# Sugar & Allied Industrial Summit - 2024

## Role of Sugar and Allied Industries in Circular Economy & Sustainability

**Date: 8th & 9th August 2024.**

**Venue: Dr. Shirname Hall, College of Agriculture, Pune**


**Organized by**

**Mahatma Phule Krishi Vidyapeeth College of Agriculture, Pune**
**MITCON Consultancy & Engineering Services Limited, Pune**
**Commissionerate of Sugar, Pune**
**The Environment Association of Maharashtra, Kolhapur**


## PREFACE

"Without cooperation, there is no salvation" - the emergence of sugar and allied industry as a major agriculture-based industry in the country.

The sugar industry in India has been a focal point for socio-economic development in the rural areas by mobilizing rural resources, generating employment and enhancing farm income. There are about 757 installed sugar factories in the country out of about 219 numbers of sugar factories are in Maharashtra. The sugarcane and sugar sector in India rank second in terms of agro-based industries, after cotton. India ranks first globally in sugar production. Apart from being the leading sugar producer, India is also the third-largest exporter of sugar in the world.

It is not only responsible for the livelihood of sugarcane farmers in rural areas but also provides employment to about 500 thousand workers in the sugar mills. Additionally, the gross value added from the sugar crop was about 806 billion Indian rupees in. However, the sector has been facing serious issues related to profitability as well as liquidity in the last few years due to depressed sugar prices inadequately covering cane prices and mismatch between sugarcane prices and sugar prices.

Present assessment of environment related reforms through national policy like charter implementation and environmental compensation along with Ethanol Blending Programme (EBP), Bio-CNG production from spent wash or press-mud etc has already been implemented so far.

Sugar industry in India has imparted significant contribution in the growth of agriculture and socio-economic status of the country. However, continuation of conventional practices owing to lack of awareness for environmentally sustainable technologies has led to the pollution in water resources resulting in degradation of environmental quality. Central Pollution Control Board & Government of India took initiative for minimizing the pollution load by formulating a charter and invoking environmental compensation for sugar industries.

Considering all these facts, MITCON Consultancy & Engineering Services Limited, Mahatma Phule Krishi Vidyapeeth, The Environment Association of Maharashtra and The Sugar Commissioner together are going to organize a Two-Day Summit on "Role of Sugar and Allied Industries In Circular Economy & Sustainability". The said conference will take place on the 8th and 9th August 2024.

This collaborative effort aims to provide a platform to create awareness, gain knowledge, interact, discuss and exchange views critical towards circular economy and sustainability. This monumental occasion will be blessed with presence of administrative officers, authorities from concerned central and state bodies, managing directors, scientists, legendary contributors, stakeholders and all of us giving it a holistic approach involving adoption of environment friendly technologies, technical guidance to the industries and respective stakeholders, optimum utilization of waste, and stringent managerial decisions.

The first day of the said conference will focus on climate change, sustainability and circular economy. The sessions will cover topics such as carbon footprint, circular bio-economy, carbon di oxide as a value-added product from fermentation in distillery, PDM: salt recovery from distillery liquid waste, carbon di oxide valorisation, green chemistry, soil conservation with some interesting case studies and success continued by panel discussion on the same.

The second day will involve discussion on recent trends in pollution control and energy transition in sugar & allied industry where some of the finest minds of their respective fields will conduct sessions which will make us introspect on environment and its protection.

| PROGRAM ITINERARY | |
|---|---|
| **THURSDAY, 08TH AUGUST 2024** | |
| **09:00 AM TO 10:00 AM** | **REGISTRATION AND BREAKFAST** |
| **10:00 AM TO 10:10 AM** | **Welcome** |
| **10:10 AM TO 12:30 PM** | **SESSION- I : INAUGURAL CEREMONY** |
| Chairman | Hon'ble Col. Dr. P. G. Patil, Vice Chancellor, M.P.K.V, Rahuri |
| Inaugurator | Hon'ble Dr. Chandrakant Pulkundwar, Divisional Commissioner, Pune |
| Chief Guest | Hon'ble Dr. Deepak Mhaisekar, Chairman, ,SEIAA, GoM |
| | Hon'ble Dr. Kunal Khemnar, Commissioner of Sugar, GoM |
| | Hon'ble Dr. Avinash Dhakane, Member Secretary, M.P.C.B., Mumbai |
| | Hon'ble Mr. Anand Chalwade, Managing Director, MITCON, Pune |
| | Hon'ble Dr. Vitthal Shirke, Director of Research, M.P.K.V, Rahuri |
| | Hon'ble Dr. Abhay Pimparkar, Director, Department of Environment, GoM |
| | Hon'ble Mr. B.B. Thombare, Chairman WISMA, Pune |
| | Hon'ble Mr. Sanjay Khatal, Managing Director, Maharashtra State Cooperative Sugar Factories Federation Ltd |
| | Hon'ble Adv.B.B. Jadhav, Chairman, Jakraya Sugars Ltd. Solapur |
| | Hon'ble Mr. N. Sheshagirirao Nara, Chairman, Sadguru Shri Sugar Factory Ltd. |
| | Hon'ble Mr. Ajit Chougule, Managing Director, WISMA, Pune |
| | Hon'ble Mr. Jitendra Mane Deshmukh, President, TEAM, Kolhapur |
| Introductory | Dr. Mahanand Mane, Associate Dean, College of Agriculture, Pune |
| | Dr. Dharmendrakumar Phalke, Assistant Professor (Soil Science) College of Agriculture, Pune |
| Vote of Thanks | Dr. Sandeep Jadhav, President, MITCON, Pune |
| Rapporteur | Dr. Mrunal Ajotikar, Assistant Professor, College of Agriculture, Pune |
| | Mr. Aditya Athavale, Assistant Vice President, MITCON, Pune |
| **12:35 PM TO 13:40 PM** | **SESSION- II : CLIMATE CHANGE & SUSTAINABILITY** |
| Chairman | Hon'ble Dr. Avinash Dhakane, Member Secretary, M.P.C.B.,GoM |
| Co-chairman | Hon'ble Mr. Anand Chalwade, Managing Director, MITCON, Pune |
| Rapporteur | Mr. Akash More, Assistant Vice President, MITCON, Pune |
| | Mr. Kalyan Gaikwad, Assistant Vice President, MITCON, Pune |
| 12:35 PM TO 12:55 PM | **Carbon Footprint: Steps to achieve net zero in sugar & allied industries.**<br>Mr. Dhawal Marghade, Assistant Vice President, Energy Transition Division MITCON. |
| 12:55 PM O 13:15 PM | **A Case Study: Circular bio-economy through bio-CNG as a value-added product.**<br>Mr. D.M. Raskar, CEO, Shreenath Mhaskoba Sakhar Karkhana Limited. |
| 13:15 PM TO 13:35 PM | **$CO_2$ valorization and green chemistry.**<br>Mr. Rahul Vaidya, Director, MITCON, Pune |
| 13:35 PM TO 13:40 PM | Vote of Thanks : Dr. Suraj Nalavade, Assisstant Professor, CSRS, Padegaon |
| **13:40 PM TO 14:40 PM** | **LUNCH** |
| **15:10 PM TO 16:35 PM** | **SESSION- III : CIRCULAR ECONOMY** |
| Chairman | Hon'ble Col. Dr. P. G. Patil, Vice Chancellor, M.P.K.V., Rahuri. |
| Co-chairman | Hon'ble Dr. Kunal Khemnar, Commissioner of Sugar, GoM |
| Rapporteur | Mr. Mukund Gharge, The Environment Association of Maharashtra, Kolhapur. |
| Rapporteur | Mr. Sandesh Deshmukh, MPKV College of Agriculture, Pune. |
| **15:10 PM TO 15:30 PM** | **A case study on PDM: Salt recovery from distillery liquid waste.**<br>Mr. Jayesh Parikh, Founder & CMD, Chem Process Pvt. Ltd. Ahmedabad, Gujrat |
| **15:30 PM TO 15:50 PM** | ***In situ* sugarcane residues and sugar industrial waste management for circular economy and environmental sustainability.**<br>Dr. D. H. Phalke, Principal Investigator and Associate Professor, CoA, Pune. |

| | |
|---|---|
| **15:50 PM TO 16:10 PM** | **Green technology for sugar industry** .<br>Dr. Sunil Dhole, Director, Chemist Group, Pune |
| **16:10 PM TO 16:30 PM** | **Value-added product from fermentation in distillery: A success Story of Jakraya.**<br>Mr. Sachin Jadhav, Managing Director, Jakarya Sugar Factory, Solapur |
| **16:30 PM TO 16:35 PM** | **Vote of thanks:** Dr. Avinash Gosavi, Professor (Soil Science), CoA, Pune |
| **16:35 PM TO 16:45 PM** | **TEA BREAK** |
| **16:45 PM TO 17:45 PM** | **ANNUAL GENERAL MEETING (AGM) OF THE ENVIRONMENT ASSOCIATION OF MAHARASHTRA.** |
| | Mr. Jitendra Mane Deshmukh, Chairman, TEAM |
| | Mr. Ashok Suryavanshi, Member Secretary, TEAM |
| **FRIDAY 09TH AUGUST 2024** | |
| **08:30 AM TO 09:00 AM** | **BREAKFAST** |
| | **SESSION- IV: INTROSPECTION ON ENVIRONMENT PROTECTION** |
| Chairman | Hon'ble Dr. Deepak Mhaisekar, Chairman, ,SEIAA, GoM |
| Co-chairman | Hon'ble Mr. Bipin Shrimali, CMD, MAHAPREIT, Mumbai |
| Rapporteur | Mr. Shrikant Kakade, Executive President, MITCON, Pune |
| Rapporteur | Mrs. Priyanka More, Chief Consultant, MITCON, Pune |
| **10:00 AM TO 10:30 AM** | Enactment of Greenbelt and CER in perspective of compliance -<br>Dr. Rahul Mungikar, Member, EAC Committee, Govt. of India. |
| **10:30 AM TO 11:00 AM** | Solar integration: Implementation & challenges<br>Mr. Harshad Joshi, CEO, MITCON, Pune |
| **11:00 AM TO 11:30 AM** | Construction of Solar Power projects in sugar mills.<br>Mr. Deepak Kokate, Director, MAHAPREET, Mumbai. |
| **11:30 AM TO 11:35 PM** | Vote of Thanks : Dr. Abhay Patil, Assistant Professor, College of Agriculture, Pune |
| **11:40 PM TO 14:50 PM** | **SESSION- V: RECENT TRENDS IN POLLUTION CONTROL IN SUGAR & ALLIED INDUSTRY** |
| Chairman | Hon'ble Dr. S. V. Patil, Member, EAC, MoEFCC, Govt. of India |
| Co-chairman | Hon'ble Dr. R.D. Dod, Professor & former Technical Member of SEIAA, GoM |
| Rapporteur | Mrs. Dr. Hemangi Nalavade, Vice President, MITCON, Pune |
| Rapporteur | Mrs. Deepa Bhandare, Director, TEAM, Kolhapur |
| **11:40 PM TO 12:05 PM** | **Advanced and emerging technologies for spent wash treatment.**<br>Dr. S.V. Patil, EAC Member, MoEF&CC Govt. of India |
| **12:05 PM TO 12:30 PM** | **Operational Troubleshooting of ETP & STP.**<br>Dr. E. P. Alhat, Vice President, MITCON |
| **12:30 PM TO 12:55 PM** | **A case study: SPOT Plant Efficiency.**<br>Mr. Sagar Patil, Environment Manager, Kranti Sugar, Sangli |
| **12:55 PM TO 13:20 PM** | **Air Pollution**<br>Dr. R.D. Dod, Professor & former Technical Member of SEIAA, GoM |
| **13:20 PM TO 13:25 PM** | **Vote of Thanks :** Dr. Deepak Savale, Assistant Professor, (Soil Science), CoA, Pune. |
| **13:25 PM TO 14:40 PM** | **LUNCH** |
| **14:50 PM TO 15:50 PM** | **SESSION- VI: CONCLUDING SESSION** |
| Chairman | Hon'ble Dr. Kunal Khemnar, Commissioner of Sugar, GoM |
| Co-chairman | Hon'ble Mr. Anand Chalwade, Managing Director, MITCON, Pune |

| | |
|---|---|
| Co-chairman | Hon'ble Dr. Mahanand Mane, Associate Dean, College of Agriculture, Pune |
| Rapporteur | Mr. Yash Jadhav, Manager, Business Development, MITCON, Pune. |
| Rapporteur | Nachiket Patil, Chief Consultant, MITCON, Pune. |
| **14:50 PM TO 15:55 PM** | Vote of Thanks: Dr. Dharmendrakumar Phalke |
| **15:55 PM TO 16:00 PM** | **National Anthem** |
| **16:00PM TO 16:30** | **Tea** |

## INSTRUCTIONS FOR THE ATTENDEES;

**Scan the following QR for downloading information about the summit.**

- **Invitation**
- **Brochures and Itinerary**
- **Photographs**
- **Session wise information**
- **YouTube Link**
- **The information on QR will get updated as the Summit progresses.**


# ALL SESSION PRESENTATION ARE COMPILED BELOW.

If any query call us at 02066289406
Or
Email at yash.Jadhav@mitconindia.com

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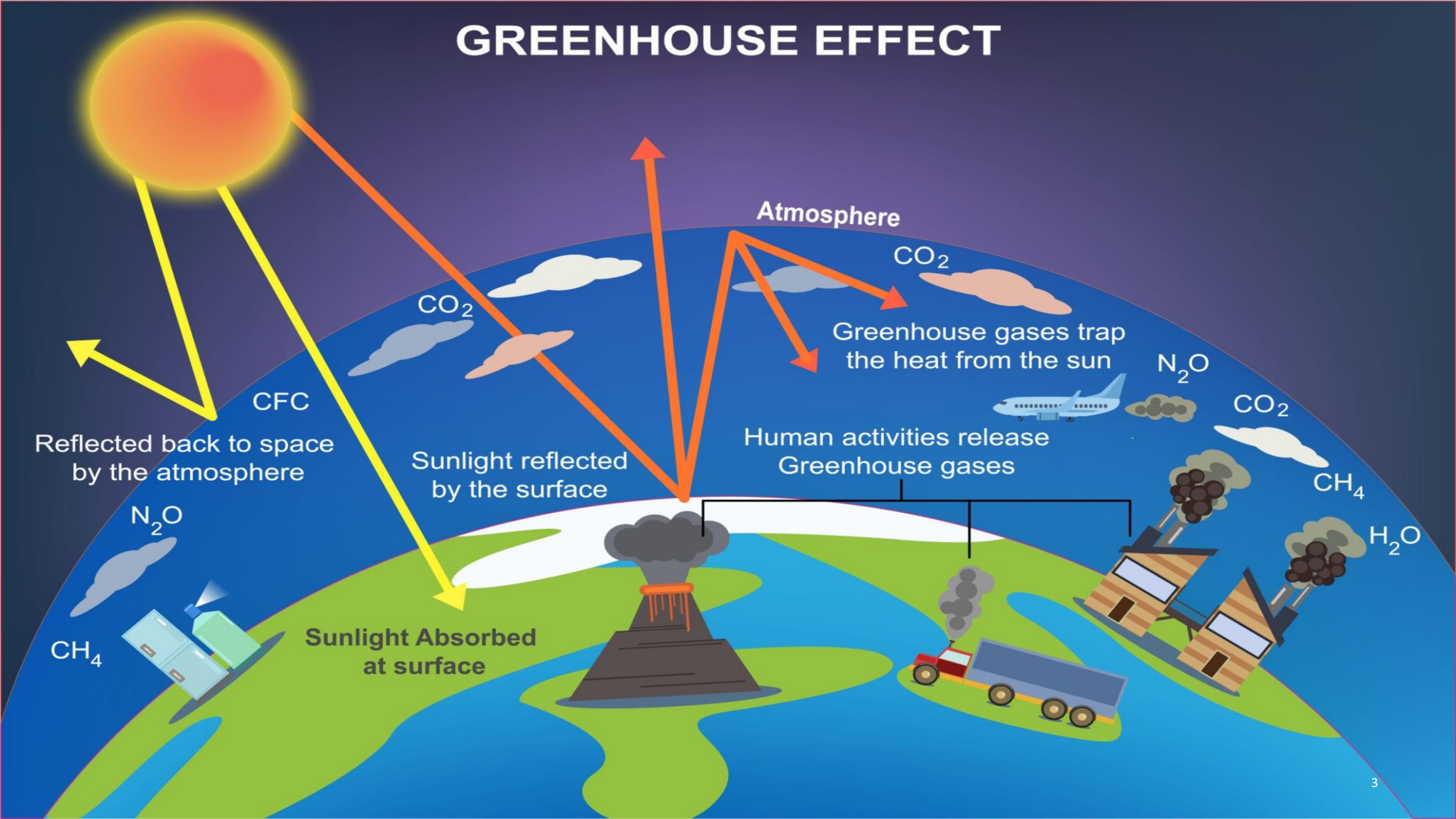
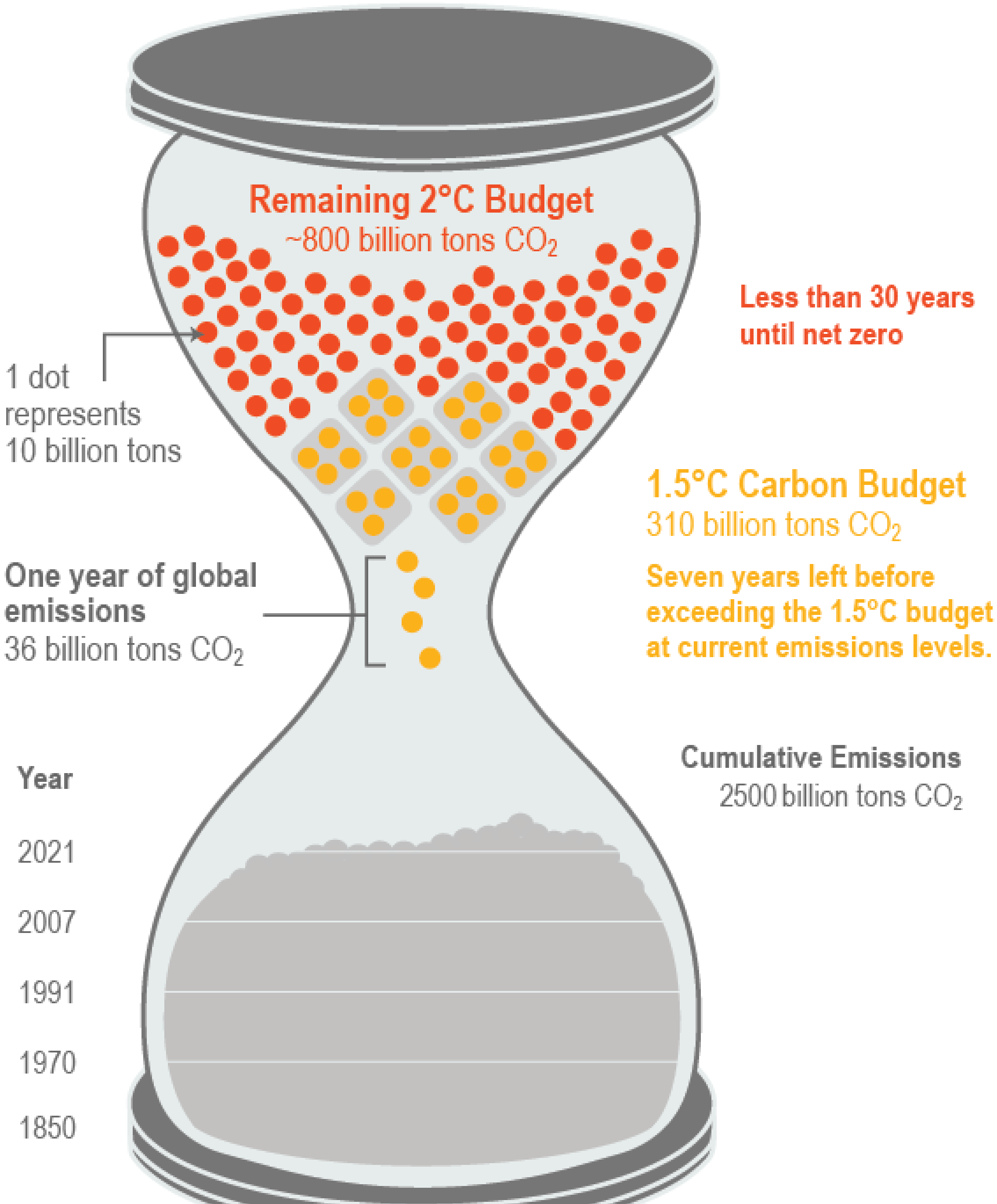
# MITCON Consultancy & Engineering Services Limited

## CARBON FOOTPRINT / GREENHOUSE GAS EMISSION INVENTORIZATION


GREENHOUSE EFFECT
Atmosphere
$CO_2$
$CO_2$
Greenhouse gases trap the heat from the sun
$N_2O$
$CO_2$
CFC
Reflected back to space by the atmosphere
Sunlight reflected by the surface
Human activities release Greenhouse gases
$CH_4$
$N_2O$
$H_2O$
$CH_4$
Sunlight Absorbed at surface

## Earth's Carbon Budget




| Impacts | 1.5 °C | 2 °C |
|---|---|---|
| % of Global Population facing Extreme Heat once every five years | 14% | 37% |
| Amount of Sea-Level Rise by 2100 | 0.40 m | 0.46 m |
| Species Loss – Plants that lose Half of their range | 8% | 16% |
| Species Loss – Insects that lose Half of their range | 6% | 18% |
| Amount of Earth's Land area where ecosystems will shift to a new biome | 7% | 13% |
| Decline in Coral Reef | 70-90% | 99% |
| Decline in Marine Fisheries | 1.5 Million tonnes | 3 Million tonnes |

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# GREENHOUSE GASES

| Greenhouse Gases | Chemical Formula | Major Sources |
|---|---|---|
| Carbon dioxide | $CO_2$ | Fossil fuel combustion (coal, oil, natural gas), deforestation, industrial processes, cement production |
| Methane | $CH_4$ | Fossil fuel combustion, Biomass burning, agricultural activities, landfills, coal mining |
| Nitrous oxide | $N_2O$ | Agricultural activities (fertilizer use), fossil fuel combustion, Biomass burning industrial processes, wastewater treatment |
| Hydro fluorocarbons | HFCs | Industrial processes (refrigeration, air conditioning, foam blowing agents) |
| Per fluorocarbons | PFCs | Industrial processes (aluminum production, semiconductor manufacturing) |
| Sulphur hexafluoride | $SF_6$ | Electrical transmission and distribution systems (insulating gas), magnesium production |
| Nitrogen Tri-flouride | $NF_3$ | Semiconductor manufacturing, LCD panel production |

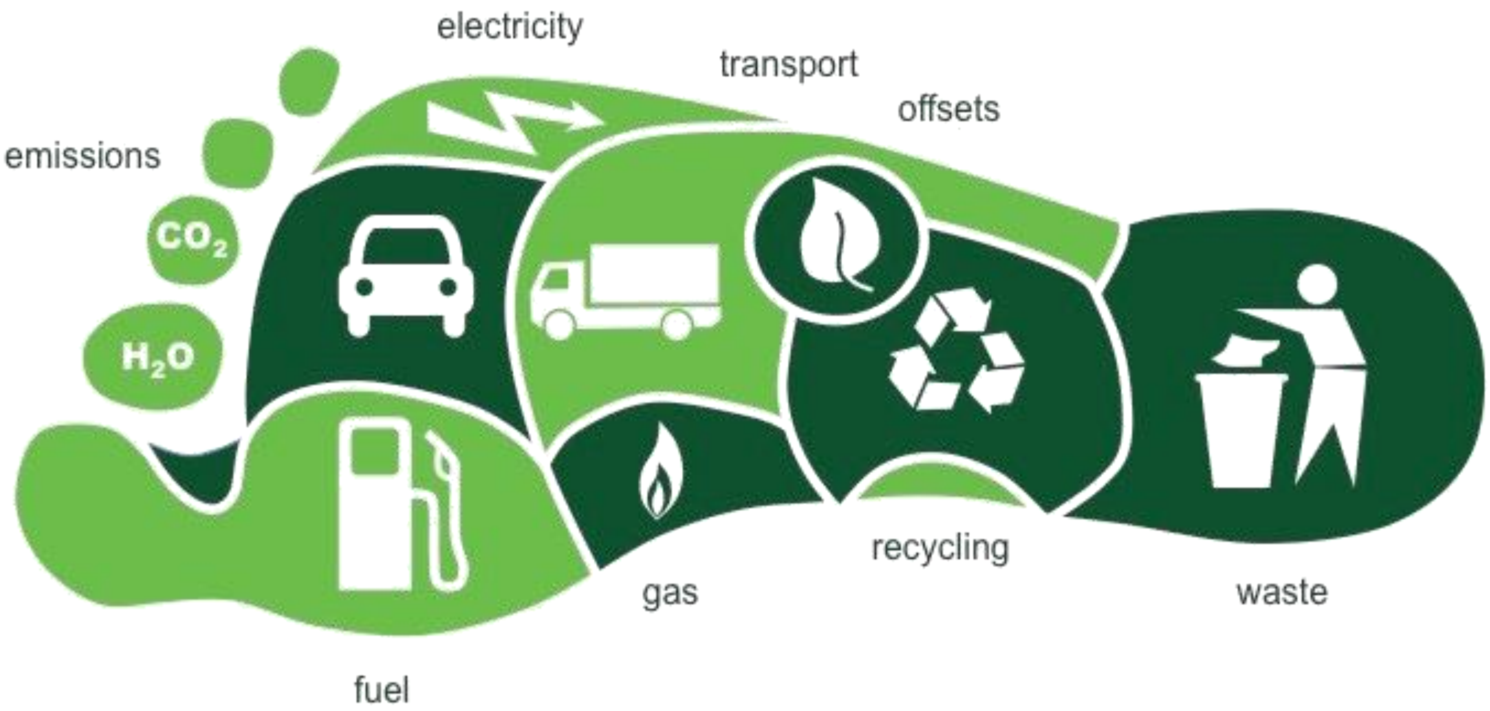
# GREENHOUSE GASES

| Greenhouse Gases | Chemical Formula | Global Warming Potential | Atmospheric Lifetime (Years) |
|---|---|---|---|
| Carbon dioxide | $CO_2$ | 1 | 50 – 200 |
| Methane | $CH_4$ | 28 | 12 |
| Nitrous oxide | $N_2O$ | 273 | 110 |
| Hydro fluorocarbons | HFCs | 4 – 14,600 | 1 – 228 |
| Per fluorocarbons | PFCs | 3,000 – 12,400 | 2,000 – 50,000 |
| Sulphur hexafluoride | $SF_6$ | 25,200 | 3,200 |
| Nitrogen Tri-flouride | $NF_3$ | 17,400 | 569 |

# CARBON FOOTPRINT

A carbon footprint is a measure of the impact our activities have on the environment, and in particular climate change. It relates to the amount of greenhouse gases produced in our day-to-day lives through burning fossil fuels for electricity, heating and transportation etc.

It is a measurement of 7 greenhouse gases we produce and unit is tons (or kg) of **carbon dioxide equivalent (CO2e)**



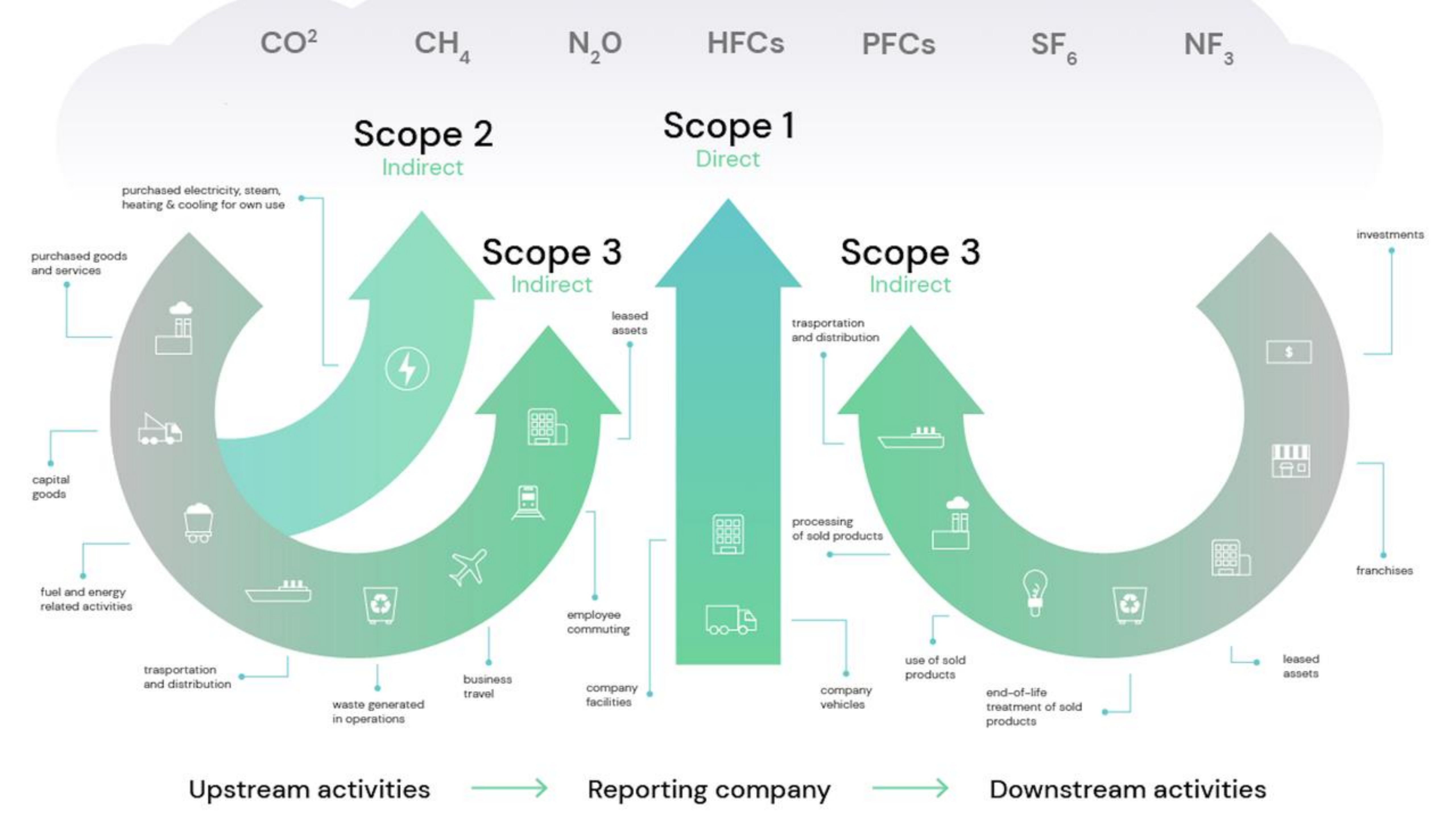
# CARBON NEUTRALITY AND NET ZERO

## Carbon Neutrality

- Focus on removal of **Carbon Emissions** as the amount produced
- Balancing Emissions with Carbon Offsets/Credits

## Net Zero

- Focus on removal of all **GHGs** as the amount produced
- Prioritize reduction, then offset residual emissions


$CO^2$
$CH_4$
$N_2O$
HFCs
PFCs
$SF_6$
$NF_3$
Scope 2
Indirect
Scope 1
Direct
Scope 3
Indirect
Scope 3
Indirect
purchased electricity, steam, heating & cooling for own use
purchased goods and services
capital goods
fuel and energy related activities
trasportation and distribution
waste generated in operations
business travel
employee commuting
leased assets
company facilities
company vehicles
trasportation and distribution
processing of sold products
use of sold products
end-of-life treatment of sold products
leased assets
franchises
investments
Upstream activities
Reporting company
Downstream activities

| Upstream or downstream | Scope 3 (Supply Chain Emissions) |
|---|---|
| Upstream | 1. Purchased goods and services<br>2. Capital goods<br>3. Fuel- and energy-related activities (not included in scope 1 or scope 2)<br>4. Upstream transportation and distribution<br>5. Waste generated in operations<br>6. Business travel<br>7. Employee commuting<br>8. Upstream leased assets |
| Manufacturing Process | |
| Downstream | 9. Downstream transportation and distribution<br>10. Processing of sold products<br>11. Use of sold products<br>12. End-of-life treatment of sold products<br>13. Downstream leased assets<br>14. Franchises<br>15. Investments |

# REPORTING STANDARDS

ISO 14064

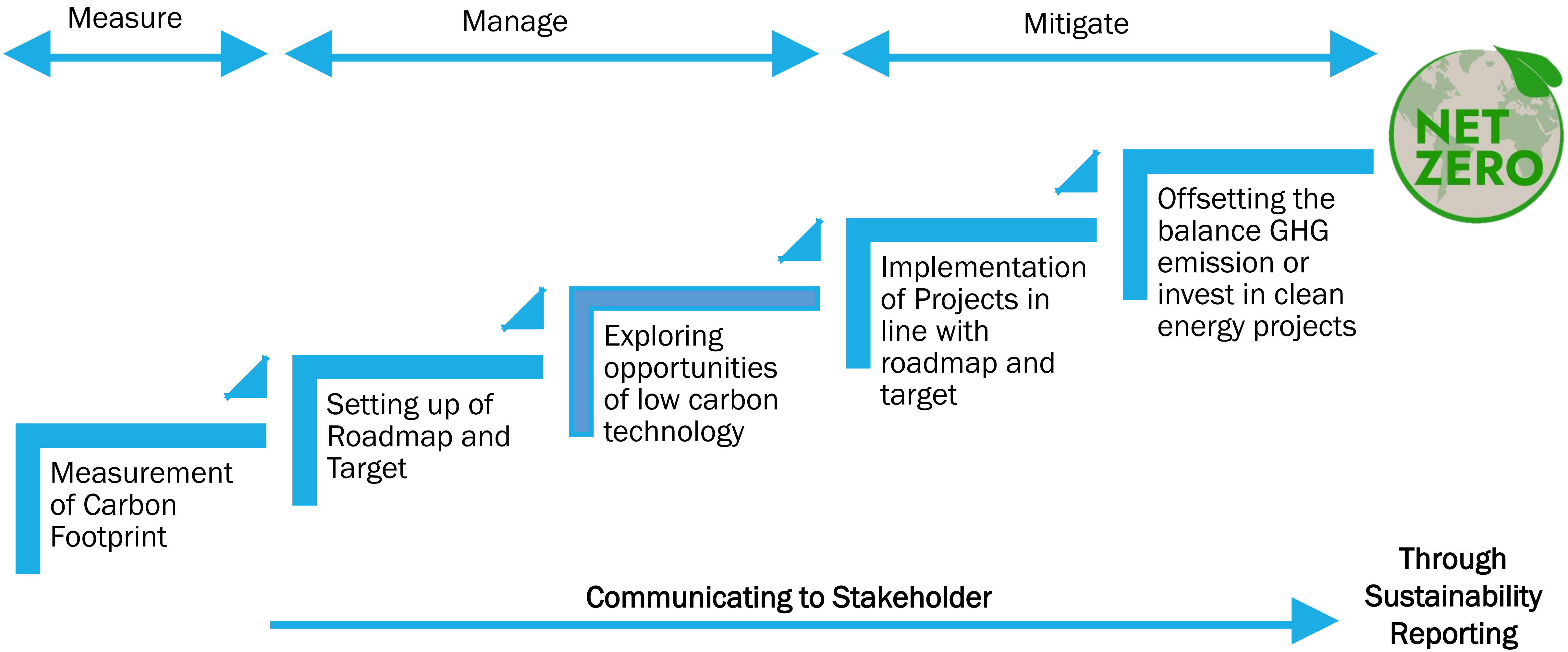
- ISO 14064-1:2018 – Organization Level quantification and reporting of GHGs
- ISO 14064-2:2019 – Project Level quantification and reporting of GHGs
- ISO 14064-3:2019 - Verification and validation of greenhouse gas statements

