2}g
Outlet Steam temp.	250 Deg.C. Super Heat



AK - SD

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Our Offer comprises of the following Annexures :

1.	Scope of Supply.	-	Annexure - I
2.	Technical Specification.	-	Annexure - II
3.	Price.	-	Annexure - III
4.	General Terms & Conditions.	-	Annexure - IV

for INDUSTRIAL BOILERS LTD.

H.S.Anand
Executive Director
09350169001

INDUSTRIAL BOILERS LTD.

Group of Companies

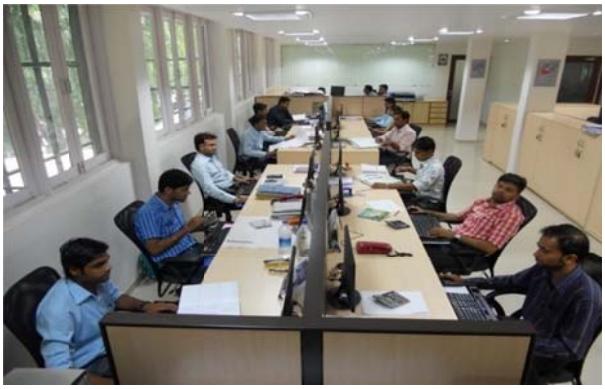
WELCOME TO IBL WORLD

The IBL group employs over 1000 people and is one of the largest steam boiler manufacturer in India. The group is led by the dynamic Homai Engineer who is the Chairperson and Managing Director.

The companies under the IBL group are :-

- Industrial Boilers Ltd. *(Manufacturer of Boilers, Thermic Fluid Heaters, ESP, Autoclaves)*
- IB Turbo Pvt Ltd. *(Manufacturer of Steam Turbines)*

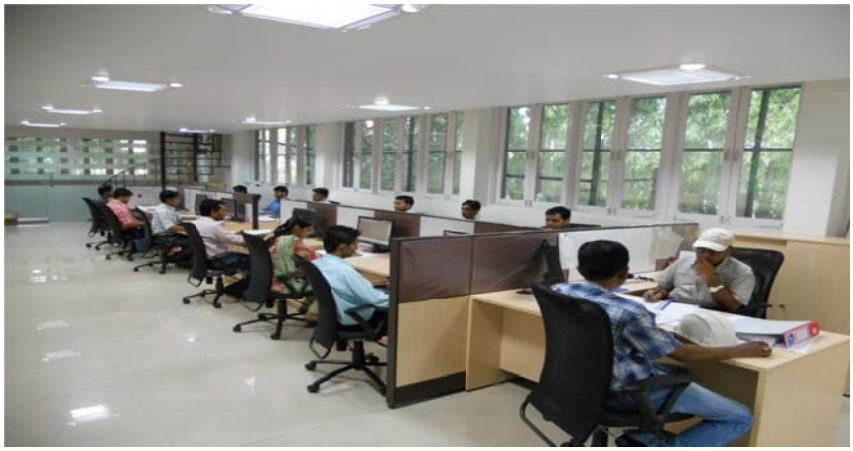
IBL is the only company to manufacture both Boilers and Turbines, providing complete power generation solutions.



IBL is the international market leader in the field of Biomass Boilers and at the very cutting edge of technology.

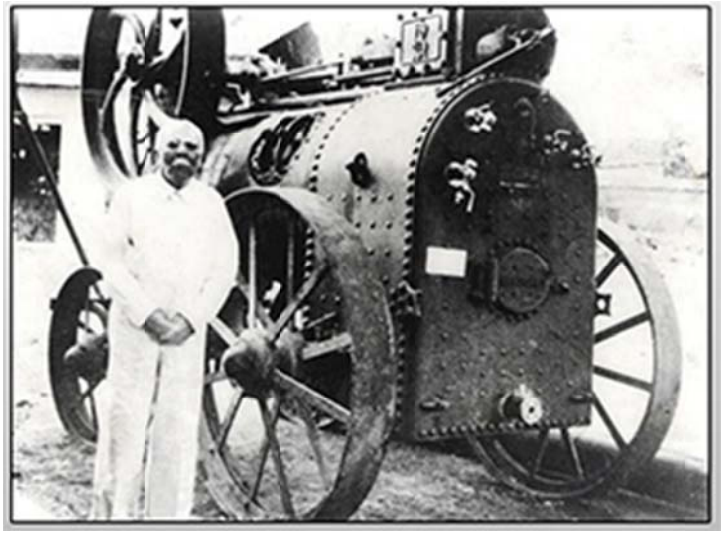
Our research is 5 to 10 years ahead of time so that we can foresee developments and provide absolutely latest technology to our customers.
Our rich history coupled with innovation is our strength.

IB Turbo has repeated Turbine business from most of the customers. With focus on quality and a formidable reputation, IB Turbo now manufactures' turbines for the world markets. Hundreds' of Turbines are in operation in India and also exported to Poland, Russia, Africa, Saudi Arabia, Singapore, Indonesia, Vietnam, Bangladesh amongst other countries.



HISTORICAL REFERENCE

The long-standing yet chequered history of the IBL Group is characterised by fantastic engineering skills and subsequent expansion into boilers and upward integration.



For a better understanding of our passion, know-how and aspirations today, we take a big step back to around 125 years ago.

Somewhere around 1860, Mr. Bomanshaw Homavazir established an engineering workshop at Hubli (Now in Karnataka). With the help of his five sons, the company started off as Engineer and Sons.

Skilled Technicians as they were, their name spread far and wide as expert engineers and soon Bomanshaw and his sons were flooded with work from the Ginning factories and they developed expertise in repairing Crank shafts of Engines. With their proficiency they were respectfully called 'Engineer Saab' by all who came in contact with them. It was almost natural that they adapted 'Engineer' as their family name.

With the advent of the Steam Engine, Engineer and Sons became an importer of Steam operated Road Roller Boilers.

After the demise of Bomanshaw, three of the brothers moved to Bombay and started Boiler related businesses. One of them, Naoroji Engineer started 'Empress Welding and Repairing Works' named after Her Highness, the Queen of England. He imported Boilers in knockdown condition from England and installed and commissioned them in Indian industries.

With the advent of Indian Independence, in 1959, Naoroji partnered with the first Indian boiler manufacturing company, 'Nestler', working out of Love Lane, Byculla, Bombay to provide Riveting and Manufacturing services.

In 1970, Naoroji's son Rusi started manufacturing boilers in the Empress Welding Workshop and by 1974 a big piece of land was purchased at Vapi (Gujarat) for Boiler manufacturing under a new company name 'Industrial Boilers.‘

The company took off in 1978 with the manufacture of Vertical Cross Tube Boilers which were fully riveted. A hundred boilers later, Package Boilers of welded design were produced.

In 1986, Industrial Boilers became India's first commercial Fluidised Bed (FBC) Boiler manufacturer and with the advent of this technology, the company reached new heights with advanced models being launched at regular intervals.

By 1990, the 'Agropak', world's first Hybrid FBC Boiler, a combination of a water wall tube furnace with smoke tube shell was developed and the industry after a lot of fears accepted it as possibly the best development in Boiler technology in over a hundred years.

In 1995, the 'Brownian Motion Furnace' boiler shook the industry from its roots with its capacity to burn almost all Bio and Residue fuels in utmost ease. Suddenly Pith, Pattal, Bark, Roots and Cow dung were branded as Fuels.

By the beginning of this century, it was becoming evident that the Power Crisis in India was deepening and a large demand existed for small power plants. Industrial Boilers launched a range of small power generation boilers working on Biomass and Coal.

By 2002, Steam Turbine manufacturing was launched with a new company 'IB Turbo' at Greater Noida (NCR). Within 10 years IB Turbo launched 5 new Turbine frames to cater to the first time Co-Generator.

Industrial Boilers diversified into Hi-Tech products like Rotary Incinerators, Electrostatic Precipitators' and Single Drum Boilers.

Today the IBL group employs over 1000 people and is the second largest boiler manufacturer in India. It is led by the dynamic Homai Engineer who is the Chairperson and Managing Director.

IBL is today the Largest Exporter of Boilers from India to the World.

RESEARCH

The IBL Group is now a Research driven, industrial organisation specialising in Design and Manufacturer of Process Steam Boilers, Industrial Boilers, Power Boilers, Turbines, Pressure Reducing Steam turbines,Mini Power Plants, Specialised Combustion solutions, Autoclaves and Vulcanisers, Solar Thermal Systems, ESP, Bag Filters and Pollution Control Equipments.

With a vast pool of highly talented and experienced engineers, IBL has continued to maintain its reputation as a Research Powerhouse of Boilers.

With Boiler technology flowing thru our veins, IBL is the international market leader in the field of Biomass Boilers and at the cutting edge of technology.

Our research is 5 to 10 years ahead of time so that we can foresee developments and provide absolutely latest technology to our customers. Our rich history coupled with innovation is our strength -a formula that always works.

IBL are Pioneers in FBC Technology with the first FBC boiler manufactured in 1986.
Till date over 5000 Fluidised Bed Combustion Boilers are in operation.
The First Hybrid boiler, "The Agropak" was developed by IBL in 1991 and still maintains its reputation as the best boiler in its class.

1980 Parallel Cross Tube Vertical Boiler.
1984 Circloflame Burner. For Improved combustion of Fuel Oils.
1986 Fluidised Bed Combustion system for Rice Husk and Coal – Replaced Stoker firing.
1990 Rapoclave - Quick Closing Autoclaves developed.
1991 Agropak - The Hybrid Boiler - Today, the most preferred design in India.
1993 Suvega Pure Water wall for furnace was developed. – Improved Radiation Capture.
1996 Brownian Motion Furnace for Biomass. - Revolutionised Biomass burning.
1999 Twin Drum Agropak design developed – Possibly the first Packaged type Power Boiler.
2000 Husko model developed - Special FBC Boiler for Rice Mills.
2002 Back Pressure Steam Turbine developed – Opened up small Cogen Applications.
2005 Multistage and Condensing Turbines developed.
2006 Cold Circulating FBC developed for Petcoke.
2008 Huskogen - A unique Micro Power Boiler with incredible efficiency.
2009 Magnum - A Large Power Boiler with Prefabricated Concept.
2010 Rotary Furnace - Unique combustion system for Incineration of Industrial, Medical Wastes and Palm Kernel.
2012 Solar Steam generator
2013 PRT - Pressure Reducing Steam Turbine developed. Economical Cogeneration of Power for all Process Industries.
2015 Automatic Hydrolic Pusher Grate developed for Biomass.
2016 Single Drum SD Boiler developed for Medium Pressure.

QUALITY APPROVALS

ISO 9001

CE – EUROPE

ASME - USA

Certificate of Registration

The Governing Board of
Q.A. International Certification Limited
hereby grants to:

INDUSTRIAL BOILERS LIMITED

Registration No. : QAIC / IN / 004 - A

(hereinafter called the Registered Company) the right to be listed in the Directory of Registered Companies in respect of the services listed below. These services shall be offered by the Registered Company at or from only the address given below in accordance with the quality management system in compliance with ISO 9001:2008.

Address to which this Certificate refers :
Plot No: 227-228, Vapi Industrial Township, Vapi G.I.D.C., Vapi - 396 195, Gujarat, India

and also at :-

Plot No. 1208/1 & 1-A, Road No. QQ, IIIrd Phase GIDC Vapi - 396 195, Gujarat, India

Approved Scope to which this Certificate refers.
The Design, Manufacturing, Installation and Servicing of Steam Boilers, Pressure Vessels, Co-Generation Systems, Pollution Control Equipments and Allied Products

Signed for and on behalf of the Board

CHIEF EXECUTIVE — SCHEME MANAGER

Certificate Issue Date : 18th May 2015 - Certificate Expiry Date : 8th March 2016
Date of Initial Registration : 9th March 2009 - Re-assessment Date : 8th March 2018
This Certificate of Registration is granted subject to the Regulations approved by the Board.

QA INTERNATIONAL

EUROPEAN INSPECTION AND CERTIFICATION COMPANY S.A.

CERTIFICATE OF FULL QUALITY ASSURANCE
(WITH DESIGN EXAMINATION & SPECIAL SURVEILLANCE OF THE FINAL ASSESSMENT)
ACCORDING TO EUROPEAN PRESSURE EQUIPMENT DIRECTIVE 97/23/EC (MODULE H1)

CERTIFICATE No.: EU.IN.CE.0055 – 10.15

THIS IS TO CERTIFY THAT EUROCERT S.A. HAS ASSESSED WITH SATISFACTORY RESULTS THE QUALITY ASSURANCE SYSTEM OF THE FOLLOWING MANUFACTURER AND HAS EXAMINED THE DESIGN, THE TECHNICAL DOCUMENTATION AND THE FINAL ASSESMENT OF THE PRESSURE EQUIPMENT DESCRIBED BELOW

INDUSTRIAL BOILERS LIMITED
227-228, Vapi Industrial Township, G.I.D.C
Vapi-396 195, Gujarat, INDIA

*DESCRIPTION OF PRESSURE EQUIPMENT:
BOILLERS AND STEAM CONDENSERS
*ANNEX TO THIS CERTIFICATE

CATEGORY OF PRESSURE EQUIPMENT:
IV

AGAINST THE PROVISIONS OF:
EUROPEAN PRESSURE EQUIPMENT DIRECTIVE
97/23/EC, ANNEX III (MODULE H1)

THIS CERTIFICATE IS VALID FOR THE FOLLOWING SCOPE:
DESIGN AND PRODUCTION OF PRESSURE EQUIPMENT

CONDITIONS AND LIMITATIONS:
Each pressure equipment should be accompanied with manufacturer's declaration of conformity and instructions of use.
The manufacturer must keep the notified body informed of any intended updating of the quality assurance system.
The manufacturer must affix the CE Marking and Eurocert's Identification No. to each item of pressure equipment as displayed below:

CE 1128

This Certificate is valid till 29/05/2017 subject to satisfactory annual surveillance.

AUDIT REPORT NO.:

TECHNICAL DIRECTOR

Please check the validity of the certificate from our website using the password zCUh642b

The data of this certificate were gathered with every possible thoroughness.
This certificate reflects the findings of the time and place of the audit
Reproduction of this document is strictly forbidden.
89, CHLOIS STR. & LIKOVRISEOS, 144 52 METAMORFOSI, ATHENS, GREECE
Tel.: ++30 210 62.52.495, 30 210 62.53.927 - Fax: ++30 210 62.03.018
Internet site: www.eurocert.gr - e-mail: eurocert@otenet.gr

Certification of MS
Cert. No. 3-3

The American Society of Mechanical Engineers

CERTIFICATE OF AUTHORIZATION

U

The named company is authorized by the American Society of Mechanical Engineers (ASME) for the scope of activity shown below in accordance with the applicable rules of the ASME Boiler and Pressure Vessel Code. The use of the certification mark and the authority granted by this Certificate of Authorization are subject to the provisions of the agreement set forth in the application. Any construction stamped with this certification mark shall have been built strictly in accordance with the provisions of the ASME Boiler and Pressure Vessel Code.

COMPANY:
INDUSTRIAL BOILERS LTD.
UNIT-II
PLOT NO. 1208/1 A-B
3RD PHASE, G.I.D.C., ROAD "QQ"
VAPI, GUJARAT 396195
INDIA

SCOPE:
Manufacture of pressure vessels at the above location and field sites controlled by the above location (This authorization does not cover impregnated graphite)

AUTHORIZED: April 6, 2015
EXPIRES: April 6, 2018
CERTIFICATE NUMBER: 42,429

Vice President, Conformity Assessment

Director, Conformity Assessment

The American Society of Mechanical Engineers

CERTIFICATE OF AUTHORIZATION

U

The named company is authorized by the American Society of Mechanical Engineers (ASME) for the scope of activity shown below in accordance with the applicable rules of the ASME Boiler and Pressure Vessel Code. The use of the certification mark and the authority granted by this Certificate of Authorization are subject to the provisions of the agreement set forth in the application. Any construction stamped with this certification mark shall have been built strictly in accordance with the provisions of the ASME Boiler and Pressure Vessel Code.

COMPANY:
INDUSTRIAL BOILERS LTD.
UNIT-I
227-228, VAPI INDUSTRIAL TOWNSHIP,
G.I.D.C., ROAD "O"
VAPI, GUJARAT 396195
INDIA

SCOPE:
Manufacture of pressure vessels at the above location and field sites controlled by the above location (This authorization does not cover impregnated graphite)

AUTHORIZED: April 6, 2015
EXPIRES: April 6, 2018
CERTIFICATE NUMBER: 42,166

Vice President, Conformity Assessment

Director, Conformity Assessment

INDUSTRIAL BOILERS LTD.

ANNEXURE - I
SCOPE OF SUPPLY
SINGLE DRUM - WATER TUBE
FBC HUSK FIRED BOILERS

CONSTRUCTION :

The Boilers offered by us are made as per the latest IBR Regulations and are of Class-I Fusion welded construction. Stringent quality control is observed at every stage of manufacture right from raw material stage to testing of Boiler prior to dispatch. The Drum is manufactured from Boiler Quality Steel, fully welded construction with 100% radiography and Stress Relieving and hydraulically tested.

FLUE GAS PATHS :

The Boiler consists of a configuration enabling high turn down ratios. The combustion once completed in the furnace is re-leased into the free board zone at a temperature slightly higher than 1200^{o}C.

The furnace enables the combustible products to completely burn off completely.

Simultaneously, the water walls absorb a large proportion of the Radiation Energy.

The Hot gases then enter into the Super heater zone where the Primary and Secondary Super heaters bring down the flue gas temperature further before the gases enter the Economiser.

The Gases after the Cyclone enter an Air Preheater where fresh combustion air is heated and flue gas temperature further brought down.

Pollution Control equipment (Optional) like Trexma Cyclones / ESP / Wet Scrubber / Bag Filter reduce the ash emission before the gases are ejected thru the ID fan and Chimney.

STEAM DRUM :

The boiler consist of one Steam drum. This drum connects the various Heating Surface Sections within the Boiler. The drum incorporates a set of Drum Internals for separation of steam before their exit.

A Periodic Blow Down connection with an internal pipe is provided in the drum for removing the dissolved solids, mud and sludge during operation.

BOILER BANK TUBES :

Tubes of BS 3059 grade are used for the Boiler Bank. These consist of water wall and Manifold Bank.

ECONOMISER BANK TUBES :

Tubes of BS 3059 grade are used for the Economizer Bank.

AIR PREHEATER TUBES :
ERW Tubes are used for the Air Preheater.

HEADERS, RISERS AND DOWNCOMERS :
These are made from extra thick **Seamless** pipes as per ASTM 106.

FEED PUMPS :
Two numbers (One duty and One stand by) electrically driven Multistage Feed Pumps with motors will be provided. Pumps are of Lubi make.

MOUNTINGS & FITTINGS ON THE STEAM DRUM :
One Air Vent Valve.
Two Single Post Spring Loaded Safety Valves.
Two Sets of Reflex Water Level Gauges.
One Pressure Gauge with Siphon and cock.
One Drain Valve.
One Check Valve.
One CBD Valve.

MOUNTINGS & FITTINGS ON THE SUPERHEATER :
One Main Steam Stop Valve.
One Air Vent Valve.
One Single Post Spring Loaded Safety Valves.
One Pressure Gauge with Siphon and cock.
One Drain Valve.
One Steam Flow Meter Orifice (Supplied Loose)

MOUNTINGS & FITTINGS ON THE ECONOMISER :
One Feed and Check Valve.
One Air Vent Valve.
One Pressure Gauge with Siphon and cock.
One Drain Valve.

MOUNTINGS & FITTINGS CONNECTED ON THE WATER WALL HEADER ;
Two Drain Valves.

MOUNTINGS & FITTINGS ON THE FEED WATER LINE :
One Pressure Gauge with Siphon and cock.
Two Stop Valve. (Pump Discharge)
Two Check Valve. (Pump Discharge)
One Feed Water Flow Control Valve
Three Isolation Valve for Feed water Control Valve.

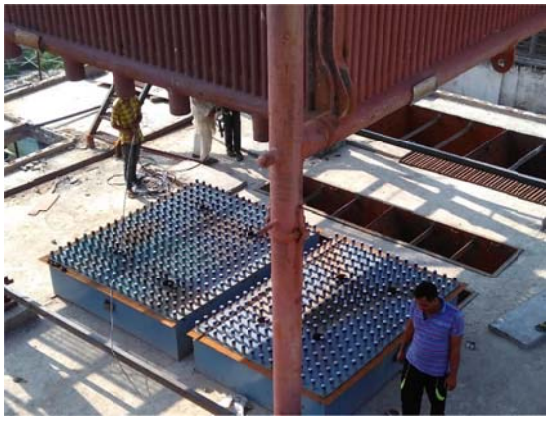
AUTOMATIC WATER LEVEL CONTROL :
Single Element Feed water regulating system to ensure correct water level in the Boiler is provided.
The system measures the Level in the Drum to accurately give an output to the Feed Water Control valve to maintain the correct water level in the boiler drum.

FLUIDISED BED EQUIPMENT :

The furnace materials such as Windbox with Stainless Steel Nozzles will be provided. Drains will be provided in the Windbox.
Windbox will have one access manhole.
Fire Doors and Ash Doors will be provided as per requirement.

FUEL FEEDING SYSTEM :

Rice Husk will be fired thru overbed Screw Feeders.



FORCED DRAFT FAN :

One Forced Draft Fan with drive motor will be provided.

INDUCED DRAFT FAN :

One Induced Draft Fan with drive motor will be provided.

ASH REMOVAL SYSTEM :

Rotary Air lock valves below Superheater Chamber & Economiser for removal of ash will be provided.

CHEMICAL DOSING :

LP dosing pump will be provided.

DEAERATOR :

Deaerator with instrumentation will be provided.
Deaerated Feed Water Tank of 30 minutes storage is in IBL Scope.

BLOW DOWN :

Blow Down arrangements include a CBD Valve connected to the steam Drum.
Drain Valves at Water Walls, Inbed headers and Economiser.