GREENHOUSE GAS PROTOCOL

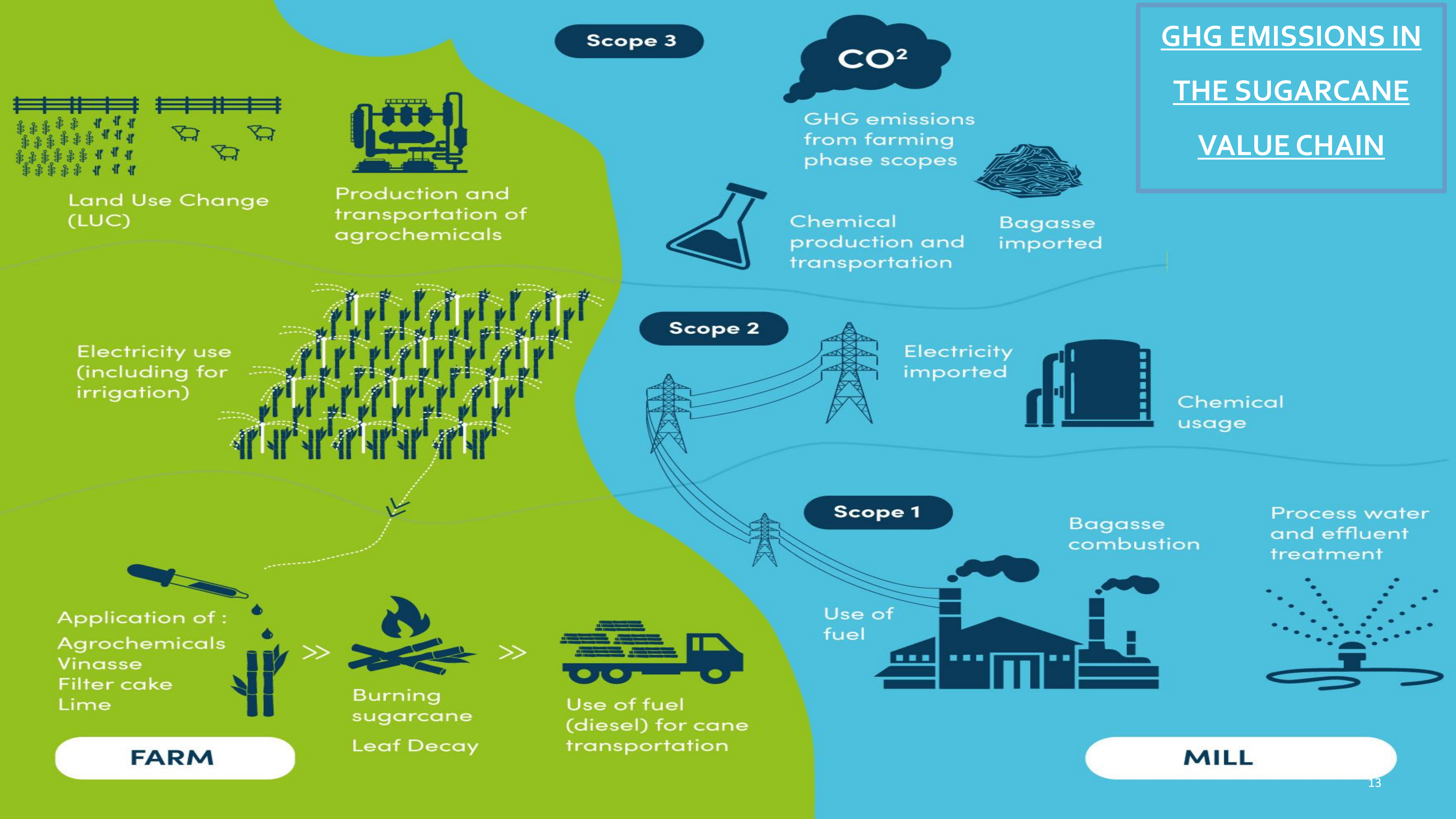
For Companies and Organizations

- Corporate Standard
- Corporate Value Chain (Scope 3) Standard

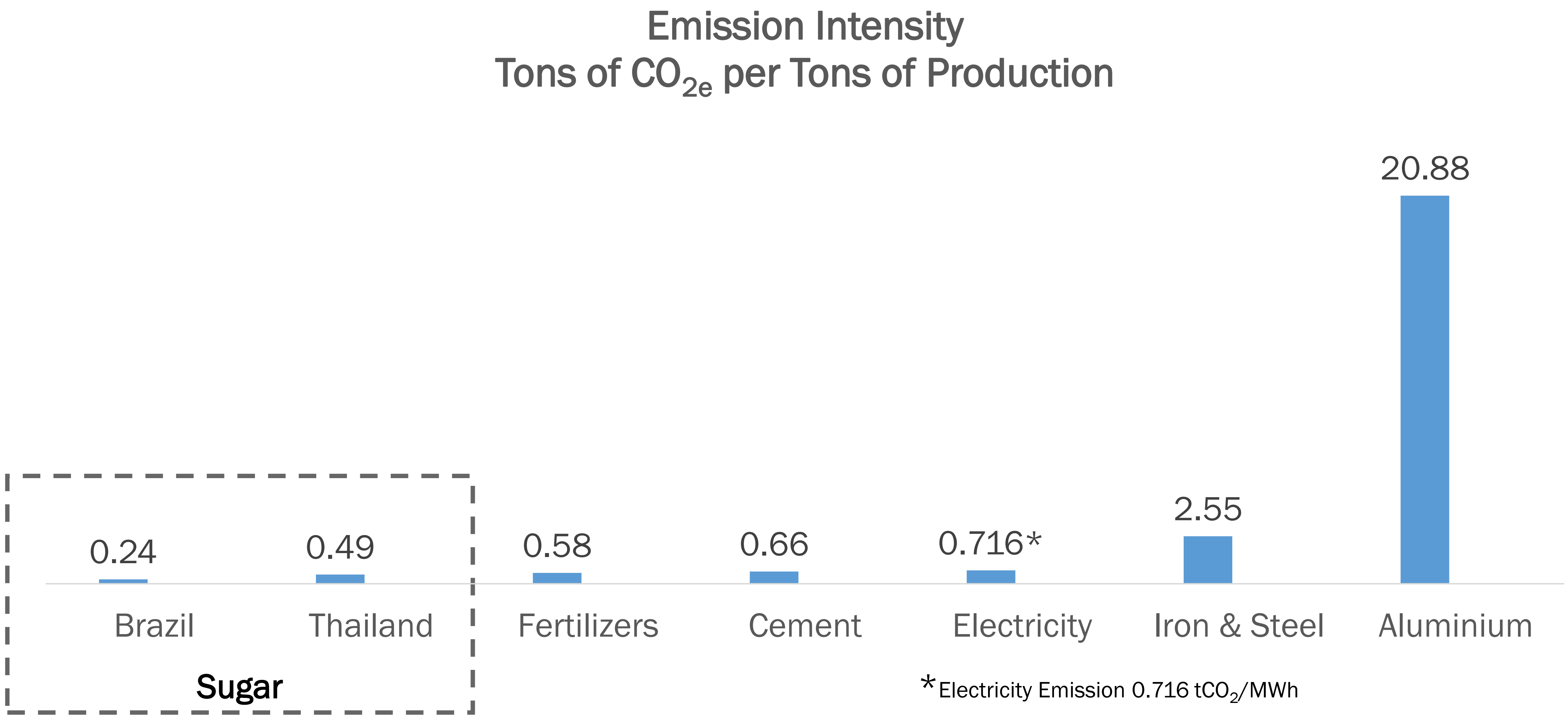
# PATHWAY TO NET ZERO



# GHG EMISSIONS IN THE SUGARCANE VALUE CHAIN



# GHG EMISSION INTENSITIES COMPARISON




*Electricity Emission 0.716 $tCO_2$/MWh

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# Thank you!


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SHREENATHNAGAR, PATETHAN, TAL.-DAUND, DIST- PUNE.
WELCOME

# SMSKL - Complex at a Glance

- First Pvt. Sector sugar factory in Pune District (MH)
- Factory Capacity : 4500 TCD (Proposed 7500 TCD)
- Co-gen Capacity : 10 MW (Proposed 20 MW)
- Distillery Capacity : 200 KLPD
- 2G Ethanol R&D Plant : 3000 L/Day
- CBG Plant Capacity : 10 MT/Day
- $CO_2$ Plant : 40 MT/Day
- Compost Production : 20000 - 25000MT/Annum

# Title

## Circular Bioeconomy through Bio-CNG as a value added product.

= Presented by =


**D.M.Raskar**

**Chief Executive Officer**

**Shreenath Mhaskoba Sakhar Karkhana Ltd.**


# OVERVIEW

Bio-CNG is a sustainable fuel derived from organic waste like Spent wash, Pressmud, agricultural Waste, food scraps, and sewage sludge.

It offers numerous benefits: high calorific value for efficient energy production, reduced emissions compared to traditional fuels, and cost-effectiveness by leveraging local waste materials.

The Indian government has introduced the CBG Blending Obligation to promote Bio-CNG use, aiming for 5% blending by 2028-29 to cut LNG imports and foster a circular economy.

# Who will produce Bio-CNG?


- Having Sugar Factory.
- Having Distillery.
- Having Biomass.

# ECONOMICAL UTILIZATION OF METHANE GAS (BIOGAS)


Use in Boiler as Axillary fuel

Use in Engine for Power Generation

Use to produce Bio-CNG (CBG)

# PROBABLE FEED STOCKS FOR PRODUCTION OF BIO-CNG

| Sr. No. | Feedstock | Traditional Use | Economical Use |
|---|---|---|---|
| 1. | Pressmud | 1. Direct use in farm as fertilizer | Methane gas Generation followed Bio CNG Production |
| 2. | Spent wash | 1. Spraying on pressmud for Composting.<br>2. In incineration Boiler.<br>3. Controlled land application. | |
| 3. | Nepier grass | 1. Cattle fodder | |
| 4. | Cow dung | 1. Compost<br>2. Slurry as Bio- Fertiliser | |
| 5. | Bagasse | 1. As a fuel for power generation (Difficult to digestion) | |
| 6. | Other Biomass from farm, vegetable market waste, City wet waste | 1. Burning, dumping at depots | |

# SMSKL– CBG PLANT DETAILS

1. Capacity – 10 TPD
2. Raw material – Spent wash from CH/BH route (550-580 $m^3$/day)
3. Type of Anaerobic Digester – CSTR (Central Stirrer Tank Reactor)
4. Biogas generation from spent wash – 25000 $Nm^3$/Day (1042 $Nm^3$/Hr.)

# SMSKL– CBG PLANT DETAILS CONT…

## 5. Components of CBG Plant-

i. H2S Removal System (Iron Chelating Chemical Process)

   a. Filter Press for Sulphur Separation

   b. Gas wash Tower

ii. Low Pressure Compressor (8 Bar)

   - 1st Stage – 0.1 Bar to 2 Bar
   - 2nd Stage – 2 Bar to 8 Bar

   a. $CO_2$ Removal System (Chilled Water Scrubbing)

   b. Water Chiller (Temp. 9-11 °C)

iii. Biogas Drying System

iv. Odorant Addition for detecting of gas leakages

v. High Pressure Compression (250 Bar)

   - 1st Stage – 7-5 Bar to 50 Bar
   - 2nd Stage – 50 Bar to 160 Bar
   - 3rd Stage – 160 Bar to 250 Bar

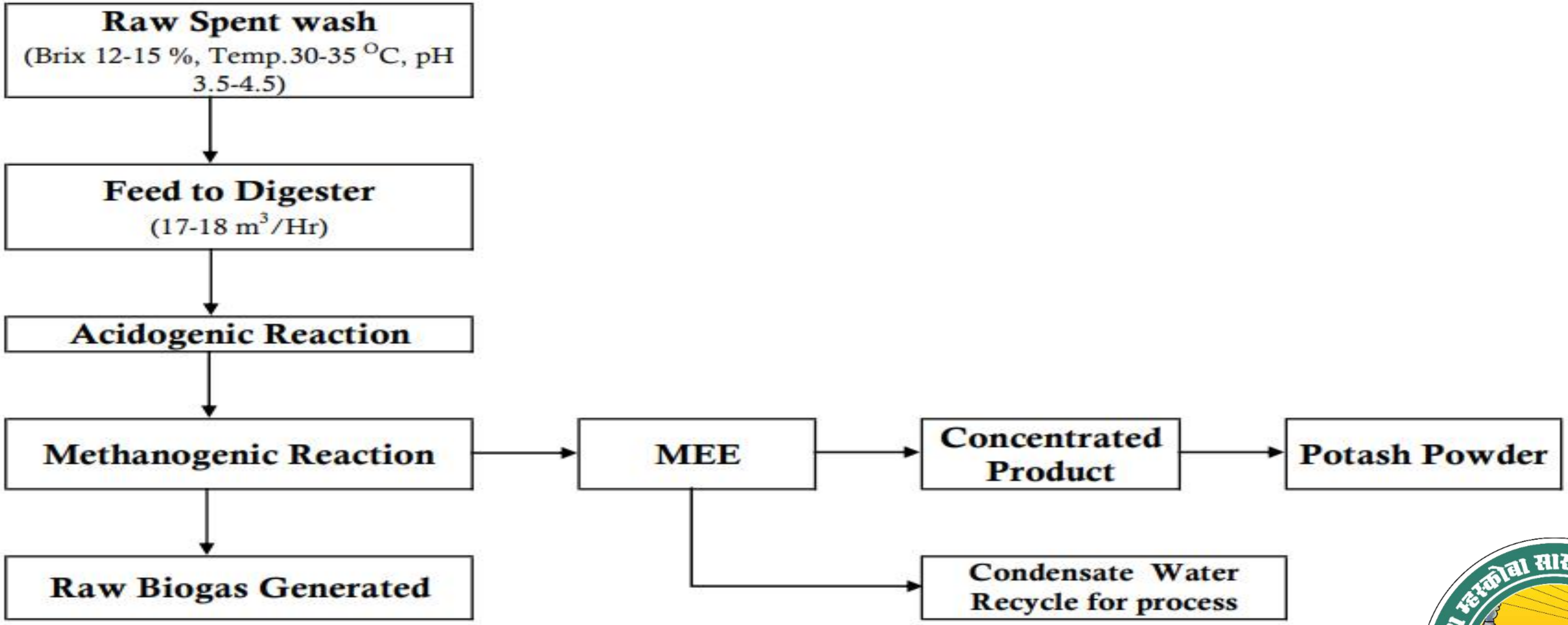
vi. High Pressure Cascade for storage of Methane gas (CBG)

श्रीनाथ म्हस्कोबा साखर कारखाना लि.
पाटेठाण, दौंड, पुणे (महा.)
॥ आमच्या सेवा साखरे पेक्षा गोड असतात ॥

# LIST OF CHEMICALS USED FOR CBG

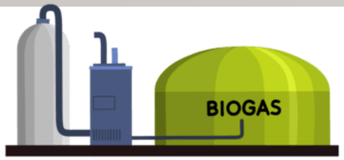
| Sr. No. | Chemical Name | Specifications |
|---|---|---|
| 1. | Di-sodium Salt (EDTA) | 2NA EDTA with 99% purity |
| 2. | Sodium Carbonate ($NA_2CO_3$) | Industrial grade |
| 3. | Un-hydrous Ferric Chloride ($FECL_3$) | Industrial grade |
| 4. | Tri-sodium Citrate | 99.0 to 100 (on anhydrous basis) |

# FLOW CHART OF RAW BIOGAS PRODUCTION



# BIO DIGESTER

**Capacity :- 12500 $M^3$**
**Feed Rate :- 18 $M^3$ / Hr**



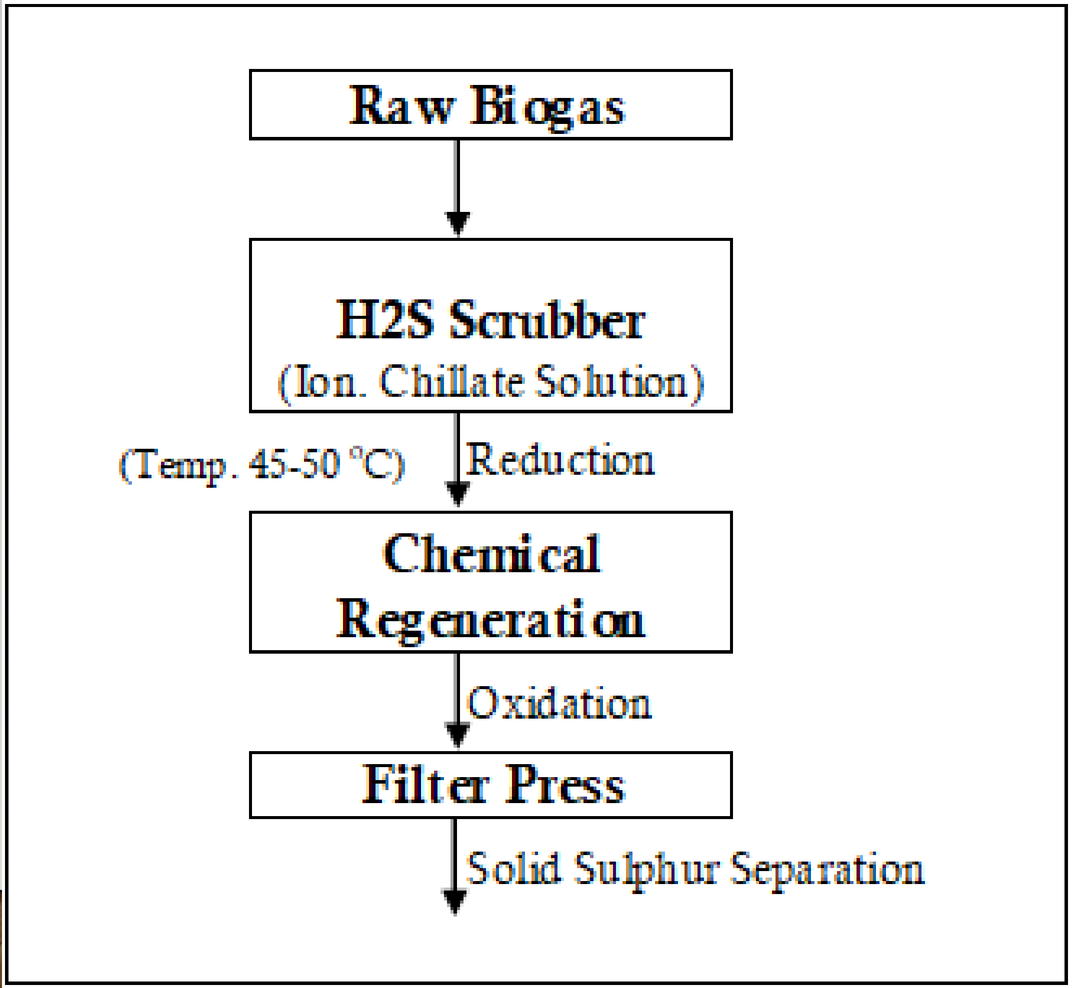

# RAW BIOGAS COMPOSITION (SPENT WASH)

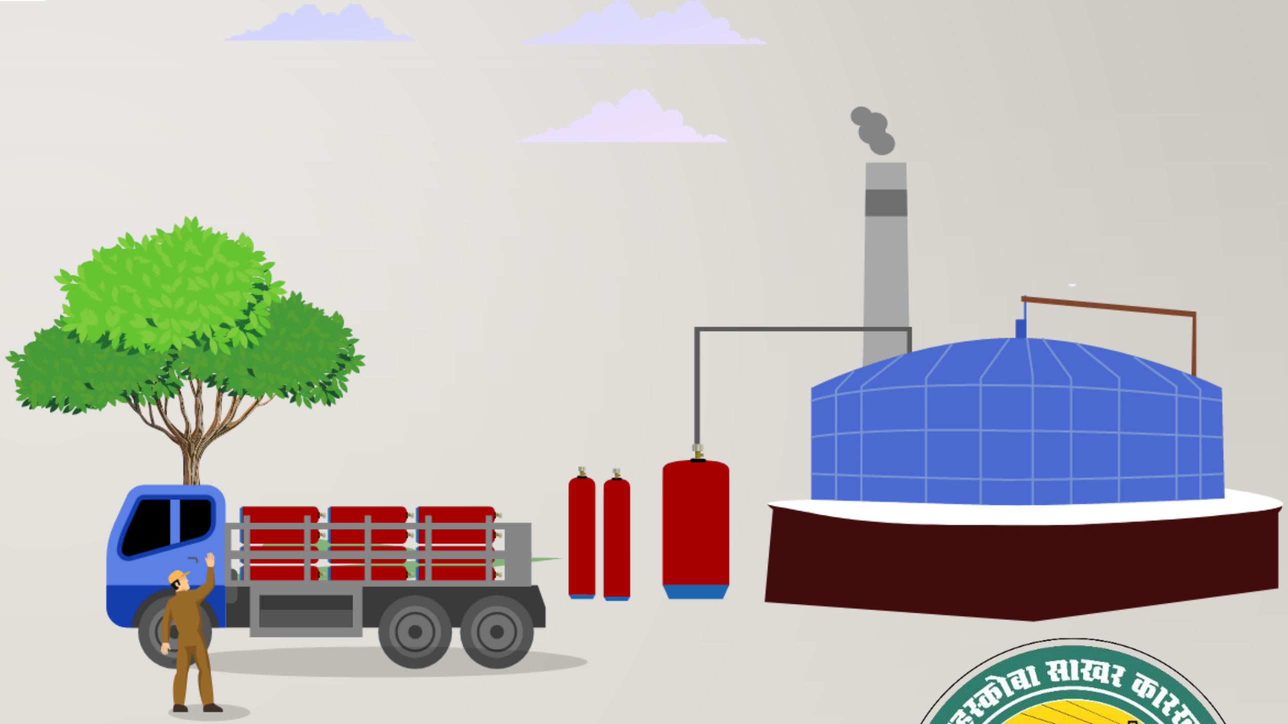
| | | |
|---|---|---|
| 1. | Methane ($CH_4$) | 55-60 % |
| 2. | Carbon Dioxide ($CO_2$) | 30-35 % |
| 3. | Hydrogen Sulphide ($H_2S$) | 2-5 % |
| 4. | Water | 1-2 % |

# HOW BIOGAS CONVERTED INTO BIO-CNG (CBG)?

# HOW BIOGAS CONVERTED INTO BIO-CNG (CBG)?

## I. H2S scrubbing by Ion exchange



# HOW BIOGAS CONVERTED INTO BIO-CNG (CBG)? CONT…

## I. H2S scrubbing by Ion exchange

### ➢ Merits

a. Ions targets $H_2S$ from gas stream offering high sensitivity.

b. It is regenerable chemical process.

c. Ion Exchange ease to operation.

d. Ion Exchange achieves high efficiency.

e. It is compatible with high amount of H2S

### ➢ Demerits

a. Requires continues regeneration.

b. Process is slightly costly.

# $H_2S$ REMOVAL SYSTEM

# HOW BIOGAS CONVERTED INTO BIO-CNG (CBG)? CONT…

## II. CO2 Removal By Chilled Water scrubbing

- Sweet biogas fed to CO2 scrubber operated under pressure at 15 to 20 deg C temperature.

- Scrubber water temperature is maintained by using chiller. $CO_2$ from biogas will dissolved /absorbed in the water due to low temperature.

- The scrubbed water will flash in the regeneration column at atm pressure to release CO2 and recycle water back to scrubber. The RO water is used for make up to CO2 scrubber.

- CO2 recovery up to 97%.

# HOW BIOGAS CONVERTED INTO BIO-CNG (CBG)? CONT…

## II. CO2 Removal By Chilled Water scrubbing

### ➢ Merits

a. Water scrubbing is a well-established and efficient method for CO2 capture.

b. Water is readily available and inexpensive, making it a cost-effective solvent.

c. It can handle high CO2 concentrations and large gas flow rates.

d. The process is flexible and can be tailored to different industrial applications.

### ➢ Demerits

a. Requires high pressure

b. Requires pre-treatment

# $CO_2$ REMOVAL SYSTEM

श्रीनाथ म्हस्कोबा साखर कारखाना लि.
पाटेठाण, दौंड, पुणे (महा.)
॥ आमच्या सेवा साखरे पेक्षा गोड असतात ॥

# HOW BIOGAS CONVERTED INTO BIO-CNG (CBG)? CONT…

## III. Removal of H2S By using Biological scrubbing (Thiobacillus bacteria)

- ✓ Biological scrubbing, also known as biological desulfurization or bio desulfurization, is a method used for the removal of sulfur compounds from gas streams using microorganisms. like Thiobacillus bacteria. This process utilizes the metabolic activity of bacteria to convert sulfur into gaseous form to Liquid form.

- ✓ In this process Thiobacillus bacteria's pretreatment with caustic soda to maintain bacteria's alkali nature.

# HOW BIOGAS CONVERTED INTO BIO-CNG (CBG)? CONT…

## III. Removal of $H_2S$ By using Biological scrubbing (Thiobacillus bacteria)

### Merits

a. Consumes less energy compared to thermal or chemical scrubbers.

b. Flexible for various gas application

c. Lower operational and maintenance costs

d. Safer for operators due to reduced handling of hazardous chemicals.

### Demerits

a. Biomass growth can lead to clogging of the system, requiring regular cleaning.

b. Generates biomass that needs to be periodically removed and properly managed.

c. Continuous supply of nutrients is necessary to sustain microbial activity.

d. Microorganisms are sensitive to changes in temperature, pH, and pollutant load.

e. Takes time to establish a stable microbial community for effective pollutant removal.

f. Biological scrubbers can require more space compared to chemical scrubbers.

# HOW BIOGAS CONVERTED INTO BIO-CNG (CBG)? CONT…

## IV. Pressure Swing Adsorption (PSA)

- **Pressure Swing Adsorption (PSA)is an effective method for purifying Compressed Biogas (CBG) by selectively adsorbing impurities like $CO_2$, $H_2S$, and water vapor using adsorbents such as activated carbon or zeolites.**

- **The process involves compressing the biogas, passing it through adsorption vessels to separate methane, and then regenerating the adsorbent by reducing pressure to release the trapped impurities.**

- **PSA is useful for separation of H2S and CO2 gases**

# HOW BIOGAS CONVERTED INTO BIO-CNG (CBG)? CONT…

## IV. Pressure Swing Adsorption (PSA)

- **Merits**

  a. Efficiently removes CO2, H2S, and water vapor.

  b. Multiple vessels allow for uninterrupted purification.

  c. Achieves methane purity levels up to 99%.

- **Demerits**

  a. Requires periodic replacement of adsorbent materials.

  b. High setup costs.

  c. Complicated for maintenance

# HOW BIOGAS CONVERTED INTO BIO-CNG (CBG)? CONT…

## V. Amination by Triethyl amines

- **Biogas purification by triethylamine typically involves its use as a selective absorbent for the removal of acidic gases such as carbon dioxide ($CO_2$) and hydrogen sulfide ($H_2S$) from biogas streams. Triethylamine (TEA) is a tertiary amine with basic properties, which makes it effective in chemically binding with acidic gases.**

- **The dissolved gasses will be separated by distillation of amines solution.**

- **The method is convenient with both gases Carbon Dioxide and Sulphur Dioxide.**

# HOW BIOGAS CONVERTED INTO BIO-CNG (CBG)? CONT…

## V. Amination by Triethyl amines

**Merits**

a. Efficient removal of hydrogen sulfide ($H_2S$), a toxic gas.

b. Low energy consumption during purification.

c. Selective absorption of $H_2S$ over other gases.

d. Easy handling as a liquid at room temperature.

e. Environmental benefits by reducing sulfur emissions.

f. Cost-effective compared to alternative methods.

g. Scalable for different sizes of biogas facilities.

**Demerits**

a. Triethylamine can be corrosive to certain materials and equipment.

b. It requires careful handling due to its toxicity and odor.

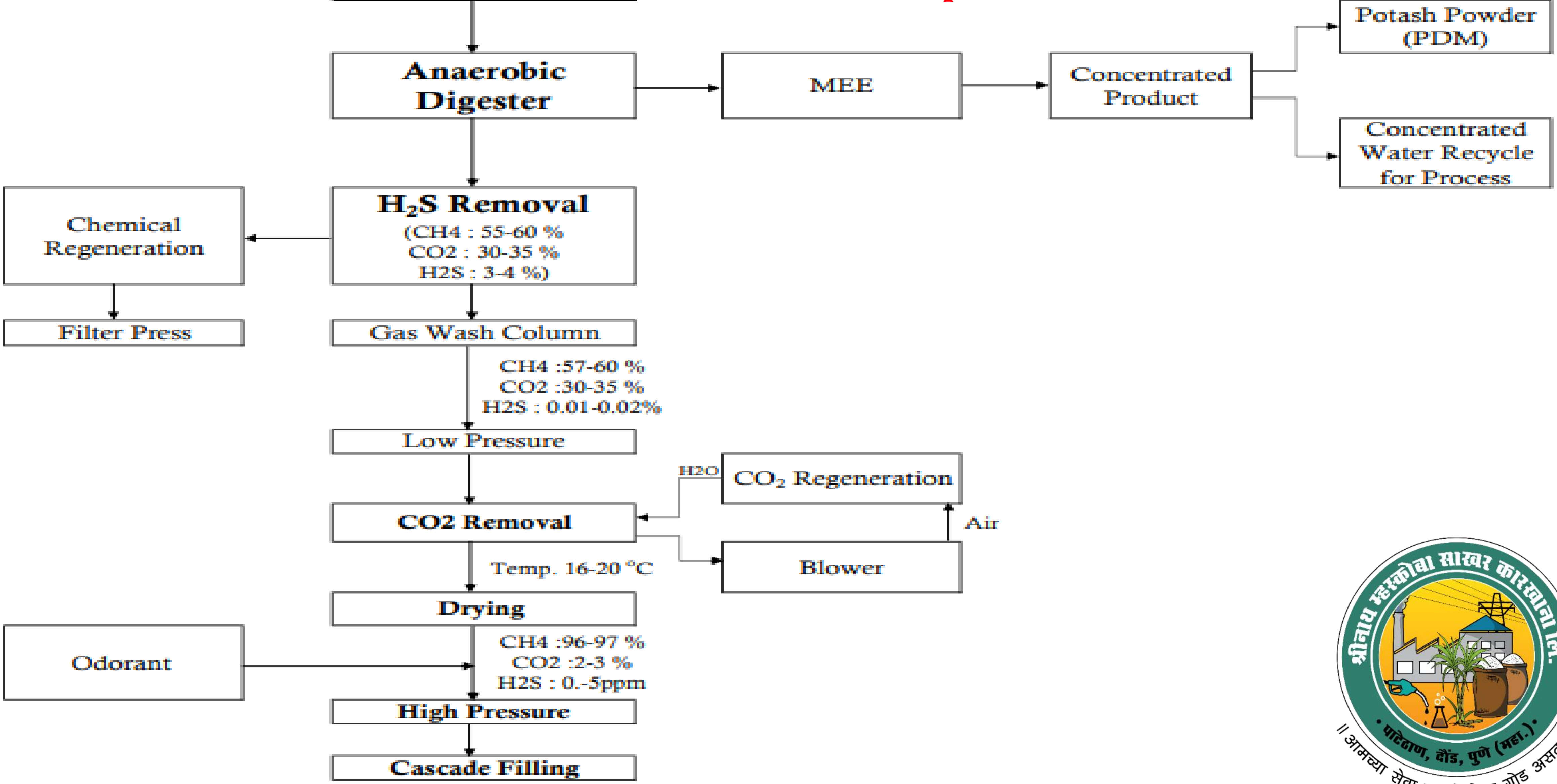
c. Exposure can lead to respiratory and skin irritation.

d. Disposal of spent triethylamine solutions may require special treatment.

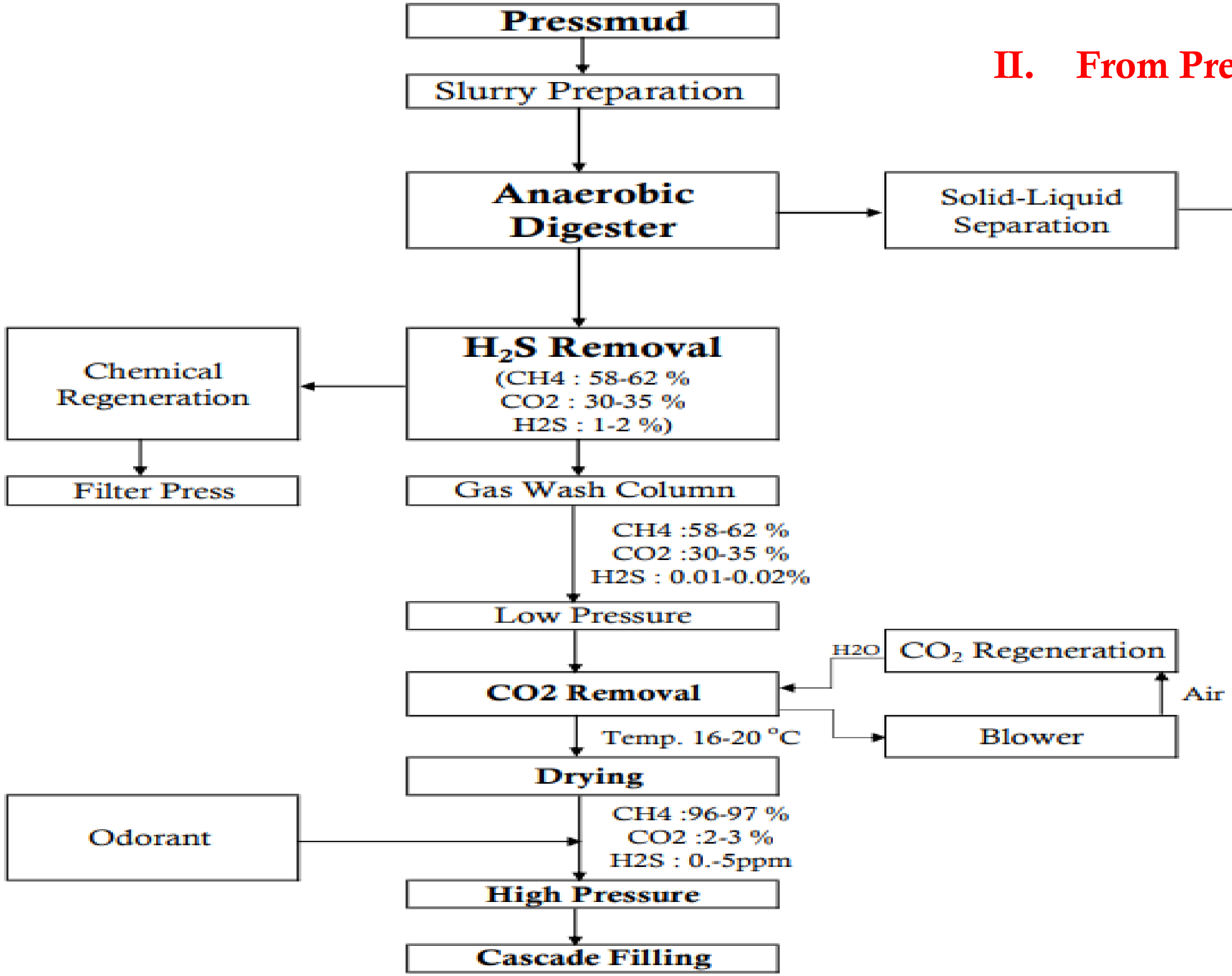
e. Initial setup costs and ongoing maintenance can be significant.

# PROCESS FLOW CHART FOR CBG

## I. From Spent wash.



# II. From Pressmud

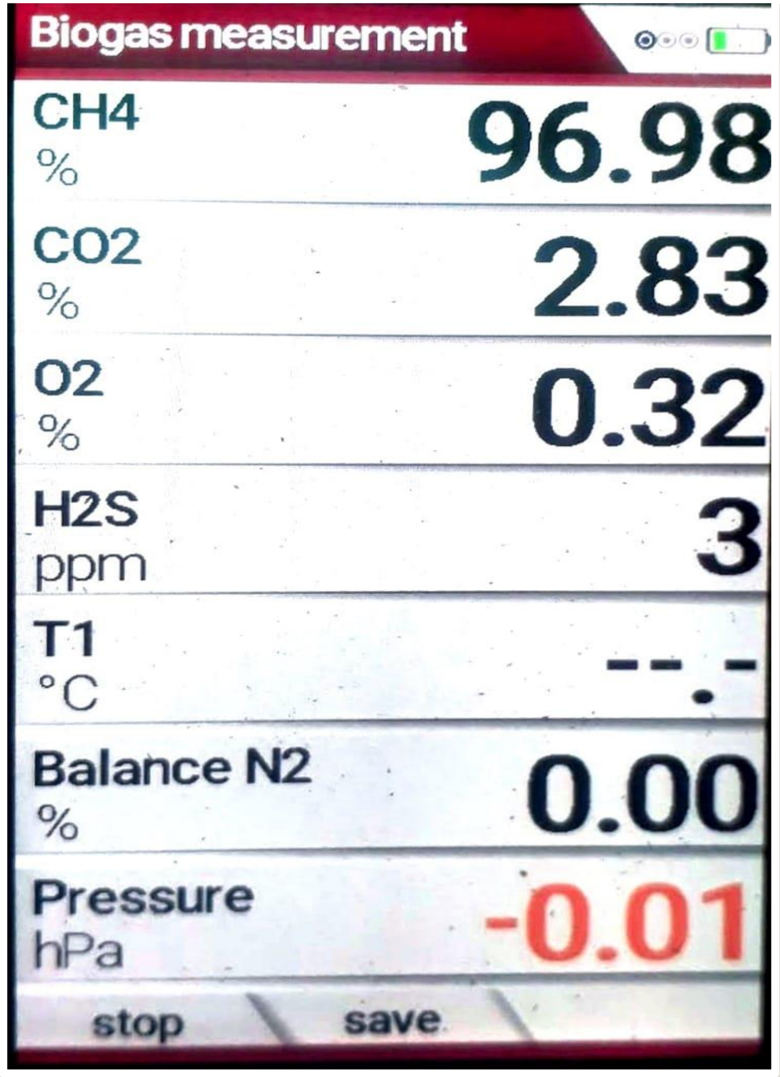



# PROCESS FLOW CHART FOR CBG

# COMPRESSED BIOGAS (BIO-CNG) COMPOSITION

| Parameters | Bio-CNG as per IS 16087 (2016) | CBG Parameters Achieved |
|---|---|---|
| $CH_4$ Methane min. | >90% | 97-98% |
| Moisture mg/m3 | < 5 | < 5 |
| Total sulfur / $H_2S$ mg/m3 | < 20 | 1-2 |
| Oxygen | < 0.5% | 0.0001 |
| $CO_2$ | < 4 | 3-4% |
| Gross calorific Value (GCV) Kcal/kg | - | 13018.32 |
| Net calorific value (NCV) Kcal/Kg | - | 11707.08 |
| Density KG/m3 | - | 0.715 |

# BIO-CNG ANALYSIS RESULT




# WHAT IS CASCADE

## ➢ Cascade

- Cascades is bunch of cylinders arranged systematically on an iron structure. These cylinders are made by Iron, Aluminum lined, carbon fiber wrapped material make with a specific standard and process. Each cylinder is manufactured and tested as per stringent guidelines of PESO.
- Cascade are made with three storage bank system with Non return valves. These are low, medium and high banks to make safer to use.