AIR PREHEATER :

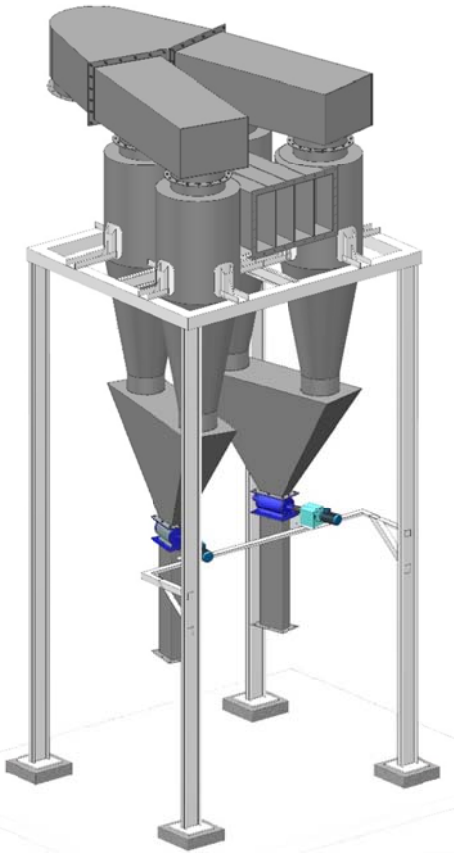
Air Preheater will be provided have Downflow of gases and is placed after the Trexma cyclone.

DUST COLLECTOR :

A highly efficient Cyclone Type TREXMA Dust Collector is provided to check carry over the dust particles which otherwise would escape to the atmosphere. The precipitator separates the dust particles by the use of centrifugal and gravitational forces.

Ash is continuously discharged from the Bottom of the dust collector from Rotary Valves coupled to geared motors.

Structure is not in IBL scope.



CONTROL PANEL :

The panel consist of a sophisticated but user friendly circuit enabling the operator to run the boiler in automatic or manual mode as desired.

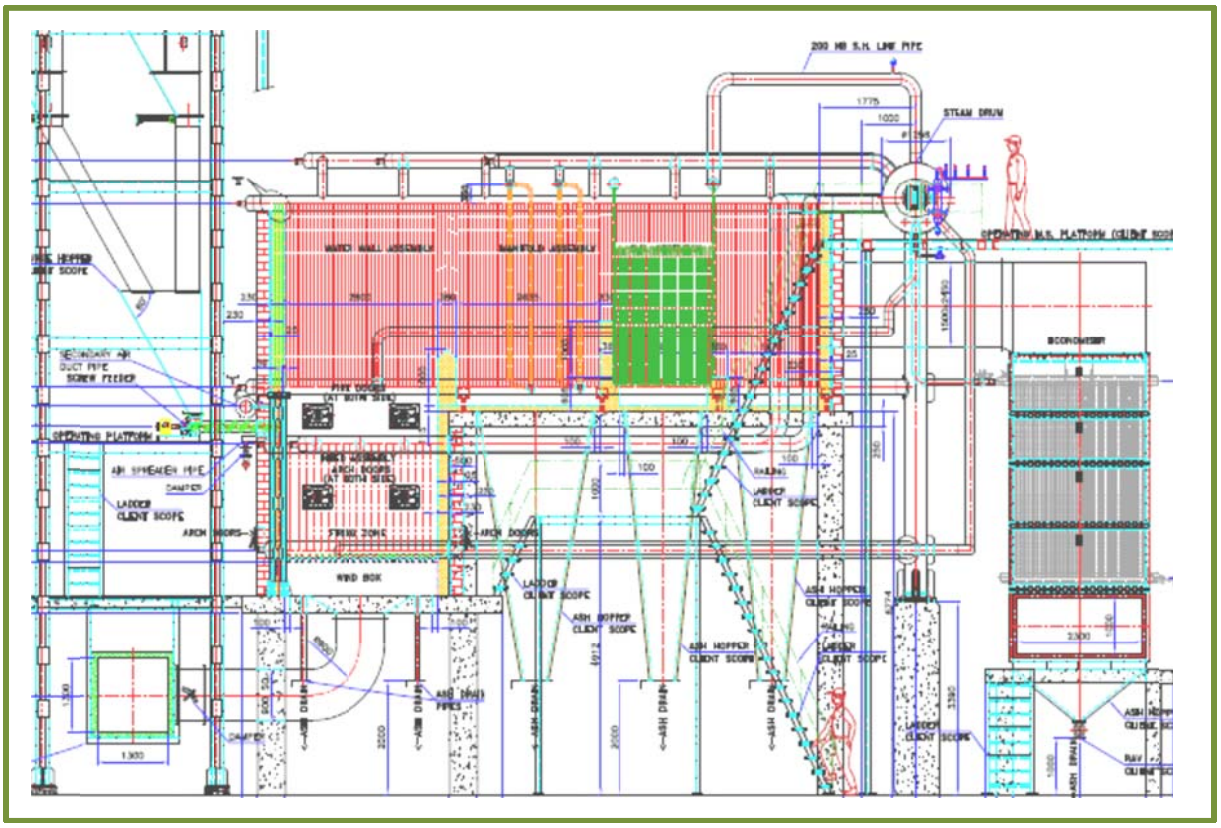
Various instruments and safety features are as detailed below:

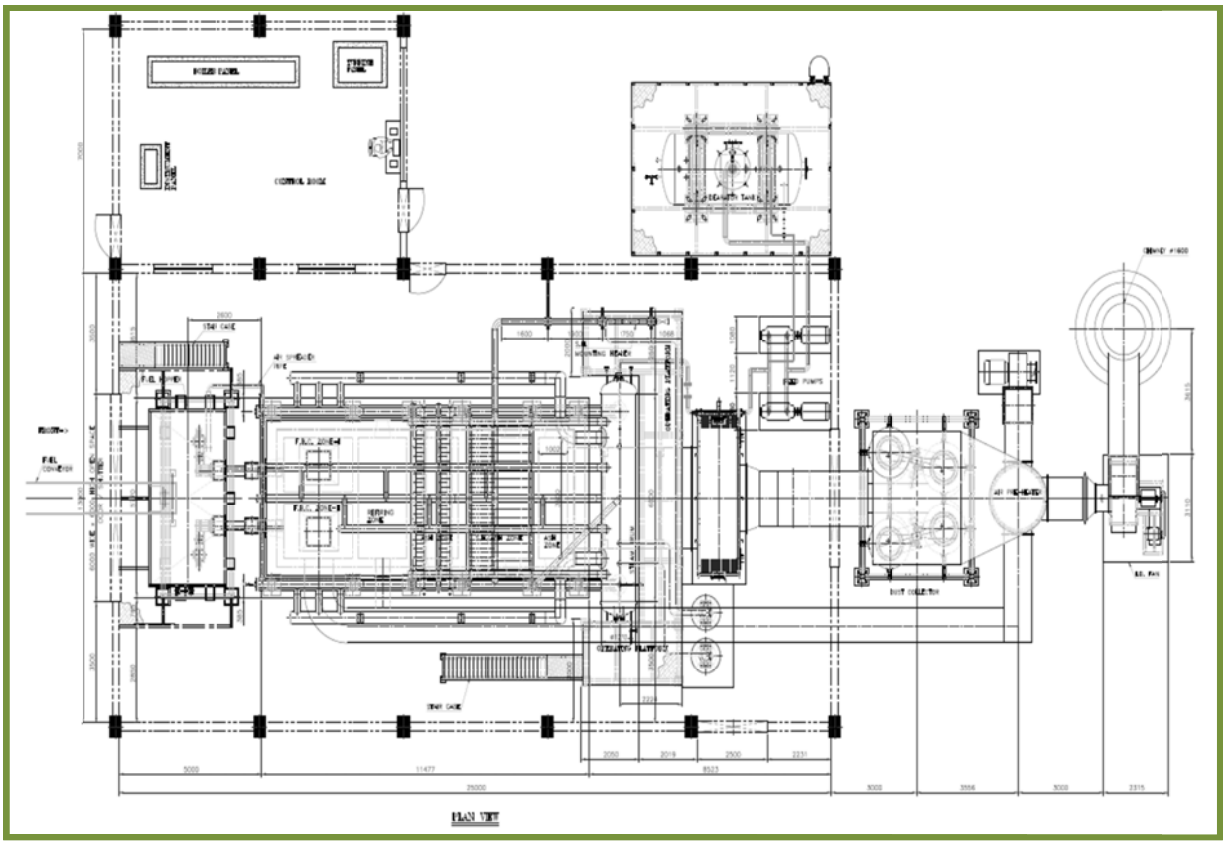
The MCC will be fixed (non-draw out) type modular with single front and is suitable for indoor application.

In the control panel Switches, Motors Starters, Indication Lamps, Control Fuses, Main Incoming Switch and Inter connecting wiring is provided.

EXCLUSIONS	
#	Water treatment plant. Feed Water Tanks, All Feed Water Piping.
#	Water and Steam Supply to Deaerator.
#	Bag Filter / ESP
#	Main Chimney.
#	Flue Gas Ducting upto Chimney
#	Interconnecting Ducting for Air Duct for FD Fan.
#	Steam, Blow down and Drain Piping.
#	All Steam Piping.
#	Fuel Handling upto Fuel feeders including Bunker, Crusher, Conveyors.
#	Ash Hoppers and Ash Handling from ash discharge points.
#	Insulation of Boiler, Economiser, APH, Piping, and Ductings.
#	Refractory and Red Bricks with Fire Cement and Mortars.
#	Structural Supports. Platform and Ladders.
#	All Electrical and Instrumentation cables. Cable Trays, Earthing.
#	IBR inspection / or any other Govt. inspection and registration at Site.
#	Compressed Dry and Oil Free Air Supply for Controls.
#	First fill of Lubricants and chemicals for boil out.
#	All civil and structural design and supply for installing the boiler.
#	Assembling and Erection of the Boiler.
#	Pressure Reducing & Desuperheating Station.
#	Taxes & Duties, Freight, Insurance as applicable at the time of dispatch.
#	Hotel Accommodation for our Site Engineers.

INDUSTRIAL BOILERS LTD.





INDUSTRIAL BOILERS LTD.

ANNEXURE - II
TECHNICAL SPECIFICATIONS OF BOILER
SINGLE DRUM - WATER TUBE - FBC

Max. Continuous rating	:	15,000 Kg/hr (From & At 80^{o}C)
Type of Boiler	:	Single Drum.
Model	:	**Agropak-SD**
Design Code	:	Indian Boiler Regulations
Design Pressure	:	24 Kg/cm^{2}
Hydraulic Test Pressure	:	36 Kg/cm^{2}
Feed water Temperature	:	105^{o}C
Thermal Efficiency on Coal (+/-2%)	:	82%
Thermal Efficiency on Husk (+/-2%)	:	80%
(As per BS: 845 Pt.1 Indirect Method)		

Material Specifications :

Boiler Drum	:	ASTM 515/516 Gr 70
Headers	:	ASTM 106 Gr B **Seamless**
Inbed Tubes	:	BS 3059 **Seamless**
Boiler Tubes	:	BS 3059
Economiser Tubes	:	BS 3059
Superheater Tubes	:	BS 3059 and **P- 11**

FD Fan

Flow	:	9170 CFM
Static head	:	600 mm WG
CFM	:	13750
Motor HP	:	75 HP

ID Fan

Flow	:	22500 CFM
Static head	:	250 mm WG
Motor HP	:	60 HP
Qty	:	1 No.

Feed Pump details

Type	:	Multistage, Vertical
Flow	:	14 m^{3}/hr
Head	:	24 Kg/cm^{2}
Make	:	Lubi
Motor HP	:	40 HP
No. of pumps	:	2 Nos.

Velocity Profile :

Freeboard Zone	:	6 - 8 m/sec
Super Heater Bank	:	8 - 10 m/sec
Economizer Bank	:	8 - 10 m/sec
APH Bank	:	8 - 10 m/sec
Gas Ducting	:	8 - 10 m/sec
Chimney	:	6 - 8 m/sec

Temperature Profile

Furnace	:	1000 - 1400^{o}C
Free Board Area	:	1200 - 1400^{o}C
After Economiser	:	170 - 200^{o}C
After APH	:	120 - 140^{o}C

BOILER VALVE SIZING
MOUNTINGS & FITTINGS

Main Steam Stop Valve.	:	125 mm
Air Vent Valve.	:	40 mm
Single Post Safety Valves.	:	50 mm
Sets of Water level gauges.	:	20 mm
Pressure gauge with siphon and cock.	:	15 mm
Blow down valve.	:	50 mm
Feed Stop valve.	:	80 mm
Feed Check valve.	:	80 mm

MOUNTINGS & FITTINGS (WATER WALL HEADERS) :

Drain valves.	:	25 mm

Recommended Chimney diameter	:	1.5 meters on top

FEED WATER SPECIFICATIONS

Deaerated and Demineralised water is recommended for the boiler.
Feed water should meet the following requirements.

Water Hardness	:	0.01 ppm max.
pH	:	8.5 - 9.5
Dissolved Oxygen	:	0.01 ppm max.
Oil Content	:	Nil
TDS	:	1 ppm max.
Silica	:	0.009 (Max.)

BOILER WATER SPECIFICATIONS

Water Hardness	:	0.01 ppm max.
pH	:	11 - 12
Unreacted Sodium Sulphate (as Na_2So_3)	:	30 -50 ppm.
Phosphates (as Po_4)	:	20 - 40 ppm.
TDS	:	1000 ppm max.
Residual Hydrazine (as N_2H_4)	:	0.5 ppm max.

INDUSTRIAL BOILERS LTD.

ANNEXURE - III
COMMERCIAL OFFER

Supply of One No. IBL, Single Drum Water Tube Boiler capable of generating **15,000 Kg/hr** of Steam (From & At 100^{o}C) at the Superheater Outlet pressure of **21 Kg/cm^{2}(g)** and as per standard scope of supply along with • Air Pre Heater. • Trexma Dust Collector, • Super Heater for 250 Deg.C. • Pressurized Economizer • Dearator Head with instruments. • Dearator Tank of 7500 Litres • Single Element Drum Level Control. • Continues Blow Down Valve at Drum	**Rs.132,00,000/-** Rupees One Hundred & Thirty Two Lakh Only)

Price Basis	Ex-Works Vapi
GST	Extra as applicable (Presently @ 18%)
Freight & Insurance	Extra as applicable
Packing & Forwarding	2% of Basic Price
Supervision of Erection	Rs. 6,00,000/- + To & Fro Fare with Lodging & Boarding for our Service Engineer

for **INDUSTRIAL BOILERS LTD.**

(MARKETING DIVISION)

ANNEXURE - IV
GENERAL TERMS & CONDITIONS

PRICE :
The prices quoted are Ex-works Vapi. Insurance and Freight charges are extra. Besides GST and bank charges are also payable by you as applicable.

DELIVERY :
The delivery will be 4 - 5 months from the date of receipt of your technically and commercially clear order accompanied by necessary advance.
We are not responsible for any delay caused by extraneous circumstances or Acts of God beyond our control and cannot pay any damages or penalties on this account. The equipment ordered may be dispatched in 1,2 or more lots. If required we can undertake the dispatch of the equipment on behalf of the buyer by road transport only to any destination given by the buyer on freight TO - PAY basis, on the clear understanding that we will not be liable for any damages whatsoever. The freight charges contracted by us on behalf of the buyer will be deemed as negotiated under the buyer's authority and therefore it shall be binding on the Buyer to make full payment.

WARRANTY :
Our boilers are warranted for a period of ONE YEAR from the date of dispatch, against any manufacturing defect or faulty workmanship reported in writing during the Warranty Period, The Warranty does not extend to consequential damages or losses. The Warranty is NULL & VOID if repairs and/or replacements are carried out without our consent in writing. It also does not cover bought-out items.
This warranty is not applicable if full payment has not been given to us.

CONFIDENTIALITY :
The client shall treat all quotations, drawings, data, technical information etc. received from Industrial Boilers Ltd., as strictly confidential and shall take all precautions necessary to prevent the unauthorised disclosure in part or parcel of any of the above mentioned, to any third party.

TERMS OF PAYMENT :
30% Advance with Purchase Order
Balance against Proforma Invoice before dispatch.

PLACE OF JURISDICTION
In the event of any dispute arising as a result of contracting to supply against this offer and quotation, the place of Jurisdiction will be New Delhi and no other place.

ARBITRATION

All disputes or differences whatsoever arising between the parties out of or relating to the construction, meaning and operation or effect of this contract or the breach thereof shall be settled by arbitration in accordance with the Rules of Arbitration of the Indian Council of Arbitration and the Award made in pursuance thereof shall be binding on both the parties.

All orders will only be accepted after the realisation after of the agreed advance which shall not be subject to any interest under any circumstances whatsoever. We however reserve the right to adjust such advance against any payments which might fall due because of delay in lifting of the ordered equipment or on account of incidental expenses incurred on buyer's behalf.

CANCELLATION :

An order placed with us cannot be canceled for any reason whatsoever. Any cancellation of order without our consent will result in the forfeiture of Advance, without prejudice to our claim for compensation and other legal remedies.

NOTE: GRAPHICS SHOWN IN THIS QUOTATION DO NOT NECESSARILY DETAIL OR SIGNIFY THE SCOPE OF OUR SUPPLY.

for INDUSTRIAL BOILERS LTD.

MARKETING DIVISION

Rain Water Harvesting Report

AQUIFER TYPES

The area includes 3 blocks of Udham Singh Nagar District i.e Jaspur, Kashipur & Bazpur, Uttarakhand. There exist multiple aquifers in the study area which are separated by thick clay layers of the thickness 17 to 35 m. The granular zones are composite in nature (Boulders mixed with pebbles, gravels, cobbles sand and clay), and are separated by the thick confining clay layers. The thickness of granular zone varies from 10 to 30 m. The First – second and second - third aquifer is separated by 17-21 m and 14 to 39 m thick clay layer. The sand grains also show gradation from coarse to fine grain. The piezometeric levels in all wells are very shallow within the range of 1 to 4 mbgl and 7mbgl at Khempur. Geologically, the Tarai and Bhabhar formation of tertiary age exists in the area. Aquifers are encountered at the depths of 45 to 70 m and 125 to 160 m. These are unconfined to semi confined in nature. The quality of the Ground Water is also suitable for drinking and irrigational purposes with EC values around 399 – 750 micromhos/cm.

Depth to Water Level

The water level in the study area occurs from 1.15 m to 15 m below ground level in the month of June, 2019, as per hydro-geological investigation.

Average seasonal fluctuation in the study area is 1-2 m as reported. Groundwater flow direction in the investigated area is towards NE to SW.

Design for RWH Structure:

For good design of rainwater harvesting, following points are to be kept under consideration:

- Ideal location with good ground slope.
- The location has adequate subsurface permeability of the aquifer to accommodate maximum recharge of rainwater through injection well.
- Rate of filtration should exceed average rainfall intensity.
- Clogging of filtration media should be cleaned periodically.
- Ground water pollution does not take place.

Baseline:

The average annual rainfall (based on last 10 years rainfall data) at Kashipur station is 1922 mm.

Rain Fall Data (last 10 years)

Years	Rainfall (mm)
2005	3073.4
2006	1759.5
2007	2624
2008	2384
2009	1724
2010	3507
2011	2311
2012	780
2013	1904
2014	538
2015	533
Average	**1921.63 or 1922**

Calculation of No. of RWH Structures

S. No	Type of Structure/ Surface	Area [A] (sq. m.)	Run off Coefficient [C]	Intensity of rainfall (m/hour) [I]	Total discharge [Q = CIA] (m^3/hr)
1.	**Roof Top**	29137.35	0.85	0.06	1486.0
2.	**Paved/Road**	11533.53	0.65	0.06	449.80
3.	**Landscape/ Open**	20031.92	0.15	0.06	180.28
	Grand Total (1-3)	**72263 sq. m**	**-**	**-**	**2116.08**

Total Rain Water Flow : 2116.08 m3/hr

Considering 15 minutes of peak rainfall,

Runoff volume : 529.02 m3/hr

Capacity of Percolation Tank : 180 KLD

Total no. of rain water harvesting pits required : Total run-off volume/volume of each pit

: 529.02 / 180 = 2.939

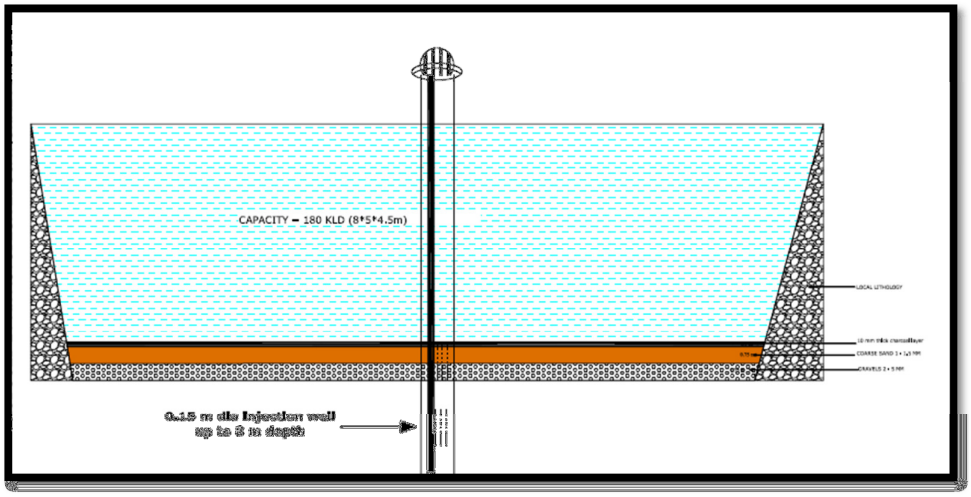
: 3 nos. of Percolation Tank

We will proposed percolation tank with 180 KLD capacity and such 3 structures will accommodate up to total rainfall volume of 529.02 m3 in any rainfall event at peak rainfall occurrence.