### ➢ Types of Cascades

a) Type 1 Cascade

b) Type 2 Cascade

c) Type 3 Cascade

d) Type 4 Cascade

# CASCADE SPECIFICATIONS

| Mobile Cascade details | Type-1 | Type-1 | Type-3 | Type-4 |
|---|---|---|---|---|
| Cascade capacity (Water liters) (Approx.) | 3000 | 4500 | 9000 | 9000 |
| Cascade Dimensions (meters) (L X B X H) (Approx.) | 3.5 X 1.87 X 1.93 | 5.25 X 1.87 X 1.93 | 2.99 X 2.43 X 2.59 | 5.24 X 1.9 X 2.4 |
| Cascade weight (Approx.) (MT) (Approx.) | 5.8 | 8.85 | 6.50 | 4.988 |
| CNG weight @ 255 BARS (MT) @ 15C (Approx.) | 0.538 | 0.806 | 1.872 | 2.176 |
| Total Weight (Cascade + CNG) (MT) (Approx.) | 6.338 | 9.656 | 8.372 | 7.164 |
| Ratio (CNG filled to Cascade Weight '%') | 9.27% | 9.11% | 28.80% | 43.62% |
| GVW and Payload of CNG Trucks in India* | GVW-10.9 MT<br>Payload-6.8 MT | | GVW-14.2 MT<br>Payload-9.4 MT | GVW-14.2 MT<br>Payload-9.4 MT |
| GVW and Payload of HSD Trucks in India* | | GVW-14.2 MT<br>Payload-9.4 MT | | |
| Truck dimensions (Meters) (L X B) | 5.15 X 2.25 | 5.8 X 2.45 | 5.8 X 2.45 | |

*As Per rules Trucks can carry maximum weight which is 5% of allowable limit

# PHOTO OF CASCADE WITH VEHICLE


श्रीनाथ म्हस्कोबा साखर कारखाना लि.
पाटेठाण, दौंड, पुणे (महा.)
॥ आमच्या सेवा साखरे पेक्षा गोड असतात ॥

# PROCUREMENT PRICE FOR CBG CGD SYNCHRONIZATION SCHEME

| Commodity | Delivery options | | Purchase Price by GAIL from Producer | Sale Price by GAIL to CGD Entity |
|---|---|---|---|---|
| | Delivery Point | Mode of Transport | | |
| CBG | Retail Outlet (RO) of CGD entity and/or CBG Plant | Through Cascades | Rs 1290/MMBTU* + Compression charge (Rs.8/Kg) | UBP + Compression charge (Rs.8/Kg) |
| Biogas | Pipeline network of CGD entity | Through Tie-in Pipeline | Rs 1290/MMBTU* + P/L Compression charge (Rs.2/Kg) | UBP + P/L Compression charge (Rs. 2/Kg) |
| | | Cascade-Decompression (DCU) | Rs 1290/MMBTU* + DCU Compression charge (Rs.8/Kg)** | UBP + DCU Compression charge (Rs.8/Kg)** |

Price methodology for Biogas under CBG-CGD synchronization scheme, price applicable from 01/06/2024 to 31/05/2026.

- **Where,**
- **1 MMBTU = 19.18 Kilogram** (On 98% purity of Methane)

# PROCUREMENT PRICE UNDER SATAT SCHEME

| S No | Lower Retail Selling Price of CBG in Slab including tax Rs./kg | Higher Retail Selling Price of CBG in Slab including tax Rs./kg | Procurement price of CBG Without GST Rs./kg | Procurement price of CBG With GST Rs./kg |
|---|---|---|---|---|
| 1 | Retail Selling Price of CBG up to 70 | | **54.00** | **56.70** |
| 2 | 70.01 | 75.00 | 55.25 | 58.01 |
| 3 | 75.01 | 80.00 | 59.06 | 62.01 |
| 4 | 80.01 | 85.00 | 62.86 | 66.01 |
| 5 | 85.01 | 90.00 | 66.67 | 70.01 |
| 6 | 90.01 | 95.00 | 70.48 | 74.01 |
| 7 | 95.01 | 100.00 | 74.29 | 78.01 |

*Note: The above table is applicable strictly for supply of CBG at a one-way distance up to 75 km from the CBG Plant. For distance beyond 75 km, the price will be first adjusted as defined in para*

# CBG OFFTAKE FROM SMSKL PLANT

| Sr. No. | Period | Sale Quantity in Kg. |
|---|---|---|
| 1. | February | 50121.50 |
| 2. | March | 76252.40 |
| 3. | April | 127407 |
| 4. | May | 94894.1 |
| | Total | 348675.428 |

| Sr. No. | Selling Point | Sale Quantity in Kg. |
|---|---|---|
| 1. | Retail Outlets (RO) | 2,42,408.97 |
| 2. | City Gas Distribution Pipeline (CGD Torrent) | 1,06,266.45 |

# BENEFITS OF BIO-CNG(CBG) PLANT

- Substitute for fossil fuel leads to save the FOREX.
- CBG being a biofuel reduces GHG emissions (Carbon reduction).
- Value addition product to sugar industry.
- Need not face the boiler tube corrosion while burning raw methane gas in boiler as auxiliary fuel.
- Will help for Revolutionary strengthening of agro economy.
- CBG is safe fuel for gas engine to generate power.(can be used after removal of H2S)

# GOVERNMENT POLICIES

1. Central financial assistance for setting up of plants for generation of Biogas/Bio-CNG from urban, industrial and agricultural waste.
2. Concession on custom duty for import of machinery and components required for initial setting up of projects for generation of Power and bio CNG
3. Additional Central Assistance for Municipal Solid Wastes (MSW) based CBG plants under Swachh Bharat Mission Urban 2.0
4. Remunerative CBG procurement price and indexing the same with CBG Retail Selling Price
5. Policy guidelines for co-mingling of CBG with Natural Gas in CGD network for improving offtake

# GOVERNMENT'S VISION FOR BIO-CNG

- CBG Blending Obligation (CBO) - The government announced a phased mandatory blending of Compressed Bio-Gas (CBG) in Compressed Natural Gas (CNG) and Piped Natural Gas (PNG) segments of the City Gas Distribution (CGD) sector in October 2023.
- CBG Blending Obligation (CBO) will promote production and consumption of Compressed Bio-Gas in the country. Five percent blending of biogas with natural gas will reduce LNG import USD 1.17 billion.
- The CBO will be voluntary till FY25 and mandatory blending obligation would start from FY26.CBO shall be kept as 1%, 3% and 4% of total CNG/PNG consumption for FY26, 2026- 27 and 2027-28 respectively. From 2028-29 onwards CBG Blending Obligation will be 5%.

# GOVERNMENT'S VISION FOR BIO-CNG CONT..

1. **Implementation :-**

The National Biofuels Coordination Committee (NBCC) is responsible for overseeing the implementation of the mandate The Ministry of Petroleum and Natural Gas (MoPNG) will provide financial assistance and other support to CGD companies CGD companies will be responsible for blending CBG in their CNG and PNG networks.

2. **Objectives :-**

The key objectives of the CBO are to stimulate demand for CBG in CGD sector, reducing Liquefied Natural Gas (LNG) imports, saving in forex, promoting circular economy and to assist in achieving the target of net zero emission among others.

# ACKNOWLEDGEMENT


- We are thankful to Hon. Dr. P.A.Raut CMD of Shreenath Mhaskoba Sakhar karkhana for giving the permission to Present this Paper.
- We are also thankful to SMSKL technical staff for their valuable support.
- We are thankful to MITCON, Mahatma Phule Krushi Vidhyapeeth & The Environment Association of Maharashtra for giving opportunity to present our Success Story

# REFERENCES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iii. Notification of MNRE Dated 28 February 2020.

iv. Notification of Waste to energy division of MNRE Dated 20 November 2022.

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vi. M/s. Praj industries, Pune for their Technical support.

vii. Gas purification 5th edition by Arthur Kohl and Richard Nielsen.

# Thanks!


श्रीनाथ म्हस्कोबा साखर कारखाना लि.
पाटेठाण, दौंड, पुणे (महा.)
॥ आमच्या सेवा साखरे पेक्षा गोड असतात ॥

**Any questions?** You can find me at: **ceo@shreenathsugar.com**

# ‘ZERO WASTE’ TECHNOLOGIES FOR RECOVERY OF POTASH FERTILIZERS, AND VALUE ADDED PRODUCTS FROM DISTILLERY WASTES – SUSTAINABILITY WITH PROFIT

# INTRO

## THE TECHNOLOGY
## FROM WASTE TO WEALTH

Chem Process Systems
P. Ltd.

CSIR - Central Salt
& Marine
Chemicals Research
Institute

## 100% SUSTAINABILITY
## CONTRIBUTING TO THE CIRCULAR ECONOMY

CHEM

# INTRO

**About CSIR - CSMCRI**

- CSMCRI has several granted patents - a top national R&D laboratory of India
- Well equipped state-of –the-art Research Centre and Laboratory
- Fully armed Knowledge Resource Centre & Research Oriented Library
- 75+ Scientists ; 150+ Research Scholars
- 200+ publications; 20+ Patents
- Ranked among top 500 Global Institutions for Research

**CSIR-Central Salt and Marine Chemicals Research Institute (CSIR-CSMCRI)**
**G. B. Marg, Bhavnagar – 364002.**
**Gujarat, India.**

# INTRO

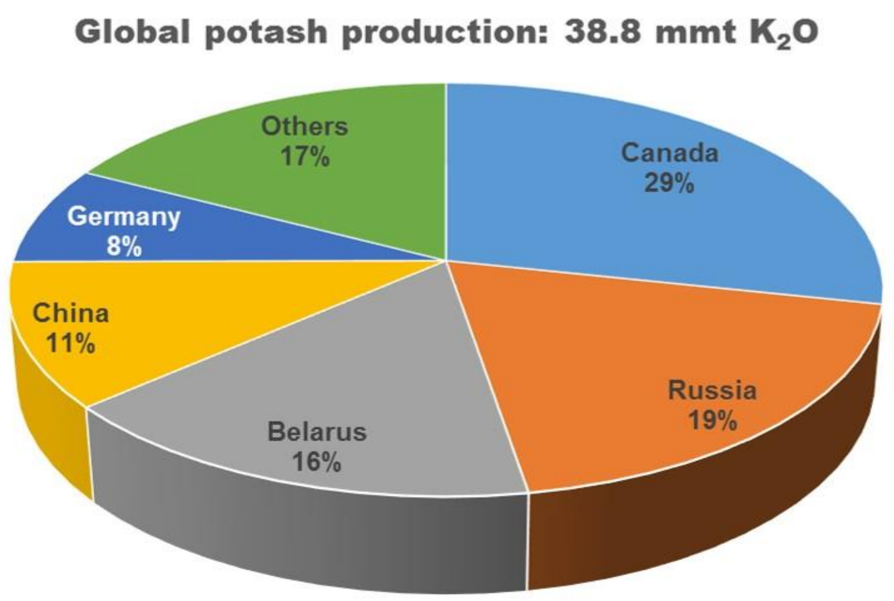
**About Chem Process**

- Established by highly qualified technical-design professionals & management specialists with core competence and rich experience
- Design, manufacture, erection, commissioning of custom designed process equipment
- Having unparalleled expertise on vacuum, evaporation, crystallization, drying, desalination,  heat transfer and other related technologies
- Workshop comprises of state-of-the-art manufacturing & testing facilities
- Supported by in-house R&D and Laboratory facilities

# WHY POTASH IS IMPORTANT ?

- The potassium sulphate market reached a valuation of US$ 4,742.0 Mn in 2021
- India is projected to account for **11.3%** of the global potassium sulphate market share in 2029
- The U.S. is anticipated to account for a market share of 9.2% in the global potassium sulphate market share by 2029.

**UNMET NEED:** INDIGENOUS POTASH FERTILISER MANUFACTURING CAPACITY




**Major potash producing countries**
(U.S. Geological Survey, Mineral Commodity Summaries, January 2016)

# CURRENT 'ZLD' LIMITATIONS

### EVAPORATION + INCINERATION

- Extremely High & Unaffordable CAPEX
- Energy Guzzler
- Heavy Design
- Maintenance prone
- Frequent Shutdowns
- Captive Power Plant Compulsory
- Ash Disposal needed
- Non-Profitable
- Loss of Organics and Minerals
- Loss of 40% water

### BIO-METHANATION + EVAPORATION + COMPOSTING

- Inconsistent & Sensitive
- Long re-establishment
- Methane Emissions
- Flaring – Air Pollution
- Labor intensive
- Seasonal Issues
- Compulsory utilization of Bio-Gas
- High Quantity of Press Mud required, limits the benefits of Press Mud to Bio-Gas

### BIO-METHANATION + EVAPORATION + SPRAY DRYING

- Complete Water Loss, more than 70% to atmosphere
- Low Thermal Efficiency, Loss of heat, Biogas utilized to achieve 250°C
- Cuts down benefit of Bagasse savings
- Highly Hygroscopic product, difficult Storage
- Along with Water, Volatile organics, NH3 and other Off-Gases Harm the Environment

# RECOVERY OF PDM / FCO GRADE POTASH FROM DISTILLERY SPENT WASH

# THE SCHEME OF OPERATIONS- PDM / POTASH

CHEM

Evaporation

Spent Wash

Validated entire process at plant; fully operational since Aug/Sep, 2020

Recovered Water (for Recycling)

Concentrated Spent Wash

Pre-treatment

Organic separation

Treated Spent Wash

Potash recovery

Lean Spent Wash

Evaporation

Water

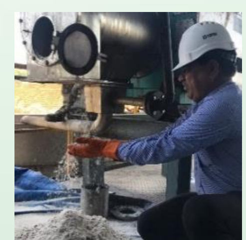
Organic-rich cake

Organic Recovery

Regeneration

DPV

PDM / FCO Grade Potash



IPL Field Trial in Gujarat. (~10% yield improvement, better produce)

# THE SOLUTION

- The Solution is a unique revolutionary patented process which will be implemented for the first time in the history of Molasses based Distilleries.

- **This process will recover valuable products from the Spent Wash:**

FCO Grade SOP based PDM (Granulated) with > 14.7% K2O Content

FCO GRADE 'POTASH' ($K_2SO_4$)

De-Salted Organics, which is a perfect alternate to Molasses in Cattle Feed Binding

# What is Potash Derived from Molasses (PDM) Criteria ?

**According to :**

**Schedule 1 of FCO , Specification of Fertilizers : Part A – Section 1 (C), Point 5.**

**5. Potash Derived from Molasses**

(i) Moisture per cent by weight, maximum 4.79

(ii) Total nitrogen, per cent by weight, minimum 1.66

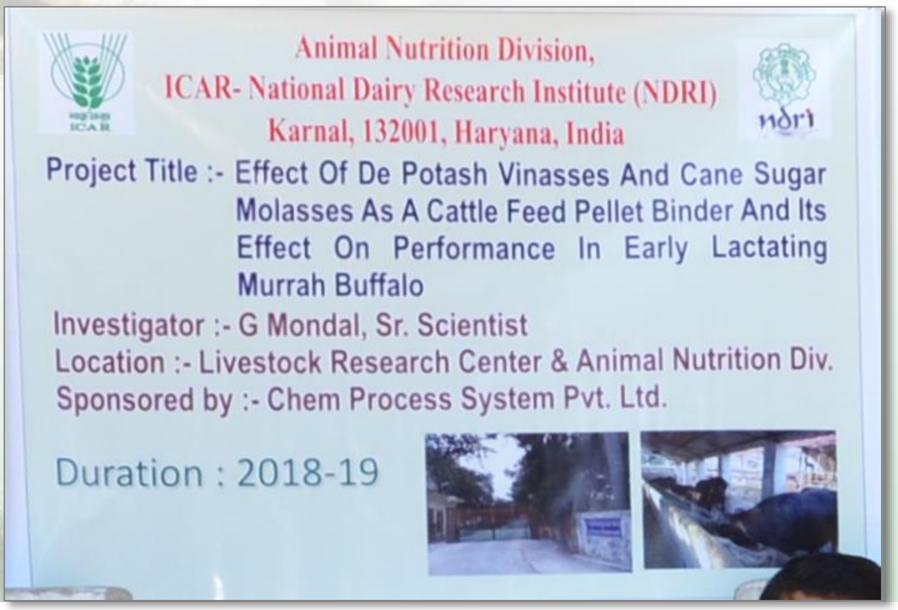
(iii) Neutral ammonium citrate soluble phosphate (as P2O5),
per cent by weight, minimum 0.39

(iv) Water soluble potash (as K2O), per cent by weight, minimum 14.70

# ADVANTAGES & COMPARISON OF PDM FROM VARIOUS TECHNOLOGIES

| Parameters | PDM powder from CSIR-CSMCRI process 'SOP' based | PDM from Spray dry powder of Concentrated Spent-wash | PDM from Ash Incineration Boiler |
|---|---|---|---|
| Intial Appearance | SOP Based powder | MOP based Powder, and Other Impurities | MOP based Powder, and Other Impurities |
| Granulation | Easy to granule and make FCO grade fertilizer, with SOP and Calcium rich minerals. | Very Hygroscopic in nature. difficult to make granulate., KCl & bentonite is added for making granulation | Easy to granule |
| % of K2O in solid | > 14.7% | > 14.7% | >14.7% |
| Nature | Non hygroscopic in nature | Very Hygroscopic in nature. | Non hygroscopic in nature |
| Ca2+ | > 10-12% | > 1-2% | > 1-2% |
| SO4 | > 45-55% | > 3-5% | > 3-5% |
| Cl- | < 2%; Low chloride salt | > 5% | > 5% |
| pH | 4.0-5.0 | 7.0 -8.5 | > 8 |
| Ca, SO4 macro nutrient | Containing high amount of SO4 and Ca, improves soil health and crop yield | Containing low SO4 and Ca. | Containing low SO4 and Ca. |
| Chloride Toxicity | Due to low Cl contain it is very favorable for Chloride sensitive crop. | Due to high Cl contain it is very unfavourable for Chloride sensitive crop. | Due to high Cl contain it is very unfavourable for Chloride sensitive crop. |
| Process | The process is green, low carbon footprint, low energy and very cost effective. | Required very high energy for spray dry. High carbon foot print process | High carbon foot print process |
| Soil pH | This powder acidic nature, which is reduced the alkalinity of the soil. Hence improve the soil heath and nutrient uptake capacity of plant. | This powder alkaline in nature, which makes soil more alkaline. | This powder alkaline in nature, which makes soil more alkaline. |
| Nutrient Availability | Acidic pH of powder helps more availability of nutrient P, Zn, Fe, Cu, Mn B | Alkaline pH makes nutrient (P, Zn. Fe, Cu, Mn B) deficiency for plant | Alkaline pH makes nutrient (P, Zn. Fe, Cu, Mn, B) deficiency for plant |

# DPV CERTIFIED BY NDRI, KARNAL AS CATTLE FEED BINDER TO REPLACE MOLASSES




**MOLASSES PRICE RISE IS ENVISAGED FOR THE CATTLE FEED INDUSTRIES DUE TO THE ETHANOL POLICY OF 'GOI'**

**OUR 'DPV' AS MOLASSES SUBSTITUTE IS AN IDEAL ALTERNATE FOR THE CATTLE FEED MARKET**

# APPROVAL FROM ICAR-NDRI, KARNAL & ADVISORY FROM MINISTRY OF ANIMAL HUSBANDRY TO USE 'DPV' AS CATTLE FEED BINDER

## De-Potash Vinasse

A Replacement of Cane Molasses
As a Cattle Feed Binder

**Evaluation & Comparison Report**
**On**
**Effects and Performance of Cattle Feed**
**With**
**De -Potash Vinasse v/s Cane Molasses**
**On**
**Lactating Murrah Buffaloes**

**By**
**ICAR-National Dairy Research Institute**
Karnal-132001 (Haryana), INDIA.

F.No. R-24014/10/2019-DIR_ANLM
Government of India
Ministry of Fisheries, Animal Husbandry and Dairying
Department of Animal Husbandry and Dairying

Krishi Bhawan, New Delhi-110001
Dated : 18th Nov 2020

**OFFICE MEMORANDUM**

**Subject: Advisory for use of DPV in cattle feed formulation**

With increasing thrust in the Government of India's Ethanol Blending Programme, the availability of molasses for livestock food is likely to be diminished. Moreover, there is an urgent need to identify and develop supply chain logistics for alternate binder(s) vis-à-vis molasses to meet the requirements of cattle feed industries operating in the states having total prohibition.

2. CSIR-Central Salt and Marine Chemicals Research Institute and M/s Chem Process System Pvt. Ltd., through collaborative research, have developed process for production of De-Potash Vinasse (DPV) from distillery spent wash. Crude protein and mineral content of DPV is higher than that of cane molasses. Based on encouraging results regarding composition, mechanical strength of pellets and palatability studies, ICAR-National Dairy Research Institute (NDRI) evaluated possibility of using DPV in cattle feed formulation in lieu of molasses and recommended that DPV can be safely incorporated in cattle feed formulation as an alternative to molasses.

3. In this backdrop, Department of Animal Husbandry & Dairying (DAHD), GOI, initiated stakeholder consultation – with representation from Line Ministries, National Dairy Research Institute, National Dairy Development Board, Cattle Feed Industries and Distilleries – to deliberate and decide upon the potential usage of DPV in cattle feed production.

4. After detailed review of NDRI's report - "Comparative evaluation of De-potash Vinasse and Cane sugar molasses a cattle feed pellet binder and its effect on performance in lactating buffaloes" and subsequent discussions, general consensus has been emerged endorsing NDRI's recommendation that DPV can be used as an alternative binder for cattle feed pellet. It was also

# BUSINESS ECONOMICS – 60 KL Distillery

| Molasses Base | Revenue Generated -Rs. / L of Alcohol | Expenses Incurred - Rs. / L of Alcohol | Profit Earned - Rs. / L of Alcohol |
|---|---|---|---|
| C – Heavy | 12.00 to 12.50 | 7.0 to 7.5 | 4.5 to 5.5** |
| B – Heavy | 12.50 to 13.00 | 7.0 to 7.5 | 5.0 to 6.0** |

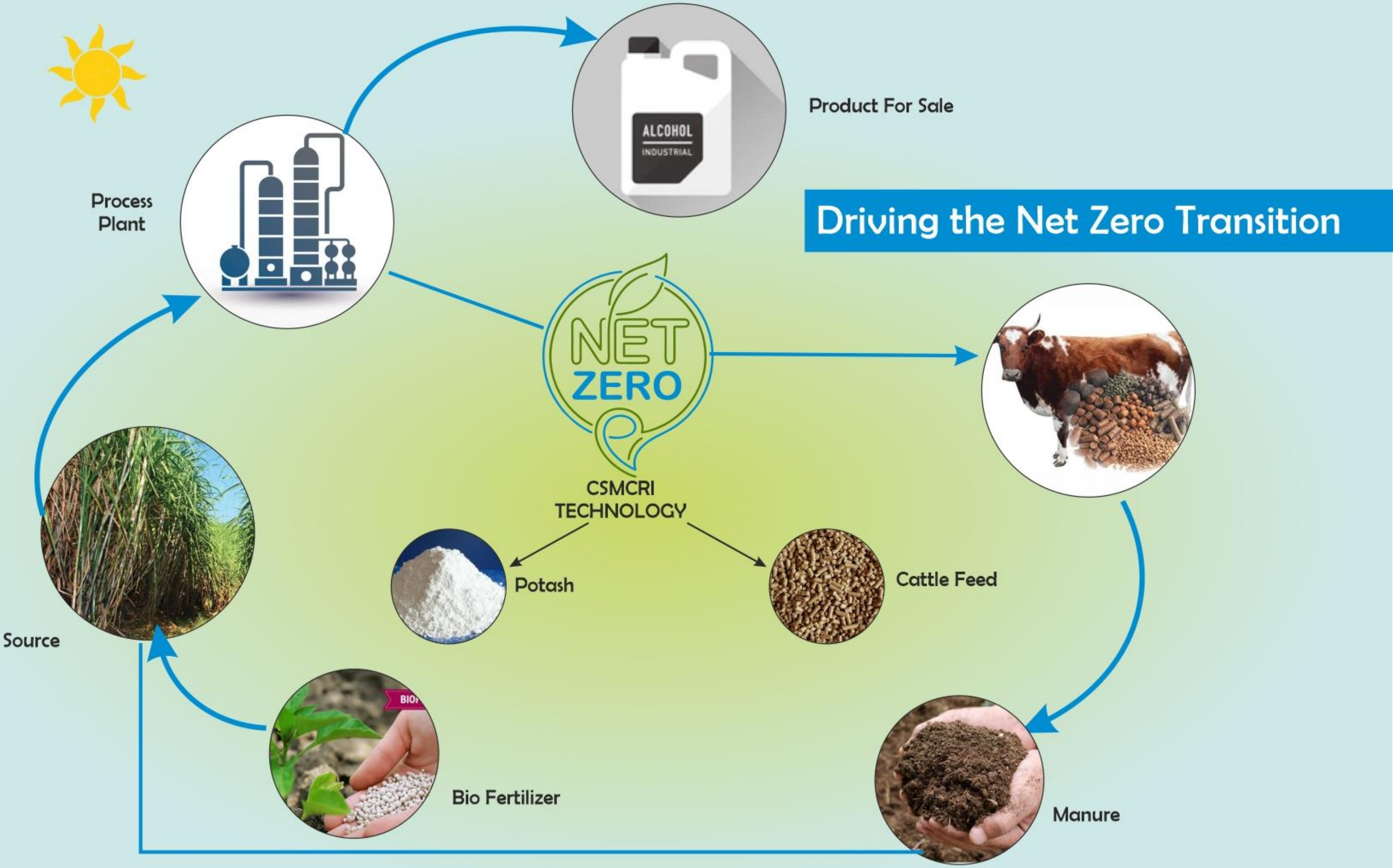
- Considering 250 operating Days
- 22 hours of Daily Operation
- ** Figures may vary based on the Region of Sugarcane , Organic and K content in the Spent-Wash and Capacity of Distillery

# BENEFITS

## Multifold Benefits of the Solution

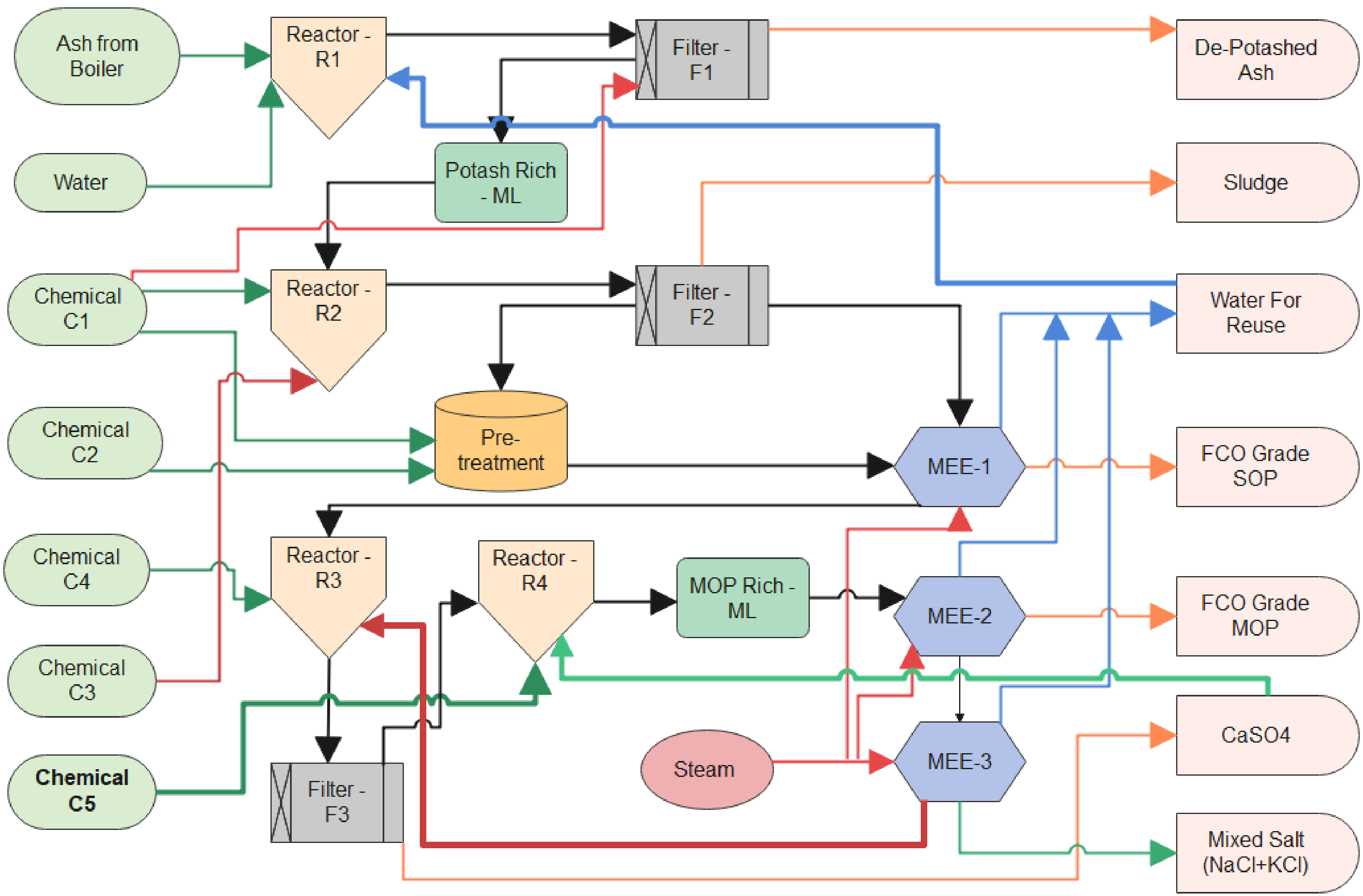
- 100% sustainable solution
- Solves the headache of Spent Wash disposal
- Distillery Working Days can be increased
- Production & Turnover can be increased
- Compliance to Pollution Control ZLD Norms
- Profitable Process giving additional earnings to the Distilleries
- Will eliminate huge investment in Incineration Boilers and associated operation & maintenance
- Requirement of fresh water would greatly decrease

## Driving the Net Zero Transition

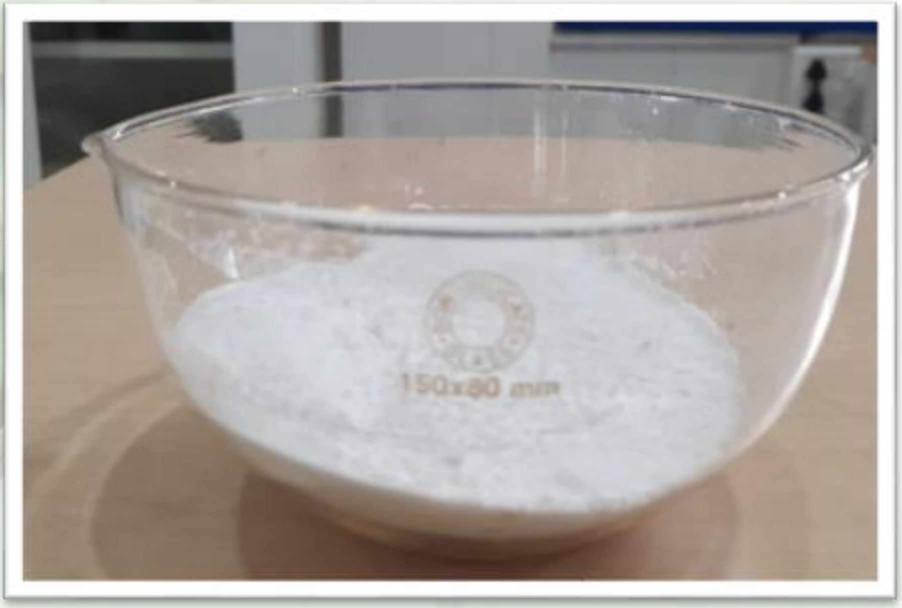


# TECHNOLOGY – 2
# RECOVERY OF FCO GRADE POTASH ($K_2SO_4$) FROM INCINERATION BOILER ASH

# THE PROCESS FLOW for SOP FROM INCINERATED ASH



# THE PRODUCT – FCO GRADE POTASH ($K_2SO_4$)

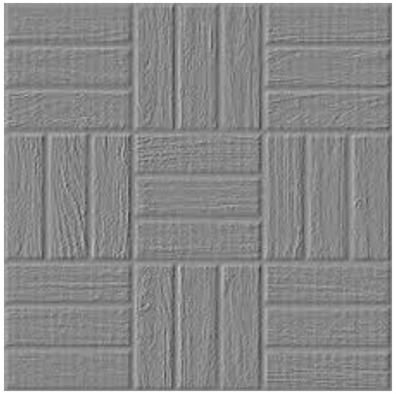



Crystal WHITE K2SO4 – FCO Grade, Ready to Bag

# THE RESIDUAL ASH

**Bricks made from Salt Free Residue Ash**

**Paver Blocks**



**Parking Tiles**

- High Strength
- Long Life
- Customizable
- Low Cost

**A GREAT VALUE ADDITION TO YOUR CSR ACTIVITIES, BRICK-WALL, COMPOUND SOLUTIONS FOR FLOOR AND LOW RISE REQUIREMENT**

## BENEFITS

### Multifold Benefits of the Solution – To The Farmers / Society

- **Improvement of land health and increased agricultural production**
- **The farmers land which gets contaminated due to disposal of Ash along with Compost will stop**
- **Ground water contamination will be eliminated**
- **100% water soluble, white crystalline appearance , purity >96%**
- **Fresh water requirement will reduce drastically for industries thus making additional water for use of irrigation & society**
- **Reduction of Air & Water Pollution in totality**

# COMMERCIAL PLANT – Potash from Spent-wash

- Distillery Cap : 60 KLPD
- Raw Spent Wash treatment : 400 KLPD
- FCO Grade Potash ($K_2SO_4$): 3.1 TPD
- DPV (Desalted Organics) : 40 TPD (55%)

MVR based System for Better Economics, Continuous Operations

**First Commercial Plant in Walchandnagar, Maharashtra.**

# COMMERCIAL PLANT – Potash from Incineration Boiler Ash

**First of its kind – Commercial Plant established in, Uttar Pradesh**

**Capacity – 60 TPD of Ash Treatment**

**Fully Automated, MVR based Operations for Better Steam Economy**

# AWARDS & ACCOLADES

Technology Innovation Award – Presented by
The Honorable President of India - Shri Ramnath Kovind


‘Ready For The Big League’ … Award


Star SME Award

प्रधान मंत्री
Prime Minister

MESSAGE

It is heartening to learn that an innovative zero-waste potash technology has been developed by Council of Scientific & Industrial Research (CSIR) and Central Salt and Marine Chemicals Research Institute (CSMCRI), Bhavnagar. The technological breakthrough will help in producing potash from spent wash, converting waste into an environmentally sustainable product.

The development of such zero-waste technology will help in making the distillery sector environmentally sustainable. The upscaling and validation of technology will help the distilleries to produce value-added products from spent wash that will be economically and ecologically viable. The technology will help prevent the contamination of groundwater and other water bodies and also contribute towards restoring degraded land.

Effective waste management continues to be one of our Government's key priorities. The technological breakthrough reinforces our Government's initiatives like 'Swachh Bharat', 'Make in India' and conversion of 'Waste to Wealth'. These attempts can succeed only through community participation and increased synergy between the public and the private sector.

The indefatigable efforts of scientists and technical experts are admirable and worth emulating.

I congratulate the scientists at CSIR, as well as CSMCRI and hope that they will continue to work with increased passion and dedication in the service of the nation.