The individual design is made for accumulation of 180 m3 of water i.e. 120 m3 of water in collection tank (3 m height x 8 m length x 5 m width and about 60 m3 in the process of infiltration through filtration media of recharge well. Hence, the dimensional parameters of collection chamber would be 8 m (length) x 5 m (width) x 3 (depth). The filtration tank dimension would be 8 m (length) x 5 m (width) x 1.5 m (depth) with 0.15 m dia recharge well (3 nos.) of 4.5 m depth depending upon the formation for recharge in aquifer through saturated zone.

This structure will be capable of handling rainwater volume @ 180 m^3 and such 3 structures will accommodate up to total rainfall volume of 1922 m^3 in any rainfall event at peak rainfall occurrence.

RAIN WTAER HARVESTING STRUCTURE PERCOLATION TANK



Calculation of annual recharge:

S. No	Type of Structure/ Surface	Area [A] (sq. m.)	Run off Coefficient [C]	Intensity of rainfall [I] (m/annum)	Total discharge [Q= CIA] (m3/ annum)
1.	**Roof Top**	29137.35	0.85	1.92	47552.15
2.	**Paved/Road**	11533.53	0.65	1.92	14393.85
3.	**Landscape/ Open**	20031.92	0.15	1.92	5769.19
	Grand Total (1-3)	**60702.8 sq. m**	**-**	**-**	**67715.19**

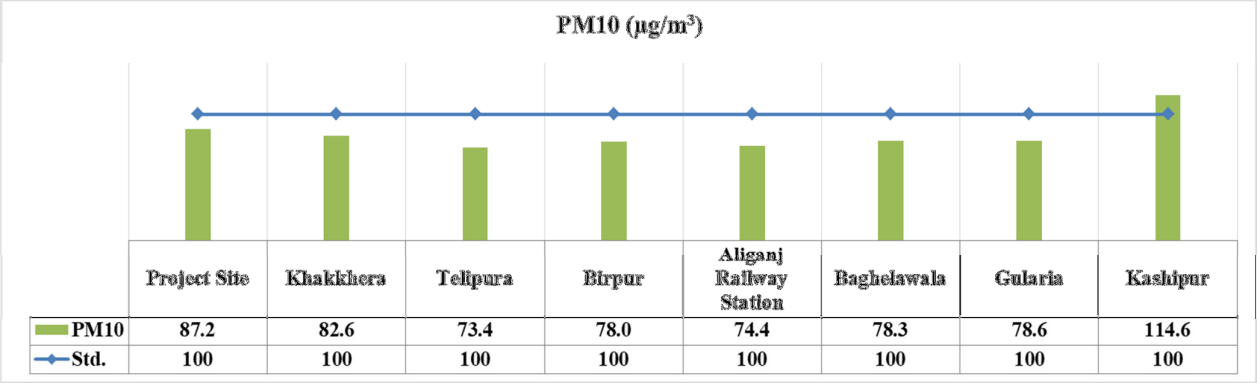
Total Annual Recharge to Ground Water Regime of the area through rainwater harvesting structure would be **67715.19 m^3/ annum.**

****

Clarification for high PM 10 values recorded during and plan to control/reduce.

Kashipur is an emerging area as industrial hub. Project is located near to existing industries. Vehicular movement and commercial acvities near to site. Particulate matter in study area recorded by Uttarakhand control pollution board is also high above the standards defined by National Ambient Air Quality Standards.(Reference enclosed)

To control the emission, only need based vehicular movement is proposed. Green cover development is proposed over about 33 % (20,031.92 sq. m.) land area – which will be helpful to reduce the pollutants of nearby areas as well as predicted impact by project operation. A green belt or tree plantation around the plant site would help to arrest the effects of particulate matter, gaseous pollutants and noise pollution in the area besides playing a major role in environmental conservation efforts.



	Project Site	Khakkhera	Telipura	Birpur	Aliganj Railway Station	Baghelawala	Gularia	Kashipur
PM10	87.2	82.6	73.4	78.0	74.4	78.3	78.6	114.6
Std.	100	100	100	100	100	100	100	100

Plant Species Suggested for Greenbelt Development in the Project Site

No	Scientific Name	Local Name	Pollution Control		Environmental adaptation		
			DC	OG	DR	SR	FR
1	*Albizialebbeck*	Siris, Kala Sirish	*	*	*	*	*
2	*Azardirachtaindica*	Neem	*	*	*	*	*
3	*Bauhinia variegata*	Kanchnar	*	_	*	*	*
4	*Ficusbenghalensis*	Bargad	*	_	*	*	*
5	*Ficusreligiosa*	Peepal	*	*	*	*	*
6	*Holopteleaintegrifolia.*	Kanjo, Chilbill	*	_	*	*	*
7	*Meliaazedarch*	Melia, Baikein	*	*	*	*	*
8	*Terminalia arjuna*	Arjun	*	*	*	*	*

Biological filter (DC- Dust Control, OG – absorptions of Gases), Environmental Adaptation (DR - Drought resistance, SR - Salinity resistance, FR - Fire Resistance)

ANNEXURE IV

Budget Allocation for Greenbelt Development

Particulars	1st Year	2nd Year	3rd Year	4th year	5th Year	Grand Total
1. Core Zone: following plantation will be developed in the existing 25 % greenbelt area of the project site.						
Saplings required for project site greenbelt	500	500	500	500	230	2230
Amount (@ INR. 250 per sapling)	125000	125000	125000	125000	57500	5,57,500
2. Buffer Zone: Every year 100 sapling will be planted upto 5 years within LIZ area like, agriculture hedges, various places of urban area (public places) and along road.						
Saplings required for Buffer zone	100	100	100	100	100	500 sapling
Amount (@ INR. 250 per sapling)	25,000	25,000	25,000	25,000	25,000	125,000
All other costs like labor costs for plantation, soil filling dressing, irrigation etc. will also borne by client / proponent.						

In order to comply with the environmental protection measures as suggested in the above sections, the project management has made budgetary provision for environmental protection and safety measures. The total capital cost towards EMP is Rs. 225 Lac and the recurring cost will be Rs. 34 Lac. The annual expenditure to be incurred on plantation, maintenance, monitoring and analysis of ambient air, effluent water and soil etc. Plantation will be done as per given technology.

Plantation Technique

- Following basic procedures need to be followed for greening the area.
- Plantation of tree species required approx. $1m^3$ pit for soil enrichment
- Pit should be filled with imported soil with 3:1:1 the ratio of sand, silt and form yard manure
- Procure well grown saplings of recommended species from the nearby Forest Department nursery
- Make 1m diameter ring bund around the planted saplings for water retention
- Watering of sapling is species specific, therefore watering need to be done once in 2 or 3 days for a period of two years
- Soil wok and weeding need to be done once in a two months

Monitoring Protocol

- The plantations need to be managed by regular watering, soil enrichment work, applying manure, weeding and provide proper protection.
- Replacement of sapling (replanting) required whenever mortality occurs in the plantation during the growth stage.
- Plantation requires after care for a period of minimum five years till the saplings attain matured tree stage.
- Any damage to the developed greenbelt due to any natural or cattle activity should be redeveloped and maintained by the agency.

Budgetary Provision for EMP

No.	**Pollution control system**	**Capital**	**Recurring**
		Rs. Lakhs	
1	Air pollution control	50.00	5.00
2	Water pollution (ETP)	150.00	22.50
3	Environment lab and monitoring	5.00	0.50
4	Occupational Health (PPE)	5.00	3.00
5	Green Belt development	15.00	3.00
Total		**225.00**	**34.00**

******

Ambient Air Quality Characteristics (Year 2019)

City	Dehradun												Rishikesh			Haridwar			Haldwani				Kashipur				Rudrapur			
Locations	Clock Tower				Raipur Road				Himalayan Drug, ISBT				Nagar Palika Parishad			SIDCUL			Govt. Hospital				Govt. Hospital				Govt. Hospital			
Zone	Commercial				Commercial/ Residential				Commercial/ Industrial				Commercial			Industrial			Commercial				Sensitive				Sensitive			
Month	P.M.10 (µg/ m3)	P.M. 2.5 (µg/ m3)	SO2 (µg/ m3)	NO2 (µg/ m3)	P.M.10 (µg/ m3)	P.M. 2.5 (µg/ m3)	SO2 (µg/ m3)	NO2 (µg/ m3)	P.M.10 (µg/ m3)	P.M. 2.5 (µg/ m3)	SO2 (µg/ m3)	NO2 (µg/ m3)	P.M.10 (µg/ m3)	SO2 (µg/ m3)	NO2 (µg/ m3)	P.M.10 (µg/ m3)	SO2 (µg/ m3)	NO2 (µg/ m3)	P.M.10 (µg/ m3)	S.P.M. (µg/ m3)	SO2 (µg/ m3)	NO2 (µg/m3)	P.M.10 (µg/ m3)	S.P.M. (µg/ m3)	SO2 (µg/ m3)	NO2 (µg/ m3)	P.M.10 (µg/ m3)	S.P.M. (µg/ m3)	SO2 (µg/ m3)	NO2 (µg/ m3)
January	165.25	82.82	23.84	28.41	131.14	67	21.87	26.47	243.12	97.72	25.15	28.4	108.06	21.44	25.97	124.37	22.11	26.16	117.3	184.06	8.32	22.62	115.44	203.95	13.46	22.54	118.14	217.3	13.28	22.52
February	182.59	80.53	24.88	28.9	113.44	63.8	22.28	26.6	220.94	88.49	25.94	29.45	102.3	21.58	26.8	131.75	22.73	26.03	108.68	174.76	7.66	25.45	113.16	202.73	13.6	22.25	118.61	213.77	13.42	22.86
March	159.28	86.67	25.66	29.39	125.21	48.27	24.88	28.67	209.34	105.01	26.24	30.16	131.66	22.49	27.52	134.26	22.27	26.69	107.43	173.55	6.94	26.43	124.48	219.69	13.27	22.52	125.5	227.94	13.43	22.86
April	171.59	97.36	25.48	29.72	117.8	63.44	26.51	31.1	212.1	111.06	26.1	30.19	150.2	23.73	28.37	131.88	22.4	26.54	107.43	174.36	6.45	29.44	115.78	210.35	13.45	22.35	126.69	224.97	13.44	22.35
May	185.26	104.56	26.06	29.87	132.38	80.93	23.42	28.58	215.7	117.56	25.82	29.85	166.21	23.95	28.46	134.16	22.05	26.3	107.94	174.5	6.55	29.83	124.58	221.55	13.72	22.72	131.1	234.21	13.62	22.73
June	196.74	100.97	25.97	29.24	136.15	82.27	23.11	27.96	222.01	113.41	25.87	29.78	195.71	23.01	27.88	125.45	20.76	25.51	108.81	175.48	7.6	30.82	126.46	226.34	13.72	22.72	127.26	228.15	13.73	22.88
July	174.77	IF	25.73	28.66	122.33	IF	23.12	28.14	220.36	IF	26.16	29.09	151.52	22.29	26.66	131.51	17.38	20.81	104.27	168.25	6.44	28.96	128.90	223.85	13.50	22.64	127.23	223.49	13.54	22.40
August	167.28	RF	24.43	28.36	119.27	RF	22.06	26.61	189.92	RF	25.23	28.35	117.02	21.69	26.86	120.17	17	20.6	104.67	175.5	6.5	29.73	123.67	224.6	13.53	22.52	125.45	228.42	13.65	22.57
September	143.58	RF	24.05	27.66	116.11	RF	23.57	27.02	168.16	RF	26.84	28.56	113.74	20.48	26.46	126.24	16.69	20.53	109.06	175.5	6.5	29.73	123.5	217.69	13.45	22.41	118.46	220.51	13.69	22.61
October	174.01	94.01	24.43	28.65	113	80.13	22.28	26.48	170.75	105.68	25.23	28.86	151.04	22.76	26.56	125.63	17.19	21	128.07	195.45	11.77	30.01	151.47	248.1	14.72	23.68	164.08	267.35	15.02	23.43
November	168.04	104.85	24.81	28.78	128.66	92.58	22.89	27.27	200.42	112.86	25.71	29.07	132.27	22.98	26.72	150.3	*	*	112.32	178.5	8.12	26.12	141.49	232.39	13.46	22.38	142.82	235.42	13.37	22.26
December	167.04	93.64	23.47	28.14	128.47	74.4	21.99	27.17	189.23	108.61	24.32	28.94	115.99	21.35	26.44	138.09	16.08	21.39	114.89	181.41	7.99	28.07	125.35	210.26	13.10	22.52	124.16	210.49	13.17	22.39
Average	**171.29**	**93.83**	**24.90**	**28.82**	**123.66**	**72.54**	**23.17**	**27.67**	**205.17**	**106.71**	**25.72**	**29.23**	**136.31**	**22.31**	**27.06**	**131.15**	**19.70**	**23.78**	**110.91**	**177.61**	**7.57**	**28.10**	**126.19**	**220.13**	**13.58**	**22.60**	**129.13**	**227.67**	**13.61**	**22.66**
Standards :																														
Annual	60		20	30	60		20	30	60		20	30	60	50	40	60	50	40	60		50	40	60						60	
24 hours	100		80	80	100		80	80	100		80	80	100	80	80	100	80	80	100		80	80	100						100	

IF- Instrument Failure

RF- Rainfall

***RDS impinge having problem**

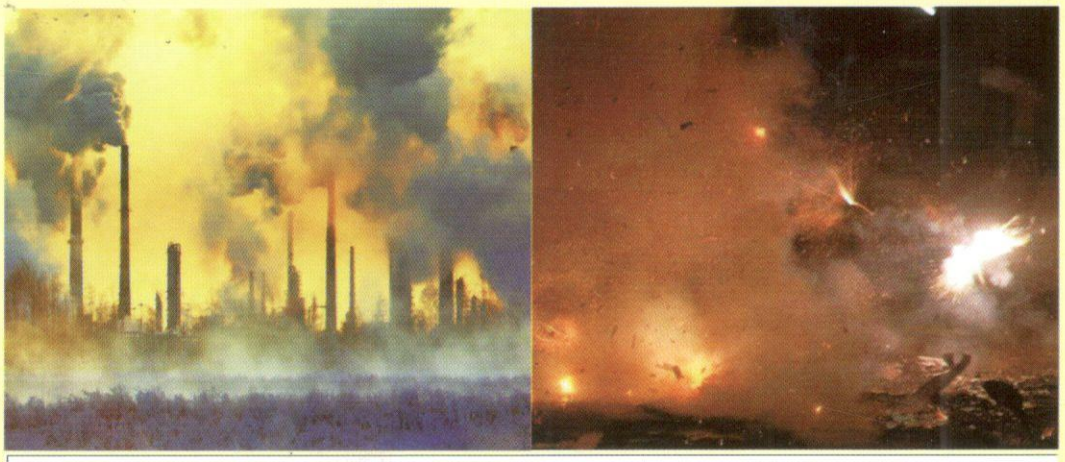
Vol. 12 Issue- II

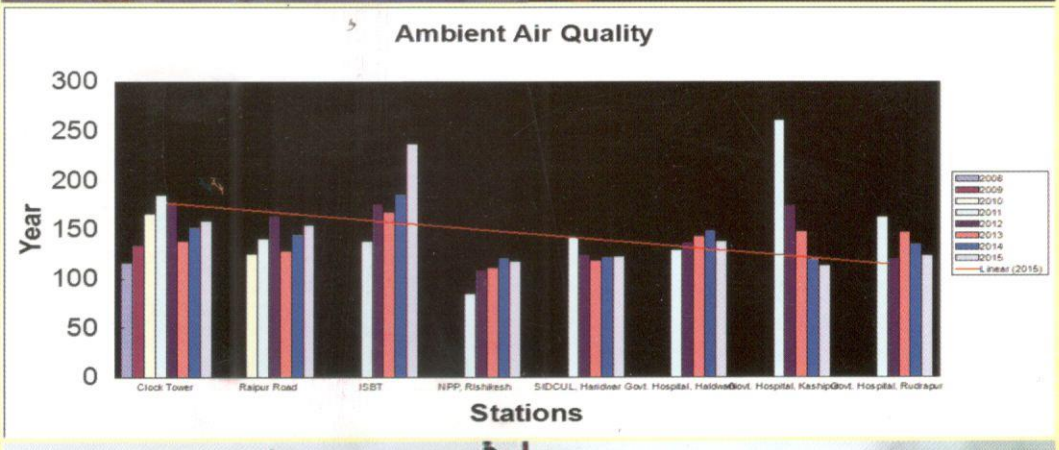
Jan-March 2016

ENVIS NEWSLETTER

ON

Urban Ambient Air Quality Status in Uttarakhand





ENVIS Centre
Uttarakhand Environment Protection and Pollution Control Board
29/20, Nemi Road, Dalanwala, Dehradun- 248001, Uttarakhand
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INTRODUCTION

Increase in technological, industrial and agricultural advancement, coupled with increases in population growth, has triggered the deterioration of environmental quality throughout the world. Rapidly growing cities, more traffic on roads, growing energy consumption and waste production, poor road quality, inadequate mass transport system and lack of strict implementation of environmental regulations are increasing the emission of pollutants into ambient air. Urban ambient air pollution is the result of emissions from a multiplicity of sources, mainly stationary, industrial and domestic fossil fuel combustion, and petrol and diesel vehicle emissions. Fossil fuels, the primary source of energy consumption, are the greatest source of ambient air pollution in urban air- producing nitrogen oxides, sulfur dioxides, dust, soot, smoke, and other particulate matter. These pollutants can lead to serious public health problems, including asthma, irritation of the lungs, bronchitis, pneumonia, decreased resistance to respiratory infections, and premature death. The burning of fossil fuels is also the major source of carbon dioxide emissions. Motor vehicles emit PM, nitric oxide and NO2 (together referred to as NOx), carbon monoxide, organic compounds, and lead. The chemical composition of the atmosphere is being altered by the addition of air pollutants, which may be endanger to living beings. The levels of air pollutants are rapidly increasing in urban area and air pollutants so generated are deteriorating human health. In addition, they cause negative impacts directly or indirectly, if at elevated concentrations, on vegetation, animal life, buildings and monuments, weather and climate, and on the aesthetic quality of the environment.

Vehicular and Industrial emissions are the major sources of air pollution in Uttarakhand. Air pollution has been aggravated by the developmental activities that typically occur as State becoming industrialized by growing cities, increasing traffic circulation; economic growth & industrialization and higher level of energy consumption. The high influxes of population to urban area, increase in consumption pattern and unplanned urban and industrial development are leaded the problem of air pollution. Presently, air pollution is widespread in urban areas where vehicular emissions are the major contributor; however industrial emission and other fugitive emission, burning of biomass or waste materials also deteriorates ambient air quality and exaggerates the problems of air pollution.

Air Quality

The term "air quality" means the state of the air around us. Good air quality refers to clean, clear, unpolluted air. Clean air is essential to maintaining the delicate balance of life on this earth — not just for humans, but for wildlife, vegetation, water and soil. Poor air quality is a result of a number of factors - including emissions from various sources, both natural and anthropogenic. Air quality is degraded when unwanted gases or other particulate materials are released into the air in large enough amounts to harm the health of people, plants and animals, and our environment and these unwanted gases pollutant and other particulate are called air pollutants. The quality of the air depends on the amount of pollutants, the rate at which they are released from various sources, and how quickly the pollutants disperse or how long they are trapped in an area.

Air Quality Monitoring and Management

When ambient air is polluted containing increased levels of harmful gases and particulate, it can endanger to the health and well being of human and can harm to the environment, which in long run result in considerable financial costs. However, before decide mitigative measures to reduce the exposure and damage, it should have an idea of existing air quality. Air quality monitoring is used to determine what pollutants are present and what are their concentration in ambient air. Air quality management addresses the issues of reducing impact of pollution be reducing exposure, which includes identifying major sources of pollutant that are affecting human health and environment, and reducing the impact through emission control and other measures.

Major Air Pollutants

The major air pollutants in ambient air are sulphur dioxide (SO_2), nitrogen oxides (NO_x), Carbon monoxide (CO); particulate matter (PM_{10} with diameter of 10 μm or less and $PM_{2.5}$ with a diameter of 2.5 μm or less), ozone (O_3) and ammonia (NH_3). Some pollutants are emitted directly called primary pollutant, while others are formed in

atmosphere from emitted precursors called secondary pollutants. Examples of a secondary pollutant is ozone, which is formed when hydrocarbons (HC) and nitrogen oxides (NOx) combine in the presence of sunlight; NO_2, which is formed as NO combines with oxygen in the air; and acid rain, which is formed when nitrogen oxides react with water. Ammonia is of increasing interest because it plays an important role in acidification and eutrophication, which may have considerable environmental impacts.

Source of Air Pollutants

The major source of urban pollutants is combustion from industry and transport. These processes emit NOx, CO, and SO_2 from burning of fossil fuels such as oil, gas, and petrol. The significant increase in numbers of vehicles contributes emission loads of various pollutants. Apart from vehicle numbers in urban areas, other reasons for vehicular air pollutants are the types of engines used, age of vehicle, outdated automotive technologies, poor maintenance of plying vehicles, quality of fuel, traffic congestion, poor road conditions, poor mass transport system, improper traffic management system etc.

Particulate matter can originate from other various sources, ranging from simple grinding of bulk matter to the transport sector, waste incineration, other types of combustion, and a whole range of complicated chemical and biochemical processes. Open burning of fuel for cooking and heating, uncontrolled burning of waste and agriculture waste, and other factories using local biomass fuels, can contribute substantial amounts of particulate matter to the atmosphere.

Impact on human health and Environment

Air pollution is mainly associated with human health, particularly with an increase in respiratory and cardiovascular diseases. Airborne particles can be inhaled. Larger particles are trapped in the nose and throat, but the small PM10 particles can penetrate into human lungs and the very small PM2.5 particles can lodge deep down in the respiratory bronchioles. These particles are particularly harmful to high-risk populations such as children and adults with pulmonary diseases. Carbon monoxide is of particular concern because it is toxic. It binds strongly with haemoglobin in the blood reducing the oxygen carrying capacity, so that even short-term exposure is harmful.

Ambient Air Quality Monitoring Network

In India, Central Pollution Control Board (CPCB) is executing a nation-wide program of ambient air quality monitoring known as National Air Quality Monitoring Program (NAMP). It is implementing **with networking of State Pollution Control Boards and other institutions across the country.** The network consists of about five hundreds operating stations covering across the country. The objectives of the NAMP are to determine status and trends of ambient air quality; to ascertain whether the prescribed ambient air quality standards are violated; to Identify Non-attainment Cities; to obtain the knowledge and understanding necessary for developing preventive and corrective measures and to understand the natural cleansing process undergoing in the environment through pollution dilution, dispersion, wind based movement, dry deposition, precipitation and chemical transformation of pollutants generated. Under NAMP, three air pollutants *viz*., Sulphur Dioxide (SO_2), Oxides of Nitrogen as NO_2, Respirable Suspended Particulate Matter (RSPM / PM10) have been identified for regular monitoring at all the locations. The monitoring of pollutants is carried out for 24 hours (4-hourly sampling for gaseous pollutants and 8-hourly sampling for particulate matter) with a frequency of twice a week, to have one hundred and four (104) observations in a year. CPCB co-ordinates with these agencies to ensure the uniformity, consistency of air quality data and provides technical and financial support to them for operating the monitoring stations.

Ambient Air Quality Monitoring Network in Uttarakhand

Under the NAMP, ambient air quality monitoring is being carried out at 8 locations of six towns in the State of Uttarakhand. Monitoring is undertaking for 24 hr. basis (8 – hourly sampling for particulate and 4 hourly sampling for gases). Details of monitoring locations are described below:

S.No.	Name of City/Town	Monitoring Location/Station
1.	Dehradun	Clock Tower
		Raipur Road
		ISBT
2.	Rishikesh	Nagar Palika Parishad campus
3.	Haridwar	SIDCUL Office, IIE, Ranipur
4.	Kashipur	Govt. Hospital Campus
5.	Rudrapur	Govt. Hospital Campus
6.	Haldwani	Govt. Hospital Campus

1. Dehradun city situated in the Doon Valley area. The Doon valley lies between two intermittent ranges of the Himalayas. The northeastern boundary forms by the lesser Himalayan ranges- part of the Great Himalaya range while southwestern boundary forming by the range of Shivalik foothills. Dehradun city has always remains attraction for natural lovers because of its unique geographical and climatic characteristics. After becoming State capital city, increase in infrastructure development, industrial development, vehicular numbers and migration etc has been reported. Due to specific geography, valley restricts movement of air pollutant in ambient air and retains an elevated level of air pollutant. Increase vehicular emission and traffic congested, poor road quality, traffic management and mass transport system are few among major contributors for deteriorated air quality. Presently ambient air quality monitoring is being carried out at three different locations viz. Clock Tower, Raipur Road, and ISBT.

2. Haridwar: Haridwar city nestled in Shivalik foothills in the north and the Ganga basin in the south. Being a shrine place, Haridwar city receives large numbers of tourists and pilgrims almost round the year, however infrastructural development to cater such large number of tourist and pilgrims could not be developed eventually. Further substantial number of industrial establishment around Haridwar after Statehood of Uttarakhand. Ambient air quality monitoring at IIE, Ranipur, Haridwar is being carried out by the UEPPCB.

3. Rishikesh: Rishikesh city is located in the foothills of the Himalayas. It is known as the Gateway to the Garhwal Himalayas and Yoga Capital of the World. It is also known as the pilgrimage town and regarded as one of the holiest places to Hindus. Rishikesh serves as the gateway to important Himalayan religious Chardhams - Badrinath, Kedarnath, Gangotri and Yamunotri.

4. Kashipur: Kashipur town of Uttarakhand is well known for industrial establishment, predominantly by pulp and paper mills, sugar mills. Apart from industrial emission and vehicular exhaust are among main contributor for deteriorating air quality, however poor road quality exaggerate the problem.

5. Rudrapur: Rudrapur city is situated in the fertile Terai region of district US Nagar. Since the establishment of Integrated Industrial Estate (IIE) by SIDCUL, the city had enjoyed rapid industrial development, resulting increase in vehicular and industrial exhausts.

6. Haldwani: **Haldwani is located in the Bhabar region of Kumaon.** Haldwani is settled on a piedmont grade (called Bhabhar) where the mountain rivers go underground to re-emerge in the Indo-Gangetic plain. Since the establishment of Integrated Industrial Estate (IIE) by SIDCUL, the city also had enjoyed rapid urbanization.

Images For The Sampling As Well As Monitoring Sites.

In order to combat air pollution it is required to identify the pollutants, its source of emission and investigate the effects of living and the environment. The National Ambient Air Quality Standards (NAAQS) is listed below:

National Ambient Air Quality Standards: The National ambient air quality standards have been notified under the Environment (Protection) Act, 1986:

National Ambient Air Quality Standards (NAAQS)

Sl. No	Pollutant	Time Weighted Average	New Standards (Schedule VII, Rule 3 (3B) 16th Nov 2009	
			Concentration in ambient air	
			Industrial Area Residential, Rural & other Areas	Ecologically sensitive area (Notified by Central Govt)
1.	Sulphur Dioxide(SO_2)	Annual Avg* 24 hours**	50.0 µg/m³ 80.0 µg/m³	20.0 µg/m³ 80.0 µg/m³
2.	Oxides of Nitrogen as NO_2	Annual Avg* 24 hours**	40.0 µg/m³ 80.0 µg/m³	30.0 µg/m³ 80.0 µg/m³
3.	Particulate matter (size less than 10µm)	Annual Avg* 24 hours**	60.0 µg/m³ 100.0 µg/m³	60.0 µg/m³ 100.0 µg/m³
4.	Particulate matter (size less than 2.5 µm	Annual Avg* 24 hours**	40.0 µg/m³ 60.0 µg/m³	40.0 µg/m³ 60.0 µg/m³
5.	Lead (Pb)	Annual Avg* 24 hours**	0.50 µg/m³ 1.0 µg/m³	0.50 µg/m³ 1.0 µg/m³
6.	Carbon Monoxide (CO)	8 hours** 1 hour	2.0 mg/m³ 4.0 mg/m³	2.0 mg/m³ 4.0 mg/m³
7.	Ozone	8 hours** 1 hour 24 hours**	100.0 µg/m³ 180.0 µg/m³ 60.0 µg/m³	100.0 µg/m³ 180.0 µg/m³ 60.0 µg/m³
8.	Ammonia (NH_3)	Annual Avg* 24 hours**	100.0 µg/m³ 400.0µg/m³	100.0 µg/m³ 400.0 µg/m³
9.	Benzene	Annual Avg*	5.0 µg/m³	5.0 µg/m³
10.	Benzo(a) pyrene	Annual Avg*	1.0 ng/m³	1.0 ng/m³
11.	Arsenic	Annual Avg*	6.0 ng/m³	6.0 ng/m³
12.	Nickel	20.0 ng/m3	20.0 ng/m³	20.0 ng/m³

Air Pollution Status

The ambient air quality data generated by the Uttarakhand Environment Protection and Pollution Control Board (UEPPCB) under National Air Monitoring Program (NAMP) from 2008 to 2015 are given below. The commonly monitored parameters are particulate matter (PM_{10}), nitrogen oxides (NOx) and sulphur dioxide (SO_2). CPCB classified cities as critically polluted if the levels of criteria pollutants are more than 1.5 times the standards. Levels up to 1.5 times the standards are labelled high. Levels that reach up to 50 percent of standards are moderate.

Ambient Air Quality Characteristics from year 2008-2015

Year	Standard	Industrial, Residential, Rural & Other		P.M.$_{10}$ 60	SO_2 50	NO_2 40
		Sensitive		60	20	30
	City Name	Site	Category	Concentration ($\mu g/m^3$)		
				P.M.$_{10}$	SO_2	NO_2
2015	Dehradun	Clock Tower	Sensitive	159.54	26.48	29.85
		ISBT	Sensitive	237.75	27.45	30.35
		Raipur Road	Sensitive	155.35	26.33	29.53
	Rishikesh	Nagar Palika Parishad	Sensitive	117.54	25.12	28.86
	Haridwar	SIDCUL	Industrial	122.68	24.12	26.49
	Kashipur	Govt. Hospital	Sensitive	113.89	-	-
	Rudrapur	Govt. Hospital	Sensitive	123.8	-	-
	Haldwani	Govt. Women Hospital	Commercial	138.89	-	-
2014	Dehradun	Clock Tower	Sensitive	152.52	25.78	29.31
		ISBT	Sensitive	186.51	27.18	29.84
		Raipur Road	Sensitive	145.11	26.28	29.6
	Rishikesh	Nagar Palika Parishad	Sensitive	121.61	23.96	27.82
	Haridwar	SIDCUL	Industrial	122.08	24.54	26.86
	Kashipur	Govt. Hospital	Sensitive	120.33	-	-
	Rudrapur	Govt. Hospital	Sensitive	135.29	-	-
	Haldwani	Govt. Women Hospital	Commercial	149.45	-	-
2013	Dehradun	Clock Tower	Sensitive	138.69	24.18	27.37
		ISBT	Sensitive	168.12	24.73	26.95
		Raipur Road	Sensitive	128.92	23.6	26.1
	Rishikesh	Nagar Palika Parishad	Sensitive	111.53	22.36	24.93
	Haridwar	SIDCUL	Industrial	118.69	27.63	28.89
	Kashipur	Govt. Hospital	Sensitive	148.5	-	-
	Rudrapur	Govt. Hospital	Sensitive	147.67	-	-
	Haldwani	Govt. Women Hospital	Commercial	143.5	-	-
2012	Dehradun	Clock Tower	Sensitive	177.15	26.52	28.25
		ISBT	Sensitive	176.72	24.75	26.89
		Raipur Road	Sensitive	163.87	25.16	27.18
	Rishikesh	Nagar Palika Parishad	Sensitive	109.25	22.06	24.76
	Haridwar	SIDCUL	Industrial	124.57	27.45	28.71
	Kashipur	Govt. Hospital	Sensitive	174.81	-	-
	Rudrapur	Govt. Hospital	Sensitive	120.50	-	-
	Haldwani	Govt. Women Hospital	Commercial	136.68		

					-	-
2011	Dehradun	Clock Tower	Sensitive	185.43	23.2	24.69
		ISBT	Sensitive	138.32	23.33	24.72
		Raipur Road	Sensitive	140.64	23.10	24.66
	Rishikesh	Nagar Palika Parishad	Sensitive	85.25	14.32	15.01
	Haridwar	SIDCUL	Industrial	142.35	24.94	24.76
	Kashipur	Govt. Hospital	Sensitive	261.56	-	-
	Rudrapur	Govt. Hospital	Sensitive	163.39	-	-
	Haldwani	Govt. Women Hospital	Commercial	129.41	-	
2010	Dehradun	Clock Tower	Sensitive	166.29	29.25	31.0
		Raipur Road	Sensitive	125.38	26.6	28.05
2009	Dehradun	Clock Tower	Sensitive	134.4	28.3	30.0
2008	Dehradun	Clock Tower	Sensitive	115.92	25.22	27.22
		Industrial, Residential, Rural & Other		**P.M.$_{10}$**	**SO_2**	**NO_2**

Standards	**Industrial, Residential, Rural & Other**	**P.M.$_{10}$**	**SO_2**	**NO_2**
		60	**50**	**40**
	Sensitive	**60**	**20**	**30**
Source	**National Ambient Air Quality Standards, Notification No. 217, dated 18 November, 2009**			

Status of PM_{10}

The annual average concentration of all PM_{10} in all cities exceeding the standards and indicating critical level as per air quality assessment criteria provided by CPCB. Moreover increasing trends of particulate matter were observed from 115.92 at Clock tower to 159.54 $\mu g/M^3$ at ISBT in Dehradun and 85.25 to 121.61 $\mu g/M^3$ at Rishikesh. Dehradun and Rishikesh monitoring stations come under sensitive area as these stations are located in the doon valley area. Concentration of PM10 at SIDCUL Haridwar ranging between 118.69 to 124.57 $\mu g/M^3$ except in the year 2011 where PM 10 exceed upto 142.35 $\mu g/M^3$.This station represent industrial locations and industrial emissions and vehicular exhaust are major contribution for increasing particulate contents. Similar trends were also observed at Kashipur Station where PM10 increases up to 261.56 $\mu g/M^3$. Increasing trend of particulate matter may be attributed to increasing vehicular emissions as increase in number of vehicular registration per year were also reported from 93451 to 201199 from 2008-09 to 2014-15, except in the year 2012-13 where new vehicular registration was less then preceding year.

Status of NO_2

Gases data are available only of Dehradun, Rishikesh, Haridwar station. Most of the time NO2 values are within limit for Dehradun & Rishikesh station, i.e. less than 30 $\mu g/M^3$. However values are near to prescribed limit stipulated for sensitive areas. These data may be taken as an indication of gases pollutant particularly in Dehradun city.

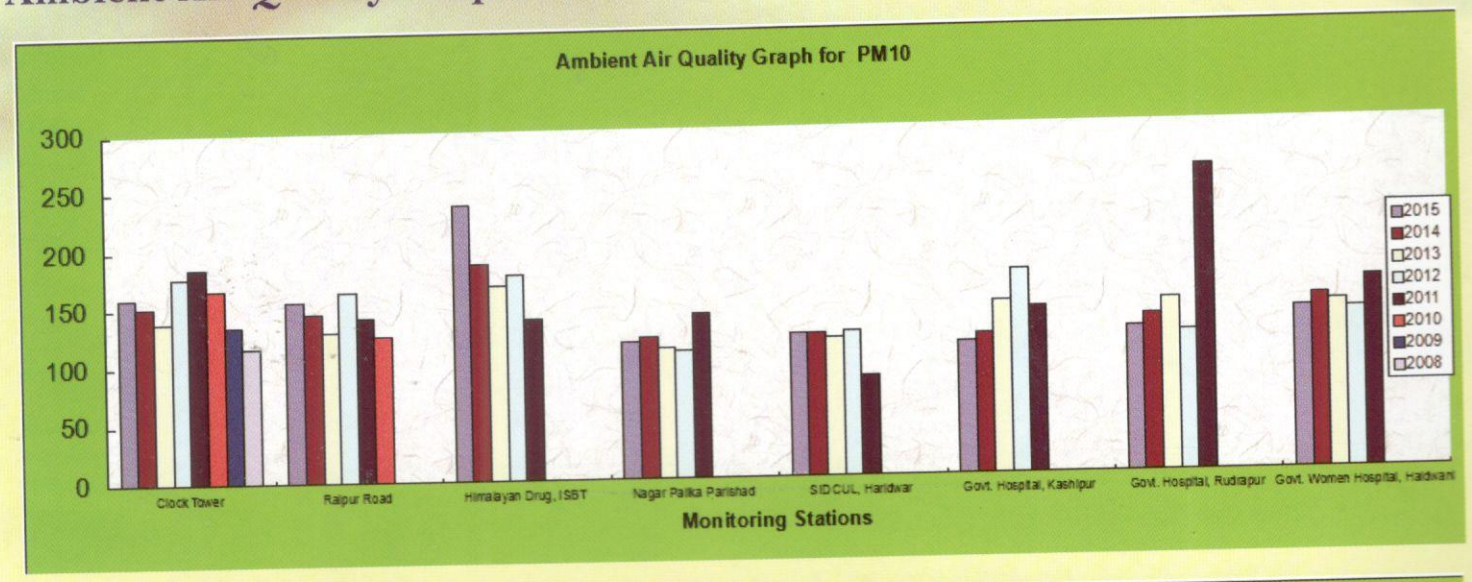
Status of SO_2

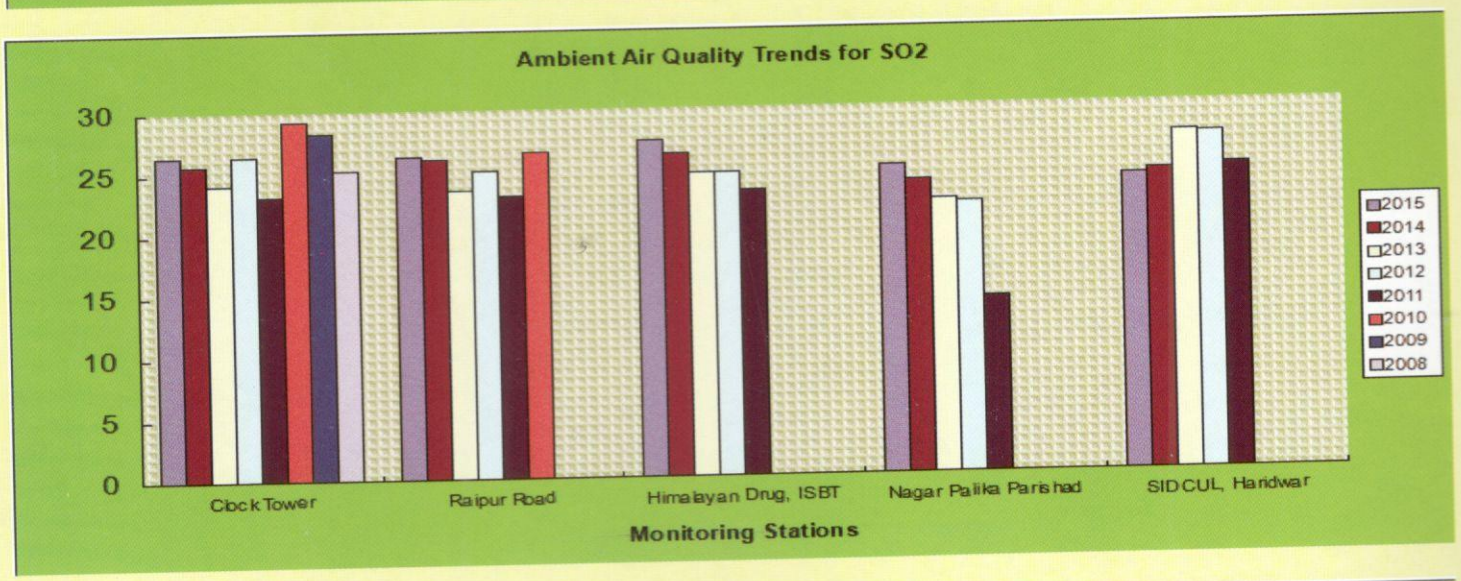
It has been observed that sulphur dioxide concentration exceed almost all the time in Dehradun & Rishikesh station, where prescribed limit is 20 $\mu g/M^3$. Increasing concentration of sulphur dioxide in ambient air represent motor vehicle emission, as the result of fuel combustion.

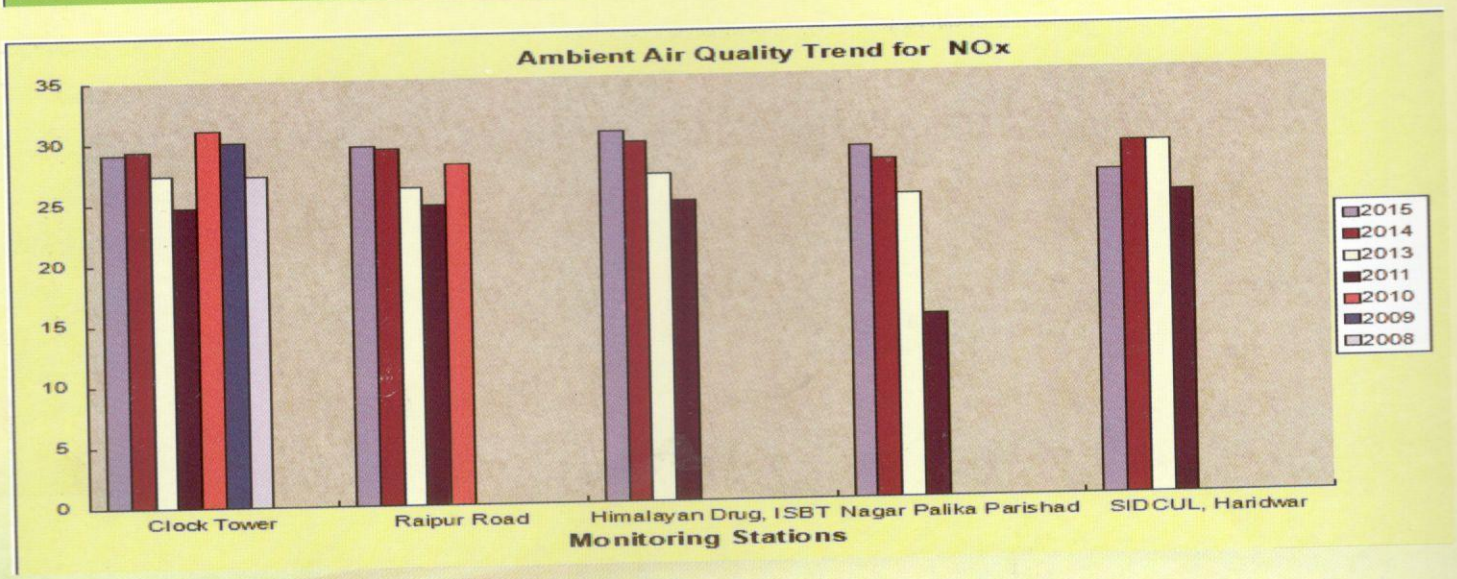
Vehicles Registered in Uttarakhand during previous Years

Vehicle Type	Year						
	2007-08	2008-09	2010-11	2011-12	2012-13	2013-14	2014-15
Two Wheeler	67850	65391	109363	126025	125082	132679	149936
Cars/Jeep	16471	16385	29367	36125	36490	33608	36896
Buses	544	348	650	723	664	700	483
Trucks	1146	850	1669	2117	1554	1491	1589
4 Wheeler Loader /Delivery Van	2866	3066	3881	4151	3758	3667	3469
Tax/Maxi	2405	2486	3427	4364	3826	3300	3056
Auto/Tempo	1512	2220	2527	1865	1289	1066	2087
Tractors	2994	2372	3348	2864	2790	3529	3011
Trailers	581	215	189	507	634	1222	162
Others	536	118	245	373	587	414	510
Total	96905	93451	154666	179114	176674	181676	201199
Source	**http://transport.uk.gov.in/pages/display/62-statistical-data**						

Ambient Air Quality Graph







Conclusion :-

Air quality monitoring data indicated lower concentration of gaseous pollutants (SO2&NOx) and higher concentration of particulate matter (PM10) in the ambient air. The incidence of higher rate of respiratory diseases among the people could be attributed to elevated concentrations of PM10, as PM10 fraction can be absorbed into human lungs tissues during breathing and cause respiratory & cardiovascular problems. Further, chemical composition of PM10 and especially in terms of heavy metal, is a matter of concern due to its both acute chronic health effects. The major causes of ambient air pollution are mainly due to ever increasing number of automobile, poor traffic control and congested road in appropriate mass transport system, fuel quality lack of after sale services and poor quality of roads. To overcome this, development and planning of city and public awareness play very important role to reduce the ambient air pollution.