(Narendra Modi)

New Delhi
कार्तिक 17, शक संवत् 1941
8th November, 2019

Dr. Harsh Vardhan
Union Minister of Science & Technology,
Earth Sciences and Health & Family Welfare
209, Anusandhan Bhawan
2, Rafi Marg
New Delhi - 110001

MESSAGE FROM THE PM – SHRI NARENDRA MODI

**Technology & Know How By:**

CSIR - Central Salt
& Marine Chemicals
Research Institute

**Engineering, Design & Manufacturing By:**

**Chem Process Systems P. Ltd.Ahmedabad**
www.chemprosys.com

# चक्रिय अर्थव्यवस्था, पर्यावरणपूरक व शाश्वत ऊस उत्पादन वाढीसाठी व जमीन आरोग्यासाठी ऊस शेतीतील व साखर कारखान्यातील टाकाऊ पदार्थाचे मूलस्थानी व्यवस्थापन

**डॉ.धर्मेंद्रकुमार फाळके**
प्रमुख शास्त्रज्ञ
राजीव गांधी विज्ञान व तंत्रज्ञान प्रकल्प,
मृद विज्ञान विभाग
कृषि महाविद्यालय, पुणे

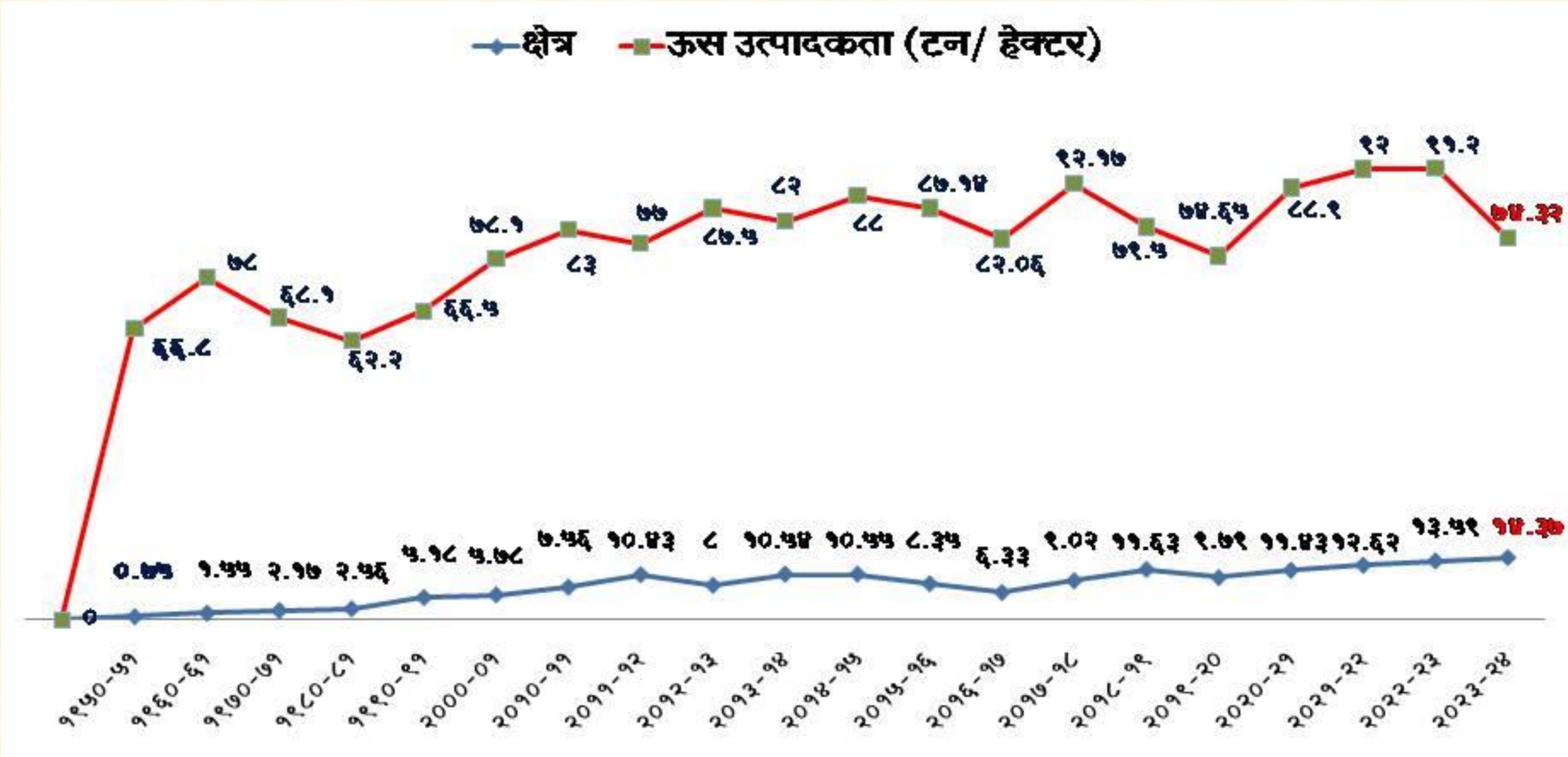
# Why sugarcane is preferred by farmers ?

- Wider adaptation to climatic condition
- Hardy crop stand
- Well setup of co-operative and private processing industry
- No risk and less headache
- Resistance to pests and diseases
- Gives response to good management
- Good monitory returns

# Existing problems

- Declining productivity
- Increasing cost of cultivation
- Fluctuating sugar and sugarcane prices
- Sugarcane industrial management problems
- Recycling of sugarcane crop residues and disposal of industrial wastes after harvest and processing

# महाराष्ट्रातील ऊसाखालील क्षेत्र आणि उत्पादकता



# ऊस शेतीचे ज्वलंत प्रश्न

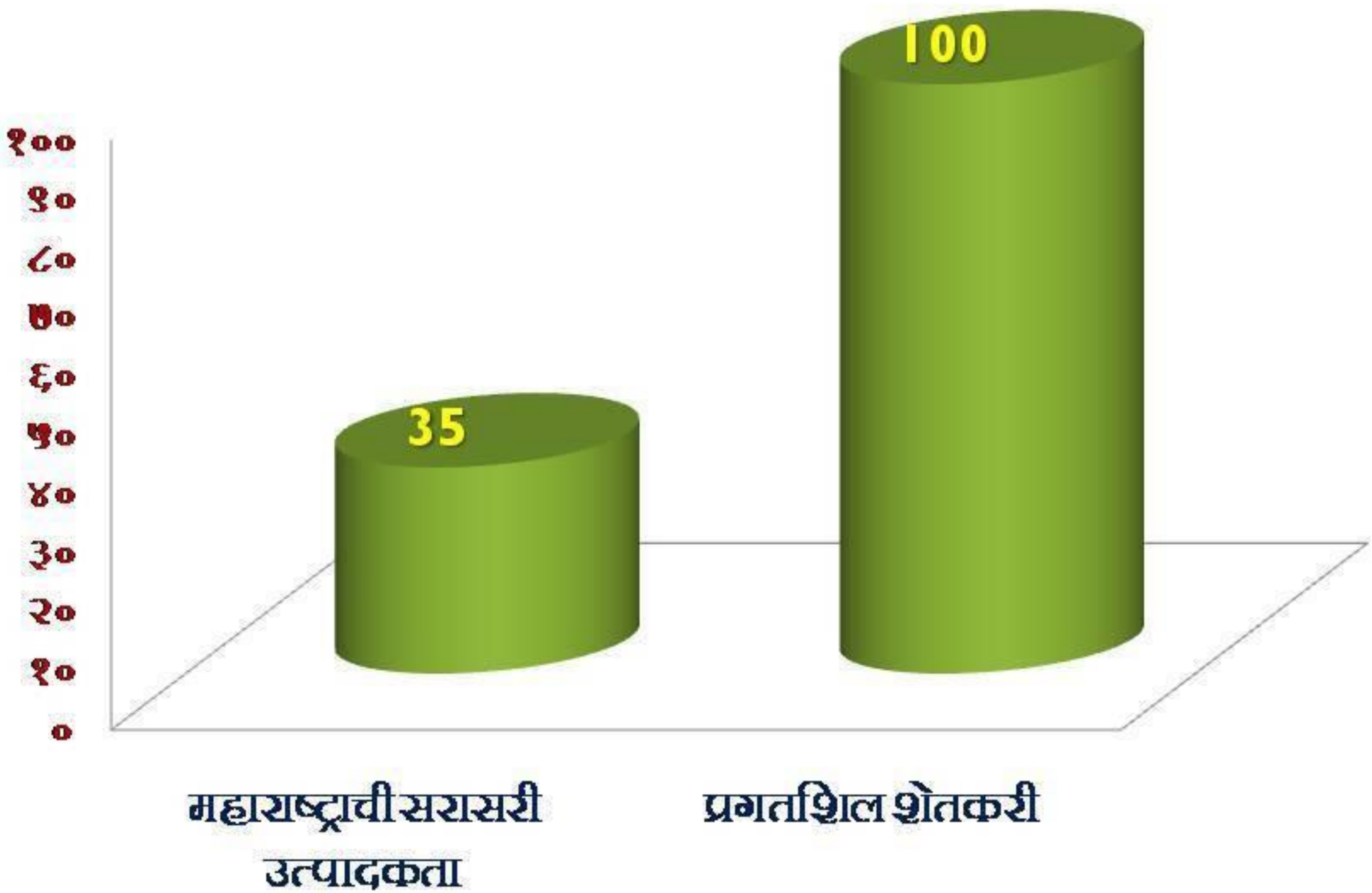
कमी होणारी उत्पादकता

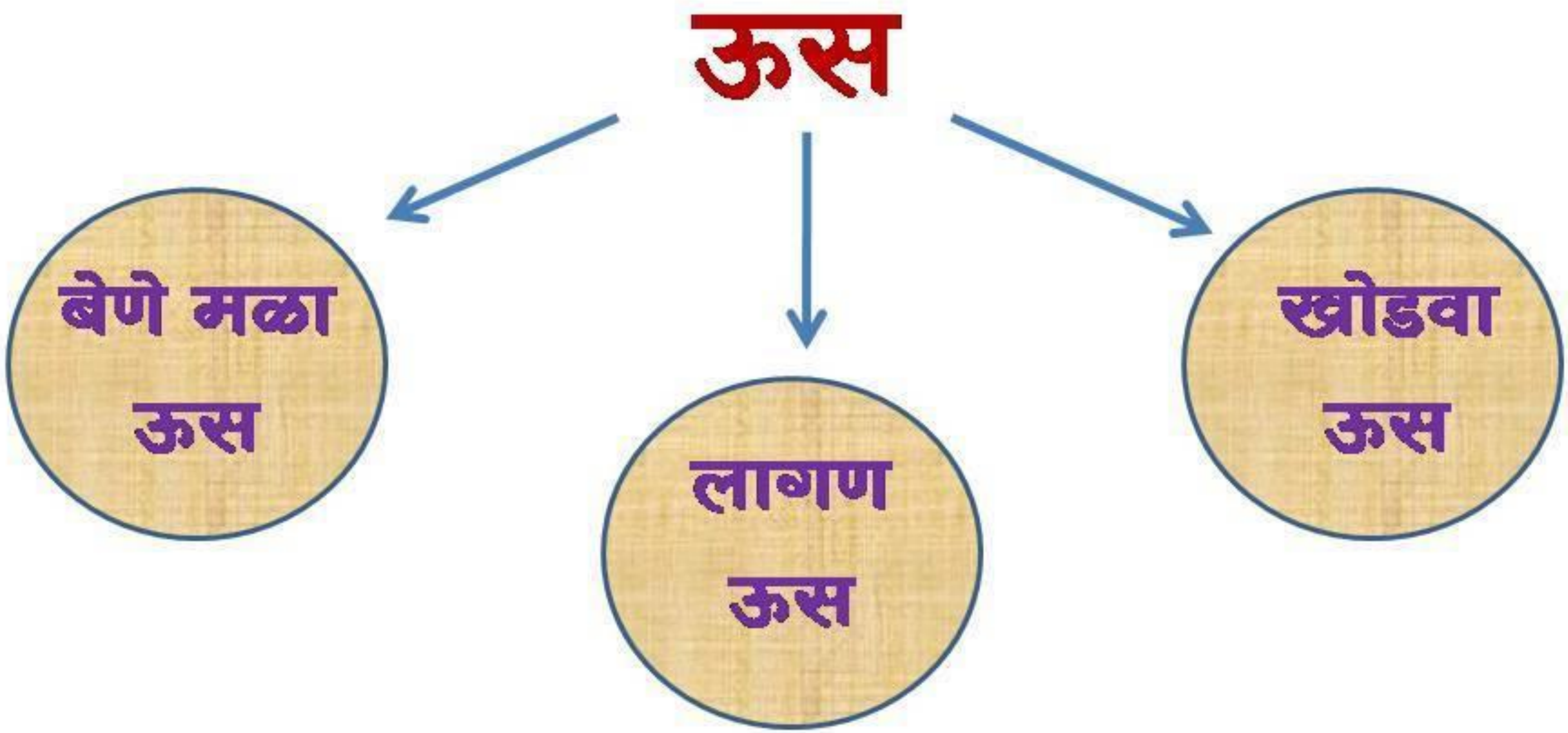
वाढता उत्पादन खर्च

# ऊसाची उत्पादकता कमी होण्याची कारणे

- अनियंत्रीत ऊस लागवड
- दुर्लक्षीत लागवड तंत्रज्ञान
- जमिनीचे बिघडलेले आरोग्य
- अमर्याद पाणी वापर
- खोडवा पिकाचे कमी उत्पादन

# ऊसाच्या उत्पादकतेमधील विषमता




ऊस
बेणे मळा ऊस
लागण ऊस
खोडवा ऊस

# सन 1750 नंतर औद्योगिक क्रांती मुळे हवामानातील हरितगृह वायूच्या प्रमाणात होणारा बदल

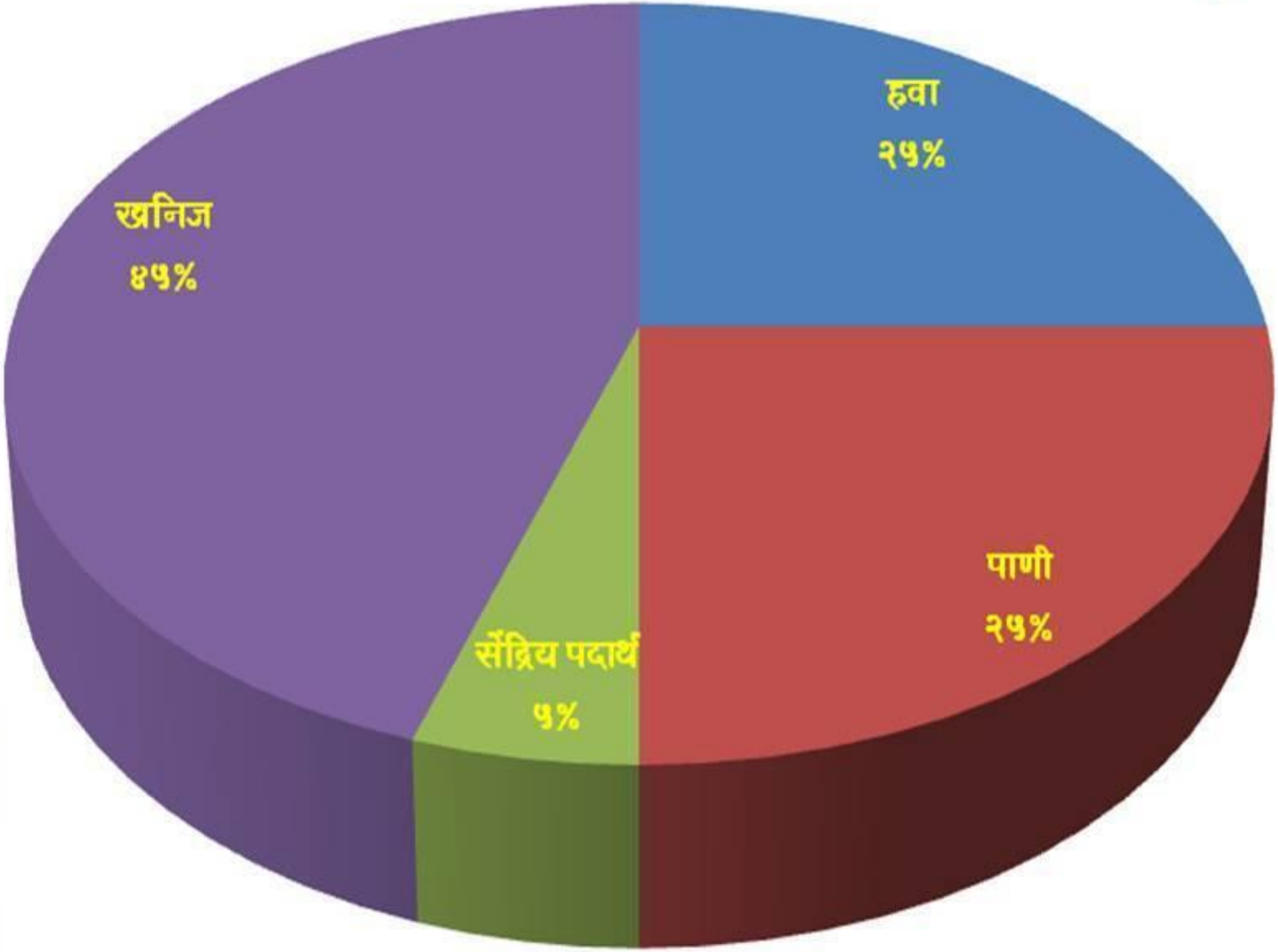
| हरितगृह वायू | सद्य स्थिती प्रमाण | सन1750 च्या पातळीवरील वाढ (%) | सद्य स्थिती वाढीचे प्रमाण (% प्रती वर्ष) |
|---|---|---|---|
| कार्बन डाय ऑक्साईड | 391 ppm | 40 | 0.4 |
| मिथेन | 1803 ppb | 150 | 0.4 |
| नायट्रस ऑक्साईड | 324 ppb | 20 | 0.25 |

(IPCC, 2011)

# हवामान बदलाचे परिणाम

- वातावरणीय तापमान वाढ
- जमिनीतील पाणी पातळी खालवली
- जमिन व जल प्रदुषण
- आम्लयुक्त पाऊस
- जमिनीची धुप
- जमिन आरोग्यावर अनिष्ट परिणाम
- पिक उत्पादन कमी झाले
- गंभीर दुष्काळी परिस्थिती
- गंभीर पुर परिस्थिती
- पिक उत्पादनाचा दर्जा खालावला
- अन्न आणि पाणी असुरक्षितता

# मातीचे घटक



**जमिनीची सुपिकता अशी कमी होते**

दुर्लक्षित मशागत व लागवड तंत्र

उष्णतेमुळे नैसर्गिकरित्या अन्नघटकांचे विघटन

पिकांच्या फेरपालटाचा व नियोजना अभाव

रासायनिक व सुक्ष्मअन्न द्रव्यांचा असमतोल वापर

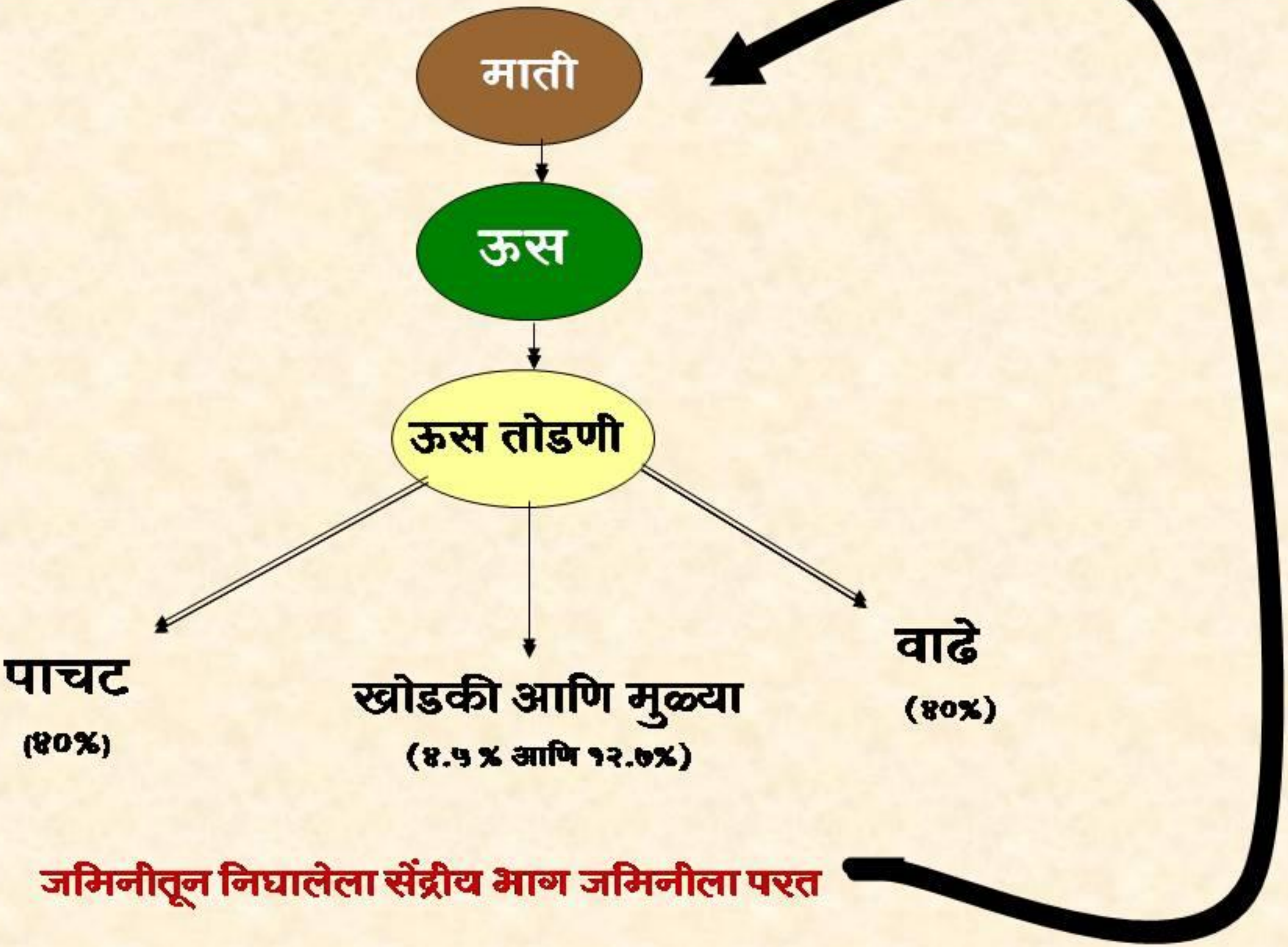
अयोग्य जमिनीची निवड

निच-याचा अभाव

पाण्याचा अवाजवी वापर

सेंद्रिय खतांचा व जिवाणूंचा कमी वापर

# तुझिये तुजला अर्पण


माती
ऊस
ऊस तोडणी
पाचट
(४०%)
खोडकी आणि मुळ्या
(४.५ % आणि १२.७%)
वाढे
(४०%)
जमिनीतून निघालेला सेंद्रीय भाग जमिनीला परत


तोडणीपूर्व पेटलेला ऊस

# तोडणीनंतर ऊसाचे पेटविलेले पाचट

# पाचट पेटविल्यामुळे होणारे हवेचे प्रदुषण

# पाचट पेटविल्यानंतरचे दृष्य

# शेतातील पाचट जाळल्यानंतर हवेतील हरितगृह वायूच्या प्रमाणामध्ये होणारा बदल

हरितगृह वायू: पाचट पेटण्या अगोदरच्या पातळीवरील वाढ (पट)

कार्बनडाय ऑक्साईड - २

नायट्रस ऑक्साईड - ६

सल्फरडाय ऑक्साईड - १.५

कार्बन मोनो ऑक्साईड - १.५

मिथेन - २.५

काजळी (VOC's) - २

पार्टीक्युलेट पदार्थ ($PM_{2.5}$) - ३.५

पार्टीक्युलेट पदार्थ ($PM_{10}$) - ४

वातावरणातील ऑक्सिजन पातळीमधील घट - १.५

# पाचट जाळल्यानंतर पाचटातील अन्नद्रव्यांचा होणारा ऱ्हास

| अन्नद्रव्य | पाचटातील प्रमाण (%) | पाचट पेटवल्याने होणारी घट (%) |
|---|---|---|
| सेंद्रीय कर्ब | ४१.६६ | १०० % |
| नत्र | ०.५१ | १०० % |
| स्फुरद | ०.३४ | ७१ % |
| पालाश | ०.८५ | ७९ % |
| गंधक | ०.१६ | ८० % |

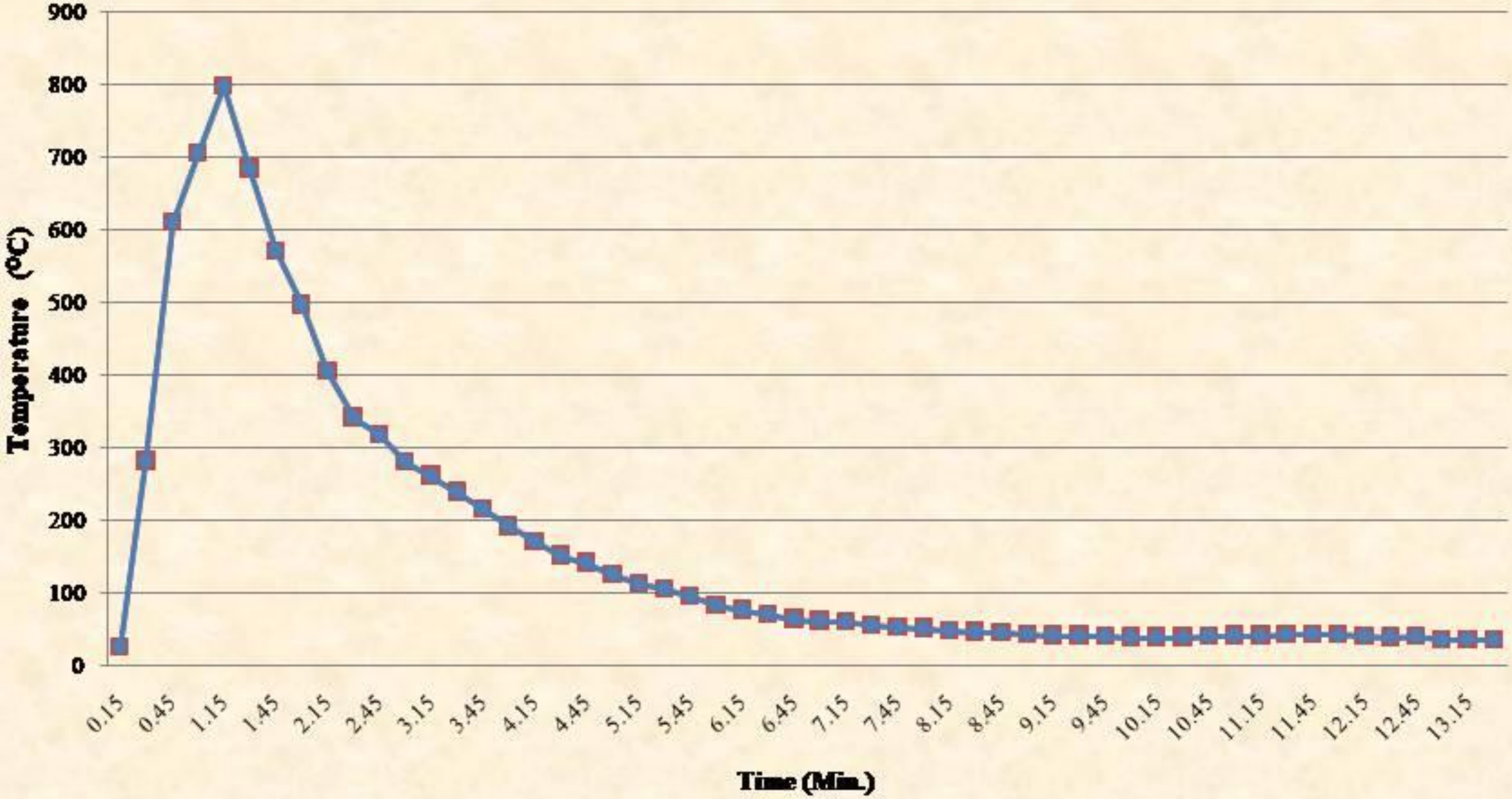
राज्यातील एकूण पाचट उत्पादन - १०५ लाख टन प्रति वर्षी (सन २०२२-२३)

जळालेली अन्नद्रव्ये भरून काढणेकरीता रासायनिक खतासाठी येणारा खर्च - ९९१ कोटी प्रतिवर्षी

# राज्यातील सरासरी प्रति वर्षी १०५ लाख टन पाचट जाळल्यानंतर होणारा आर्थिक तोटा

| अन्नद्रव्य | पाचट पेटवल्याने होणारी आर्थिक तोटा (कोटी प्रति वर्ष) |
|---|---|
| नत्र | ६२.५ |
| स्फुरद | २४६.९६ |
| पालाश | ५०७.७६ |
| गंधक | १७१.५ |
| लोह | १.०८४ |
| मंगल | ०.३४२ |
| जस्त | ०.२९३ |
| तांबे | ०.२२३ |
| एकूण | ९९१ |

# Periodical Temperature of Flame at Soil Surface during Sugarcane Trash Burning



# पाचट जाळल्यानंतर जमिन आरोग्यावर होणारा परीणाम

१ से.मी. खोलीवरील तपमान
(४२° – ६०°)

५ से. मी. खोलीपर्यंत सुक्ष्म
जिवाणूंची संख्या

**Impacts**

- Loss of soil organics
- 27-73 % of N lost
- 50% reduction in bacterial population on burning
- Exchangeable $NH_4^+$ – N & biacarbonate extractable P content show immediate increase

१० से. मी. खोलीपर्यंत सेंद्रिय
कर्ब आणि नत्र

# शेतातील पाचट इतर उपयोगासाठी बाहेर



# पाचटाचे बाह्यस्थानी कंपोस्ट व गांडूळखत

# शेतातील मूलस्थानी पाचटाचा पुर्नवापर

१. लागणीच्या ऊसामध्ये पाचटाचे आच्छादन

२. खोडवा ऊसामध्ये पाचटाचे आच्छादन

३. खोडवा काढून टाकावयाचा असल्यास पाचट जमिनीमध्ये गाडणे

# शेणखत आणि पाचटातील घटक

| घटक (%) | शेणखत | पाचट |
|---|---|---|
| सेंद्रीय कर्ब | ३८.५० | ४५.०० |
| नत्र | ०.५६ | ०.५० |
| स्फुरद | ०.३५ | ०.२० |
| पालाश | ०.७८ | १.०० |

# पर्यावरणपूरक खोडवा व्यवस्थापन तंत्रज्ञान

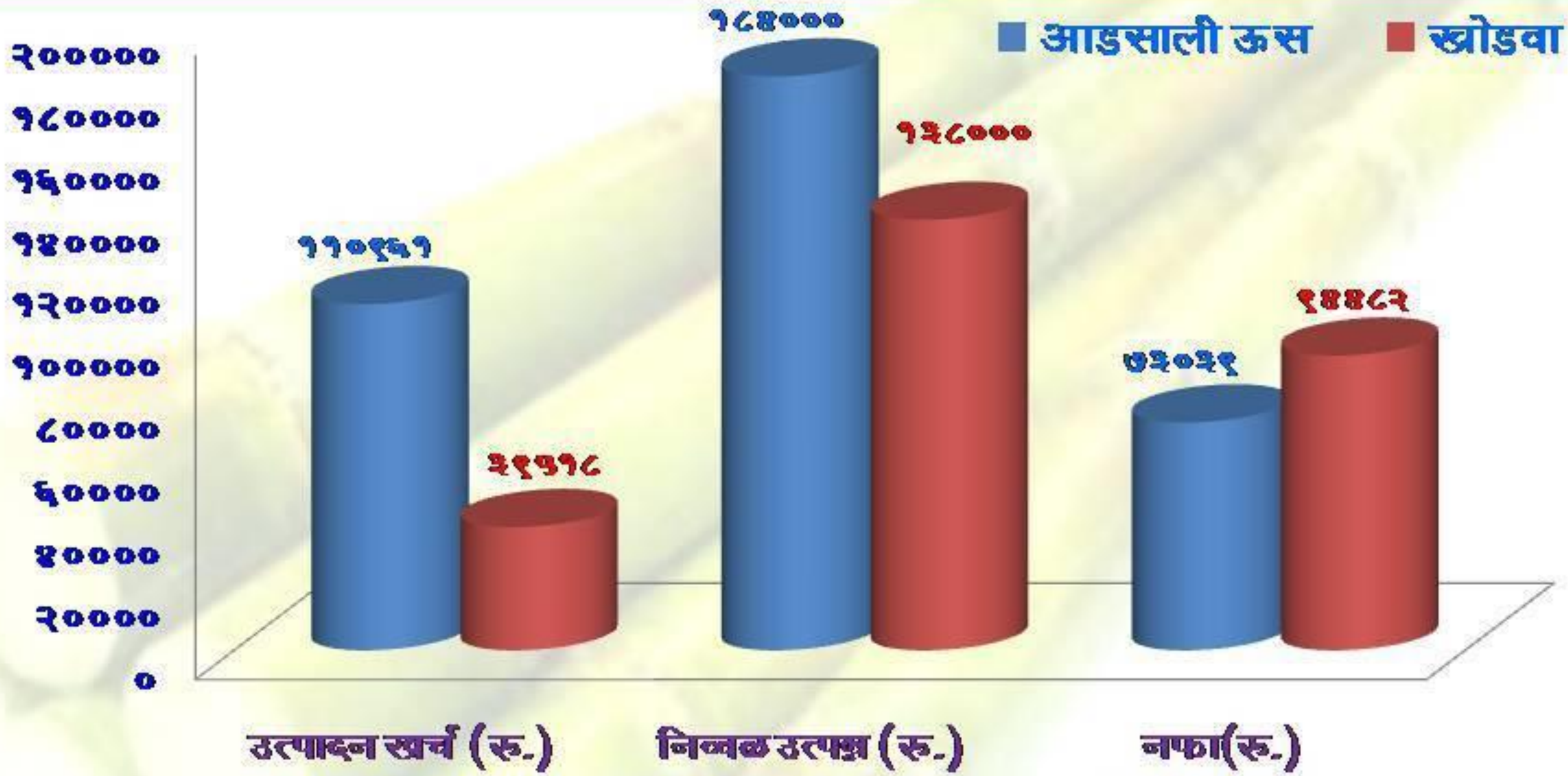
बुडखे मोकळे करणे

सरीमध्ये पाचट ठेवणे

युरीया आणि सिंगल
सुपर फॉस्फेट
पाचटावर टाकणे

पाचटावर कंपोस्ट
कल्चर टाकणे

# आधुनिक उस खोडवा व्यवस्थापन




| | आडसाली ऊस | खोडवा |
|---|---|---|
| उत्पादन खर्च (रु.) | ११०९६१ | २९५१८ |
| निव्वळ उत्पन्न (रु.) | १८४००० | १३८००० |
| नफा(रु.) | ७३०३९ | ९४४८२ |

# Effect of different methods of trash management on soil physicochemical properties, yield and quality of sugarcane ratoon (Mean of 3 seasons)

| Sr. No. | Particular | Burning of trash + broadcasting of fertilizers | Keeping of trash in furrows + pocket application of fertilizes | % increase |
|---|---|---|---|---|
| **A) Yield parameters** | | | | |
| 1. | Yield (t $ha^{-1}$) | 80.4 | 96.5 | 20.02 |
| 2. | CCS (t $ha^{-1}$) | 11.87 | 14.29 | 20.39 |
| **B) Soil chemical properties** | | | | |
| 3. | Org. C (%) | 0.70 | 0.85 | 21.43 |
| 4. | Av. N (Kg $ha^{-1}$) | 181.6 | 226.7 | 24.83 |
| 5. | Av. $P_2O_5$ (kg $ha^{-1}$) | 13.7 | 22.9 | 61.15 |
| 6. | Av. $K_2O$ (kg $ha^{-1}$) | 2921.3 | 337.7 | 15.53 |
| **C) Soil physical properties** | | | | |
| 1. | Bulk density (g $cm^{-3}$) | 1.29 | 1.24 | -- |
| 2. | Max. water holding capacity (%) | 68.66 | 75.66 | 10.05 |

Source: Jadhav *et al.*, (2000)

# Cane yield as affected by trash mulching at different places in India

| Treatment | Cane yield (t/ha) | | Soil type | Reference |
|---|---|---|---|---|
| | 1988-89 | 1989-90 | | |
| **Jalandhar (Panjab)** | | | | |
| No mulching | 32.6 | 35.8 | Sandy loam | Kanwar *et al.*, 1992 |
| Mulching | 59.2 | 57.9 | | |
| CD (0.05) | 9.7 | 6.3 | | |
| **Karnal (Haryana)** | | | | |
| No mulching | 48.5 | 47.2 | Sandy loam | Kumar and Srivastava, 1991 |
| Mulching | 64.2 | 57.2 | | |
| CD (0.05) | 1.5 | 13.3 | | |
| **Mazaffarnagar (Uttar Pradesh)** | | | | |
| No mulching | 60.4 | 53.3 | Sandy loam | Malik *et al.*, 1996 |
| Mulching | 76.6 | 51.9 | | |
| CD (0.05) | 1.5 | NS | | |
| **Sehore (Madhya Pradesh)** | | | | |
| No mulching | 70.6 | 55.8 | Clay loam | Sharma & Verma, 1996 |
| Mulching | 80.7 | 80.2 | | |
| CD (0.05) | 8.0 | 5.7 | | |
| **Cuddalore (Tamil Nadu)** | | | | |
| No mulching | 102.0 | 127.9 | Clay loam | Pandian *et al.*, 1992 |
| Mulching | 116.4 | 135.5 | | |

# बदलत्या हवामान परिस्थितीत शाश्वत पिक उत्पादनासाठी आतंरराष्ट्रीय हवामान बदल अभ्यास गटाच्या शिफारशी (IPCC)

- कमीत कमी मशागत तंत्रज्ञान
- शुन्य मशागत तंत्रज्ञान
- पिक फेरपालट
- सेंद्रिय व जिवाणू खतांचा जास्तीत जास्त वापर
- हिरवळीच्या पिकांचा वापर
- माती परिक्षणा आधारे एकात्मीक अन्नद्रव्य व्यवस्थापन
- शेतातील मूलस्थानी काडीकचरा व पिक अवशेषांचे चक्रांकन
- आंतर पीक पध्दतीचा वापर

कृति प्रात्यक्षिके

# खोडवा ऊस उत्पादन ९५ टन प्रति एकर

# खोडवा काढून टाकावयाचा असल्यास मूलस्थानी पाचट जमिनीमध्ये गाडणे

# प्रतिहेक्टरी ऊस पिकाचे अवशेष आणि साखर कारखान्यातील उपपदार्थ उत्पादन

# खोडवा काढून टाकण्याची पारंपारीक पध्दत

# खोडवा काढून टाकण्याची पारंपारीक पध्दत

# खोडवा काढून टाकल्यानंतर पाचट कुजविण्याची सुधारीत पध्दत

# खोडवा काढून टाकल्यानंतर पाचट कुजविण्याची सुधारीत पध्दत

# Composition of added sugarcane crop residues and it's industries wastes

| Composition | Crop residues and industrial wastes | | | | |
|---|---|---|---|---|---|
| | Sugarcane trash | Sugarcane stubbles | Pressmud cake | Pressmud compost | Post biomethanated spent wash |
| pH (1:10) | - | - | 6.6 | 7.20 | 7.30 |
| EC (1:10) | - | - | 3.10 | 22.10 | 33.40 |
| Total N (%) | 0.49 | 0.47 | 1.96 | 2.16 | 0.15 |
| Total P (%) | 0.18 | 0.20 | 2.78 | 1.04 | 0.22 |
| Total K (%) | 0.85 | 0.30 | 1.13 | 2.04 | 1.04 |
| Total Fe (ppm) | 2041 | 1981.5 | 2548 | 12638 | 46 |
| Total Mn (ppm) | 229 | 210.75 | 353 | 412 | 30 |
| Total Zn (ppm) | 21.25 | 20.0 | 190 | 210 | 7.92 |
| Total Cu (ppm) | 20.61 | 5.25 | 83 | 124 | 1.35 |
| TOC (%) | 50.75 | 50.19 | 40.69 | 42.44 | 13.22 |
| C:N ratio | 103.57 | 106.78 | 20.76 | 19.64 | 9.00 |
| Cellulose (%) | 51.55 | 50.38 | 42.43 | 35.0 | - |
| Hemicellulose (%) | 8.9 | 8.7 | 8.8 | 8.3 | - |
| Lignin (%) | 40.0 | 42.1 | 52.7 | 52.60 | - |
| Cellulose : lignin ratio | 1.28 | 1.19 | 1.32 | 0.66 | - |

## Per ha nutrient addition during *in situ* recycling of sugarcane crop residues and it's industrial wastes into experimental plot

| Sugarcane crop residues and industrial wastes | Quantity recycled kg $ha^{-1}$ | Per ha nutrient addition (kg $ha^{-1}$) | | | |
|---|---|---|---|---|---|
| | | Total Carbon | Nitrogen | Phosphorus | Potassium |
| Sugarcane trash | 13600 | 6902 | 66.64 | 24.48 | 115.6 |
| Sugarcane strubbles | 3289 | 1650 | 15.45 | 6.57 | 9.86 |
| Pressmud | 3976 | 1617.8 | 110.53 | 77.92 | 44.92 |
| Post biomethenated spent wash | 14880 (16352 L $ha^{-1}$) | 1967 | 24.52 | 34.97 | 170.06 |
| Pressmud Compost | 1988 | 843.70 | 42.94 | 20.6 | 40.55 |

# Possible nutrient recovery and economy

- **Nutrient removed by per ton sugarcane – 2.08 : 0.53 : 2.8 kg $t^{-1}$ N, $P_2O_5$ and $K_2O$**
- **100 t $ha^{-1}$ sugarcane crop removes – 208: 53: 280 kg $ha^{-1}$ N, $P_2O_5$ and $K_2O$**

**(Pharande and Kadlag, 2007)**

- **112 t $ha^{-1}$ sugarcane crop removes 233: 59:314 kg $ha^{-1}$ N, $P_2O_5$ and $K_2O$**
- **Per ha nutrient recovery after harvest of 112 t $ha^{-1}$ sugarcane through crop residues and industrial wastes –**

217.14: 143.94: 340 kg $ha^{-1}$ N, $P_2O_5$ and $K_2O$

**93 % recovery of N**
**244 % recovery of $P_2O_5$**
**108 % recovery of $K_2O$**

**excluding secondary and micronutrients**

Estimated experimental economical potential – 20,216 Rs. $ha^{-1}$
Estimated economical potential of Maharashtra State

Rs. 15,342 Corers

**(by considering productivity of MS- 85 t $ha^{-1}$ during 2012-13)**

# Effect of *in situ* decomposition of sugarcane crop residues and sugar industrial wastes on soil chemical properties at 45 days after incorporation

| Treatment | pH (1:2:5) | EC ($dSm^{-1}$) | OC (%) | Available Macronutrients (kg $ha^{-1}$) | | | Available Micronutrients (kg $ha^{-1}$) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | N | P | K | Fe | Mn | Zn | Cu |
| $T_1$: R-SCR | 7.60 | 0.17 | 0.45 | 178 | 12.50 | 322 | 4.40 | 6.17 | 3.11 | 7.13 |
| $T_2$: B-SCR | 7.53 | 0.14 | 0.42 | 164 | 9.0 | 345 | 3.60 | 5.57 | 2.53 | 6.60 |
| $T_3$: I-SCR | 7.67 | 0.16 | 0.67 | 212 | 14.0 | 334 | 4.53 | 8.10 | 4.03 | 8.33 |
| $T_4$: ISCR + U | 7.74 | 0.19 | 0.73 | 213 | 15.67 | 337 | 4.60 | 8.33 | 4.07 | 8.73 |
| $T_5$: ISCR + CD | 7.77 | 0.17 | 0.76 | 228 | 16.33 | 356 | 4.57 | 8.80 | 4.17 | 8.83 |
| $T_6$: ISCR + U + MI | 7.99 | 0.19 | 0.81 | 234 | 18.33 | 371 | 5.17 | 9.25 | 4.43 | 9.73 |
| $T_7$: ISCR + CD + MI | 7.89 | 0.18 | 0.78 | 232 | 17.33 | 364 | 4.90 | 8.97 | 4.20 | 9.00 |
| $T_8$: ISCR + PMC+ PBSW+U +SP+MI | 8.09 | 0.23 | 0.85 | 246 | 21.33 | 374 | 5.43 | 9.60 | 4.63 | 10.33 |
| SE $\pm$ | 0.19 | 0.02 | 0.023 | 4.87 | 1.32 | 3.92 | 0.28 | 0.35 | 0.17 | 0.57 |
| CD @ 5% | NS | NS | 0.076 | 14.84 | 4.02 | 11.90 | 0.87 | 1.06 | 0.52 | 1.73 |
| Initial | 8.20 | 0.26 | 0.46 | 176 | 11.33 | 319 | 4.23 | 5.91 | 2.87 | 6.77 |

# Effect of *in situ* decomposition of sugarcane crop residues and sugar industrial wastes on soil chemical properties after incorporation of sunhemp green mannuring prior to planting of sugarcane

| Treatment | pH (1:2:5) | EC ($dSm^{-1}$) | OC (%) | Available Macronutrients (kg $ha^{-1}$) | | | Available Micronutrients (kg $ha^{-1}$) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | N | P | K | Fe | Mn | Zn | Cu |
| $T_1$: R-SCR | 7.31 | 0.16 | 0.47 | 189 | 13.55 | 317 | 4.78 | 9.05 | 4.10 | 6.83 |
| $T_2$: B-SCR | 7.32 | 0.18 | 0.44 | 175 | 12.60 | 353 | 4.19 | 6.87 | 3.55 | 6.50 |
| $T_3$: I-SCR | 7.35 | 0.21 | 0.80 | 228 | 18.17 | 354 | 5.44 | 10.73 | 4.12 | 8.40 |
| $T_4$: ISCR + U | 7.55 | 0.19 | 0.82 | 233 | 18.50 | 359 | 6.03 | 8.96 | 4.13 | 8.77 |
| $T_5$: ISCR + CD | 7.6 | 0.24 | 0.83 | 236 | 20.33 | 367 | 6.59 | 9.18 | 4.40 | 8.82 |
| $T_6$: ISCR + U + MI | 7.67 | 0.28 | 0.91 | 252 | 21.00 | 374 | 6.75 | 10.77 | 4.81 | 9.88 |
| $T_7$: ISCR + CD + MI | 7.44 | 0.27 | 0.83 | 241 | 20.50 | 369 | 6.64 | 10.73 | 4.77 | 9.78 |
| $T_8$: ISCR + PMC+ PBSW+U +SP+MI | 7.97 | 0.36 | 0.92 | 260 | 23.83 | 378 | 7.20 | 11.57 | 5.36 | 10.37 |
| SE $\pm$ | 0.11 | 0.03 | 0.03 | 5.32 | 1.12 | 5.14 | 0.17 | 0.49 | 0.22 | 0.51 |
| CD @ 5% | NS | 0.10 | 0.10 | 16.16 | 3.39 | 15.6 | 0.53 | 1.49 | 0.69 | 1.56 |
| Initial | 8.20 | 0.26 | 0.46 | 176 | 11.33 | 319 | 4.23 | 5.91 | 2.87 | 6.77 |

# Effect of *in situ* decomposition of sugarcane crop residues and sugar industrial wastes on soil chemical properties after harvest of sugarcane

| Treatment | pH (1:2:5) | EC ($dSm^{-1}$) | OC (%) | Available Macronutrients (kg $ha^{-1}$) | | | Available Micronutrients (kg $ha^{-1}$) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | N | P | K | Fe | Mn | Zn | Cu |
| $T_1$: R-SCR | 8.04 | 0.33 | 0.34 | 182 | 10.33 | 306 | 4.03 | 6.61 | 3.93 | 6.60 |
| $T_2$: B-SCR | 7.91 | 0.30 | 0.29 | 166 | 7.17 | 350 | 3.47 | 5.20 | 3.50 | 6.20 |
| $T_3$: I-SCR | 8.10 | 0.36 | 0.60 | 211 | 13.00 | 337 | 4.20 | 8.37 | 4.17 | 7.57 |
| $T_4$: ISCR + U | 8.14 | 0.37 | 0.66 | 216 | 13.33 | 343 | 4.37 | 8.60 | 4.17 | 7.67 |
| $T_5$: ISCR + CD | 8.14 | 0.42 | 0.67 | 222 | 12.83 | 344 | 4.87 | 8.57 | 4.37 | 8.30 |
| $T_6$: ISCR + U + MI | 8.18 | 0.42 | 0.71 | 234 | 13.67 | 346 | 5.10 | 9.37 | 4.40 | 8.60 |
| $T_7$: ISCR + CD + MI | 8.16 | 0.38 | 0.68 | 227 | 12.33 | 342 | 4.67 | 9.23 | 4.33 | 8.43 |
| $T_8$: ISCR + PMC+ PBSW+U +SP+MI | 8.22 | 0.46 | 0.72 | 249 | 14.33 | 357 | 5.60 | 9.54 | 5.10 | 9.50 |
| SE ± | 0.06 | 0.04 | 0.02 | 4.59 | 1.06 | 3.78 | 0.37 | 0.35 | 0.13 | 0.28 |
| CD @ 5% | NS | NS | 0.07 | 13.94 | 4.46 | 11.46 | 1.13 | 1.06 | 0.41 | 0.85 |
| Initial | 8.20 | 0.26 | 0.46 | 176 | 11.33 | 319 | 4.23 | 5.91 | 2.87 | 6.77 |

## Effect of *in situ* decomposition of sugarcane crop residues and sugar industrial wastes on soil chemical properties after harvest of sugarcane

| Treatment | pH (1:2:5) | EC (dSm$^{-1}$) | OC (%) | CaCO$_3$ (%) | Available Macronutrients (kg ha$^{-1}$) | | | Available Micronutrients (kg ha$^{-1}$) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | N | P | K | Fe | Mn | Zn | Cu |
| $T_1$: R-SCR | 8.14 | 0.21 | 0.35 | 18.3 | 185 | 13.22 | 329 | 12.64 | 11.82 | 3.61 | 6.48 |
| $T_2$: B-SCR | 8.11 | 0.18 | 0.32 | 18.1 | 172 | 9.49 | 300 | 12.58 | 11.66 | 2.67 | 4.63 |
| $T_3$: I-SCR | 8.23 | 0.23 | 0.62 | 18.2 | 198 | 14.78 | 332 | 14.02 | 12.03 | 4.19 | 6.58 |
| $T_4$: ISCR + U | 8.31 | 0.26 | 0.66 | 18.0 | 217 | 19.14 | 336 | 15.65 | 12.21 | 5.01 | 6.62 |
| $T_5$: ISCR + CD | 8.27 | 0.25 | 0.67 | 17.8 | 203 | 18.31 | 335 | 14.62 | 12.06 | 4.75 | 6.61 |
| $T_6$: ISCR + U + MI | 8.36 | 0.28 | 0.77 | 17.0 | 228 | 25.29 | 352 | 16.73 | 12.39 | 7.25 | 6.73 |
| $T_7$: ISCR + CD + MI | 8.34 | 0.27 | 0.72 | 17.4 | 224 | 22.33 | 340 | 16.32 | 12.27 | 5.59 | 6.67 |
| $T_8$: ISCR + PMC+ PBSW+ U +SP+ MI | 8.40 | 0.29 | 0.79 | 16.1 | 234 | 26.20 | 368 | 17.07 | 12.49 | 7.61 | 6.85 |
| SE $\pm$ | 0.009 | 0.005 | 0.027 | 0.595 | 2.165 | 0.347 | 3.545 | 0.36 | 0.10 | 0.087 | 0.121 |
| CD @ 5% | 0.027 | 0.015 | 0.82 | NS | 6.631 | 1.061 | 10.85 | 1.10 | 0.27 | 0.266 | 0.37 |
| Initial | 8.19 | 0.21 | 0.30 | 18.8 | 163 | 12.33 | 316 | 5.55 | 9.57 | 3.23 | 4.58 |

# Presearsonal sugarcane yield and yield contributing characteristics as influence by *in situ* sugarcane wastes decomposition in Inseptisol

| Treatment | Cane yield (t $ha^{-1}$) | CCS yield (t $ha^{-1}$) | CCS% |
|---|---|---|---|
| $T_1$: R-SCR | 129.86 | 16.50 | 12.77 |
| $T_2$: B-SCR | 126.84 | 16.12 | 12.71 |
| $T_3$: I-SCR | 135.55 | 17.47 | 12.89 |
| $T_4$: ISCR + U | 137.66 | 17.89 | 13.00 |
| $T_5$: ISCR + CD | 139.40 | 18.33 | 13.15 |
| $T_6$: ISCR + U + MI | 147.01 | 19.93 | 13.56 |
| $T_7$: ISCR + CD + MI | 142.01 | 18.73 | 13.19 |
| $T_8$: ISCR + PMC+ PBSW+U +SP+ MI | 150.17 | 20.37 | 13.57 |
| SE $\pm$ | 3.06 | 0.59 | 0.28 |
| CD @ 5% | 9.27 | 1.57 | NS |

# Ratoon sugarcane yield and yield contributing characteristics as influence by *in situ* sugarcane wastes decomposition in Inseptisol

| Treatment | Cane yield (t $ha^{-1}$) | CCS yield (t $ha^{-1}$) | CCS% |
|---|---|---|---|
| $T_1$: R-SCR | 103.78 | 13.37 | 12.89 |
| $T_2$: B-SCR | 96.41 | 12.36 | 12.83 |
| $T_3$: I-SCR | 111.46 | 14.55 | 13.06 |
| $T_4$: ISCR + U | 114.87 | 15.11 | 13.16 |
| $T_5$: ISCR + CD | 118.26 | 15.70 | 13.28 |
| $T_6$: ISCR + U + MI | 126.68 | 17.32 | 13.68 |
| $T_7$: ISCR + CD + MI | 119.63 | 15.93 | 13.32 |
| $T_8$: ISCR + PMC+ PBSW+U +SP+ MI | 131.43 | 18.04 | 13.73 |
| SE $\pm$ | 3.26 | 0.69 | 0.29 |
| CD @ 5% | 9.81 | 2.04 | NS |

# पर्यावरणपूरक व शाश्वत ऊस व्यवस्थापन जागृती अभियान

- किसनवीर सह. साखर कारखाना लि., भुईंज
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- जकराया शुगर्स लि., वटवटे, ता. मंगळवेढा, जि.सोलापूर
  (पर्यावरणपूरक व शाश्वत ऊस शेती)
  शेतकरी संख्या - २०००

- सदगुरु श्री श्री साखर कारखाना लि., राजेवाडी, ता. आटपाडी, जि. सांगली (सेंद्रिय व नैसर्गिक ऊस शेती)
  शेतकरी संख्या - १०००

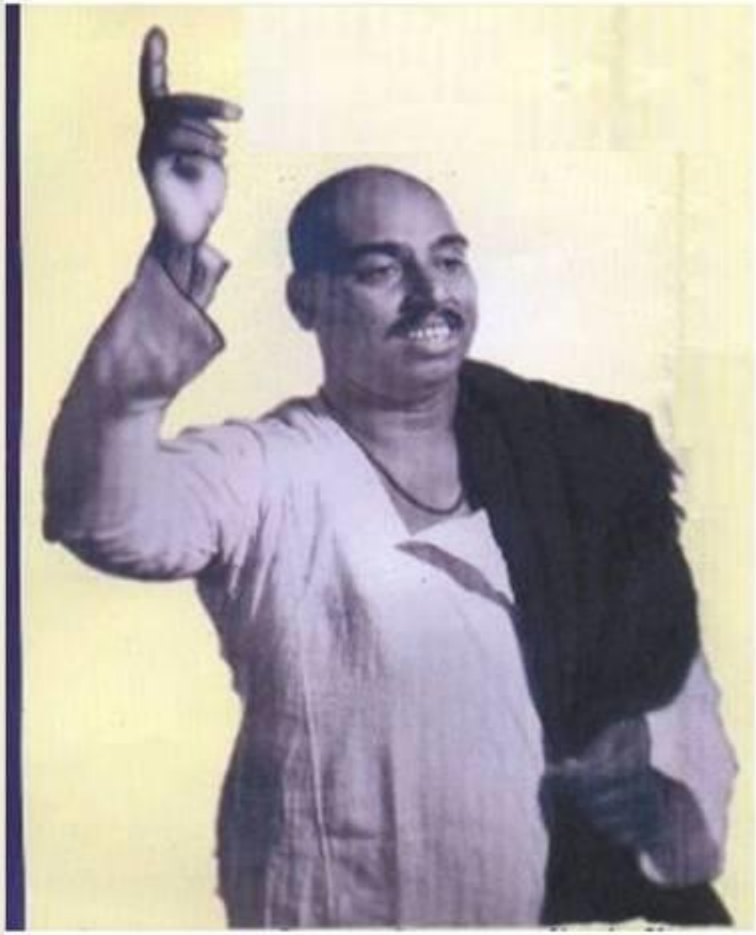
# सारांश

१. माती व ऊस शेती साखर कारखानदारीचा पाया आहे. ज्या मातीतून उपलब्ध होणारी संपूर्ण जैवसंपत्ती परत त्याच मातीला मिळाली पाहिजे (चंक्राकन)

२. ऊस शेतीतील पालापाचोळा व साखर कारखानदारीतील टाकावू उपपदार्थांचे (ऊसाचे पाचट, खोडकी व मुळ्या, वाढे, प्रेसमड/ प्रेसमड कंपोष्ट, बगॅसची राख आणि स्पेंट वॉश) एकत्रित व मूलस्थानी चक्रांकन अत्यंत महत्त्वाचे

३. पर्यावरणपूरक, शाश्वत व विक्रमी ऊस उत्पादनासाठी तसेच जमिन आरोग्य व्यवस्थापनासाठी ऊस शेतीतील पाचट व साखर कारखान्यातील टाकावू पदार्थांच्या मूलस्थानी व्यवस्थापनाचा अंतर्भाव आदर्श ऊस विकास कार्यक्रमात करण्याची गरज

# धन्यवाद



## राष्ट्रसंतांचा दिव्य संदेश

आपण जे जे काही खातो ।
रक्त मांस तेणे जमवितो ।।
उरले ते खत म्हणतो ।
भूमीवरी घालावया ।।
त्या खताची झाली जोपासना ।
तीच फळते काढावया उत्पन्ना ।।
खत नसता भूमीची दैना ।
होवू लागे ।।

# Green Technologies for Sugar Industry: Sustainability for Profitability

SUNIL DHOLE, PHD (CHEM ENGG)

CO-FOUNDER AND DIRECTOR

CHEMDIST

ChemDist

Science. Engineering. Technology

Delivering Separation & Process Technology

# Team

**Director & Co-Founder**

**Dr. Sunil Dhole**

PhD (Chemical Engineering), IIT Kanpur

**Panel Member**

- Board of Director at Water Quality India Association
- Committee Member of Bureau of "Indian Standard for Community Water Purifier"

**Director & Co-Founder**

**Tushar Wagh**

MBA, Chemical Engineering

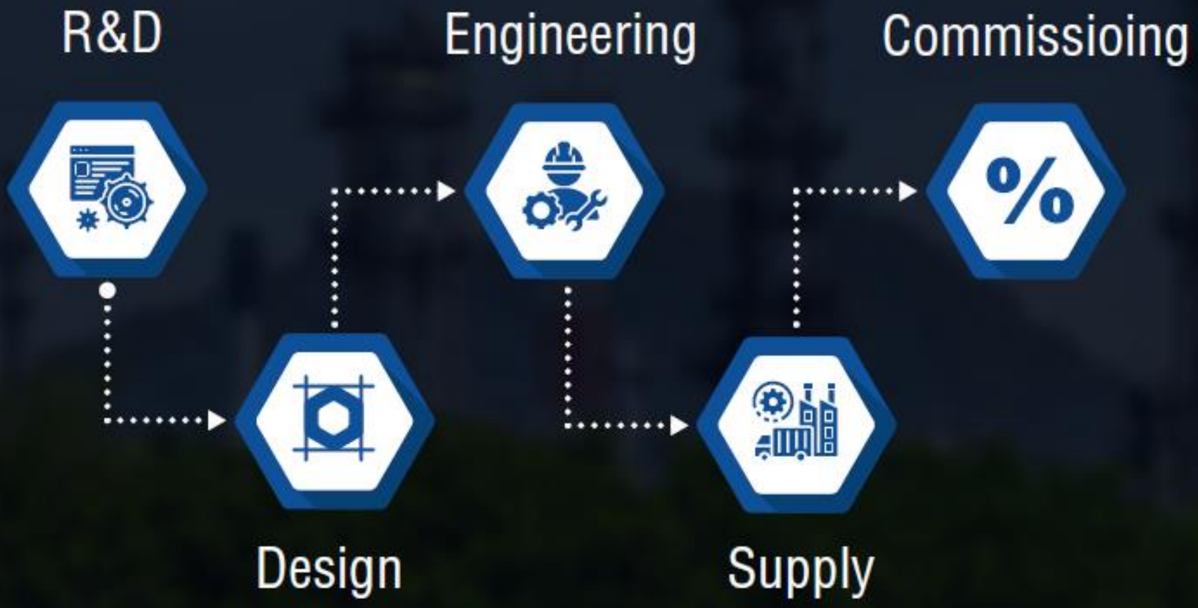
**Mentor**

**Prof. J B Joshi (Padma Bhushan)**

- International Member of the National Academy of Engineering of the United States of America
- Emeritus Professor of Eminence,ICT

# What We Do

## Delivering Separation & Process Technologies




# Capabilities

## Area of Expertise

### Heat & Mass Transfer

- Heat Exchanger
- Mass Transfer Internals
- Turbulator
- Reactors & Agitators

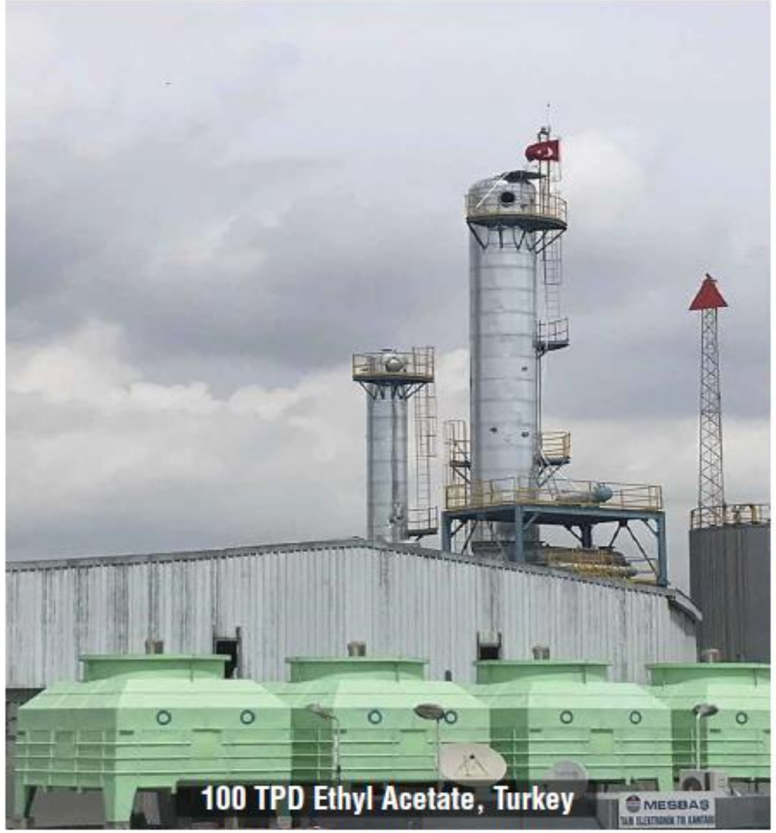
### Membrane Technology

- Gas Separation
- Membrane Distillation
- Ultrafiltration-NanoFiltration
- Pervaporation

### Process Technologies

- Distillation
- Evaporation
- Reaction & Mixing
- Oil & Gas Technology

## Commissioned Projects


100 TPD Ethyl Acetate, Turkey


HPCL, Vizag India


Anisole Plant, Saudi Arabia


200 TPD Fractionation Plant, Dubai


Distillation Plant, USA

## Team & Facilities

- 100+ Engineers
- 250+ workers

## Infrastructure

- 3 Fabrication Units
- 1 Lakh Sq. Ft. Area

# Journey So Far

**50+**
Successful Turnkey Projects Installation

**500+**
Clients Served

**12+**
Industrial Segments


**10+**
Patents

**30+**
Products

**10+**
Technologies

**6000+**
Oxygen Concentrators Running

**6 Mn**
Tata Swach Serving People Per Day

**100 Mn**
Mask Delivered

# Collaborations



RMIT UNIVERSITY

DRDO

Schneider Electric

## Our R&D Network

**Dr. Dipankar Bandopadhyay**
Professor, IIT Guwahati
(Clean Energy - Fuel and Solar Cells)

**Dr. Amol Kulkarni**
Scientist, CSIR-National Chemical Laboratory
(Continuous Manufacturing and Scale-up)

**Dr. Srinivas Mettu**
Senior Research Fellow, RMIT University
(Bio-Technology)

**Dr. Akshai Kumar Alape Seetharam**
Assistant Professor, IIT Guwahati
Catalysis (Heterogeneous and Homogeneous)

**Dr. Nageswara Rao Peela**
Associate Professor, IIT Guwahati
(Biomass Conversion to Value Added Chemicals)

**Dr. Vivek Vitankar**
Ph.D, ICT Mumbai & Director at FluiDimensions
(Computational Fluid Dynamics)

**Dr. Sandip Patil**
Ph.D, IIT Kanpur & Director, E-Spin Nanotech Pvt. Ltd.
(Nano Technology)

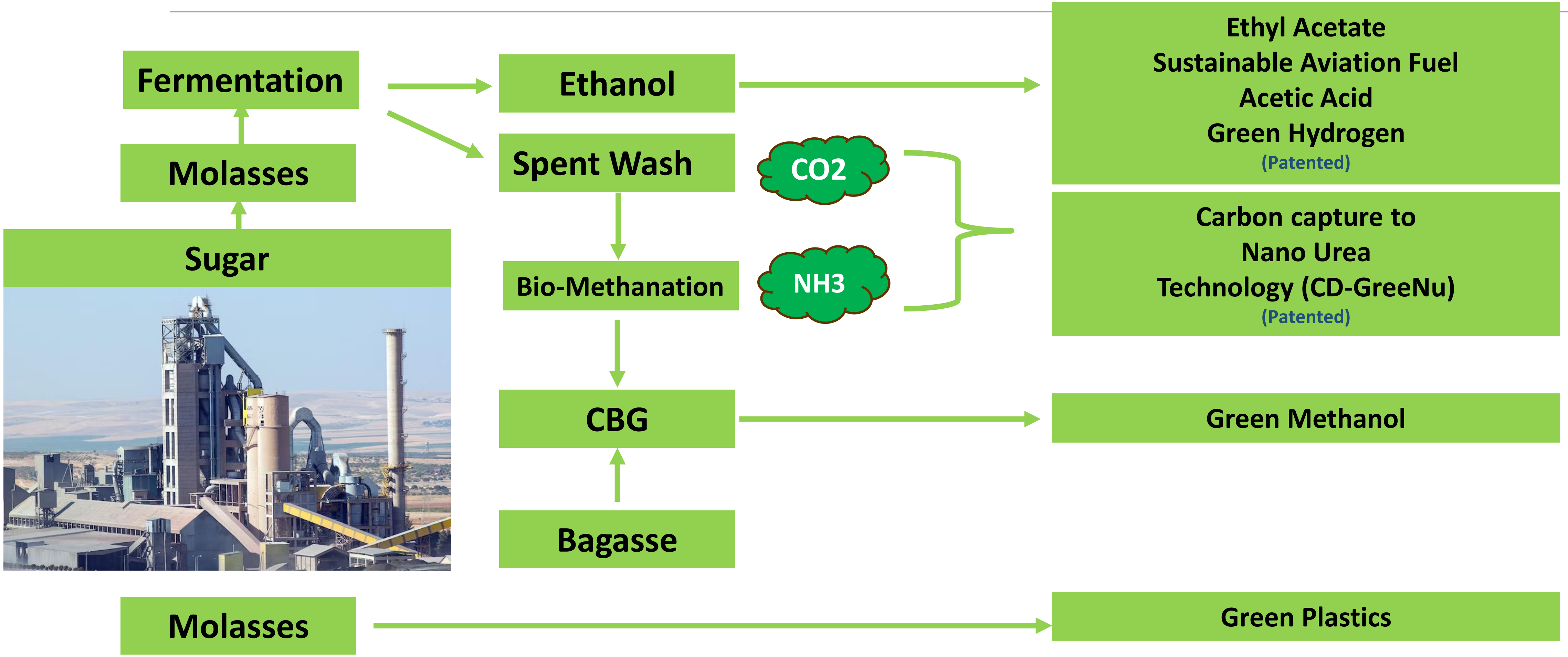
**Dr. Uttam Manna**
Professor, IIT Guwahati
(Bio-inspired Polymer Materials)

**Dr. Tapas K. Mandal**
Professor, IIT Guwahati
( Micro-Nano Technology for Energy Harvesting)

# Our Focus

- To innovate and scaleup green technologies which are commercially feasible in today's market scenario
- The Net Zero technologies giving green consumable products along with the green Hydrogen as a by product
- Use of Green Hydrogen in the existing chemical industry
- To Convert captured carbon (CO2) into valuable Agro-products of mass consumption

# Why Sugar Industry?



# Our Technologies

1. Captured $CO_2$ and $NH_3$ (from Sugar Factory) to Nano-Urea
2. Bio-ethanol to Bio-Aviation Fuel (SAF) and Green Hydrogen*
3. Bio-ethanol to Acetic Acid and Green Hydrogen*
4. Bio-ethanol to Ethyl Acetate and Green Hydrogen*
5. Low temperature cracking of Ammonia to Hydrogen and Nitrogen (no emissions of Nox)
6. Methanol cracking to Formic Acid and Hydrogen (with no emissions of CO and $CO_2$)* (Bagasse)
7. Bio-mass to Green Plastic (no $CO_2$ emissions in the process)

*** Green Hydrogen is a by-product, the commercial feasibility comes from the main product**

# Nano-Fertilizer Market Driver

Problems with the Existing Fertilizers:

1. Wastage – up to 70%
2. Efficiency – up to 30%
3. Carbon foot print – One of the highest carbon foot print product
4. GHG emissions – Up to 6% of the total emissions
5. Pollution: Water, air and Soil
6. Soil Fertility and Productivity – Reduction due to over use

# Market Potential

| ChemDist – Green Nano-Urea Technology | | |
|---|---|---|
| Sr. No. | Patented Technologies | Product Market by 2030 |
| 1 | Waste $CO_2$ to Nano-Urea | Bn 200 USD (nano-fertilizer) |

ChemDist
MEMBRANE SYSTEMS PVT. LTD.