Interventions for better ambient air quality:

Despite of Legislative/policy measures, ambient air pollution remains a major concern. Besides continuing and consolidating the ongoing schemes/programs, new initiatives and definite programs need to be formulated for effective management of ambient air pollutions.

Vehicular Pollution:

Since vehicular emission contributes significantly to the air quality deteriorations, vehicular pollution deserves top priority. A practical strategy should be worked out that reduces both emission and congestion by using mix set of instruments. Some of these are:

- Strengthening of mass transport system.
- Incentives and regulations affecting vehicles with view to reducing the rate of ownership of personal vehicles.
- Suitable traffic planning and management.
- Introduction of economic instruments- Taxes on fuels, & vehicles and the revenue so generated could be used for pollution control measures.
- Tightening the emission norms and fuel quality specifications.
- Promotion of alternative fuels such as CNG/LPG/Propane battery operated vehicles.
- Replacement of two stroke engine.
- Curbing fuel adulteration-state-of-art testing facilities and deterrent legal actions.
- Strengthening inspections and maintenance system comprising inspections, maintenance and after sales service certification of vehicles is crucial for regulating pollution.
- Improving road quality and maintenance.

Industrial Pollution:

- Introduction of cleaner technologies.
- Waste minimization techniques-involving process change, raw material substitution, improved housekeeping etc.
- Waste utilization involving reclamation and utilization of wastes
- Fuel gas desulphurisation
- Incentives for the development and adoption of cleaner technologies and emission reduction initiatives.
- Development of data base for clean technology-their performance, sources, investment etc should be regularly updated and disseminated.
- Strengthening of emission standards need to be done.
- Appropriate siting of high air pollution potential activities.
- Economic instrument as incentives for pollution prevention and control measures.

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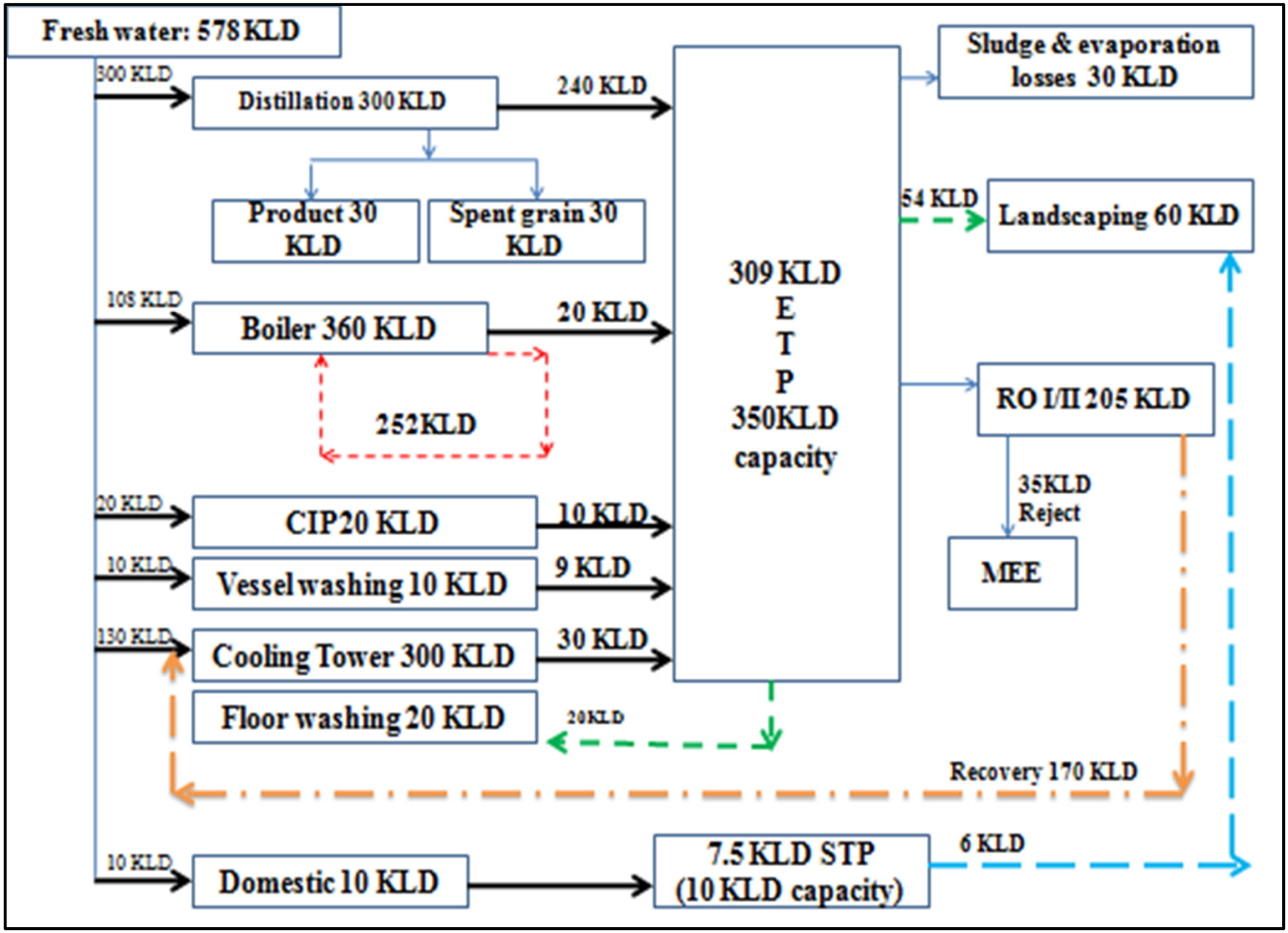
WATER BALANCE



What if a single partner
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Proposal

For

Effluent Treatment Plant with Upflow Anaerobic Sludge Blanket Reactor (UASB Reactor)

Submitted to

Mbevs Pvt. Ltd.

Kashipur

Design Parameters

Flow	350 M /Day
COD	- 18200 Mg/Ltr.
BOD	- 6500 Mg/Ltr.

TISHA ENVIRO SOLUTION PVT. LTD.

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D-97, EWS, B.S. Colony, Bhiwadi,
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Technical Proposal

Commercial Proposal

Annexure

DESIGNING PARAMETERS

I. Basic Design Data

The characteristics of the raw effluent considered for designing the effluent treatment plant are as follows:

- Flow - 540 m^3/day
- COD - 18200 mg/L
- BOD - 6500 mg/L
- TSS - 5000 mg/L
- TDS - 1200 mg/L
- Assumed Temperature - 36 ^oC – 38 ^oC
- Assumed pH - 6.5 – 7.5

Note: It is confirm that Client shall provide effluent at Equalisation Tank having pH of 6.5 - 7.5

It is assumed that the effluent does not contain any inhibitory substance for the biological process. It is also assumed that all other parameters are within acceptable limits prescribed by the concerned Pollution Controlling authority.

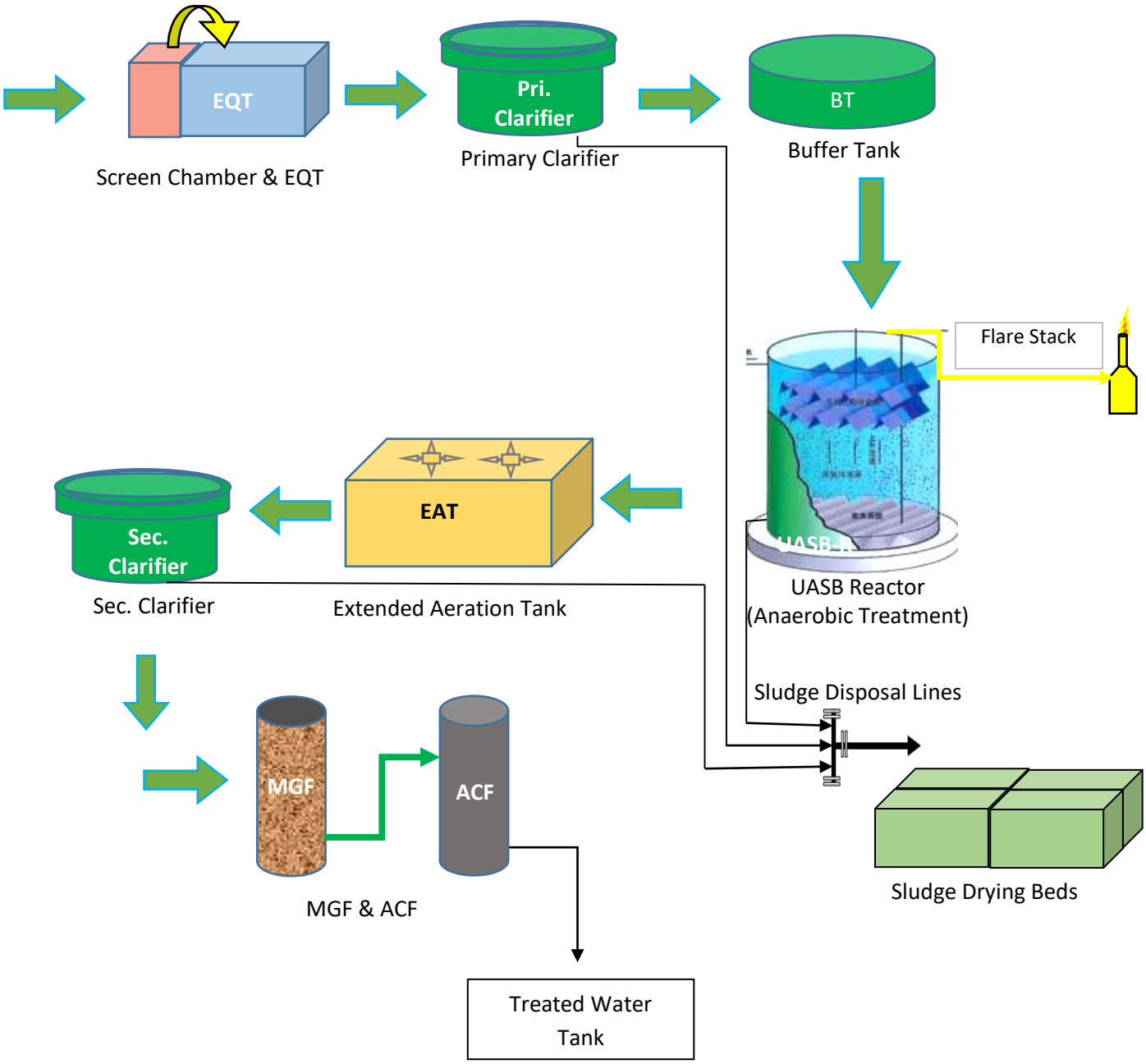
II. Performance Guarantee

Upon reaching the steady state, the treated effluent from the plant shall confirm the following characteristics subjected to proper operation and maintenance and maximum ± 5% deviation in the influent characteristics.

- **COD - < 150 mg/L**
- **BOD - < 20 mg/L**
- **pH - > 7.0**
- **Biogas - 0.45 ± 5 % m^3/Kg COD removed at 60 % methane @ design load.**

III. Treatment Scheme

As per the attached process flow diagram.



IV. Process Description

The raw wastewater from the process shall be taken to the effluent treatment plant by suitably designed channel or closed pipe depending upon the topography of the site.

Effluent shall enter into the existing screen chamber for the removal of floating matter from the effluent. Effluent shall then enter into the existing equalization tank.

- **Screen Chamber (2 m^3):**

First of all effluent enters in screen chamber, at outlet there is a screen of 5 – 8mm holes to in which we trap scrap more than 8 mm size.

- **Equalization Tank (135 m^3 Approx.):**

The effluent enters in the equalization tank for equalization and surge control. Existing blowers shall be used for mixing the effluent.

- **Primary Clarifier: (115 m^3 approx.):**

The effluent is then pumped to the pre settling tanks. The clarifier is a hopper bottom tank.

In these tanks, solids get settled at the hopper bottom. The supernatant from these tanks overflow uniformly over the peripheral launder. The sludge is circulated to the existing sludge drying beds for disposal.

- **Buffer Tank (135 m^3 approx.):**

In buffer tank the complex organics in the wastewater is subjected to hydrolysis. The hydrolyzed effluent shall be then pumped from the buffer tank for anaerobic treatment in the UASBR digester.

- **UASBR (1650 m^3 approx.):**

UASBR digester consists of mainly feed distribution network at the bottom, sludge blanket at approx. mid height of reactor and the gas, liquid, solid separator at the top of the reactor.

In UASBR process the bacteria responsible for digestion process are present in the form of sludge blanket. The bacteria grow and reside as bacterial flocs suspended in the up flow effluent stream. The bacteria take upon organic content of wastewater to metabolize it and produce biogas and biomass. UASBR operates in the mesophillic range of temperature, i.e. 36° - 40°C. The pH inside the reactor is usually kept around 7.2 while proper ratio of volatile acid and alkalinity is maintained.

Biogas is collected at the top of the reactor and burnt in flare stack. If biogas utilization is aimed for, biogas-handling units such as gas holder, blower and

burners etc. will have to be additionally provided. The anaerobically digested effluent is collected from the network of gutters and launder and sent to the aeration tank.

- **Extended Aeration Tank (1500 m^3 approx.):**

Effluent from anaerobic reactor shall then enter into the Aeration Tank. In EAT Micro- organisms degrade soluble organics aerobically. In order to ensure required population of bacteria in EAT, a requisite Mixed Liquor Suspended Solids (MLSS) is maintained in EAT. To maintain requisite MLSS and Food to Microorganisms ratio (F/M), part of the settled sludge from existing secondary clarifier will be recirculated back to the aeration tank. An aeration system consisting of existing diffused aeration system with existing blowers shall be used to provide oxygen to bacteria.

- **Secondary Clarifier (140 m^3 approx):**

The mixed liquor from EAT enters the central well of secondary clarifier for separation of sludge and liquid. The clarifier is a hopper bottom circular tank with centrally driven clarifier mechanism. In clarifier solids get settled at the hopper bottom. The supernatant from the clarifier overflows uniformly over the peripheral launder. Parts of sludge from the respective clarifiers are recirculated back to the extended aeration tank while balanced are sent to the existing sludge drying beds for disposal.

- **Multi Grade Filter (MGF) (1 no.):**

De-chlorinated wastewater will then be pumped to Multi Grade Filter for removal of suspended solids. Multi Grade filter shall consist of a cylindrical mild steel vessel with dished ends. Filter media in the form of sand and gravel will be provided.

- **Activated Carbon Filter (ACF) (1 no.):**

Activated carbon filter shall consist of a cylindrical mild steel vessel with dished ends. Activated carbon (IV-900) removes some part of TDS, color & odor from treated water.

- **Sludge Drying Beds (100 m^2 each):**

In the aerobic digestion, the sludge is sufficiently mineralized and does not need any further treatment before dewatering and disposal. Sand filtration drying beds will be provided, where sludge will be dewatered by filtration through sand bed and drying the dewatered sludge by solar radiation. Sludge drying beds are constructed in brick masonry with a sand media supported by gravel bed and suitable under-drainage arrangement.

V. Utility Requirements:

Sr. No.	Items	Specifications	
1	Power For Drives	Connected Power	**Approx. 115.00 KW**
		Operating Power	**Approx. 58.6 KW**
2	Manpower	1 Chemist in general Shift. One operator in each shift.	
3	Chemicals & consumables	Seed sludge or cow dung, Soda ash, DAP, Urea, Hypo, SMBS, Micronutrients like FeCl3, NiCl2, COCl2, ZnCl2.	

Note: These figures are tentative and are subjected to change as per plant layout requirement during detailed engineering and other technical aspects.

VI. Battery Limits

- **Raw Effluent @ 37 °C** : At the inlet of screen.
- **Treated Effluent** : At the outlet of ACF.
- **Power** : From MCC to terminal boxes of equipments
- **Biogas** : From reactor to Flare Stack.
- **Sludge** : Upto SDB.
- **Service Water** : At one point in ETP.

VII. Exclusions:

- Incomer to MCC Panel.
- Treated wastewater line & disposal arrangement.
- Sludge handling & disposal arrangement.
- All civil works.
- ETP street internal & external lighting.
- Laboratory with apparatus and chemicals.
- Power and Water for operation and construction of ETP.
- Biogas piping and burning system in boiler.
- Any repair/ replacement in existing equipment.
- Steam purging in the Buffer Tank during winter season.
- Any other work not covered this offer.

VIII. Scope of Work

Description	TESPL Scope	Client scope
Detail Engineering for revamping of ETP with UASBR digester.	✓	×
Soil Investigation Report.	×	✓
Structural design of civil structure.	×	✓
Supply of GLSS along with its structural Supports	✓	×
Supply of pumps, motors, flow meter	✓	×
Erection of GLSS and bought out items.	✓	×
Supply and erection of all piping and valves in our scope	✓	×
All new piping & fabrication required to be supplied apart from our scope	×	✓
Electrical works such as MCC Panel within battery, PBS, Cabling, Earthing etc. for new drives only etc. for new drives only.	✓	×
Cable trenches for laying cables.	×	✓
Civil works and allied painting work including construction of UASBR and internal columns & tie beams.	×	✓
Supply and erection of all ladder, railing, insert plates and puddle flanges, manhole necks.	×	✓
Seed supply, start-up chemicals, micronutrients etc.	×	✓
Operational Manpower, Power and Water for construction & operation of reactor.	×	✓
Temporary piping, pumping arrangement & water for hydraulic testing.	×	✓
Laboratory, Tele-communication facility, fax etc.	×	✓
Supervision of start-up and commissioning activity.	✓	×
Providing Laboratory Manual, Process manual.	✓	×
Suitable boarding facilities at site to TESPL staff, free of cost during commissioning & supervision of works.	×	✓
Suitable lodging facilities at site to TESPL staff, free of cost during commissioning & supervision of works.	×	✓
Painting of all Civil units	×	✓
Any other works not specifically mentioned above.	×	✓

IX. List of Supply Items (TESPL Scope)

Sr. No.	Equipment Specifications	
1	**Screen**	
	Type	Inclined bars, manually cleaned
	MOC	SS
	No.	1 no.
	Make	TESPL
2	**EQT Blowers**	
	Type	Twin Lobe
	No.	2 no.
	MOC	MS/CI
	HP	3 hp
	Make	Ingersoll Rand/ Everest/ Eqvt.
3	**Transfer pumps near EQT**	
	Type	Horizontal, centrifugal, non-clog, gland pack
	MOC	SS-304
	Flow	Approx. 25 m^3/hr, 10 m head.
	Quantity	2 nos. [1W + 1 SB]
	Make	Grundfos/KBL/CRI/eqvt.
4	**UASBR feed pumps**	
	Type	Horizontal, centrifugal, non clog, gland pack
	MOC	SS-304
	Flow	Approx. 50 m^3/hr, 12–15 m head.
	Quantity	2 nos. [1W + 1 SB]
	Make	Grundfos/KBL/Johnson/CRI/eqvt.
5	**UASBR GLSS (Fabricated)**	
	MOC	MS, FRP Coted all sides, Wet parts in Epoxy coat
	Quantity	Suitable for UASBR reactor
	Make	TESPL
6	**Flare Stack (Fabricated)**	
	No.	1 no. Manually ignited
	MOC	MSEP
	Make	TESPL
7	**Extended Aeration Tank Blowers**	
	No.	2 no.
	Type	Twin Lobe
	Pressure	0.6 kg/cm^2
	Motor Rating	50 hp
	Capacity	1200 m^3/hr.
	Make	Ingersoll Rand/ Everest/eqvt.

8	**EAT Diffusers**	
	Type	Fine bubble. Tubular type
	Size	1000/93 mm
	MOC	EPDM
	Make	Rehau/eqvt.
	Grid	Easily remove & replace
9	**Clarifier Mechanism 2 Nos. (Pri. & Sec.)**	
	Diameter	Approx. 8.0 m & 10 m
	Type	Central driven, MSEP, RCC Bridge
	RPH	2.5 – 3.0
10	**Sludge Recirculation Pumps (Pri. & Sec.)**	
	Type	Horizontal, centrifugal, non-clog, gland pack
	MOC	SS-304 all
	Flow	Suitable
	Quantity	4 nos. [2W + 2 SB]
	Make	KBL/Eqvt.
11	**MGF Feed Pumps**	
	Type	Horizontal, centrifugal, non-clog, gland pack
	MOC	CI all
	Flow	Approx. 30 m3/hr, 30 m head
	Quantity	2 nos. [1W + 1 SB]
	Make	KBL/Johnson/CRI/eqvt.
12	**Multi Grade Filter (MGF)**	
	Type	Cylindrical Vessel, Multi-layer Sand fill
	MOC	MS
	Qty	1 no.
13	**Activated Carbon Filter (ACF)**	
	Type	Cylindrical Vessel, Activated carbon 900 IV
	MOC	MS
	Qty	1 no.

14	**Additional Equipments**	
	Pipeline	MS class C
	Valves	Kitz/Prime/Zolloto/Eqvt.
	Pressure Monitors	Waree/Eqvt.
	Manometer	Veksler/Eqvt.
	Electrical Items	L&T, Schneider/Eqvt.
	Pressure/Vacuum Breaker	Sant/Prime/Eqvt.
	Electrical Cable	Polycab/Eqvt.
15	**Flow Meter**	
	Type	Electromagnetic
	Quantity	01 No.
	Make	Unitech/Forbes marshell/Eqvt.