# Competitive Advantages

- Bio raw materials ($CO_2$ and Ammonia captured from Sugar Factory) to produce **Carbon Neutral Nano-Urea**
- Low temperature process
- The catalyst invented by us is based on the abundantly available metals
- Catalyst will be manufactured inhouse to have a complete control on the business chain
- Affordable Nano-Urea

# CD Nano - Urea Process

$$NH_3 + CO_2 \longrightarrow NH_4COONH_2$$

Captured from Bio-Methanated Spent Wash

CO2 captured from Industry

$$NH_4COONH_2 \rightleftharpoons CO(NH_2)_2 + H_2O$$

**Urea Conversion to Nano-Urea Using CD-Bind slow release binder**

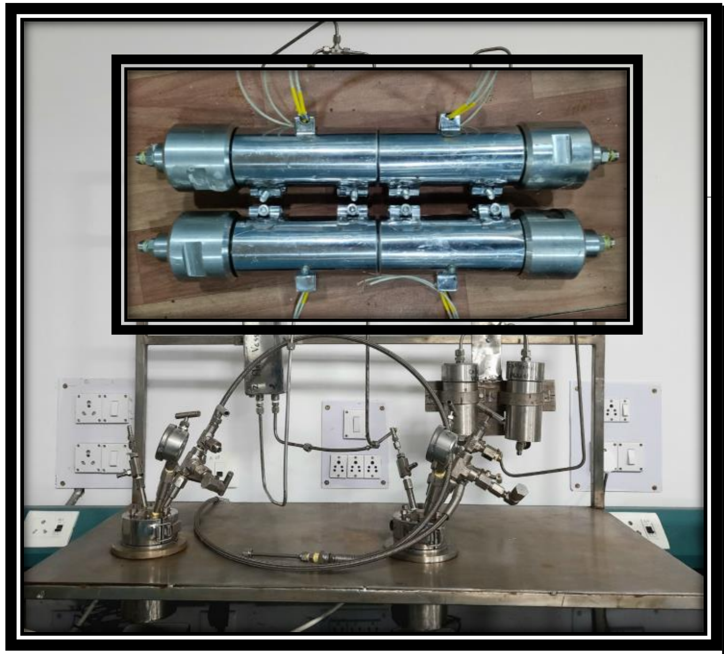
**Nano Urea with 20%-30% Nitrogen**

# Conventional Urea : Challenges

| | Conventional Urea |
|---|---|
| Environmental Pollution | Soil, Water and Air |
| $CO_2$ Footprint | Very High |
| Renewable and Green | No |
| Nitrogen Convey | 30-50 % to plants |
| Sustain Release | No. Due to which more urea wasted in climate |
| Available Form | Solid |
| NOx | NOx formation during use |
| Soil Yield / Fertility | Continuous use decreases soil yield |

# Labs

# Pilot and Lab Plants



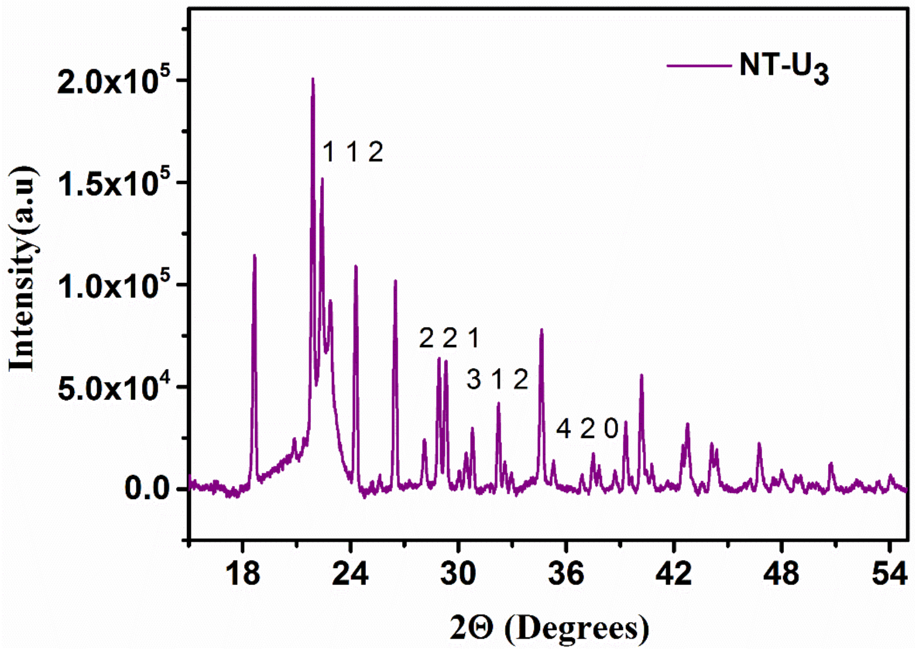

# Synthesis of Nano-Urea

*Nitrogen*
*Weight % = 20-30 %*

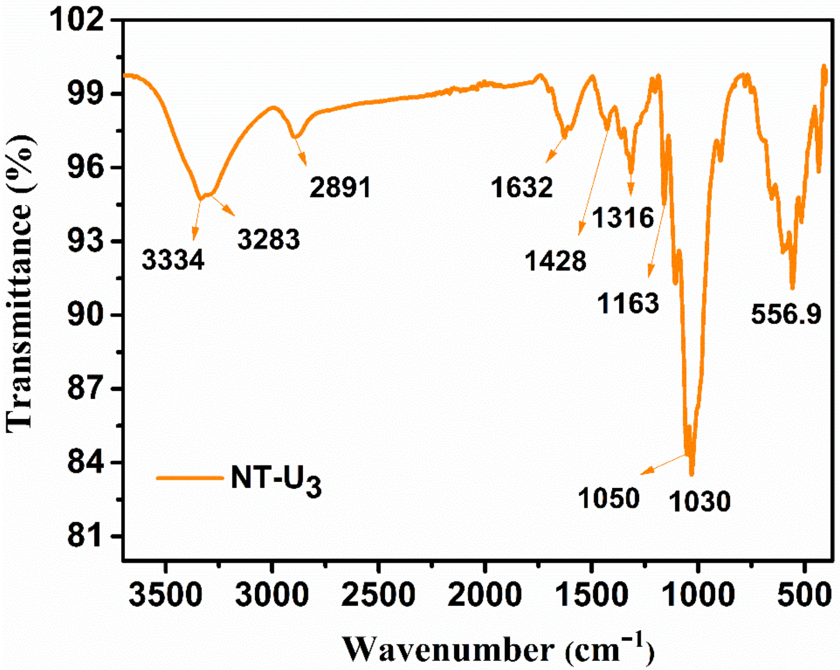
*Nano fringes of ~30-40 nm*

*Highly crystalline material*

# Synthesis of Nano-Urea- Nano Urea : Binder (1:1)

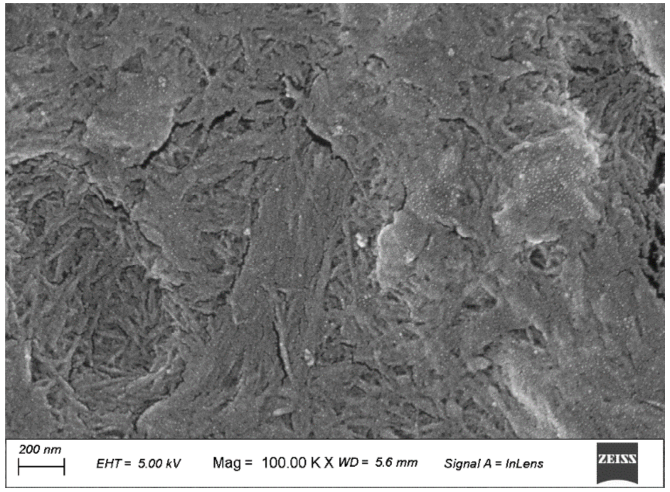


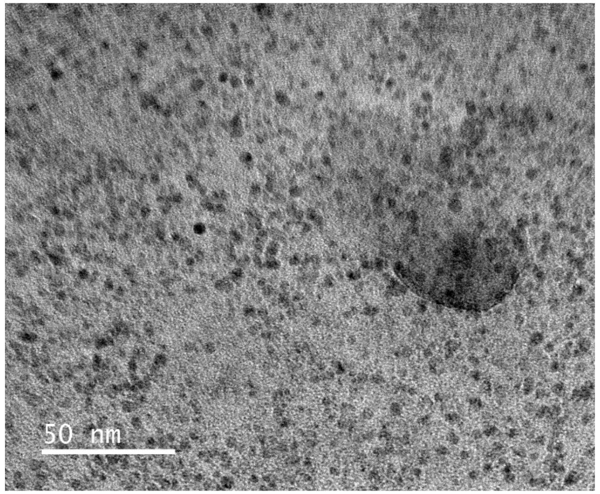

*p*-XRD




*FTIR*

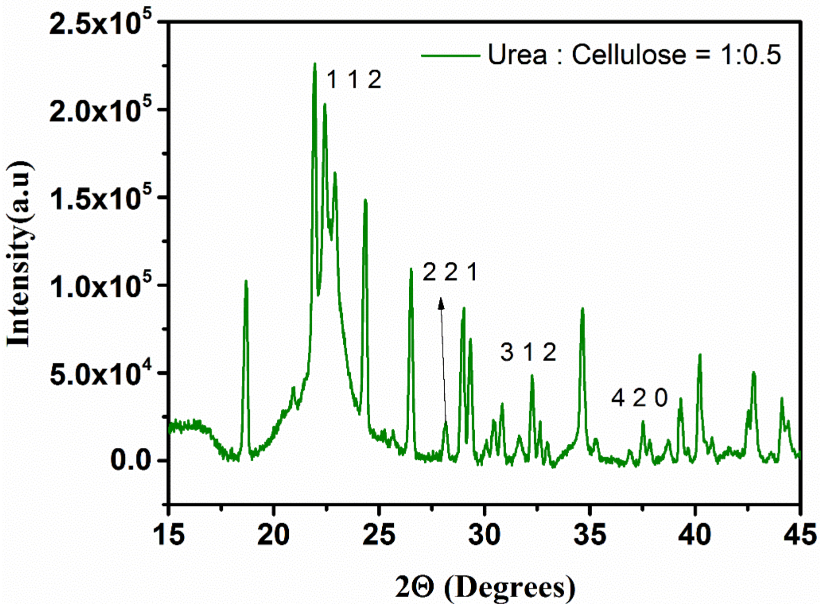
*FESEM*



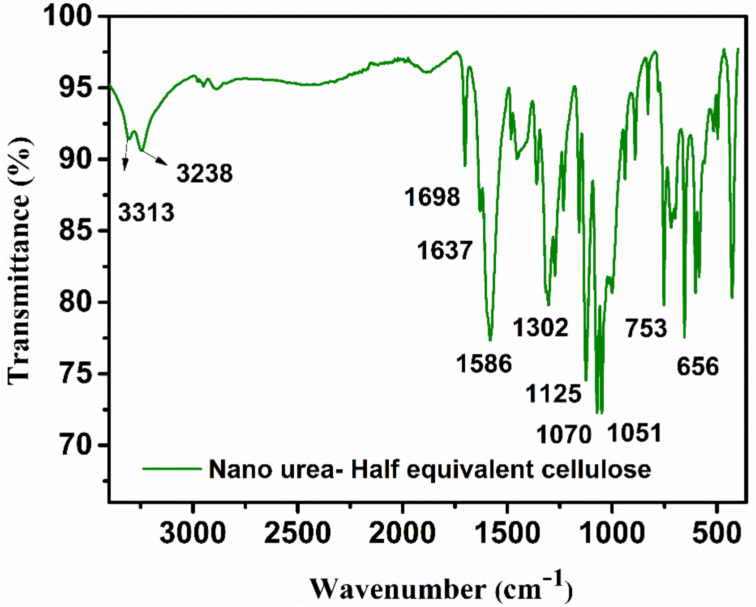




*FETEM*

# Synthesis of Nano-Urea- Nano Urea : Binder (1:0.5)

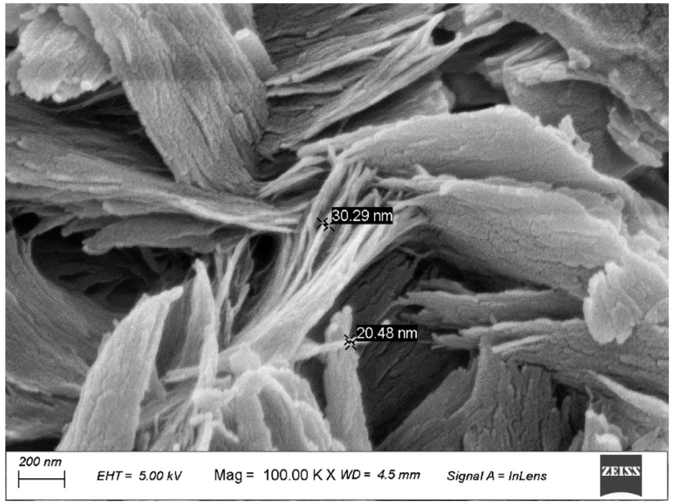



*p*-XRD

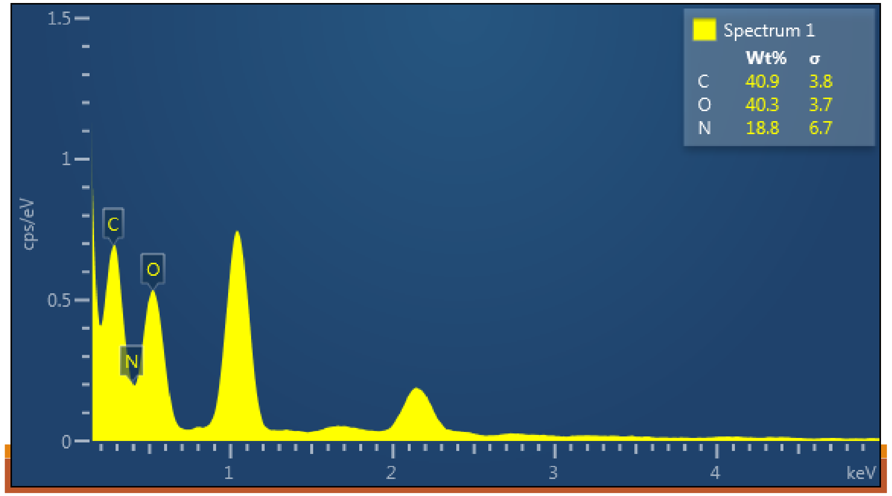



FTIR

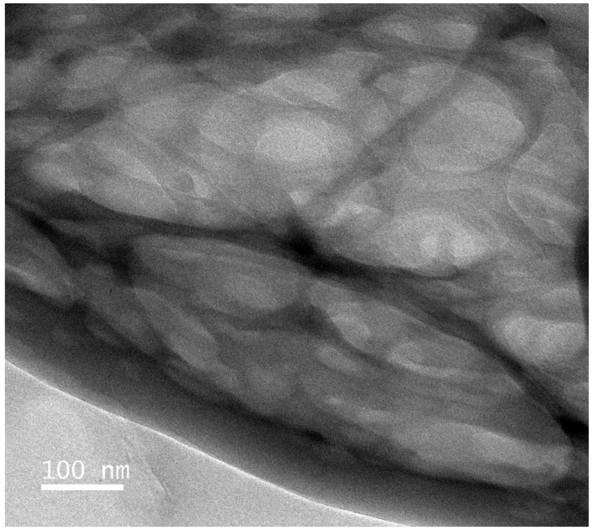
FESEM



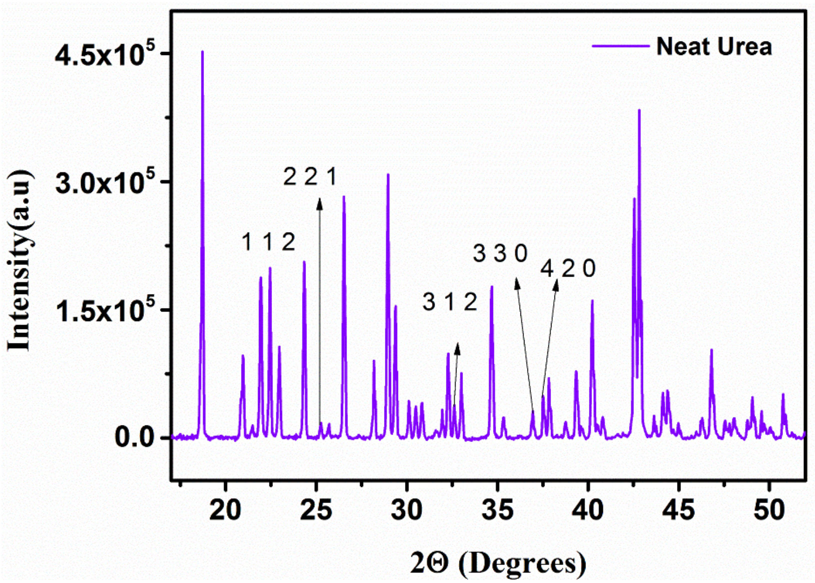

EDS




FETEM

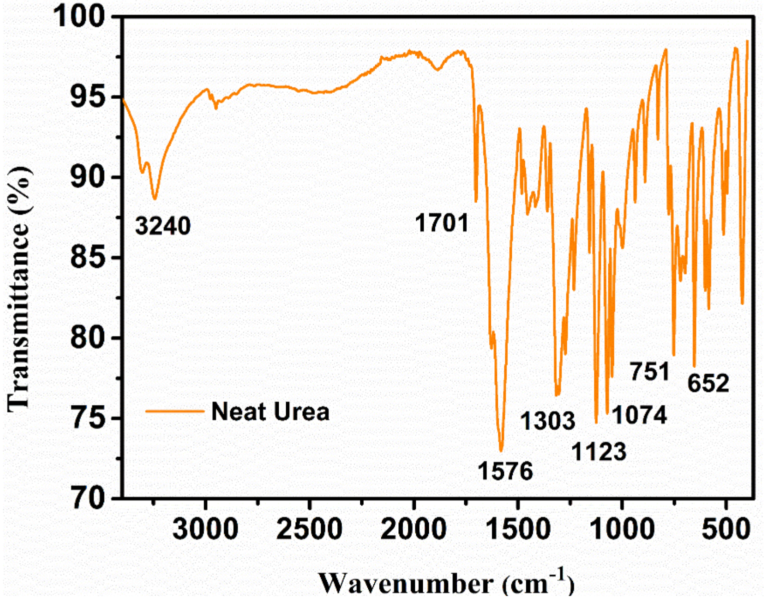


# Synthesis of Nano-Urea- Nano Urea (100%)




*p*-XRD

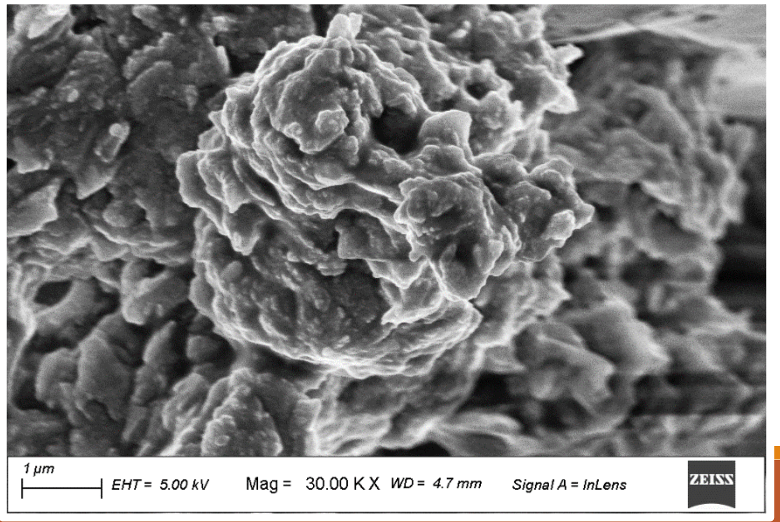
FTIR

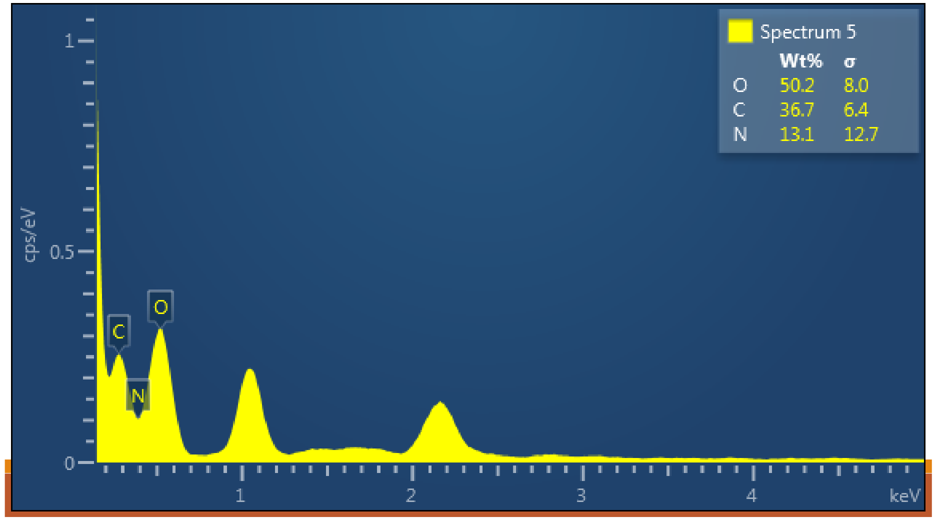


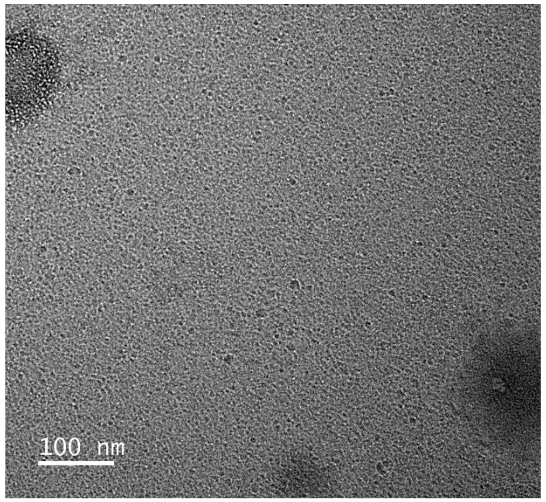

FESEM

EDS

FETEM



# Synthesis of Nano-Urea- Characterizations

| Sample | *p*-XRD | FESEM | EDS | FETEM | FTIR | NMR | | Zeta potential |
|---|---|---|---|---|---|---|---|---|
| | | | | | | $^{1}H$ | $^{13}C$ | |
| 100% Nano Urea | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Nano Urea: Slow release Binder 1:0.5 equivalent | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Urea: Slow release Binder 1:1 equivalent | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Nitrogen Content – 20-23%

# Soyabean Crop Trials (MPKV Rahuri)

| | |
|---|---|
| T1 | Control |
| T2 | Recommended dose of Fertilizers |
| T3 | Recommended dose of Biochar (N% = ) |
| T4 | 20% Less of RDF of Biochar |
| T5 | 20% More of RDF Biochar |
| T6 | Recommended Dose of Nanourea (N%= ) |
| T7 | 20% Less of RDF Nano urea |
| T8 | 20% More of RDF Nanourea |
| T9 | Biochar + Nanourea |
| T10 | 20% less of BN Content |
| T11 | 20% More of BN Content |
| T12 | Rhizobium + Biochar |
| T13 | Azotobacter + Biochar |
| T14 | FVM + Biochar |
| T15 | FVM + Biochar |
| | Total Nano Urea required (kgs) |
| | Biochar (Kgs) |
| Plot Size | 3 x 3 m |
| Design | Randomize Block Design |
| Total Area Required | 125 sqm / replication |
| Replications | 3 |

# CD - Nano Urea : Field Trials

(MPKV Rahuri)




# Conventional Urea Vs. Nano Urea

| | Conventional Urea | ChemDist Nano Urea Technology |
|---|---|---|
| Environmental Pollution | Soil, Water and Air | Nil Pollution |
| $CO_2$ Footprint | Very High | Almost NIL |
| Renewable and Green | No | Yes |
| Nitrogen Convey | 30-50 % to plants | More than 80 % to Plant |
| Sustain Release | No. Due to which more urea wasted in climate | Yes. Due to which no wastage of Nano Urea in climate. |
| Available Form | Solid | Solid |
| NOx | NOx formation during use | No NOx emissions |
| Soil Yield / Fertility | Continuous use decreases soil yield | Increased soil yield and increase in crop production |

# Media Coverage


BBC coverage on Oxygen Concentrators


Ministry of Education tweets about CD-OXY

PM. Narendra Modi wears our N95 SWASA Mask


# Our R&D Network

**Dr. Dipankar Bandopadhyay**
Professor, IIT Guwahati
(Clean Energy - Fuel and Solar Cells)

**Dr. Akshai Kumar Alape Seetharam**
Assistant Professor, IIT Guwahati
Catalysis (Heterogeneous and Homogeneous)

**Dr. Sandip Patil**
Ph.D, IIT Kanpur & Director, E-Spin Nanotech Pvt. Ltd.
(Nano Technology)

**Dr. Amol Kulkarni**
Scientist, CSIR-National Chemical Laboratory
(Continuous Manufacturing and Scale-up)

**Dr. Nageswara Rao Peela**
Associate Professor, IIT Guwahati
(Biomass Conversion to Value Added Chemicals)

**Dr. Uttam Manna**
Professor, IIT Guwahati
(Bio-inspired Polymer Materials)

**Dr. Srinivas Mettu**
Senior Research Fellow, RMIT University
(Bio-Technology)

**Dr. Vivek Vitankar**
Ph.D, ICT Mumbai & Director at FluiDimensions
(Computational Fluid Dynamics)

**Dr. Tapas K. Mandal**
Professor, IIT Guwahati
( Micro-Nano Technology for Energy Harvesting)

6:55 4G

INDIA TODAY NE

ChemDistGroup of Companies is the industry collaborator on this project. Speaking on the industrial potential of the research Dr. Sunil Dhole, Director, ChemDist Group of Companies, said, “Commercially speaking, the exciting fact about this work is that an abundantly available and cheaper organic chemical like Methanol can be converted to Hydrogen using a cheaper catalyst, at lower temperatures and without the emission of Carbon Dioxide. This technology has the potential to make significant strides towards achieving carbon neutrality.”

The details of the catalytic system have been published in ACS Catalysis. The paper has been co-authored by Vinay Arora, Eileen Yasmin, Niharika Tanwar, Venkatesha R. Hathwar, Tushar Wagh, Sunil Dhole, and Akshai Kumar A.S.

indiatodayne.in

# Media Coverage

**Selected in Hydrogen Mission by Govt. of India**

**IITGu Chemdist News covered by 91 Newspapers all over India**

https://www.indiatodayne.in/assam/story/iit-guwahati-researchers-develop-catalyst-to-produce-sustainable-green-hydrogen-fuel-551320-2023-05-01

भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

ChemDist

## ChemDist Media Review

IIT Guwahati Researchers develop catalyst to produce Sustainable Green Hydrogen fuel


ACS Catalysis

Pincer–Ruthenium-Catalyzed Reforming of Methanol—Selective High-Yield Production of Formic Acid and Hydrogen

Vinay Arora, Eileen Yasmin, Niharika Tanwar, Venkatesha R. Hathwar, Tushar Wagh, Sunil Dhole, and Akshai Kumar*

Dr. Sunil Dhole
Director & Co-Founder
Chemdist

Tushar Wagh
Director & Co-Founder
Chemdist

#TRUEINNOVATION

WWW.CHEMDISTGROUP.COM

# Selected in Hydrogen Mission by Govt. of India

*With Prof. Ajay Sood (Principal Scientific Advisor to the Prime Minister), Dr. Raghunath Mhaselkar (Former DG CSIR)*


*With Prof. Abhay Karandikar (Secretary Department of Science and Technology, Govt. of India), Dr. Ashish Lele (Director CSIR-NCL)*

Dr. Sunil Dhole was nominated for the Padma Shri Award for his contribution in Science and Technology in the year 2023

# Thank You

www.chemdistgroup.com

info@chemdist.in

Tushar Wagh
+91 9545557224

Dr. Sunil Dhole
+91 9559213333

# WELCOME

## To All DELEGATES

**2024-25**

Mr.Sachin B. Jadhav
(B.Sc. Agri, M.B.A)
Managing Director
Jakraya Sugar Ltd .

# Project Highlights

- **5000 TCD Integrated Sugar Plant.**
- **25 MW Power Co-generation Plant.**
- **Qualified and Experienced professionals .**

  **working on the project**
- **Plant Commissioned on April 2011.**
- **Successful crushing of 12th Season.**
- **Expansion Distillery Unit 120 KLPD to 200 KLPD.**

# Distillation Section

Distillation Section :- Capacity
200 K.L.P.D.

Distillation is the process of separating the components of a liquid mixture through selective evaporation and condensation. The basis of separation is the difference in the vapor pressures (volatilities) of the respective components.

# Distillery Products

- **Rectified spirit:-** is an ethanol solution that has been condensed to a high concentration. It's also known as agricultural ethyl alcohol, rectified alcohol, or neutral spirits. Repeated distillation, also known as rectification, can be used to purify it. The rectified spirit formula is $C_2H_5OH$....

- **Extra Neutral Alcohol (ENA)** :-is the purest form of alcohol, with no taste or smell. It can be made from different raw materials such as sugarcane molasses or grains like corn, rye, wheat, barley, and rice. ENA is primarily used as a base for spirits and alcoholic beverages, but it also has many other applications.

- **Denatured Spirits (SDS)** :-are alcohol or rum which has been treated with denaturants to make it unfit for beverage use.

- **Absolute Ethanol** :-has a variety of applications and is commonly used as a reagent, solvent, disinfectant, antiseptic, feedstock, fuel, and low-temperature liquid.

# Fermentation Section

Fermentation Capacity :- a)350m3 b)400m3 c)600m3 d)1100m3

Fermentation :-is an anaerobic biochemical process. In fermentation, the first process is the same as cellular respiration, which is the formation of pyruvic acid by glycolysis where net 2 ATP molecules are synthesised. In the next step, pyruvate is reduced to lactic acid, ethanol or other products.

# Evaporation section

Evaporation Section:-MEE 3 stage

A)15m3/h B)20m3 C)50m3

Evaporation is a process by which water is transformed from liquid to a gaseous state. Heat is the main cause of evaporation. The temperature at which the water starts evaporating is referred to as the latent heat of vapourisation.

# COMPRESSED BIO – GAS PLANT

Bio -Digester 1

Bio -Digester :- Capacity

Bio -Digester 1:-18000 m3  20m3 per hours spent was used.

1) Biogas is made in a digester which is a tank filled with bacteria that eat organic waste and give flammable gas (biogas). 2) The bacteria in the tank should be taken care of well and proper food is to be given. 3) The bacteria convert organic matter into methane gas through anaerobic respiration.

The Bio-gas from both the big digesters is fed to our 20TPD bio gas plant

Bio -Digester 1:-18000m3   24m3 per hours spent was used.

# Potash Powder dryer

➢**Capacity: Dryer 6000m3/hour**

Potash Powder dryer(bio methanation):- Capacity

➢6m3/hour

➢9m3/hour

A Potash Powder dryer takes a liquid stream and separates the solute or suspension as a solid and the solvent into a vapor. The solid is usually collected in a drum or cyclone. The liquid input stream is sprayed through a nozzle into a hot vapor stream and vaporized. Solids form as moisture quickly leaves the droplets.

➢Capacity: Dryer 9000m3/hour

➢**Dryer 9000m3/hour**


JAKRAYA SUGAR LTD. Mfg.
PDM Potash export to South Africa

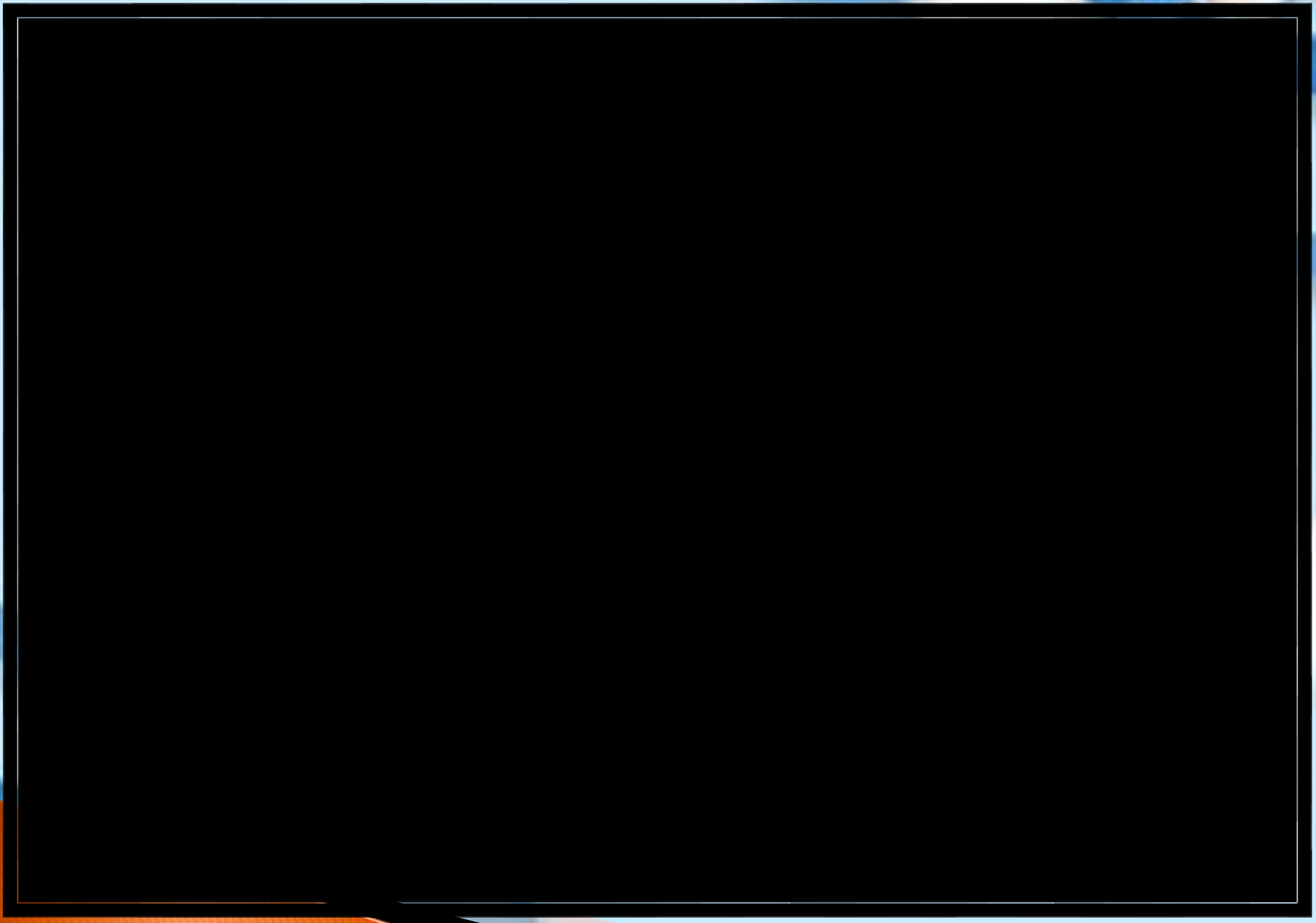
# Granulation plant

Granulation plant :- Capacity
150M.T. per day

Granulation plant :- is a set of fertilizer machines for making fertilizer granules. In your fertilizer making company, a set of granulation machine can help you get more market in fertilizer industry. It is convenient for you to turn fertilizer powder into granules.

# Granulation plant

# Granulation process video



# CBG GAS

CBG Plant:- Capacity

20 T.P.D. (purity 96% to 98%)

The Bio Gas is purified to remove hydrogen sulphide ($H_2S$), carbon dioxide ($CO_2$), water vapour and compressed as Compressed Bio-Gas (CBG), which has methane ($CH_4$) content of more than 90%. CBG has calorific value and other properties similar to CNG and hence can be utilized as green renewable automotive fuel.

# CBG Purification Area

# HP Compressor Unit

# CBG Filling Station

# CBG Filling Station

Thank you

# Green Belt – CER Compliance
# &
# Perspective for HARIT Bharat


By

**Rahul Mungikar, M.Sc. Ph.D. L.L.B.**

Member - EAC Industry II, MoEFCC, Govt of India

Member – Expert Committee, NBA, MoEFCC, GoI

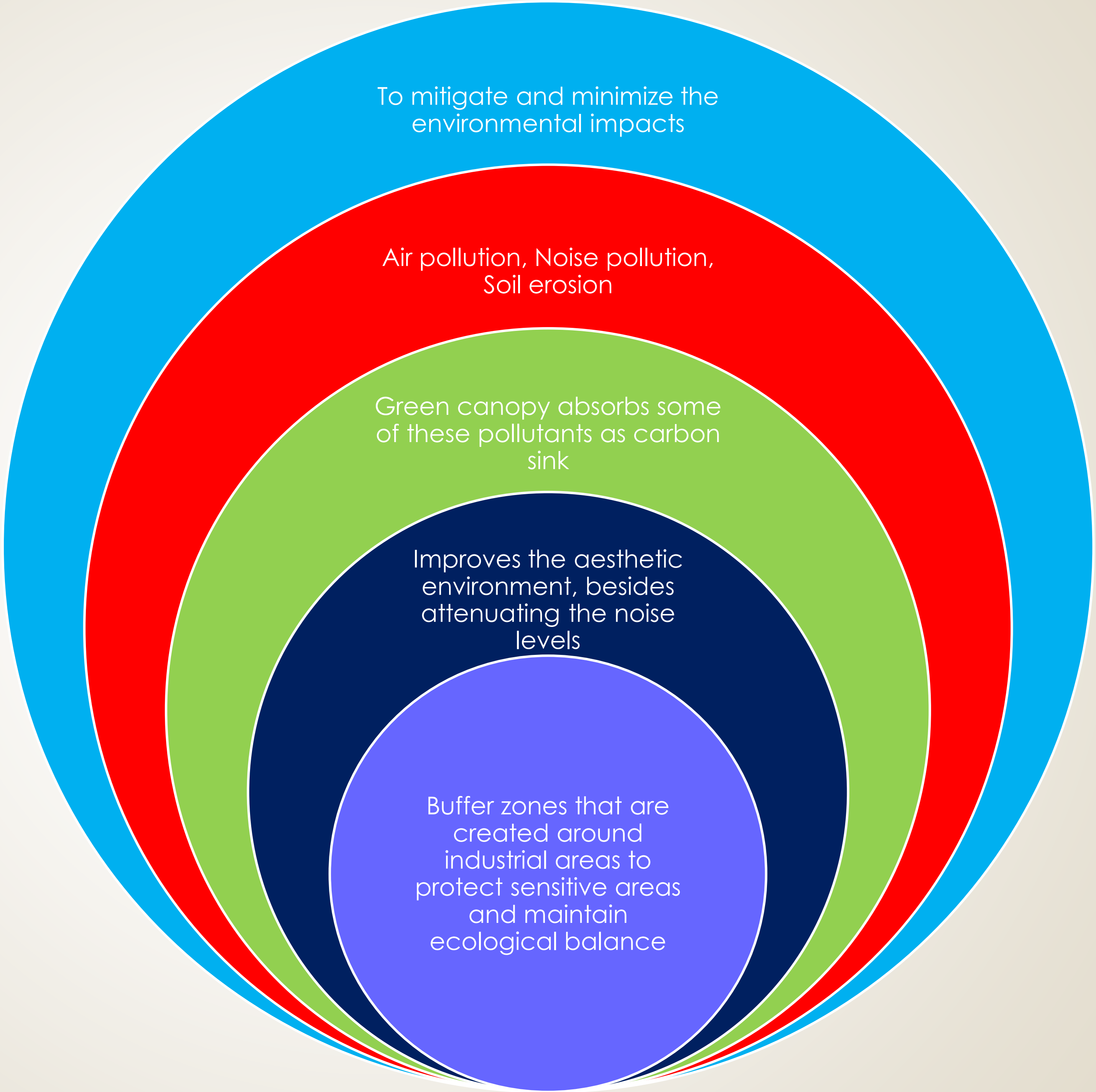
Member – MEE Committee WII Dehradun

Professor in Life Sciences , DES Pune University

Srushti Conservation Foundation
Nurture Nature


**H**olistic **A**pproach for **R**evitalization of **I**ndigenous **T**radition

# Green Belt


To mitigate and minimize the environmental impacts
Air pollution, Noise pollution, Soil erosion
Green canopy absorbs some of these pollutants as carbon sink
Improves the aesthetic environment, besides attenuating the noise levels
Buffer zones that are created around industrial areas to protect sensitive areas and maintain ecological balance

Narayan Clinic (Dr. Chandrakant Ajmeri)
Amir Zerox And Internet Telecom
Rang Heights
Jay Ambe School Rd
Alaknanda Rd
Alaknanda Rd
Jay Ambe Intern
Shivkrupa Hair art
Image © 2024 Airbus
53 m
Google Earth

# Existing Practices

3m to 5m wide greenbelt all around the plant premises; many times not continuous

Wind resistant and long lived

Species planted along the roads, offices, and infrastructure facilities

Fast growing species selected

Broad leaf trees growing above 10 m in height

Species includes, Guajava, Mango, Coconut, Bottlebursh etc

The species should form a dense crown cover

The species should form a litter in abundance on the plantation floor

Generally local/indigenous fast-growing trees/ shrubs should be planted

For protection against biotic interference thorn fencing around the plantation,

circular trench around the planting pit and sown with fast growing thorny shrubs on the ridge should be followed.

# Expectation

# Green Belt at cost of .....

- Industries are setting up in the natural areas
- Increasing polluting load to the environment
- Displacing local species diversity within the periphery of 1 km from the industry
- The industries close to the forest areas, riverine system, aquatic close bodies, sea shore etc having more indirect impact on the local diversity
- EIA is before the project which is never discuss about the restoration in the industry area

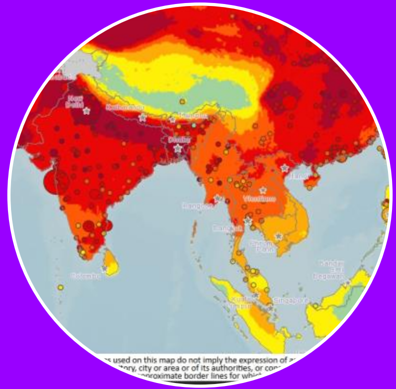
Srushti Conservation Foundation
Nurture Nature

# Comprehensive Environmental Pollution Index (CEPI)

It ranges between 0-100 and captures overall quality of the environment covering ambient air, surface water and land by following algorithm of pollution sources, pathways and receptors

CEPI aims to measure the environmental performance of industrial area/clusters


The industrial clusters having aggregated CEPI score of 70 and above are considered as critically polluted areas (CPAs),



Areas having CEPI score between 60-70 are considered as severely polluted areas (SPAs)

Areas having CEPI score less than 60 are considered as other polluted areas (OPAs).

Srushti CONSERVATION FOUNDATION Nurture Nature

# Drawbacks in existing practices

- Plant species are selected without considering the agroclimatic zone and its role in the environment
- There is no consideration of the grasses or shrubby species in intermediate places
- Most of the exotic / invasive species are selected for the plantation purposes
- Monoculture plantation hamper the soil, pollinators in the environment
- Fragmented greenbelt is proposing by the industries
- No access to the green zone for the living organisms in the vicinity

# Limitation of Green Belt & Impact

The existing green belt is unable to control pollution in totality

Most of the fast growing species are non- native or exotic

Delayed plantation can be observed in old industries

No space in many industry for further plantation

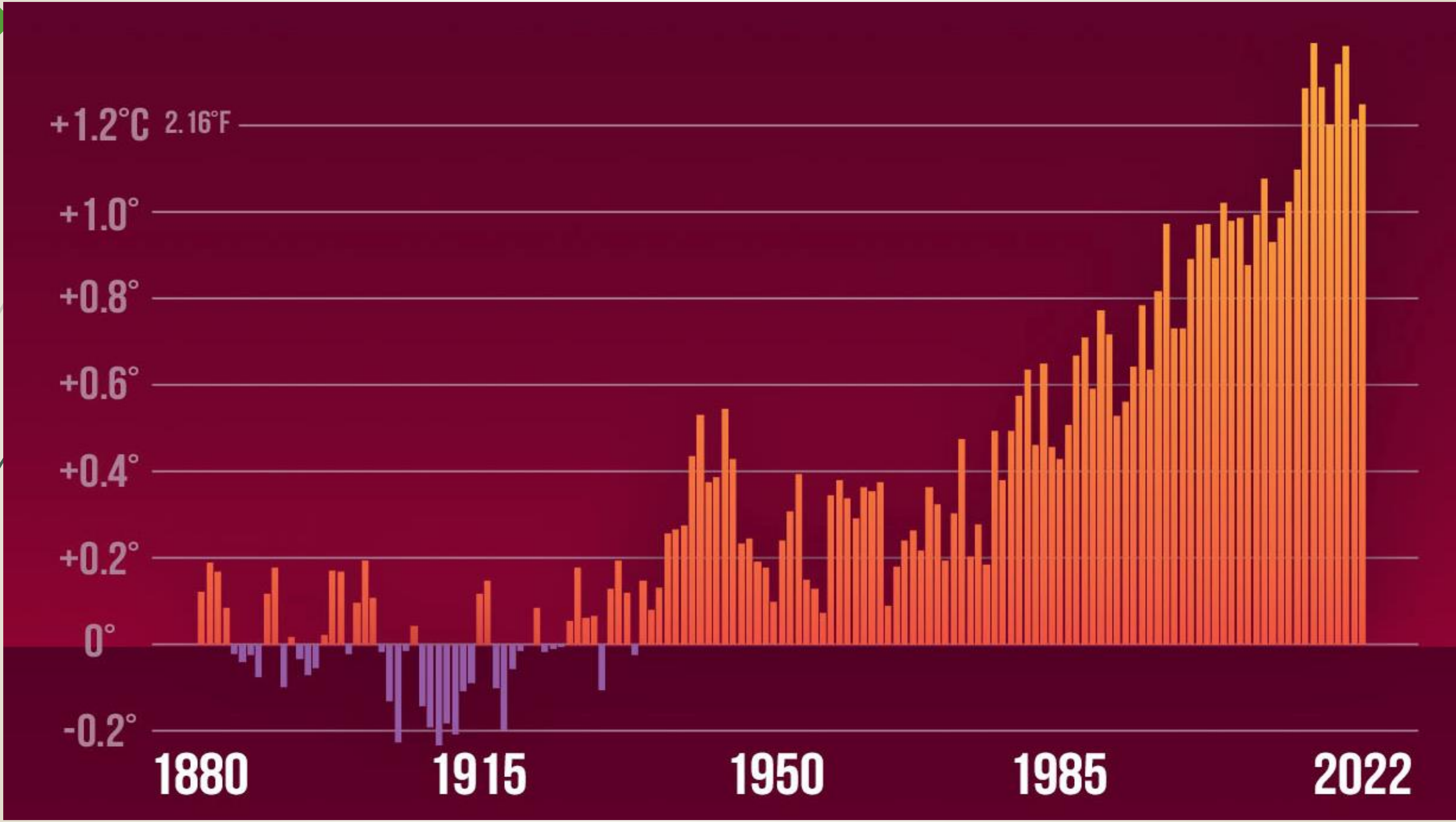
Green Blet is considered as wastage place / mandate

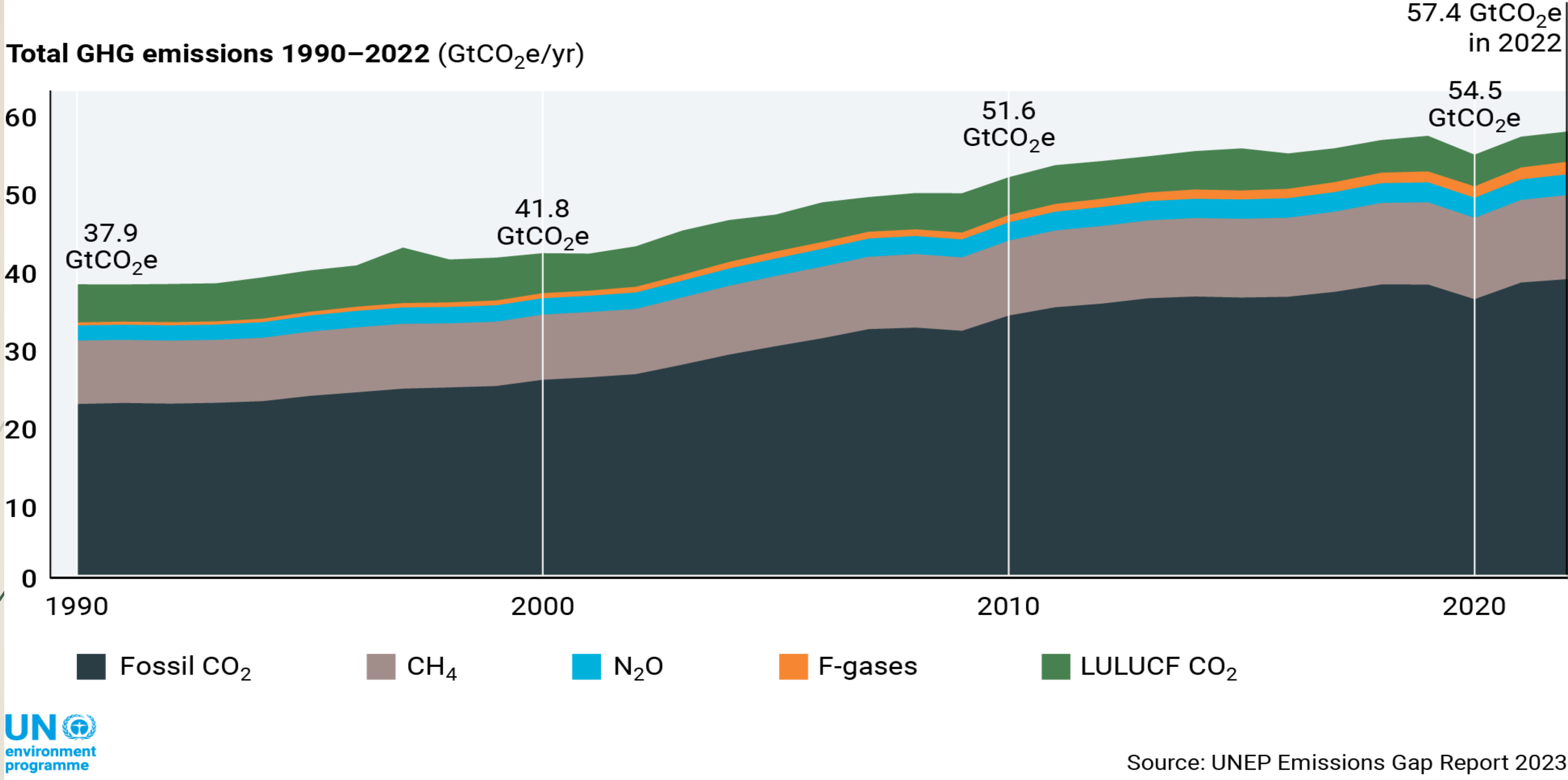
Associated biodiversity with green belt is limited

May or may not supporting for Ecosystem Services in ecological ways

Helping to develop Critically Polluted Areas

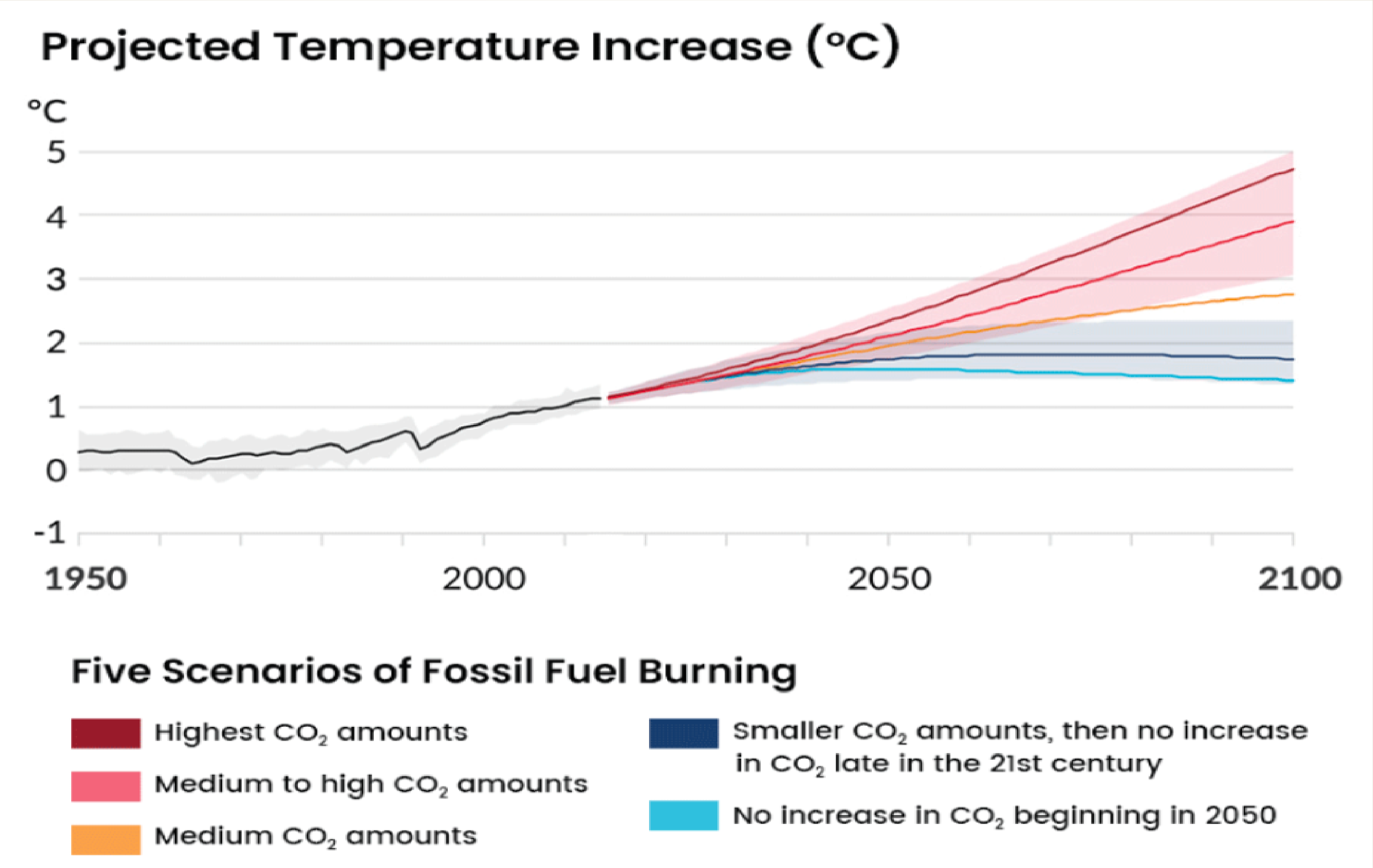
Global Average Temperature Anomalies, departure from 1881-1910.



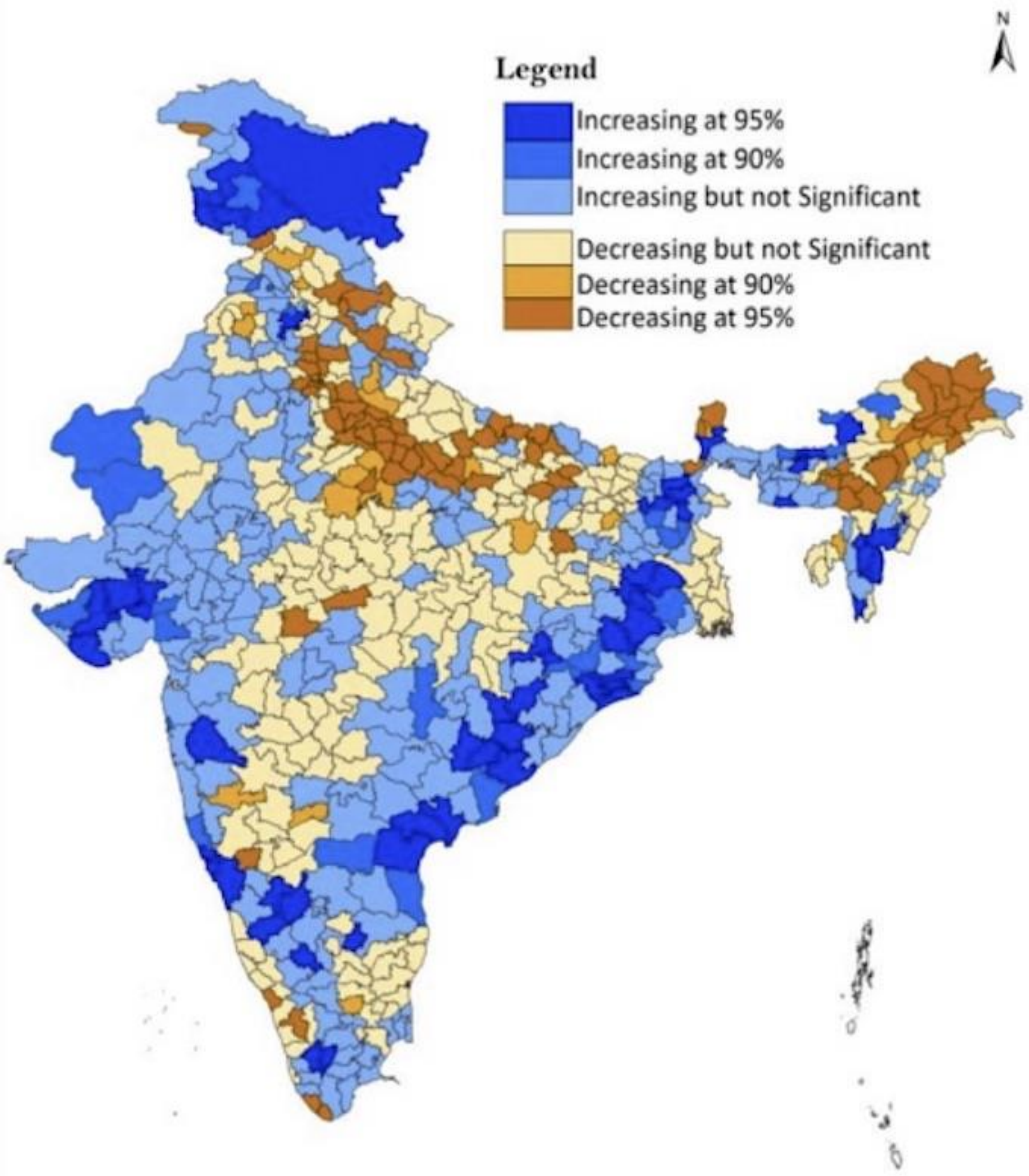



**Total annual anthropogenic greenhouse gas (GHG) emissions (gigatons of $CO_2$-equivalent per year, $GtCO_2$-eq/yr) for the period 1990 to 2022**

**Global GHG emissions increased by 1.2 per cent from 2021 to 2022 to reach a new record of 57.4 gigatons of CO2 equivalent (GtCO2e)**




The amount of climate change by the end of the century depends on decisions we make today. If we reduce $CO_2$ amounts to stop increasing after 2050, global average temperature will increase from 1-1.5°C, and this is considered a best case scenario (blue line in graph). If we don't reduce $CO_2$ and the amounts continue to increase, the worst case scenario warming will be 4.5-5°C (red line in graph). Source, *IPCC Working Group I, 2021.*




# Changing Rainfall Pattern In India – Worry In India

# Expected disasters

There is very high confidence that the frequency and intensity of extreme heat and heavy precipitation events are increasing in most continental regions of the world.

It will lead to increase in the future as global temperature increases.

There is high confidence that extreme precipitation events will very likely continue to increase in frequency and intensity throughout most of the world.

Observed and projected trends for other types of extreme events, such as floods, droughts, and severe storms, have more variable regional characteristics.

India shares 6.67% of Global GHG emission

It is on 138 Climate Vulnerability Index and 132 human Development Index

The index has analyzed 640 districts in India and found that 463 of these are vulnerable to extreme floods, droughts and cyclones.

27 Indian states and Union territories are vulnerable to extreme climate events which often disrupt the local economy and displace weaker communities.

The states of Assam, Andhra Pradesh, Maharashtra, Karnataka and Bihar are the most vulnerable to extreme climate events such as floods, droughts and cyclones in India.

# Climate Vulnerability Index In India

Srushti CONSERVATION FOUNDATION Nurture Nature

# How green belt can be used for

OECM – Other Area based Conservation Measures, IUCN initiation

Green Credits – ICFRE but affecting restoration

Biodiversity Credits – in early stage but compelling instrument

Consider – Global Biodiversity Framework

Enhancing Biodiversity based Eco-system Services – Financing

For Employee Engagement

For Training and Capacity Building program

Interactive Nature Trails

# Industries & International forum

## Global Biodiversity Framework 2030

- **TARGET 1:** Plan and Manage all Areas To Reduce Biodiversity Loss
- **TARGET 2:** Restore 30% of all Degraded Ecosystems
- **TARGET 3:** Conserve 30% of Land, Waters and Seas
- **TARGET 6:** Reduce the Introduction of Invasive Alien Species by 50% and Minimize Their Impact
- **TARGET 7:** Reduce Pollution to Levels That Are Not Harmful to Biodiversity
- **TARGET 8:** Minimize the Impacts of Climate Change on Biodiversity and Build Resilience
- **TARGET 9:** Manage Wild Species Sustainably To Benefit People
- **TARGET 12:** Enhance Green Spaces and Urban Planning for Human Well-Being and Biodiversity
- **TARGET 14:** Integrate Biodiversity in Decision-Making at Every Level
- **TARGET 15:** Businesses Assess, Disclose and Reduce Biodiversity-Related Risks and Negative Impacts

# Conclusion


- Green belt is not just a target for industry..
- HARIT – Holistic Approach for Revitalization of Indian Tradition essential
- Its for our future generation and sustainable development
- We encroached natural areas for industries
- Green Belt can convert to profitable part – Ecosystem Services, Jump Sites, Habitat, Canopy Cover etc
- Displacement of many species already taken place
- LiFE for Sustainable Developmet

# Thank you

**Climate Change**

Avoid Everything which is Unmanageable

Manage Everything which is Unavoidable


| | |
|---|---|
| Contact: | Dr Rahul Mungikar |
| Mobile: | 9822611128 |
| Mail id: | rahul.Mungikar@gmail.com |
| | rmungikar@the-scf.org |

MITCON®

Solutions for Sustainable Tomorrow

An ISO 9001:2015 Certified, SBTi registered,
NSE Listed Company

# MITCON Consultancy & Engineering Services Limited

Sugar & Associated Industry Conclave

# BUSINESS DIVISIONS

**01**
**Energy Transition**

**02**
**Biofuel & Green Chemistry**

**03**
**Environment**

**04**
**Business Advisory**
- Banking & Financial Services

**05**
**Training**
- Skill Development

**06**
**Infrastructure Consulting**
- Shrikhande Consultant Limited

**07**
**Trusteeship**
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**08**
**Carbon Project Development**
- MITCON NBS

**09**
**Satellite Monitoring**
- Planeteye Farm-AI
- Planeteye Infra-AI

# RENEWABLE ENERGY

MITCON Consultancy & Engineering Services, is OSS (One Stop Solution) for comprehensive service in regards to Renewable Energy.

Solar, Wind, Hydro, Co-Gen, Bio-Gas, Bio-Char, Pumped Hydro, Battery Energy Storage System (BESS), Carbon Credits deptt. work seamlessly to deliver the best of Customer experience.

With a technically qualified in-house team having a cumulative work experience of 60 years in the field of Solar power, MITCON has enabled its customers to reduce their cost of power and carbon footprint in a significant way.

# COGENERATION BASICS

CHP – Combined Heat & Power Cycle

Incineration based Power Plants including Bagasse use CHP as a principal technology.

Typically CHP is used in Sugar plants where bagasse, a residual product, is used as fuel. Heat, Steam & Power are delivered as end product

Other fuels used are Natural gas, biomass, bagasse & coal

# BAGASSE POWER GENERATION



| Limitations | Merits |
|---|---|
| Pollution i.e. emission of CO2 & production of ash. | Less pollutant as compared to fossil fuels. |
| Regular cleaning activities of whole plant in addition to breakdowns | Reduced dependency on MSEDCL during productive season |
| Intake of power @8 to 9 Rs/unit during non-productive season. | Levelized cost of electricity Rs….. during productive season.<br>Extra energy sold to MSEDCL at a tariff up to Rs. 4.8 /Unit. |
| Relatively low energy density as compared to other fuels hence larger quantity of bagasse is required to produce same amount of energy resulting in high storage space. | Dual output of heat & electricity increases the overall efficiency of the energy system as compared to separate heat & power generation |
| Investment in infra for co-generation plant setup. OPEX to handle bagasse power plant. | Establishing Cogeneration facilities can contribute to rural development by improving infrastructure and providing energy access to remote areas. |
| Economic viability of bagasse cogeneration can be affected by sugarcane price fluctuations. | Improves overall efficiency of resource in sugarcane industry by turning waste product into a valuable energy resource. |

# SOLAR POWER GENERATION

| Limitations | Merits |
|---|---|
| Land – about 2.7 acres per MW | Solar energy is abundant, renewable & provides an almost limitless source of power as long as the sun shines. |
| Regular washing of solar panels. | No GHG emissions during operations thus contributing towards a cleaner environment and helping combat climate change. |
| Limited degradation in solar panels. | Present cost of solar plant Rs.3 Crore/MW approx. with good bankability |
| Limited efficiency in rainy season | Solar plant – Flexible in size. Starts with 1kW to any big size.<br>It allows individuals, businesses, and communities to generate their own electricity. |
| Impact on Net billing due to fluctuations in MSEDCL APPC Tariff. | Solar systems can be scaled to meet different needs, from small residential setups to large-scale solar farms. They can be installed on rooftops, integrated into building materials, or deployed in open areas. |
| Net-metering upto 1 MW for rooftops resulting in mismatch in installable capacity & consumption requirement. | Solar power can be deployed in remote or off-grid locations. It can go off-grid.<br>Asset for 25 years |
| Frequent changes in Government policies | By generating electricity close to where it is used, solar power reduces transmission and distribution losses associated with long-distance electricity transport. |
| | Constructive use of non utilized land. Return on investment up to 3 years |
| | Solar Plant can be Net Metered with 12 months banking with MSEDCL |

# INTEGRATING COGENERATION WITH SOLAR

MITCON
Solutions for Sustainable Tomorrow

| | |
|---|---|
| Utilization | • Bagasse can be used in CBG plants and can also be used as an input fuel for Biochar |
| Solar Power Integration | • Combining Solar & Bagasse power can lead to a more energy efficient system.<br>• Solar power is available for full year i.e during crushing or otherwise. It can provide power to ethanol plant w/o Co-gen being operational |
| Additional Rev | • Excess electricity generated by solar PV + Co-gen can be fed into the grid at certain price or stored in BESS for later use.<br>• Integrating solar power with cogeneration can help sugar mills comply with environmental regulations. Bagasse can be stored fro Biochar making or CBG. Additional revenue of carbon credits through Biochar. |
| Enhanced Corporate Image | • Adopting solar power and cogeneration demonstrates a commitment to sustainability and innovation. This can be beneficial for brand reputation and can attract environmentally conscious bankers, investors and customers |
| Sustainable Development | Integrating solar power with cogeneration aligns with broader goals of sustainable development by leveraging renewable energy sources and improving overall system efficiency. |
| Scalability and Flexibility | Solar power systems can be scaled up or down based on energy needs, and when paired with cogeneration, they provide a flexible approach to meeting both electrical and thermal energy demands. This adaptability is beneficial for a range of applications from industrial facilities to large residential buildings. |
| Technological Integration | Combining solar power with cogeneration including Biochar & CBG plants showcases the integration of advanced technologies and renewable energy solutions, setting a precedent for other industries. |

# AVAILABLE GUIDELINES

- The Maharashtra Electricity Regulatory Commission (MERC) has provided guidelines concerning the setup of rooftop Solar systems for sugar factories that possess energy/power purchase agreements (EPA/PPA) with the Maharashtra State Electricity Distribution Company (MSEDCL) for their bagasse-based cogeneration ventures.

- The directives, designed to enforce the MERC ruling dated July 21, 2022, imposed on 18.03.24, specify that sugar mills holding EPA/PPA contracts with MSEDCL for bagasse-based cogeneration projects are required to submit requests to the Chief Engineer (renewable energy) for the installation of grid-connected rooftop solar setups.

- Following commissioning, the solar project should be regarded as a hybrid project during the operational phase of the sugar factory and operated under a net metering or net-billing arrangement during the non-operational phase.

- An amendment agreement between the Sugar Industry and MSEDCL is required to integrate the capacity of the forthcoming solar project and its commercial terms into the current EPA/PPA.

# CASE STUDY – SAHAKAR MAHARSHI BHAUSAHEB THORAT SAKHKARI SAKHAR KARKHANA LTD

| Cogen & Solar PV Integrated | UoM | Without Solar | With Solar |
|---|---|---|---|
| **Sugar Factory** | **5500 TCD** | **MSEDCL** | **750 kWp** |
| MSEDCL Effective Tariff /Levelized Cost of Generation | Rs/KVAH | 9.41 | 2.10 |
| Total yearly Consumption | KVAH | 10,30,000 | 10,30,000 |
| Annual Payable | Rs | 96,92,417 | 21,63,000 |
| **Savings** | **Rs/Annum** | | **75,29,417** |
| **Payback** | **Years** | | **3.2** |

By installing a 750 kWp Solar SMBKTSSL shall save apprs78% over MSEDCL annual billing.

# ECONOMIC INCENTIVES

CORCS can be applied in the sugar industry to support emission reduction projects, helping to both mitigate greenhouse gas emissions and provide economic benefits through the generation and sale of carbon credits.

Selling carbon credits generated from emission reduction projects can provide additional revenue streams for sugar producers.
***(Carbon Credit Currently priced at $ 1.5 per credit)***

By producing Biochar, sugar industries can earn CORCs, which can be traded or sold to entities looking to offset their carbon emissions.

**Process of Earning CORCs:**

**Production:**
Implement Biochar production systems in the sugar industry.

**Certification:**
Get the Biochar production process certified by recognized bodies to ensure it meets the criteria for carbon sequestration.

**Issuance of CORCs:**
Once certified, CORCs are issued based on the amount of $CO2$ sequestered through the biochar process.

**Trading:**
CORCs can then be traded in carbon markets, providing an additional revenue stream for the sugar industry.
This approach not only helps in reducing the carbon footprint but also adds economic value to the sugar industry through the trading of CORCs.

MITCON
Solutions for Sustainable Tomorrow

# Thank you!


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Pune - 411005 Maharashtra (India)

# Solarisation of Co-operative Sugar Factories

Date:- 09.08.2024

**MAHATMA PHULE RENEWABLE ENERGY AND INFRASTRUCTURE TECHNOLOGY LTD**

**(A Subsidiary of MPBCDC, Govt of Maharashtra Company)**

# About MAHAPREIT

*MAHAPREIT, Mission, Core Business & Verticals*

**MAHAPREIT** (Mahatma Phule Renewable Energy and Infrastructure Technology Limited) Established in April 2021, a subsidiary of the Government of Maharashtra's Mahatma Phule Backward Class Development Corporation.

**MISSION** Uplift economically disadvantaged families/ Lower class of society through Sustainability Projects.

## Core Business

- Developing, operating, and managing Renewable Energy and Clean Energy Projects
- Promoting Decarbonization, energy efficiency, and climate change solutions.

## Verticals

- **Renewable Energy & Electric Vehicles (EV)** Promoting Clean Energy & Sustainable Transport
- **Agro Processing & Biofuels** Supporting Agriculture & exploring alternative Fuel
- **Software Technology Park & Data Centre** Fostering innovation & Digital Infrastructure
- **Energy Efficiency** Optimizing energy use for a greener future.
- **Environment & Climate Change** Addressing environmental challenges for a sustainable future.
- **Emerging Technologies** Exploring cutting-edge solutions like green hydrogen and futuristic energy integration.
- **Corporate Social Responsibility (CSR)** Creating social impact and empowering communities.

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# About MAHAPREIT

*Grant, Financial and Technical Partner*

Government of Maharashtra

**Granted Permission**: For G-to-G work with various government and semi-government departments (GR dated 10.07.2023)

## Channel Partner

ENERGY FOR EVER
इरेडा IREDA
ONCE IREDA ALWAYS IREDA

REC
Endless energy. Infinite possibilities.

पी एफ सी PFC

erf
environmental resources foundation

IMAT

CONVERGENCE
energy. simplified

EESL
एनर्जी इफिशिएंसी सर्विसेज़ लिमिटेड
ENERGY EFFICIENCY SERVICES LIMITED
(A Joint Venture Company of PSUs of Ministry of Power, Govt. of India)

## Financial and Technical Partner

- Global Energy Alliance for People and Planet (GEAPP)
- Global Green Growth Institute (GGGI)
- World Bank
- Asian Development Bank (ADB)
- Agence Française de Développement (AFD)
- NTPC
- SJVNL
- MAHAPREIT Alternative Investment Fund (MAIF)

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# About MAHAPREIT

*Sectoral priorities and KRA for Inclusive Growth*

<table>
<tr><th>Sr NO</th><th>Sector</th><th>Priority concerns</th><th>Key Result Areas</th></tr>
<tr><td>1</td><td>Environment, CC</td><td rowspan="5">1) Mandate Compliance<br>2) Global commitments<br>3) Infrastructure/utility improvement<br>4) Effective land reforms implementation<br>5) Clean energy and transport land scape</td><td rowspan="5">1) Visibility across state of Maharashtra / India<br>2) Renewable Energy footprint<br>3) Climate change mandates compliance at national level<br>4) Equitable distribution of income and wealth<br>5) Sustainable development and INCLUSIVE growth of Maharashtra</td></tr>
<tr><td>2</td><td>Renewable Energy</td></tr>
<tr><td>3</td><td>Affordable Housing</td></tr>
<tr><td>4</td><td>Infrastructure Projects</td></tr>
<tr><td>5</td><td>Agriculture</td></tr>
</table>

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# About MAHAPREIT

*Major Projects being undertaken by MAHAPREIT*

| | |
|---|---|
| 1) Thane Cluster Development Project | 2) Development of Data Centre at Jambhul |
| 3) Development of 100 MW Solar Power Plant | 4) Development of 10000 MW Hybrid Power Plant (Solar + Wind) across Maharashtra. |
| 5) Installation of 310 Charging Stations across MH | 6) Export Oriented 2000 MT Cold Storage Facility at Ratnagiri for Mango |
| 7) Mahagony Plantation in 1000 Acre | 8) 400 MW Solar Rooftop Project for MSMEs |
| 9) Solar Projects in Goa | 10) Chandrapur Water Pumping |

# Current Status of Sugar Industries in Maharashtra

| विशिष्ट | साखर कारखान्यांची संख्या |
|---|---|
| A.उभारणी पुर्ण झालेले सहकारी साखर कारखाने | १७५ |
| बी – उभारणीखाली असणारे सहकारी साखर कारखाने | ४ |
| C – पाईपलाईन संवर्गातुन वगळण्यात आलेले सहकारी साखर कारखाने | १९ |
| D – नोंदणी रद्द करण्यात आलेले सहकारी साखर कारखाने | २३ |
| E – खाजगी साखर कारखाना म्हणुन वर्ग झालेले सहकारी साखर कारखाने | २८ |
| F–भाडेतत्वावर चालविण्यात येणारे अनसायनातील सहकारी साखर कारखाने | १ |
| G. भाडेतत्वावर चालविण्यात येणारे सहकारी साखर कारखाने | ८ |
| H. अवसायनातील सहकारी साखर कारखाने | ४५ |
| I. राज्यशासनाकडुन विक्री करण्यात आलेले सहकारी साखर कारखाने | ७ |
| J. राज्य बँक/ जिमस/ डी. आर. टी./ कडुन विक्री करण्यात आलेले सहकारी साखर कारखाने | २९ |

# Current Status of Sugar Industries in Maharashtra

*Participation of Sugar Industry In Solar Energy Generation Project*

1. Cogeneration: Use of solar for co-generation.
2. Grid Connected Solar Power: Install Solar panels and sell extra electricity to grid
3. Captive Solar Power: Use for self-consumption.
4. Solar based Irrigation: Saving in farmers electricity costs
5. Biomass- Solar Hybrid: Sugar Industry can use Hybrid Biomass and Solar
6. Solar power based Distillery
7. Net metering: for Exporting additional energy to grid and reduce electricity bill
8. Renewable Energy Certificate (REC): Sugar Industry secure REC by generating electricity and sell to other companies
9. Solar based Bagasse drying: To reduce electricity bill
10. Solar based Sugar drying: To reduce electricity bill
11. Cluster based Solar Projects: Multiple sugar industry can form cluster and implement Solar projects
12. Sugar Industry operate for Season (120-140 days), Solar work throughout year thereby proper utilisation of Sugar Industry employees
13. For Electric Vehicles Charging: Sugar Industry can use during Season/off-season period
14. Opportunity to reduce Global Warming and earn Carbon Credit

**Sugar Industry can implement above measures, reduce their energy costs, earn revenue and contribute to State Renewable Target**

***Source: Circular Sugar Commissioner, Maharashtra State, on dated 14-06-2024***

# Current Status of Sugar Industries in Maharashtra

*Participation of Sugar Industry In Solar Energy Generation Project*

1. **Project Cost and Payback**
    - In terms of sizing for big projects are less costly whereas small size projects are costly
    - Cost Depend on Solar panel – types, manufactures, and other accessories, quality of instruments
    - Vary between Ground mounted and Roof top.
    - Solar Energy depends on location, panel quality, panel angle, temperature, etc.
        - 1 kW Project – 4-5 units/day >
        - 1 MW – 15-16 Lakh units, 3 – 3.5 acres land and approximately Rs. 3-4 Crore
        - Sugar Industry without Cogeneration plant: Project payback within 2-3 years
        - Sugar Industry with Cogeneration plant: Project payback within 3-4 years

2. Sugar Industries which are Commercial and Industrial categories can get benefit of Accelerate Depreciation

3. Problems faced by Sugar Industries and their resolution:

   Cogeneration Association of India had approached Maharashtra Electricity Regulatory Commission for resolution of various problems faced by Sugar Industries.