X. List of Civil Units (Client's Scope)

Sr. No.	Unit Name	Qty	Volume (M3)	MOC
1	Screen Chamber	1	2	RCC M25
2	EQT	1	135	RCC M25
3	Pri. Clarifier	1	115	RCC M25
4	Buffer Tank	1	135	RCC M25
5	UASBR Foundation	1	17 m Ø	RCC M25
6	Aeration Tank	1	1500	RCC M25
7	Sec. Clarifier	1	140	RCC M25
8	Sludge Drying beds	4	100 each	RCC M25
9	Miscellaneous Equipment Foundations	1	Lot	

Note-These dimensions are tentative and are subjected to change as per detailed engineering.

I. Delivery

The plant shall be ready for the commissioning within Six months from the date of techno commercially cleared work order / purchase order along with the Advance. Delivery is subjected to

- Timely release of payments.
- Approval of layout and GA within 4 working days from your side.
- If approved drawings are revised, we shall need minimum 12 days to submit revised drawings.

Commissioning means: Seeding of the plant and smooth running of all equipments.

II. Validity

The offer is valid for a period of 30 days, from the date of submission.

III. Warranty

All mechanical equipments supplied by TESPL shall be under warranty for 12 months from the date of supply.

ANNEXURE I

DESIGN BASIS FOR CIVL WORKS	
References: 1) IS 456/2000 2) IS 857/1987 3) IS 1989/2002 4) IS 3370/2009 5) IS 13920/1993	
Permissible Stresses:	
Concrete	M20 (M 200)
Direct Compression	50 kg/cm^2
Bending	70 kg/cm^2
Direct tension	12 kg/cm^2
Bending Tension	17 kg/cm^2
Shear	7 kg/cm^2
Average Bond	8 x 1.4
Local Bond	13 X 1.4
Water retaining members:	
Tensile Stress on Water face	1500 kg/cm^2
Tensile stress on face away from water	For members < 225 thick : 1500 kg/cm^2 For members > 225 thick : 1900 kg/cm^2
Tension in shear reinforcement	1750 kg/cm^2
General Purpose:	
Tensile Stress	2300 kg/cm^2
Comp in column	1900 kg/cm^2
Specific Gravity of Effluent	**1.05**

STANDARD ASSUMPTIONS FOR CIVIL WORKS ESTIMATE	
1	No blasting is considered for excavation.
2	No filled up soil will occur in the proposed layout.
3	Back filling will be done by excavated material only.

4	No land development, area levelling, site cleaning, wood/tree cutting is considered. No internal /outside roads & green belt development is considered.
5	No compound wall, fencing, area lighting in ETP area are considered in civil cost
6	Storm water drainage is not included in civil cost.
7	Design is based on Safe bearing capacity of soil as 15 MT /Sq.m at 1.5 m depth
8	No uplift pressure is considered in design. Ground water table should be minimum 5 mts below GL.
9	Disposal of excavated material is restricted to 200 mts in factory area. Lead beyond 200 mts will be payable extra.
10	Ground level & finished ground level will be considered as same.
11	Client to provide sufficient area for storage of materials, equipment & for construction works at site.
12	MOC of all water retaining structures in RCC M20. For M25 grade concrete design mix shall be required & estimation need to revised.
13	MOC of MCC room & sludge drying beds is brick masonry.
14	M10 grade of concreting is considered for PCC.
15	No architectural treatment to any unit is considered.
16	For construction 43 grade (OPC) cement is considered.
17	TOR steel /TMT of ISI mark without any special treatment is considered.
18	MS/plywood shuttering is considered for plain & circular surfaces of tanks.
19	12mm thick smooth cement plaster in CM 1:6 with waterproof compound for internal surface of wall are considered.
20	20mm thick rough cement plaster for external surface of wall in CM 1:6 are considered.
21	For external paint Water proof cement paint of snocem or nitocem make is considered.
22	Hand railing should be in MS 40NB B class pipe & ladder in ASA 50 x 50 x 5 is considered.
23	MS inserts/manholes in RCC work during casting are considered.
24	50mm thick IPS is considered for all water retaining structure.
25	Epoxy painting on inner surface of RCC tank is considered for EQT & Pl Clarifier only.
26	Operator's room, chemical storage room & toilet block are not considered.
27	In MCC room electrification, mosaic tiles, aluminium door & windows are considered. OBD paint for internal & snocem paint for external wall is considered.
28	For Laboratory internal electrification, Ceramic tile flooring, Platform of Kadappa stone, Sintex tank with fitting, water line up to sink, Internal OBD & external waterproof paint considered. No electrical fittings like fan tube considered. No carpentry work for platform is considered.
29	No stair case tower is considered for MCC & Lab, for two storeyed structures.
30	Water & power for construction of ETP will be given by client at one point in ETP premises free of cost.
31	Temporary piping, pumping arrangement & water for hydraulic testing is not considered.
32	No gland leakage chamber & line & disposal arrangement are considered.
33	Space for labour hutment will be provided by client free of cost.
34	Any hindrance or obstruction created by local people will be handled by client during ETP constriction.

ANNEXURE II

PERFORMANCE TEST

The trial runs will be considered as successful if the performance standards as mentioned above are met as per the procedure detailed below:

Performance test shall be conducted at designed organic load at a hydraulic load not exceeding the design flow. The inlet parameters for the test shall not exceed the design conditions during test period. The influent condition shall not deviate more than 5% from the design condition.

The trial runs will be conducted for a continuous period of 72 hours. If designed organic / hydraulic load is not available upon reaching stabilized state, trial runs shall be conducted at 'available load' which shall not be exceeding either the designed organic load or designed hydraulic load in any case.

Influent and Effluent sample values of different parameters will be based on average of daily values determined from a composite sampling. The performance test shall be started with a 3 days' notice to Client after reaching steady state. Client shall ensure uninterrupted supply of raw effluent conforming to the inlet design conditions and all utilities including power, chemicals, manpower etc. during stabilization/ commissioning period prior to test runs and also during trial runs. If trial runs cannot be conducted due to reasons attributable to client within 6 months from the date of hydraulic testing or within 3 months from the date of seeding, the plant will be deemed to be taken over by the client and the related payments, if any shall be released immediately along with handover certificate.

Upon successful completion of trial runs, client shall formally take over the plant and issue a performance cum handover certificate.

ANNEXURE III

STANDARD ELECTRICAL SPECIFICATIONS

ELECTRICAL SPECIFICATIONS
MCC panel shall be fully compartmentalized and free standing floor mounting. Maximum height of panel shall be 2.1 mtr and depth of compartment 400 mm. Double front type panel shall be provided if no of feeders are more. Painting shall be Epoxy based powder coating (RAL 7032). Thickness of panel shall be 16 SWG. Panel to be provided with Neoprene gaskets. Cable entry shall be from the bottom as a standard feature. Top cable entry may be provided, if required. Each starter of MCC will consist of :
A) SFU (Switch Fuse Unit) or MPCB – Minimum feeder size shall be 350 mm x 300 mm.
1. Contactor
2. Overload Relay
3. ON / Trip indication.
4. Emergency stop stay – put push button.
5. Motor rating above 11.0 KW, Star Delta starter will be provided.
6. Incomer of MCC will be: MCCB (Moulded Case Circuit breaker) shall be provided to incomer cable.
B) Earthing
Earthing would be done using G.I. pipe rods as per I.S. standards. G.I. conductor earthing will be done for all electrical equipment and noncurrent carrying metallic structures / tanks. G.I. conductors will be used for lightning protection, connected directly to separate earth pit.
C) Push Button Station
Push button station will be provided near the motor wherever required with lock and key system. Flameproof push button station (as per IS 2148) will be provided for flameproof section and non-flameproof push button station (as per IS 2147) will be **provided for non-flameproof section.**
D) Cable Laying
G I open type cable trays will be provided for indoor application. Cables will be buried in trenches for outdoor cables.
E) Erection Material
Double compression glands will be provided in flameproof section and single compression glands will be provided in the non-flameproof section.
F) Motor Cover
All motor covers shall be of GI material only
G) Internal Wire
All internal wires of MCC Panel are copper wires.
H) Miscellaneous Details

- MOC of bus bar shall be Aluminium with heat shrinkable PVC sleeves with colour code of red, yellow, blue for phase identifications
- No capacitor/CVT shall be provided in the panel.
- 10 % spare feeders subjected to maximum of 3 nos. shall be provided without switchgears.
- No additional NO/NC contact shall be provided for PLC provision.
- All meters shall be digital type.
- Thickness of gland shall be 3mm.

I) Power & Control Cables

Motor	**Cable no & Size**	**MOC**
upto 1.5 kW	1 No. X 3 core x 2.5 mm^2	Copper
above 1.5 kW & 5.5 kW	1 No. X 3 core x 4.0 mm^2	Copper
above 5.5 KW & 11 KW	1 No. X 3 core x 6.0 mm^2	Aluminium
15 KW	2 Nos. X 3 core x 10.0 mm^2	Aluminium
18.5 KW	2 Nos. X 3 core x 10.0 mm^2	Aluminium
above 18.5 KW & upto 26 KW	2 Nos. X 3 core x 16.0 mm^2	Aluminium
30 KW	2 Nos. X 3 core x 25.0 mm^2	Aluminium
above 30 KW & upto 45 KW	2 Nos. X 3 core x 25.0 mm^2	Aluminium
52 KW	2 Nos. X 3 core x 35.0 mm^2	Aluminium
above 52 KW & upto 75 KW	2 Nos. X 3 core x 50.0 mm^2	Aluminium
90 KW	2 Nos. X 3 core x 70.0 mm^2	Aluminium
100 KW	2 Nos. X 3 core x 95.0 mm^2	Aluminium
Control cable for push button station	1 No. X 3 core x 1.5 mm^2	Copper
For DOL Starter	**Motor rating**	**Cable size**
	Upto 5.5 KW	2.5 mm^2
	7.5 KW	4.0 mm^2
	9.3 KW	4.0 mm^2
	11.0 KW	4.0 mm^2
	Internal Wire	Copper
For Star – Delta Starter	**Motor rating**	
Power	**Cable size** (supply side)	**Cable size** (motor side)
15.0 KW	10.0 mm^2	4.0 mm^2
18.5 KW	10.0 mm^2	4.0 mm^2
22 KW	16.0 mm^2	6.0 mm^2
30 KW	25.0 mm^2	10.0 mm^2
45 KW	50.0 mm^2	25.0 mm^2

For-

TISHA ENVIRO SOLUTION PVT. LTD.

What if a single partner
offered you a world of expertise
to take care of environment you live in?

Proposal

For

Waste Water Recycle Plant

Submitted to

Microbrew Beverages (P) Ltd.

Kashipur

TISHA ENVIRO SOLUTION PVT. LTD.

No. 403, 4th floor, Block B Bulding
no. 101(old) Near Metro Piller no. 166
New Ashok Nagar, New Delhi 110096
e-mail- info@tishaenviro.com

D-97, EWS, B.S. Colony, Bhiwadi,
Rajasthan 301 019
email- info@tishaenviro.com

To,
M/s. Microbrew Beverages (P) Ltd., Kashipur

SUBJECT: Your enquiry for Supply of Reverse osmosis Plant based on ETP water.

Dear sir,

Kindly refer to your enquiry for your requirement of Water Treatment Plant for your project.

As desired and discussed we are pleased to enclose herewith our complete techno commercial proposal for your perusal for supply of complete Water Treatment unit.

1) Annexure I : Clariflocculator
2) Annexure II : Ultra filtration Plant capacity 25000 LPH
3) Annexure III : Reverse Osmosis Plant Capacity 13000 LPH Stage I
4) Annexure IV : Reverse Osmosis Plant Capacity 5000 LPH Stage II

We hope you will find the same in line and favour us with your valued order. However if you have any queries please don't hesitate to contact us.

Thanking you and assuring you of our best cooperation and attention at all times, we remain.

Yours faithfully
For **TISHA ENVIRO SOLUTION P. LTD.**

ANNEXURE I

Technical Specifications

A. Physico-Chemical Treatment (Clariflocculator)

Quantity required : 01 No.
Capacity : 25 m^3/hr

FLASH MIXER
Quantity : 1no.
Volume : 1000 litrs
MOC : MS

Agitator
Quantity : 1 No.
MOC of agitator : SS 304
Piping of flash mixer : 1 lot MSEP

FLOCCULATION SYSTEM
Quantity of chambers : 1 no. Volume: 3,000 litrs
MOC : MSEP

Agitator
Quantity : 1 Nos.
MOC of agitator : SS 304
Piping of flash mixer : 1 lot MS

TUBE SETTLER
Volume : 20 m3 Approx
Media : Hexagonal Chavron Shaped

CHEMICAL DOSING SYSTEM
Tank : 1000 liters x 2
Agitator with gear box : 2 nos., SS 304
Metering Pump : 4 nos, 30 LPH

UF Feed tank
Quantity required : 1 Nos.
Scope : Client
Capacity : Approx 50 KL
MOC : Civil

ANNEXURE II

ULTRA FILTRATION PLANT CAPACITY 25000 LPH

We have designed the system strictly on basis of the analysis report considered & mentioned below

COD	:	150 PPM
BOD	:	25 PPM
Total Dissolved Solids	:	10000 PPM
TSS	:	45 – 50 PPM

The system has been designed for total output of 25000 Ltrs of Pure water per Hour.

1) **Raw water Feed Pump / Fast Flush Pump**

Quantity	:	1 No.
Type	:	Horizontal
Make	:	Kirloskar
Flow rate Ltrs/hr	:	26000
Head mtrs	:	30

2) **Chlorination Dosing System :**

Quantity	:	1 No.
Model	:	TESPL 0-6
Type	:	Electronic Dosing Pump
Capacity	:	0-6 LPH
Material of Construction	:	PP
Piping	:	PVC / HDPE
Tank	:	100 Ltrs
Make	:	E Dose

3) **Multi Grade Filter**:

Quantity	:	One
Model	:	TESPL 1400 MGF
Height (MM)	:	1800
Material of Construction	:	MSEP
Service Flow rate(LPH)	:	25000
Back wash Flow Rate (LPH)	:	25000
Backwash Time (minutes)	:	5 to 10 minutes
Media	:	Graded Quartz Sand, Gravels, Pebbles
Valves	:	Cast Iron Butterfly Valves
Piping (Inter connecting)	:	MSEP
Valves & Pipeline size	:	80 MM

4) **Activated carbon Filter :**

Quantity	:	One
Model	:	TESPL 1300 ACF
Height (MM)	:	1800
Material of Construction	:	MSEP

Service Flow rate (LPH)	:	25000
Back wash Flow Rate (LPH)	:	25000
Backwash Time (minutes)	:	5 to 10 minutes
Media	:	Graded Quartz Sand, Gravels, Pebbles
Valves	:	Cast Iron Butterfly Valves
Piping (Inter connecting)	:	MSEP
Valves & Pipeline size	:	80 MM

5) **Acid Dosing System:**

Quantity	:	1 No.
Model	:	TESPL 0-10
Type	:	Electronic Dosing Pump
Capacity	:	0-10 LPH
Material of Construction	:	PP
Piping	:	PVC / HDPE
Tank	:	100 Ltrs
Make	:	E Dose / Equiv.

6) **Alkali Dosing System:**

Quantity	:	1 No.
Model	:	TESPL 0-10
Type	:	Electronic Dosing Pump
Capacity	:	0-10 LPH
Material of Construction	:	PP
Piping	:	PVC / HDPE
Tank	:	100 Ltrs
Make	:	E Dose / Equiv.

7) **Disinfectant Dosing System:**

Quantity	:	1 No.
Model	:	TESPL 0-10
Type	:	Electronic Dosing Pump
Capacity	:	0-10 LPH
Material of Construction	:	PP
Piping	:	PVC / HDPE
Tank	:	100 Ltrs
Make	:	E Dose / Equiv.

7) **Backflush Pump**

Flow Rate (LPH)	:	40000
Quantity	:	1 No.
Material of Construction	:	Cast Iron
Type	:	Horizontal
Make	:	Kirloskar
Head mtrs	:	25

8) **Ultra Filtration Specifications**

Permeate Flow rate (Ltrs/ hr)	:	25000
Working pressure (Kgs/cm2)	:	2.5
Membrane Make	:	Qua/ Hyflux/Oltermare/ Equiv
Membrane Qty.	:	1 lot
Membrane Housing Type	:	Horizontal
Material of Construction	:	PVC
Housing Quantity	:	1 lot
Instrumentation	:	One lot
Pressure Gauge	:	Five nos.
Rotameter	:	Two nos.
L.P. Switch	:	One no.
H.P. Switch	:	One no.

9) **Skid** : One no.
Material of Construction : M .S. Epoxy painted

10) **Control panel** : One No.
MOC : MS Powder Coated
Operation : Fully Automatic

11) RO 1st Feed water tank

Quantity required : 1 Nos.
Scope : Client
Capacity : Approx 50 KL
MOC : Civil

ANNEXURE III

STAGE I RO PLANT CAPACITY 25000 LPH (Feed Water)

We have designed the system strictly on basis of the analysis report considered & mentioned below

Ph	:	7.0
Turbidity	:	Less than 5 NTU
TDS	:	10000 PPM
Iron as Fe	:	Less than 0.1 PPM
Silica	:	Less Than 10 PPM
BOD	;	Less Than 10 PPM
COD	:	Less Than 30 PPM

The system has been designed for a total output of 13000Ltrs of Pure water per Hour.

The recommend scheme of treatment comprises of following operational steps. These coming in correct sequence as described below.

The Water from the storage tank available shall be supplied to the Micron Unit , Before Micron Unit water is then dosed with Polymer based Anti scalant comprising of various constituents to take care of Total hardness present in Raw water. The Total Hardness present in the raw water if not treated would result in fouling & choking of the membranes, resulting in early replacements. We propose to dose sequestrine based food grade ANTISCALANT for taking care of Hardness.

The water is then fed into Micron Filter of 5 Micron rating. The Water from there is fed into the Reverse Osmosis Block with the help of High Pressure Pump for further treatment of TDS. The RO Block is designed for optimum recovery and salt rejection of almost 95% – 97%. This ensures a Low TDS i.e. LESS than 50 PPM approx. at the outlet of RO Block.

1) **Raw water Pump**

Quantity	:	1 Nos.
Type	:	Centrifugal-
MOC	:	SS
Make	:	Kirloskar/CRI/ Eqv.
Flow rate Ltrs/hr	:	25000

2) **De Chlorination Dosing System:**

Quantity	:	1 No.
Model	:	TESPL 0-10
Type	:	Electronic Dosing Pump
Capacity	:	0-10 LPH
Material of Construction	:	PP
Piping	:	PVC / HDPE
Tank	:	100 Ltrs
Make	:	E Dose

3) **AntiScalant Dosing System:**

Quantity	:	1 No.
Model	:	TESPL 0-10
Type	:	Electronic Dosing Pump
Capacity	:	0-10 LPH
Material of Construction	:	PP
Piping	:	PVC / HDPE
Tank	:	100 Ltrs
Make	:	E Dose

4) **Micron Cartridge Filtration Unit :**

Quantity	:	One
Flow Rate LPH	:	25000
Rating (Micron)	:	5
Type	:	Cartridge
Material of Construction	:	Polypropylene
Cartridges Quantity	:	1 Lot.
Housing Qty .	:	1 no.
Housing MOC	:	Stainless Steel
Size	:	30” Long

5) **REVERSE OSMOSIS BLOCK**

a) **High pressure Pump**

Flow Rate (LPH)	:	25000
Quantity	:	1 No
Material of Construction	:	Stainless Steel
Type	:	Vertical
Make	:	CNP / CRI / Evq.
Feed Pressure Kgs/cm2	:	18 to 20

b) **R.O. Specifications**

Permeate Flow rate (Ltrs/ hr)	:	13000
Reject Flow rate (Ltrs/hr)	:	12000
Salt rejection (%)	:	Above 97%
Working pressure (Kgs/cm2)	:	18
Membrane Type	:	Polyamide
Membrane Model	:	SW 8040
Membrane Make	:	Dow/Hydraunatics USA / Toray
Membrane Qty.	:	1 Lot.
Membrane Housing Type	:	Inter connecting Horizontal
Material of Construction	:	FRP
Housing Make	:	Pentair / Alfa
Housing Quantity	:	1 Lot.
Interconnecting Pipeline	:	One lot
Material of construction	:	UPVC
Size	:	40 / 25 NB

c) Instrumentation	:	One lot
Conductivity meter	:	One no.
ORP Meter	:	One no.
Pressure Gauge	:	Five nos.
Rotameter	:	Two nos.
L.P. Switch	:	One no.
H.P. Switch	:	One no.
d) Skid	:	One no.
Material of Construction	:	M .S. Epoxy Painted
e) Control panel	:	One No.
MOC	:	MS Powder Coated
Operation	:	Automatic

6) Membrane Flushing / Cleaning System

a) Permeate Water Storage Tank

Quantity	:	One
Capacity	:	500 Ltrs
Material of Construction	:	HDPE

b) Flushing Pump

Quantity	:	One
Type	:	Mono block centrifugal
Material of Construction	:	Stainless Steel
Flow rate Ltrs / hr	:	12000
Make	:	CRI / CNP

c) Micron Cartridge Filter

Quantity	:	One
Capacity	:	12000 Ltrs/hr
Rating	:	5 Micron
Material of Construction	:	Polypropelene
Cartridge Qty.	:	1 Lot.
Housing MOC	:	Poly carbonate

7) RO 2nd Feed tank

Quantity required	: 1 Nos.
Capacity	: Approx 15 KL
MOC	: HDEP/ PVC /EQV.

ANNEXURE II

STAGE II RO PLANT CAPACITY 12000 LPH (Feed Water)

We have designed the system strictly on basis of the Reject water from I st Stage RO Plant considered & mentioned below

Ph	:	7.0
Turbidity	:	Less than 5 NTU
TDS	:	22000 PPM (Based on Reject of I stage RO)

The system has been designed for an total output of 5000 Ltrs of Pure water per Hour.

The recommend scheme of treatment comprises of following operational steps. These coming in correct sequence as described below.

The Reject Water from the storage tank available shall be supplied to raw water Feed Pump Then water is feed to Micron Unit , Before water is fed into Micron unit it is dosed with Polymer based Anti scalant comprising of various constituents to take care of Total hardness present in Raw water. The Total Hardness present in the raw water if not treated would result in fouling & choking of the membranes, resulting in early replacements. We propose to dose sequestrine based food grade ANTISCALANT for taking care of Hardness.

The water is then fed into Micron Filter of 5 Micron rating. The Water from there is fed into the Reverse Osmosis Block with the help of High Pressure Pump for further treatment of TDS. The RO Block is designed for optimum recovery and salt rejection of almost 95% – 97%. This ensures a Low TDS i.e. LESS than 75 PPM approx. at the outlet of RO Block.

1) **Raw water Pump**

Quantity	:	1 Nos.
Type	:	Centrifugal
MOC	:	Stainless Steel
Make	:	CRI / CNP / Eqv.
Flow rate Ltrs/hr	:	12000

2) **Antiscalant Dosing System:**

Quantity	:	1 No.
Model	:	TESPL 0-6
Type	:	Electronic Dosing Pump
Capacity	:	0-6 LPH
Material of Construction	:	PP
Piping	:	PVC / HDPE
Tank	:	100 Ltrs
Make	:	E Dose

3) **Acid Dosing System:**

Quantity	:	1 No.
Model	:	TESPL 0-6
Type	:	Electronic Dosing Pump
Capacity	:	0-6 LPH
Material of Construction	:	PP
Piping	:	PVC / HDPE
Tank	:	100 Ltrs
Make	:	E Dose

4) **Micron Cartridge Filtration Unit :**

Quantity	:	One
Flow Rate LPH	:	12000
Rating (Micron)	:	5
Type	:	Cartridge
Material of Construction	:	Polypropylene
Cartridges Quantity	:	1 Lot.
Housing Qty.	:	1 no.
Housing MOC	:	Poly carbonate
Size	:	20” Long BB

5) **REVERSE OSMOSIS BLOCK**

a) **High pressure Pump**

Flow Rate (LPH)	:	12000
Quantity	:	1 No
Material of Construction	:	Stainless Steel
Type	:	Vertical
Make	:	CNP / CRI / Grundfos/ Eqv.
Feed Pressure Kg/cm2	:	22 to 25

b) **R.O. Specifications**

Permeate Flow rate (Ltrs/ hr)	:	5000
Reject Flow rate (Ltrs/hr)	:	7000
Salt rejection (%)	:	Above 97%
Working pressure (Kgs/cm2)	:	23
Membrane Type	:	Polyamide
Membrane Model	:	SW 8040
Membrane Make	:	Dow/Hydraunatics USA / Toray / GE
Membrane Qty.	:	1 Lot.
Membrane Housing Type	:	Inter connecting Horizontal
Material of Construction	:	FRP
Housing Make	:	Pentair / Alfa
Housing Quantity	:	1 Lot.
Interconnecting Pipeline	:	One lot
Material of construction	:	UPVC
Size	:	40 / 25 NB

c) Instrumentation	:	One lot
Conductivity meter	:	One no.
Pressure Gauge	:	Five nos.
Rotameter	:	Two nos.
L.P. Switch	:	One no.
H.P. Switch	:	One no.
d) Skid	:	One no.
Material of Construction	:	M .S. Epoxy Painted
e) Control panel	:	One No.
MOC	:	MS Powder Coated
Operation	:	Automatic

6) **Membrane Flushing / Cleaning System**

a) Permeate Water Storage Tank

Quantity	:	One
Capacity	:	500 Ltrs
Material of Construction	:	HDPE

b) Flushing Pump

Quantity	:	One
Type	:	Mono block centrifugal
Material of Construction	:	Stainless Steel
Flow rate Ltrs / hr	:	5000
Make	:	CRI / CNP

c) Micron Cartridge Filter

Quantity	:	One
Capacity	:	5000 Ltrs/hr
Rating	:	5 Micron
Material of Construction	:	Polypropelene
Cartridge Qty.	:	1 Lot.
Housing MOC	:	Polycarbonate

Delivery period

We shall dispatch the materials/equipment within 06-18 weeks/months from the date of receipt of technically and commercially clear purchase order with advance payment. The delivery period is subject to the following:

- Advance payment is received along with the Purchase order
- All milestone payments are received within the time frame specified/discussed and mutually agreed upon.
- Our proposal does not envisage any inspection of equipment to be supplied prior to dispatch either by purchaser or his authorized representative. In the event Inspection is insisted upon by purchaser prior to dispatch, it shall be restricted to visual inspection only at our Principal's/our sub vendor's works/premises. In such cases, purchaser's representative shall arrive for inspection on the date or dates indicated by us, at his own cost. In the event the purchaser's representative does not arrive on the date specified for inspection, we shall be at liberty to dispatch the material to the purchaser.
- Force majeure clause is applicable

We shall erect and commission the plant within 3- 6 weeks/months thereafter. The period is subject to the following:

- Civil works are completed according to the civil scope.
- Power connection is given at our MCC/drives
- Influent connection is given according to the quantity and quality considered in the design.
- Chemicals reqd. according to the standards are supplied to us while the plant is ready for commissioning.
- All statutory approvals and clearances as required will be arranged by you

Validity period

- Our offer is valid for a period of 45 days from the date of this proposal and is subject to variation thereafter.
- This supply does not cover any consequential damages what so ever.

De-mobilization and re-mobilization

- In the event of the customer not being ready with the inputs such as civil works, power connection, water connection and chemicals, we will have the option to withdraw ourselves from site.

- Once the above inputs are ready at customer end, we will remobilize the site within 15 days of intimation regarding readiness. The charges incurred by us on account of re-mobilization will be borne by the customer.

Warranty

Our liability in respect of any defect or failure of any equipment supplied by us or any loss, injury or damage attributable thereto is limited to making good by way of replacement or rectification , defects which show up under proper use therein , provided the equipment is operated and maintained strictly in accordance with our instructions and arise entirely from proven faulty design, materials or workmanship, within a period of 12 months from date of commissioning of equipment or 18 months from date of supply, whichever is earlier. At the end of this period all our liabilities will cease. Under this warranty:

a. We shall have the right to make any replacement or repairs that is required either at site or one of our factories. In case of a replacement buyer shall return the replaced part/component to us within 7 (seven) days.
b. The warranty period for the entire plant including the replace/repaired part will be limited to the remaining unexpired portion of the total warranty period. Electrical components such as conductivity/pH meters, motors, contractors, PLCs, relays solenoid valves, pressure switches & flow meters, rubber components and instruments such as pressure gauges, thermometers and rota meters are not covered under this warranty.
c. Micron cartridges and Ultra filtration/Reverse Osmosis Membranes – where applicable - will carry separate warranty and will be discussed, since their performances are related to the influent conditions and operation of the plant.
d. Where equipment is ready for dispatched but cannot be dispatched due to reasons attributable to the buyer, the warranty period will be limited to 18 months from date of readiness for dispatch as notified by us in writing.
e. No other party or agency may carry out replacement or repairs unless authorized by us in writing.
f. If a part/component is to be replaced or repaired under this warranty, there will be no charge for the replacement. However, the travel and conveyance as well as boarding & lodging expenses incurred by our representative deputed for this work will be charge to the buyer at actual.
g. This warranty does not cover replacements/repairs required as a result of normal wear & tear, accidents or damages/defects caused by misuse/mail-operation of the equipment by the buyer.
h. If we observe mistaken operation and usage of spurious chemicals and spares, our warrantee becomes null and void.

Performance guarantee

The performance of the plant with respect to throughput, output and running cost is strictly based on the influent conditions based on which the plant is designed. In the event of any deviation from the design basis and also if we observe mistaken operation and usage of spurious chemicals and spares, our guarantee becomes null and void.

Force Majeure

Force Majeure means any act, event or circumstances, or combination of acts, events or circumstances, which materially and adversely affect our performance or its obligation pursuant to the terms of this Agreement, but only if and to the extent that such acts, events or circumstances are not within our reasonable control, were not reasonably foreseeable and could not have been prevented or overcome by the us through the exercise of reasonable skill or care. Where such performance is affected in part, we shall be relieved of the performance of the part, which is adversely affected. Force Majeure shall comprise of political Force Majeure events like war, revolution, sabotage or terrorism, or non political events like flood, cyclone, lighting, earthquake drought, storm, Tsunami, fire or explosion, strikes, lock outs etc.

ANNEXURE – V

SCHEDULE OF EXCLUSIONS/DAVIATIONS

1. *Power supply, any civil work and any welding work.*
2. *Loading, Unloading & handling equipments at site, labour, tool & tackles*
3. *Customer will provide Lifting Machine or crane at site for moving vessel and equipment*
4. *All interconnecting pipe line and water and chemical storage tank.*
5. *Water analysis reports before and after commissioning.*
6. *Any Pollution control approval, electrical inspection, factory inspection etc.*
7. *All statutory clearance required for implementation for the project.*
8. *Any other services/ supply not clearly mentioned in our scope of supply*

Thanking you and assuring with our best services all the time,

Yours faithfully,

Anoop Shukla
9136653100
Tisha Enviro Solution P. Ltd.

TISHA ENVIRO SOLUTION PVT. LTD.

Air Dispersion Modelling

1. Introduction

The project is a proposed malt based distillery coming up at Khasra Nos.933, 934, 936, 937, 938, 940, village Mahuakheraganj, tehsil Kashipur, and district Udham Singh Nagar, state Uttarakhand promoted by Microbrew Bistro Private Limited. As part of the Environmental Impact Assessment that is being conducted for the project, an air dispersion modelling analysis is being undertaken to determine the impact of the air pollutants from the proposed project on the ambient air quality.

This report describes the air dispersion modelling analysis for PM, NO_2, SO_2 & CO from the project only and the consequent comparison with the CPCB's National Ambient Air Quality Standards (NAAQS-2009).

2. Process Description & Air Pollutant Sources

The project is a proposed malt based distillery coming up at Khasra Nos.933, 934, 936, 937, 938, 940, village Mahuakheraganj, tehsil Kashipur, and district Udham Singh Nagar, state Uttarakhand. The location of the project along with surroundings is shown in the Fig 1.

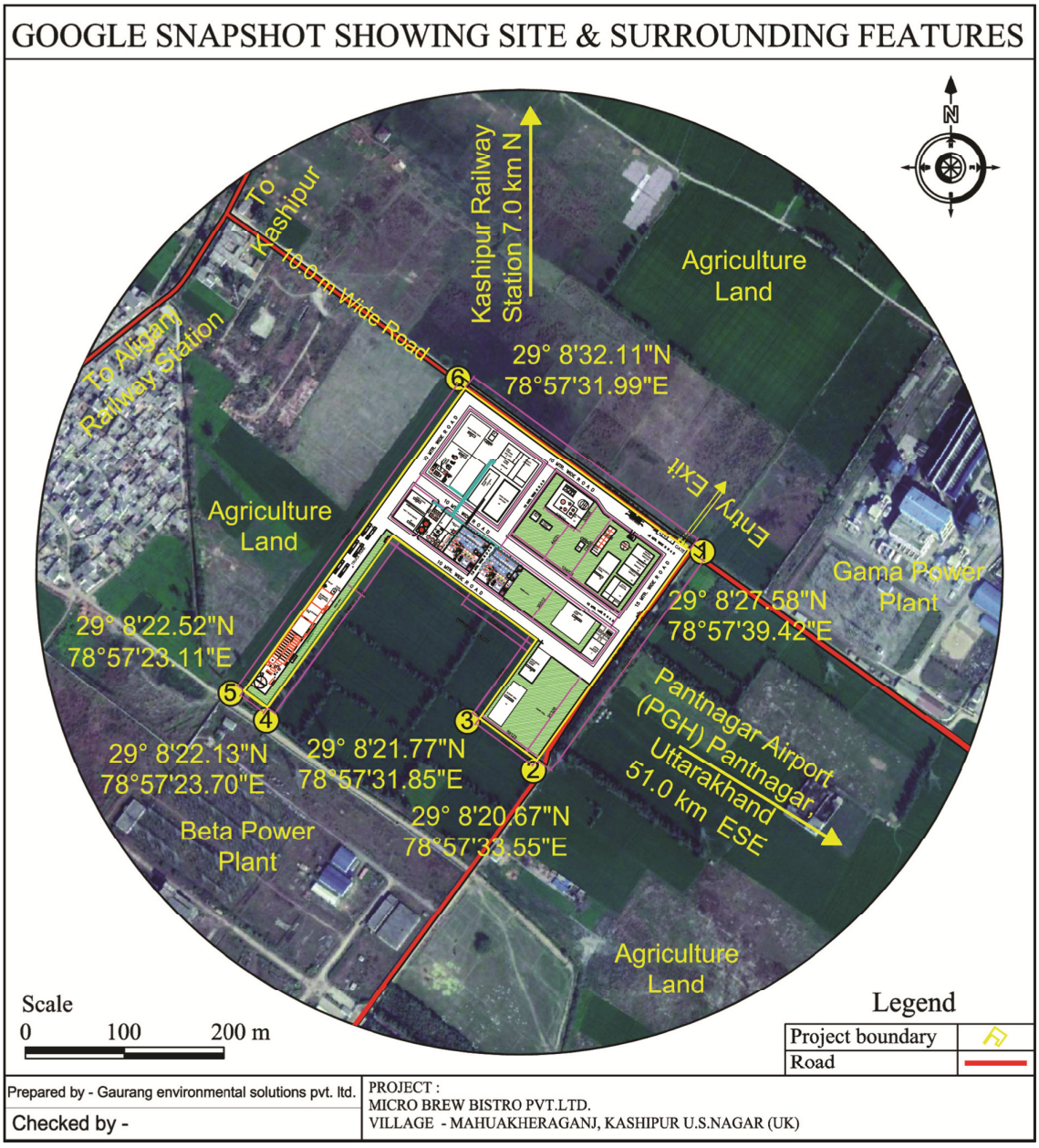


Fig 1: Google map showing the site & its surroundings

3. Potential Air Emissions

In this modelling approach only those sources are considered which are potential sources of air pollution due to the proposed project. The major air pollution will be caused due to Handling of material, introduction of vehicular emissions due to transportation activities and during the operation of DG set and Boiler. The major air pollutants are Nitrogen Dioxide (NO_2), Sulphur Dioxide (SO_2), Carbon monoxide (CO), Particulate Matter (PM).

4. Air Dispersion Modelling Methodology

4.1 Modelling Approach

The assessment methodology for the air dispersion modelling exercise follows the guidancespecified in the US EPA user guide for AERMOD. The model of selection is the commercially available AERMOD View dispersionmodel, developed by Lakes Environmental. This model is used extensively to assess pollutionconcentration and deposition from a wide variety of sources. AERMOD View is a true, nativeMicrosoft Windows application and runs in Windows applications. The AMS/EPA RegulatoryModel (AERMOD) was specially designed to support the EPA's regulatory modelling programs.AERMOD is a regulatory steady-state plume modelling system with three separate components:

- ✓ AERMOD (AERMIC Dispersion Model),
- ✓ AERMAP (AERMOD Terrain Pre-processor), and
- ✓ AERMET (AERMOD Meteorological Pre-processor).

The AERMOD model includes a widerange of options for modelling air quality impacts of pollution sources, making it a popularchoiceamong the modelling community for a variety of applications. Some of the modelling capabilitiesof AERMOD include the following:

- The model may be used to analyze primary pollutants and continuous releases of toxicand hazardous waste pollutants.
- Source emission rates can be treated as constant or may be varied by month, season,hour-of-day, or other optional periods of variation. These variable emission rate factorsmay be specified for a single source or for a group of sources. For this project allemission rates were treated as constant.
- The model can account for the effects of aerodynamic downwash due to buildings thatare nearby point source emissions.
- Receptor locations can be specified as gridded and/or discrete receptors in a Cartesianorpolar coordinate system.
- For applications involving elevated terrain, the U.S. EPA AERMAP terrain pre-processing program is incorporated into the model to generate hill height scales as well as terrain levations for all receptor locations.

- The model contains algorithms for modelling the effects of settling and removal (throughdry and wet deposition) of large particulates and for modelling the effects of precipitationscavenging for gases or particulates.
- AERMOD requires two types of meteorological data files, a file containing surfacescalarparameters and a file containing vertical profiles. These two files are provided by theU.S. EPA AERMET meteorological pre processor programme.

4.2 Model Inputs

4.2.1 Source Emissions

A critical step for conducting air dispersion modelling is to quantify the emissions from the various sources at the project. Emission rates should be estimated in the following order of preference:

- Continuous emissions monitoring data
- Stack Emission Testing data
- Manufacturer's emission data
- Mass balance calculations
- Emission factors
- Engineering calculations

Table1 shows the source information data determined for the proposed project, while Table 2 displays the emission rates that were calculated based on the use of manufacturer's emission specifications:

Table 1: Point Source:

1. D. G. Set

S. No	Particular	Capacity	fuel	Quantity	Stack Height	
					Required	Provided
1.	D.G Set:2 Nos.	1000 kVA	HSD	100 lt/hr	6.3 m	30 m

Table: Stack inventory

Parameters	Units	Capacity of DG Set (kVA)
		1000
Number of DG Sets	No.	2
Stack Height	m	30
Stack Diameter	m	0.3
Stack exit velocity	m/s	14
Flue Gas Temperature	0K	553
Gas exist flow rate	m3/sec	0.98

Table 2: Emission Factors for DG Set

S. No.	Particulars	Emission Factors			
		SO_2	PM	NO_X (NO and NO_2 expressed as NO_2)	CO
1.	Diesel Generator	0.05 % of Sulphur in HSD	75 mg/Nm3	710 ppmv	150 mg/Nm3

DG set SO_2 emissions are based on sulphur content of 0.05% and(Emission Standards for Diesel Engines (Engine Rating more than 0.8 MW (800 KW) were notified by the Environment (Protection) Third Amendment Rules 2002, vide G.S.R. 489 (E), dated 9thJuly, 2002 at serial no. 96, under the Environment (Protection) Act, 1986.)

2. Boilers

S. No	Particular	Capacity	Fuel	Quantity	Stack Height	
					Required	Provided
1.	Boiler : 2 nos.	15 TPH	Rice husk	4395 Kg/hr	33.56 m	36 m

Table: Stack inventory

Parameters	Units	Capacity of Boiler
		15 TPH
Number of Boilers	No.	2
Stack Height	m	36
Stack Diameter	m	1.5
gas exit velocity	m/s	8
Gas exit Temperature	^{0}K	443
Gas exist flow rate	m^3/sec	14.13

Table 3: Emission Factors for Boiler

S. No.	Particulars	Emission Factors			
		SO_2	PM	NO_X	CO
1.	Boiler	0 .127 g/s	0.356 g/s	0.386 g/s	1.32 g/s

Table: Emission factors for boilers (uncontrolled)

Process Configuration ∟ Substance / ∟ *Subtype*	Emission Factor (kg/t)	CAT	EFR	Notes
Carbon monoxide	2.61E+00	1,2a,2b	B	a
Oxides of Nitrogen	7.60E-01	2a,2b	B	a
Particulate matter ≤10.0 µm	6.15E+00	2a,2b	U	a, b
Particulate matter ≤2.5 µm	3.51E+00	2a,2b	U	a, b
Polycyclic aromatic hydrocarbons (B[a]Peq)	5.00E-04	2a,2b	U	a
Sulfur dioxide	2.50E-01	1,2a,2b	C	a, d
Polychlorinated dioxins and furans (TEQ)	4.75E-10	2b	U	c

Line Source:

Transportation of material

About 15 no. of trucks will be deployed per day for transportation of product and 15 passenger cars.

Table No.4: Emission norms from vehicles

Details	Unit	Description	
Type of vehicle	-	**Heavy Diesel vehicles**	**Passenger cars**
Expected vehicles	Nos.	15	15
Emission Rate of CO	g/km/vehicle	1.5	1.0
Emission Rate of NOX	g/km/vehicle	3.5	0.12
Emission Rate of PM	g/km/vehicle	0.02	0.006

Source: CPCB Guidelines

4.3 Model Domain, Receptor Network and Terrains

4.3.1 Receptor Network

The selection and location of the receptor network are important in determining the maximumimpact from a source and the area where there is significant air quality impact. Impacts wereassessed at locations beyond the fence line. Consequently, the receptor locations were selectedas a grid that is defined by discrete Cartesian receptors, square in shape, and withorigin at the centre of the proposed project site. Total 448 receptor has been selected for the 10 km buffer of the project with 20 points each side.

4.3.2 Terrain Considerations

The classification of the land use in the vicinity of the proposed project is needed because dispersion rates differ between urban and rural areas. In general, urban areas causegreater rates of dispersion because of increased turbulent and buoyancy-induced mixing. This isdue to the combination of greater surface roughness caused by more buildings and structures andgreater amounts of heat released from concrete and similar surfaces. The USEPA guidanceprovides two procedures to determine whether the character of an area is predominantly urban orrural. One procedure is based on land-use type, and the other is based on population density.Both procedures require an evaluation of characteristics within a 3-km radius from the subjectsource, but the land-use methodology is considered more accurate. Hence, this method wasapplied and it was determined that the rural dispersion coefficient be selected for this modelling project.

Additionally, the topography in the region of the proposed project isdefined as either simple terrain (terrain lying below the stack top elevation) or complex terrain (terrain above the top of the stack). Measurements of the terrain in the area surrounding theproposed project were made using terrain data obtained from SRTM 90 m derived from the WebGiS.

4.3.3 Meteorological Data

The AERMOD model requires hourly surface data values for wind speed, wind direction, rainfall, relative humidity, pressure, cloud cover and ceiling height and solarradiation and at least once daily mixing height data. Surface data (temperature, rainfall, relative humidity, pressure, cloud cover and solar radiation as well as wind data (direction and speed) for year 2018-19 for the winter season was utilized for the study which is collected from site specific meteorological station.

Both data files for the surface and mixing heights were then used to generate the meteorologicalfile required by the AERMOD dispersion model using the AERMET meteorologicalpre-processor programme. This AERMET programme has three stages to process the data. Thefirst stage extracts meteorological data and assesses data quality through a series of quality assessment checks. The second stage merges all data available for 24-hour periods and writesthese data together in a single intermediate file. The third and final stage reads the mergedmeteorological data and estimates the necessary boundary layer parameters for dispersion calculations by AERMOD.

The meteorological pre-processed data was used to determine its corresponding Wind Roseplot (see Figure 4). The wind rose show that the predominant wind direction is from Southeast this means that the emissions plume will be dispersed mainly in the south East direction.

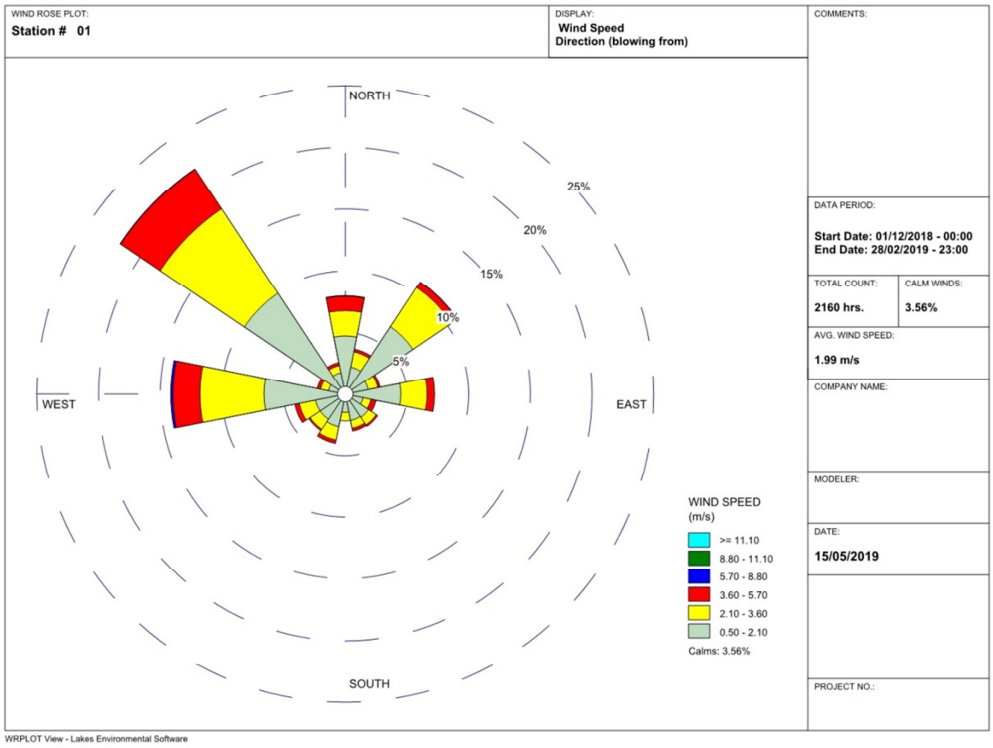


Fig 2: Windrose diagram

5. Model Results

With the various sources identified, a model domain established of 10 km in the north to south-east direction and centred in the middle of the project site, and the necessary input files created, model predictions weremade for the pollutants NO_2, PM, CO & SO_2 for averaging periods for which there are National Ambient Air Quality Standards. Model runswere conducted for the project's air pollutant sources air quality impact in combination with the other defined sources in the vicinity ofthe project. Results are shown as below:

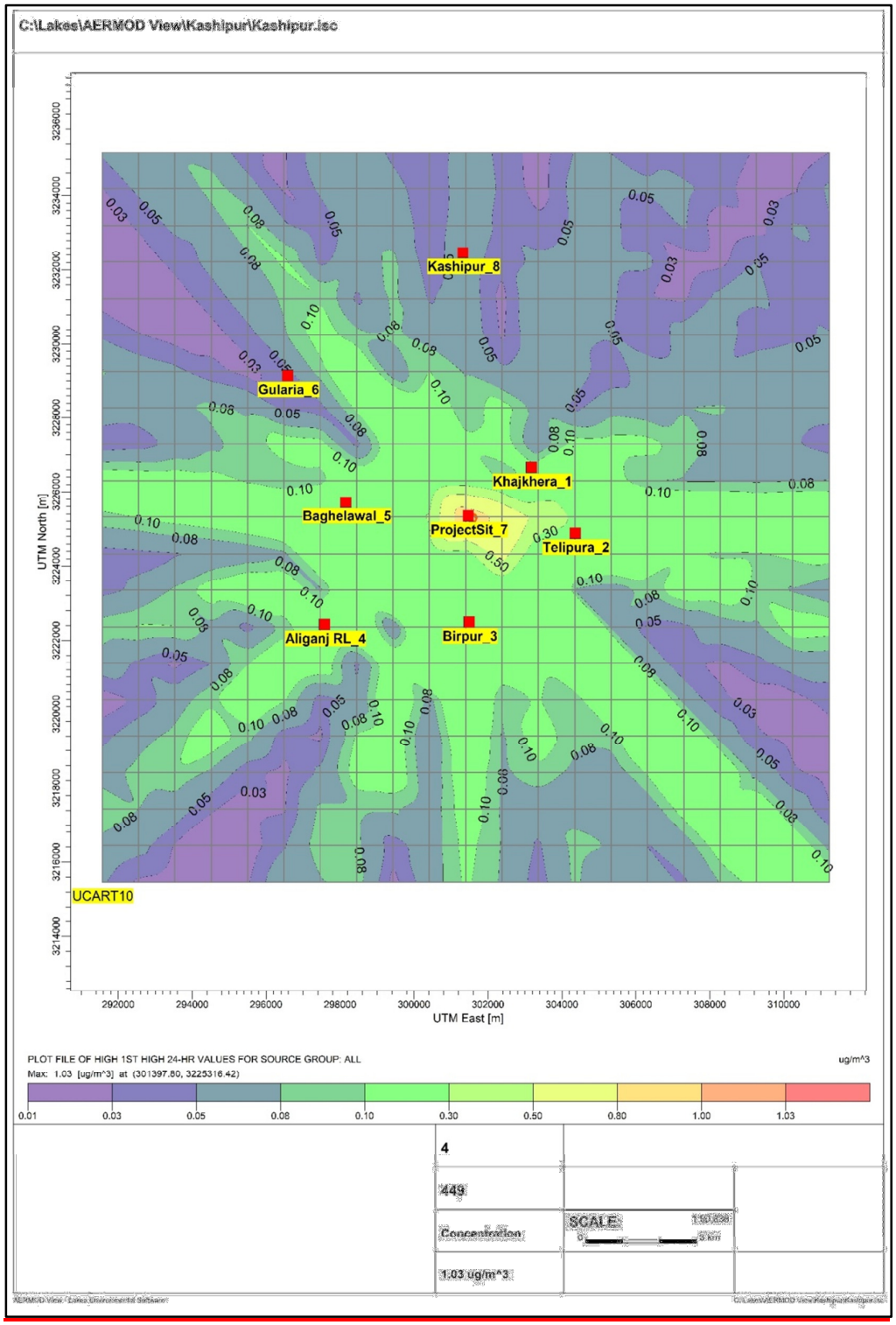


Fig 3:-Isopleth Showing Maximum Ground Level Concentrations of PM

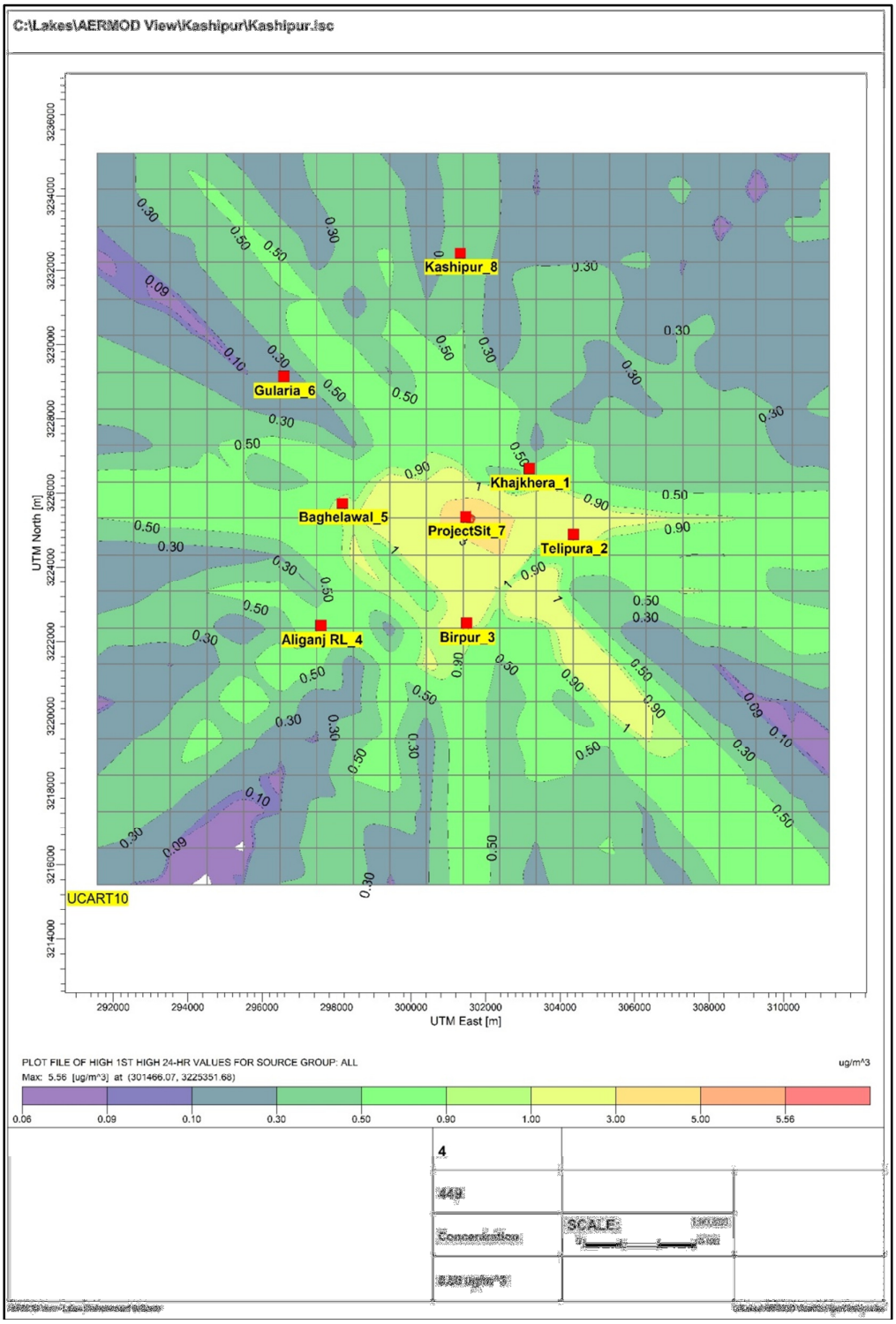


Fig 4:-Isopleths Showing Maximum Incremental Ground Level Concentrations of NO_2

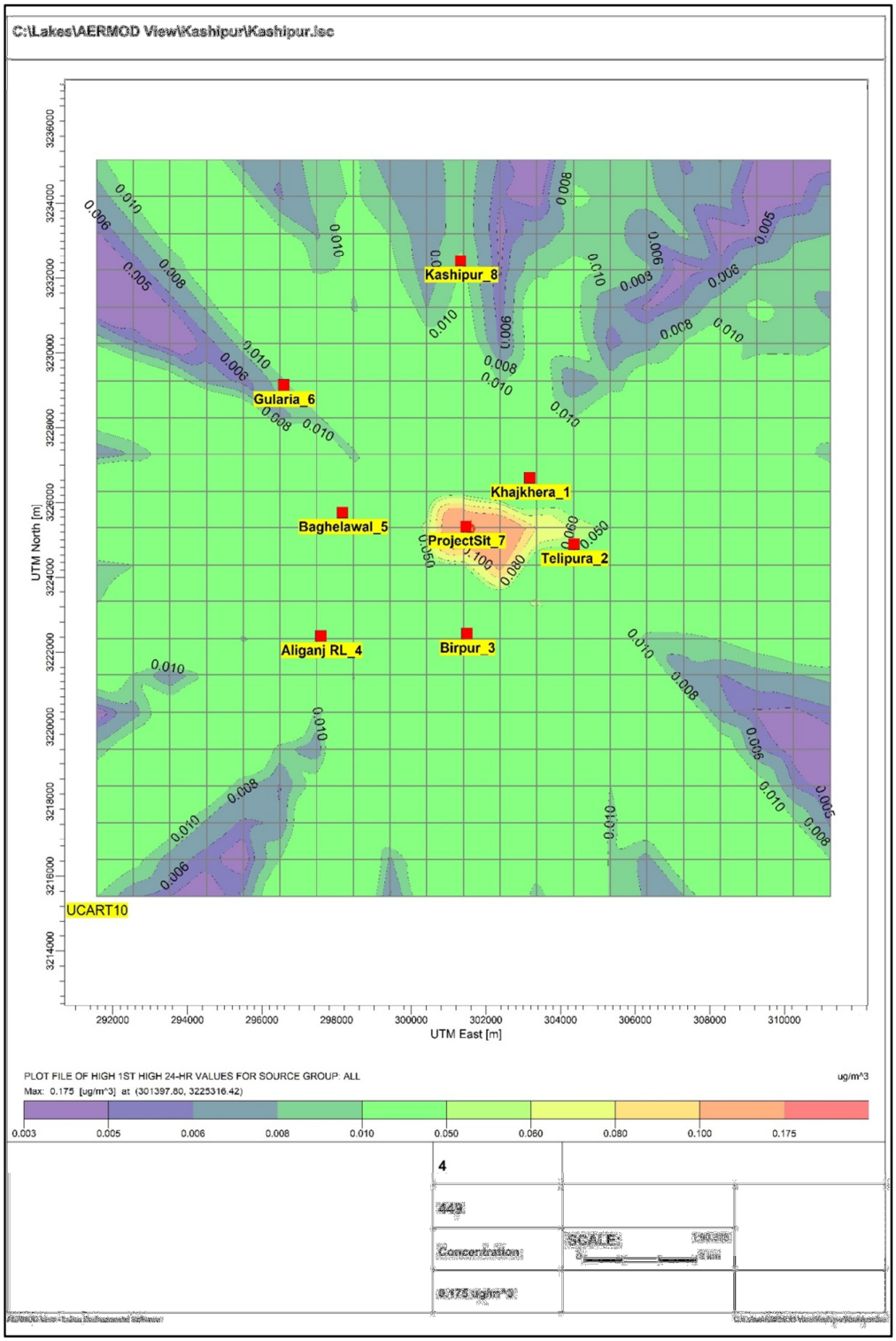


Fig 5:-Isopleths Showing Maximum Incremental Ground Level Concentrations of SO_X

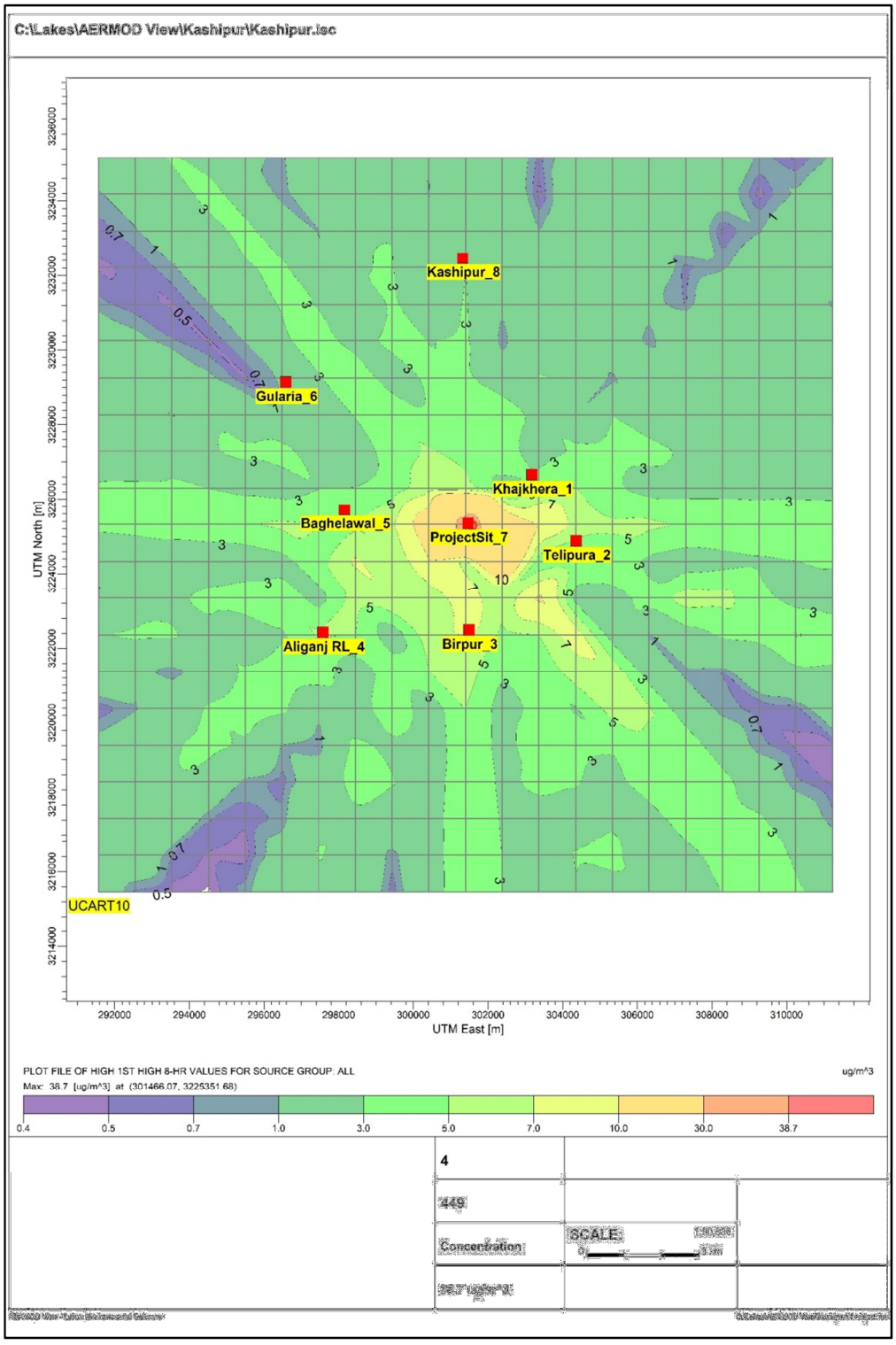


Fig6:-Isopleths Showing Maximum Incremental Ground Level Concentrations of CO

Table 6: Resultant concentration of pollutants on sampling locations

S. No.	Location	Parameter	Baseline Levels (max)	Incremental GLC ($\mu g/m^3$)	Resultant GLCs ($\mu g/m^3$)	Limits as per NAAQS
1	Project Site	PM	88.5	0.94817	89.45	100 $\mu g/m^3$
		NOx	19.9	5.55892	25.5	80 $\mu g/m^3$
		SO_2	11.8	0.1476	11.95	80 $\mu g/m^3$
		CO	1120	38.70908	1158.71	2000 $\mu g/m^3$
2	Khajkhera	PM	83.5	0.10835	83.61	100 $\mu g/m^3$
		NOx	20.1	0.52559	20.63	80 $\mu g/m^3$
		SO_2	10.5	0.01893	10.52	80 $\mu g/m^3$
		CO	1700	3.22295	1703.22	2000 $\mu g/m^3$
3	Telipura	PM	75.8	0.24534	76.04	100 $\mu g/m^3$
		NOx	21.5	1.28652	22.79	80 $\mu g/m^3$
		SO_2	10.9	0.05212	10.96	80 $\mu g/m^3$
		CO	1250	4.7845	1254.78	2000 $\mu g/m^3$
4	Birpur	PM	79.7	0.24016	79.94	100 $\mu g/m^3$
		NOx	22.1	1.15471	23.25	80 $\mu g/m^3$
		SO_2	11.8	0.04053	11.84	80 $\mu g/m^3$
		CO	1380	7.83279	1387.83	2000 $\mu g/m^3$
5	Aliganj RS	PM	75.9	0.15587	76.05	100 $\mu g/m^3$
		NOx	21	0.74241	21.74	80 $\mu g/m^3$
		SO_2	9.9	0.0266	9.93	80 $\mu g/m^3$
		CO	1350	5.3864	1355.39	2000 $\mu g/m^3$
6	Baghelawala	PM	79.7	0.17982	79.88	100 $\mu g/m^3$
		NOx	20	1.02823	21.02	80 $\mu g/m^3$
		SO_2	10	0.02329	10.02	80 $\mu g/m^3$
		CO	1500	4.50107	1504.50	2000 $\mu g/m^3$
7	Gularia	PM	79.5	0.0404	79.54	100 $\mu g/m^3$
		NOx	21	0.15271	21.15	80 $\mu g/m^3$
		SO_2	11.8	0.00861	11.81	80 $\mu g/m^3$
		CO	1250	1.00996	1251.00	2000 $\mu g/m^3$
8	Kashipur	PM	116	0.06671	116.07	100 $\mu g/m^3$
		NOx	28	0.46941	28.47	80 $\mu g/m^3$

		SO_2	13.2	0.0105	13.21	80 µg/m^3
		CO	1880	3.02752	1883.03	2000 µg/m^3

Conclusion:

The maximum incremental GLCs due to the proposed project for various parameters are superimposed on the maximum baseline concentrations recorded during the study period and it is found that all the results are well within the permissible limits except the value of PM10 at Kashipur. Probable reasons for the same are emissions from the other industries, vehicular emissions and commercial activities near the project site.

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