***Source: Circular Sugar Commissioner, Maharashtra State, on dated 14-06-2024***

# Policy and Regulatory Framework

*Integration of Solar or other Renewable Energy Source with Bagasse Cogeneration Plant*

**Eligibility:** Sugar factories with bagasse-based cogeneration plants and an EPA with MSEDCL can install Solar PV their no any capacity restriction.

**Hybrid Generation:** Combined solar and cogeneration is treated as a hybrid renewable energy source with a single grid injection point.

**Net Metering/Net Billing:** Up to 1MW solar is net-metered, above 1MW is net-billed; as per amendment has done upto 5MW for Net-Meter

**Operating Periods:** Hybrid system under net-metering/net-billing, solar only under net-metering

**Commercial Agreements:** Amend EPA to include solar capacity and tariff. Solar tariff based on MSEDCL's latest competitive rates. Weighted average tariff applied

**Grid Support Charges:** Applicable to cogeneration plants with EPA and rooftop solar, exempt for those without EPA under net-metering.

***Source: As per MERC Order 40 of 2022***

# Policy and Regulatory Framework

*Integration of Solar or other Renewable Energy Source with Bagasse Cogeneration Plant*

**Current Live Sugar factories PAN Maharashtra**
102 nos - Factories Commissioned bagasse based Cogeneration projects with cumulative capacity of 1775.85MW.

**Challenge: Un-utilized Banked Solar Energy**

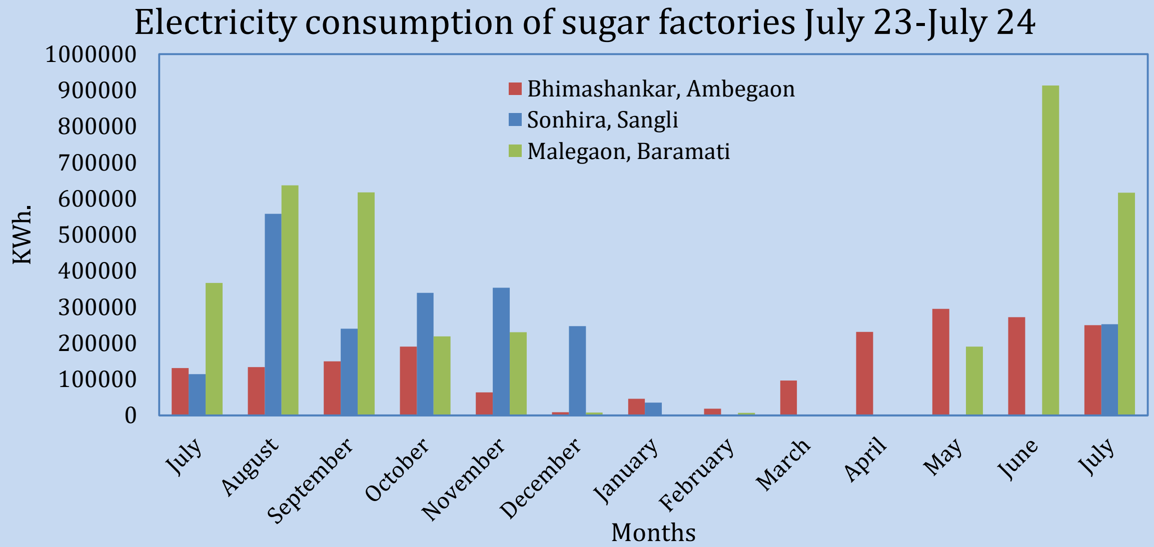
**Regulatory Limitation:** As per MERC (Grid Interactive Rooftop Renewable Energy Generating) Regulation 2019 and its amendment, un-utilized banked solar energy during the non-operating period cannot be carried forward to the operating period.
**Impact:** Any surplus energy remaining at the end of the financial year must be settled, potentially leading to financial losses or underutilization of generated solar power.

**Key Concern:**
Efficient utilization of generated solar energy within the financial year is crucial to maximize benefits under the current net-metering arrangement.

# Site Visit at Various Sugar factories

*Site Survey and Analysis*

| Factory | Crushing capacity, TPD | Cogeneration capacity, MW | Open area, acre | Roof area, sq. m. | Solar Potential, MW | On season avg. bill, Units | Off season avg. bill Units |
|---|---|---|---|---|---|---|---|
| Malegaon Sugar | 10000 | 35 | NA | 17000 | 2 | 3497 | 561706 |
| Bhimashankar Sugar | 6000 | 19 | NA | 12000 | 1.5 | 42180 | 206310 |
| Sonhira Sugar | 9500 | 22 | 20 | 11000 | 8+1.4=9.4 | 13 | 269362 |






**As per site visit ,there is scope for Solar to Easy expansion to meet growing energy demands , Grid stability and Continue Revenue stream**

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# Business Opportunity for Sugar Factories

*Integrated with Solar and other RE Source*

- **Hybrid System for Sugar Industry (Rooftop Solar and Bagasse cogeneration Plant)**
- **Solar Thermal Integration with Bagasse Cogeneration Plant**
- **Compressed Biogas (CBG)**
- **Agrivoltaics**
- **Solar power based Distillery**
- **Cluster based Solar Projects**
- **RE options Wind,Vertical axis Wind, Micro hydro**

## Challenges for implementation

- Provision for energy banking mechanism
- Land parcel @5km periphery on rent basis for solar projects.
- Overaged Roofs need to Change
- Seasonal variability in Energy Demand
- Limited Awareness and Education
- Policy and Regulatory
- Alignment with Corporate Sustainability Goal

# Business Opportunity for Sugar Factories

*Hybrid System for Sugar Industry (Rooftop Solar and Bagasse cogeneration Plant)*

- Sugar sector is a vital player in global agriculture and food production
- A unique proposition by seamlessly combining solar energy with conventional/co-gen sources

**Relevance of Hybrid Solar System:**

1. Environmental conservation:

   Sugar Industry is under pressure to reduce carbon footprint and adopt sustainable practices.

2. Operational Cost Reduction:

   Generating own electricity through Solar Panels, sugar mills can significantly reduce their reliance on grid power, resulting in cost savings over time.

3. Energy Security:

   Hybrid grant degree of self- sufficiency, enabling businesses to exert greater control over energy supply

**Benefits of Hybrid Solar System:**

1. Reliability and Continuity
2. Scalability : Easy expansion to meet growing energy demands
3. Enhanced reputation: By adopting sustainable practices, can position themselves as responsible industry leader

# Business Opportunity for Sugar Factories

*Hybrid System for Sugar Industry (Rooftop Solar and Bagasse cogeneration Plant)*

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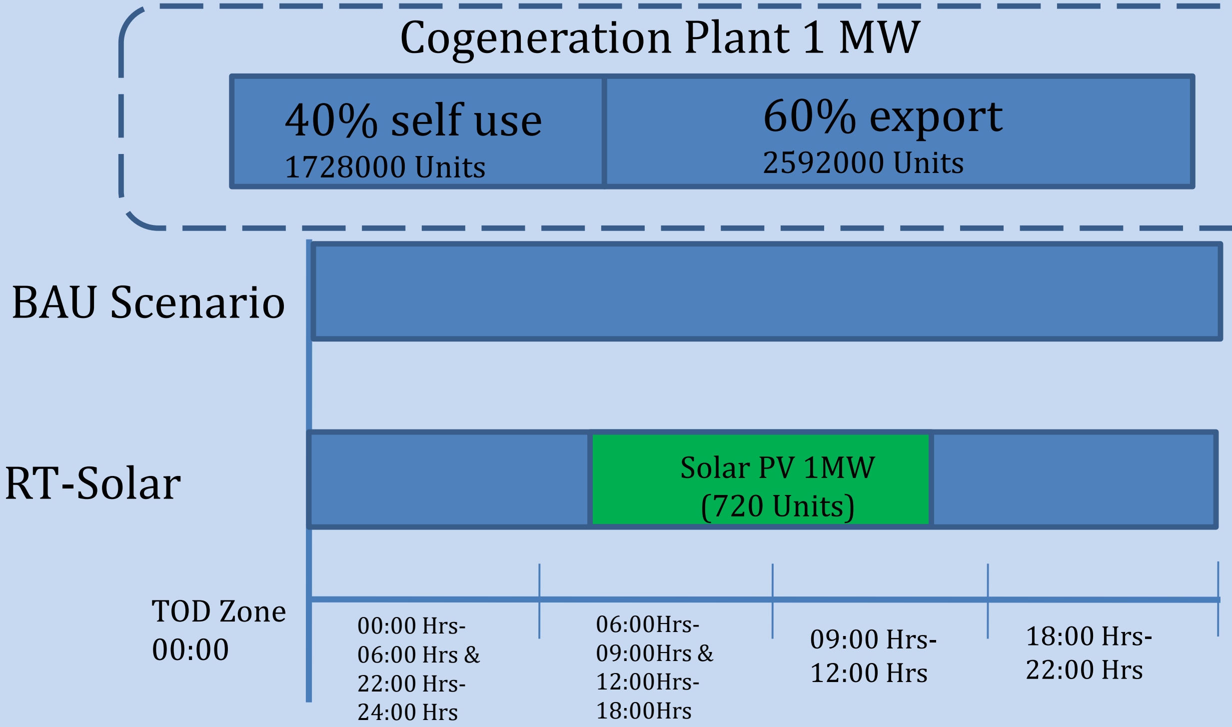
Assuming 6 months sugar crushing season




Revenue from export
**Rs. 1,24,41,600**
Savings
**Rs.1,21,82,400**

**Renewable Energy Savings**
Against cogeneration tariff
**Rs. 12,24,000**

**Renewable Energy Savings**
Against MSEDCL tariff
**Rs. 63,00,000**

Yearly savings due to Solar Energy plant against cogeneration tariff Rs. 24,48,000 against MSEDCL tariff Rs.1,26,00,000

# Business Opportunity for Sugar Factories

*Solar Thermal Integration with Bagasse Cogeneration Plant*

## Types of Solar Thermal Systems

**Flat-Plate Collectors**: Common collectors for water heating.
**Evacuated Tube Collectors**: High efficiency in cold climates; vacuum insulation.
**Concentrated Solar Power (CSP)**: Uses mirrors to generate steam for electricity in large-scale plants.

## Applications

Domestic water heating (homes, pools)
Space heating (integrated with building systems)
Industrial heating (food processing, manufacturing)
Electricity generation (CSP systems for grid supply)

## Advantages

**Renewable Source**: Abundant sunlight.
**Cost Savings**: Lowers utility bills after installation.
**Low Maintenance**: Minimal ongoing costs.

- Evacuated Tube collector can achieve water temperature up to 80-85$^{o}$C.
- Preheated water used for boiler to generate steam.
- Saved bagasse can be used to run the boiler in off season.

- 1 MW capacity boiler can save daily 800-900kg bagasse/biomass.
- During the operating season 180 ton bagasse saved.

# Business Opportunity for Sugar Factories

*Solar Thermal Integration with Bagasse Cogeneration Plant*

**Benefit**

| | |
|---|---|
| **Cost Savings on Energy** | Reduced Fuel Consumption: Less reliance on traditional fuels (bagasse, coal, oil). -<br>Lower Energy Bills: Decreased overall energy expenses. |
| **Improved Efficiency** | Enhanced Process Efficiency: Better steam generation from preheated water.<br>Optimized Heat Recovery: More effective utilization of waste heat. |
| **Reduction in Operational Costs** | Lower Maintenance Costs: Reduced downtime and expenses.<br>Longer Equipment Life: Extended lifespan of boilers and thermal equipment. |
| **Environmental Benefits** | Reduced Carbon Footprint: Lower greenhouse gas emissions.<br>Compliance with Regulations: Meets sustainability standards. |
| **Enhanced Energy Security** | Diversification of Energy Sources: Reduced dependence on fossil fuels. |
| **Increased Productivity** | Consistent Steam Supply: Stable low-grade steam for processing. |
| **Potential for Revenue Generation** | Selling Excess Power: Additional revenue from grid sales. |
| **Financial Incentives** | Government Subsidies and Incentives: Offset initial investment costs. |

# Business Opportunity for Sugar Factories

*Compressed Biogas (CBG)*

## Production Process

**Feedstock**: Organic materials (agricultural waste, food scraps, cow dung ).
**Anaerobic Digestion**: Microorganisms break down organic matter, producing biogas (60-70% methane, 30-40% CO2).
**Purification**: Removal of impurities and CO2 to increase methane concentration.
**Compression Ratio**: To increase energy density for storage and transport.
CBG is usually compressed to around 200 bar, which can increase its energy density by about 2.5 times compared to uncompressed biogas.

## Benefit

**Renewable Energy**: Sustainable alternative to fossil fuels, reduces greenhouse gas emissions.
**Waste Management**: Effective use of organic waste.
**Energy Security**: Enhances energy independence.
**Versatility**: Applications in electricity generation, heating, and vehicle fuel.
**Applications**
**Transportation**: Fuel for vehicles designed for natural gas.
**Power Generation**: Used in gas engines for electricity.
**Heating**: Residential and industrial heating applications.

# Business Opportunity for Sugar Factories

*Compressed Biogas (CBG)*

## Pressmud- a promising biproduct of the Sugar Industry

A sugarcane mill with a capacity of 10,000 Tons Per Day (TPD) can generate around 400 tons of pressmud.
Properties of Pressmud
Pressmud is rich in organic content with properties such as:
– Total solids: 23%
– Moisture content: 77%
– Volatile matter: 77%
– Nutrient content: P (1.4-4%), K (0.5-2%), Ca (3.2-12%), Mg (1-2%), Fe (0.08-0.3%), S (0.1-0.5%)

## Conventional Use of Pressmud

- Traditionally, pressmud is used in:
- Composting and vermicomposting
- Incineration for energy recovery
- Pelletization
- Animal feed

However, the most promising use of pressmud is found in production of CBG

# Business Opportunity for Sugar Factories

*Compressed Biogas (CBG)*

## Advantages of Pressmud for CBG Production


**High Organic Content: Consistent quality of CBG**

**Eco-Friendly: The digestate from anaerobic digestion can be used as a fertilizer, closing the loop in a sustainable manner**

**Cost Effective Minimal to zero pre-treatment required**

**Simplified Supply Chain Single Sourcing from mills**

**High Conversion Efficiency: 25 tonnes of pressmud can produce 1 tonne of CBG.**

# Business Opportunity for Sugar Factories

*Compressed Biogas (CBG)*

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**Potential for CBG Production from Pressmud**

Total Sugar-cane crushed annually- 1200lakh tonnes (estimated based on 2022-23 data)

| | |
|---|---|
| Pressmud output | - 60 lakh tonnes |
| Biogas Production | - 2,40,000 tonnes |
| Revenue from sale of CBG | - INR 1100 Crores |

(@ Rs. 46/ kg aprvd by IOCL)

CBG Production through Pressmud is promoted under GoI's SATAT Scheme

# Business Opportunity for Sugar Factories

*Compressed Biogas (CBG)*

MAHAPREIT

## Provisions under SATAT Scheme of GoI

- Oil & Gas marketing companies are executing long term agreements for off-take of CBG at an assured price.
- Bio manures produced from CBG plants has been included as “Fermented Organic Manure” under Fertilizer Control Order 1985 vide gazette notification dated 13 July 2020.
- Reserve Bank of India has notified inclusion of CBG projects under Priority Sector Lending vide directives to Banks dated 4.9.2020.
- State Bank of India has also developed a new loan product for financing of CBG projects.
- Ministry of New and Renewable Energy has extended Central Financial Assistance (CFA) Scheme for FY 2020-21.
- State Level Committees have been constituted for implementation and monitoring of SATAT initiative in States of Haryana and Punjab
- MoPNG is also in discussion with Multilateral Financial Institutions like World Bank, Asian Development Bank (ADB) etc. for enabling financing options via line of credit for CBG developers.

## Further provisions under the scheme

State Government to create enabling mechanism for establishing Bio mass supply chain to ensure sustainable supply of bio mass at a stable price for at least a period of 10 years.

Ministry of Agriculture and Farmers Welfare to include Digested Bio Gas Slurry (DBGS) produced from CBG projects under FCO.

Central Pollution Control Board to categorize CBG Projects under 'White Category'.

Department of Fertilizer to extend benefits of Market Development Assistance in form of Rs. 1500/ton to FOM and direct fertilizer companies and marketing entities to co-market FOM with fertilizers.

Department of Economic Affairs to facilitate creation of line of funding from multilateral financial institutions for CBG projects.

# Business Opportunity for Sugar Factories

*Agrivoltaics*

- **Dual Land Use: Maximizes land efficiency by combining agriculture and solar energy production.**
- **Increased Crop Yields**: Solar panel shade can reduce heat stress and water evaporation, leading to higher yields.
- **Water Conservation**: Helps retain soil moisture, reducing irrigation needs.
- **Renewable Energy Generation**: Contributes to clean energy production and lowers greenhouse gas emissions.
- **Economic Diversification**: Provides farmers with additional income through leasing land or selling excess energy.
- **Improved Soil Quality**: Maintains healthier soil conditions with reduced sunlight exposure.
- **Biodiversity Support**: Creates habitats for various species in shaded areas.
- **Resilience to Climate Change**: Offers a stable environment for crops amid climate variability.
- **Reduced Land Competition**: Addresses land scarcity by integrating energy production with agriculture.

# Financial Aspect

*MAHAPREIT Proposal*

- MAHAPREIT is acting as Super RESCO/ Super ESCO
  - energy generation / saving demonstration with capex investment.
- MAHAPREIT ready to invest Partially / fully capital Investment.
  - Innovative business model with international green finance.
- MAHAPREIT can create investment pipeline of about - 1000Cr in Phase 1.
- MAHAPREIT sets target for development of Project
  1. Solar Rooftop 100MW
  2. Ground Mount 100MW
  3. Compress Biogas 1000Tonnes
  4. Innovative Business Model with assured RoE @ 15 %.

# Overall Benefit

Job creation

Quality Assurance

Top-tier solar installers

Mutual benefits to all stakeholders

Benefit of economies of scale

Green Investment

Sustainable Operations

Easy Access to Finance

MAHATMA PHULE RENEWABLE ENERGY &
INFRASTRUCTURE TECHNOLOGY LIMITED
Subsidiary of MPBCDC (Gov. of MH Undertaking)

**Address**
**B-501 Pinnacle Corporate Park, Next to Trade Center, BKC**
**Bandra (East), Mumbai - 400051**

# Thank You

Summit on Role of Sugar and Allied Industries in circular Economy & sustainability

# THE ENVIRONMENTAL IMPACT OF SUGAR PRODUCTION: ADDRESSING AIR POLLUTION SCENERIOS IN SUAGAR INDUSTRY


Presentation By:

**Dr. Ramesh Dod**

Former member EAC, MoEFCC, Govt. of India

# SUGAR PRODUCTION

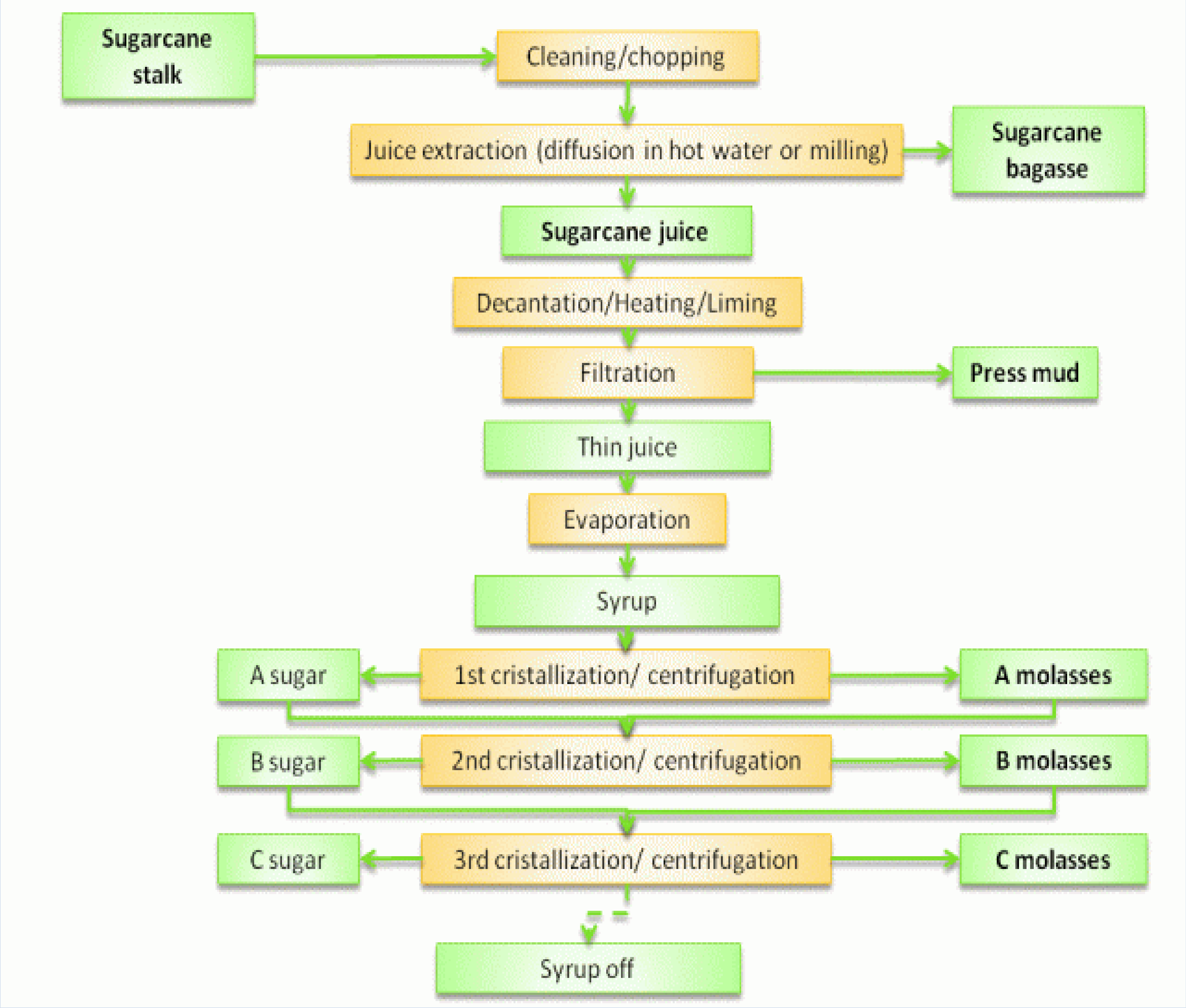
- The sugar industry plays a vital role in the economies of many countries, particularly in India and Brazil.
- More than 145 million tonnes of sugar (sucrose) is produced per year in about 120 countries.

- Annual consumption is expanding each year by about two million tonnes.
- Sugar production involves several processes: cane cultivation, harvesting, juice extraction, clarification, crystallization, and refining.

- Sugar industry is an agro-based industry which relies upon the production of sugarcane and sugar beet.
- These industries impart significant contribution in the socio-economic development of the nations as these fulfill one of the basic necessities of human survival.
- However, sugar industries are often targeted for being the polluter of environment.
- Almost all the major divisions in sugar manufacturing plant, such as mill house, processing plant, boilers, cooling towers etc. are responsible for waste generation.
- Various governments, regulatory authorities, and researchers across the globe are involved in finding the solution of these environmental issues through research and effective management .
- Moreover, sustainable solution lies in the holistic approach involving adoption of environment friendly technologies, technical guidance to industries, optimum utilization of waste, and stringent managerial decisions.

- In India, sugar production is largely concentrated in the state of Uttar Pradesh, Maharashtra, Karnataka, Tamilnadu, and some other pockets.
- Uttar Pradesh and Maharashtra are the leading states contributing 34% of the total sugar production in the.
- Sugar industry is a seasonal industry operating for a maximum period of 5 - 6 months in a year.
- Sugar accounts for approximately 10-12% of the total yield from the sugarcane processed.
- Molasses, a by-product of sugar extraction, represents approximately 3-4% of the capacity.
- Bagasse, which is the fibrous residue left after extracting juice from the sugarcane, makes up about 30% of the processed material.
- Additionally, press mud, a residue from the filtration process, accounts for around 4%

# *Sugar Production Process*



## Environmental issues associated with sugar industries

- Though sugar industries are essential and economically important, these are responsible for being one of the biggest users and polluters of the Environment .
- Effluent from sugar industries has complex characteristics having potential to contaminate the freshwater resources, if discharged inappropriately.
- In India, regulatory compliance of the industrial units (emission and effluent discharge) is monitored by the respective State Pollution Control Boards (SPCBs) of the state, and by the highest statutory authority for control of pollution, viz. Central Pollution Control Board (CPCB) from the centre.
- Ministry of Environment, Forest & Climate Change (MoEF&CC) of India has set the standards for effluent discharge from sugar industries 2016 (The Gazette of India, 2016)

# HEALTH AND ENVIRONMENTAL IMPACTSDUE TO AIR POLLUTION

**Human Health**

- Respiratory Issues: Exposure to particulate matter can cause asthma, bronchitis, and other respiratory conditions.
- Cardiovascular Problems: Long-term exposure to pollutants like CO and NOx can lead to heart diseases.
- Eye and Skin Irritation: Contact with certain pollutants can cause irritation and other health issues.

**Environmental Impacts**

- Acid Rain: $SO_2$ and NOx can contribute to the formation of acid rain, damaging crops, forests, and water bodies.
- Soil and Water Contamination: Pollutants can settle on soil and water surfaces, leading to contamination.
- Vegetation Damage: Ozone and other pollutants can damage crops and other plants.

## The Importance of Air Pollution Control in Sugar Industry:

Air pollution control in the sugar industry is of utmost importance, not only from an environmental perspective but also to comply with regulatory standards. By implementing robust air pollution control measures, sugar mills can achieve the following benefits:

**Environmental Protection:** The reduction of harmful emissions ensures that the air around the sugar mills remains clean and safe, safeguarding the health of nearby communities and preserving the natural ecosystem.

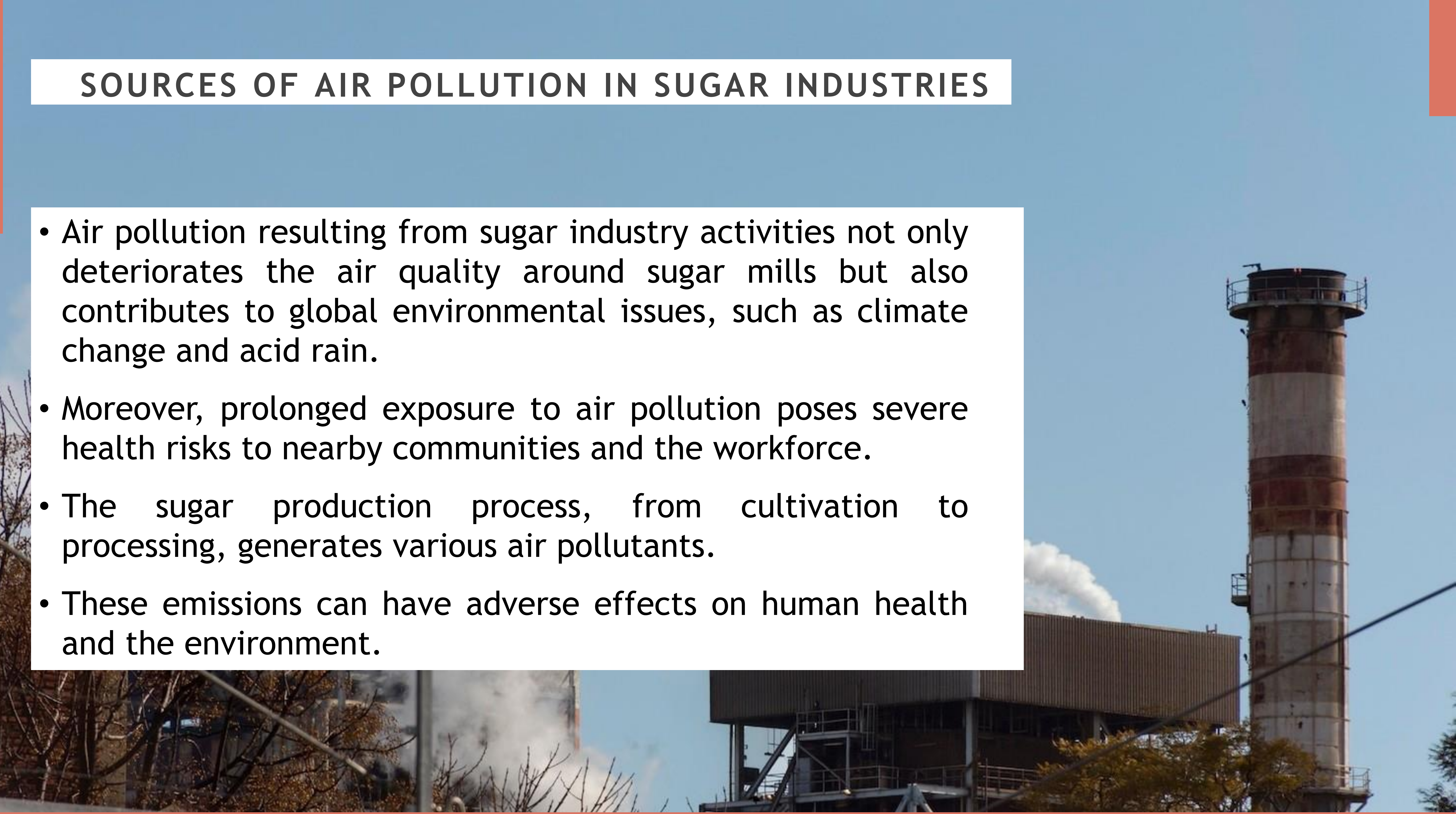
**Sustainability:** Sustainable practices, such as effective air pollution control, enhance the sugar industry's overall sustainability by minimizing its environmental footprint.

**Compliance with Regulations:** Governments and environmental agencies have established strict regulations and emission standards to protect air quality. Compliance with these regulations is mandatory for the sustainable operation of sugar mills.

**Public Health:** The release of particulate matter and other harmful pollutants can lead to respiratory problems, cardiovascular diseases, and other health issues in nearby communities. Controlling air pollution helps safeguard the health of workers and residents alike.

## Approach towards the sustainable environmental reforms in sugar industries

- The existing system in the Indian sugar industries is the conventional one which operates on inefficient technologies.
- Most of the industries in India are small scale and unorganized having inefficient supply chain coordination, which makes large scale production uneconomical.
- Moreover, being a seasonal industry, financial issues also burden the system. Therefore, management of pollution in industries by the owners becomes an unapproachable issue and is often neglected owing to lack of awareness, limitation of options, and financial constraints.



## SOURCES OF AIR POLLUTION IN SUGAR INDUSTRIES

- Air pollution resulting from sugar industry activities not only deteriorates the air quality around sugar mills but also contributes to global environmental issues, such as climate change and acid rain.
- Moreover, prolonged exposure to air pollution poses severe health risks to nearby communities and the workforce.
- The sugar production process, from cultivation to processing, generates various air pollutants.
- These emissions can have adverse effects on human health and the environment.

Most of the sugar Mills use bagasse as fuel in boilers.

The burning of bagasse in boiler produces PM, Oxidex of Nitrogen, carban, sulphur di oxide.
Generally except for PM, other emissions of bagasse fired boilers are within the limits prescribed by Pollution Control authorities.

The PM is usually referred as fly ash, consists of ash, unburnt bagasse and carbon particles.
Fly ash is very light and it contains large percentage of fines.

If the APC's are not installed, fly ash will escape into the atmosphere through the chimney. The PM coming out of chimney will travel distances depending upon the particle size and atmospheric conditions.

The heavier PM will settle on vegetation and damage them.
There are reports of dizziness and physiological effects like irritation in the eye, noise, throat and lungs in the surrounding area.

## COMBUSTION PROCESSES

- Bagasse Burning : Bagasse, a fibrous residue left after sugarcane juice extraction, is often used as fuel in boilers.
- Fossil Fuels: Boilers and furnaces also rely on coal or oil, leading to significant emissions.

## CHEMICAL REACTIONS

- Sulphur Dioxide Emissions: $SO_2$ is released during the sulphur burning process for sugar bleaching.

## DUST AND PARTICULATE MATTER

- Cane handling: Dust generation during the unloading, handling, and preparation of cane.
- Crushing and Grinding: Release of particulate matter from milling operations.

# POLLUTANTS EMITTED FROM THESE SOURCES

## Particulate Matter (PM)

**Bagasse Ash:** Fine ash particles released from the combustion of bagasse.

Ash emission is 1500-1600 mg/N$m^3$

**Dust:** Generated during various mechanical operations.

## Gaseous Pollutants

**Nitrogen Oxides (NOx):** Emitted from high-temperature combustion processes.

**Sulphur Dioxide ($SO_2$):** Released during the burning of sulphur.

**Carbon Dioxide ($CO_2$):** A by-product of combustion processes.

**Carbon Monoxide (CO):** Incomplete combustion of carbon-containing fuels.

## Volatile Organic Compounds (VOCs)

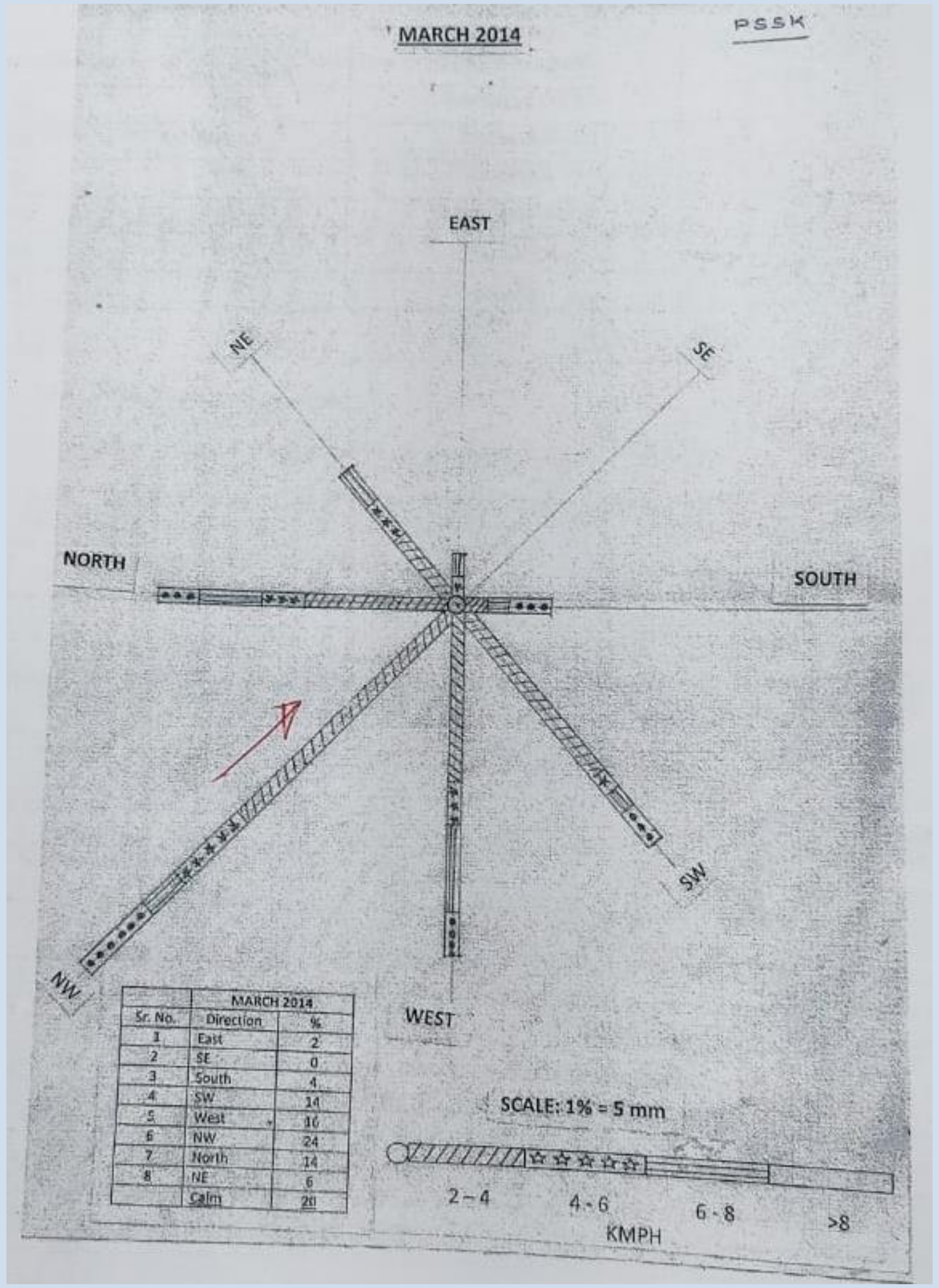
**Fermentation Processes:** VOCs are emitted during the production of molasses and ethanol.

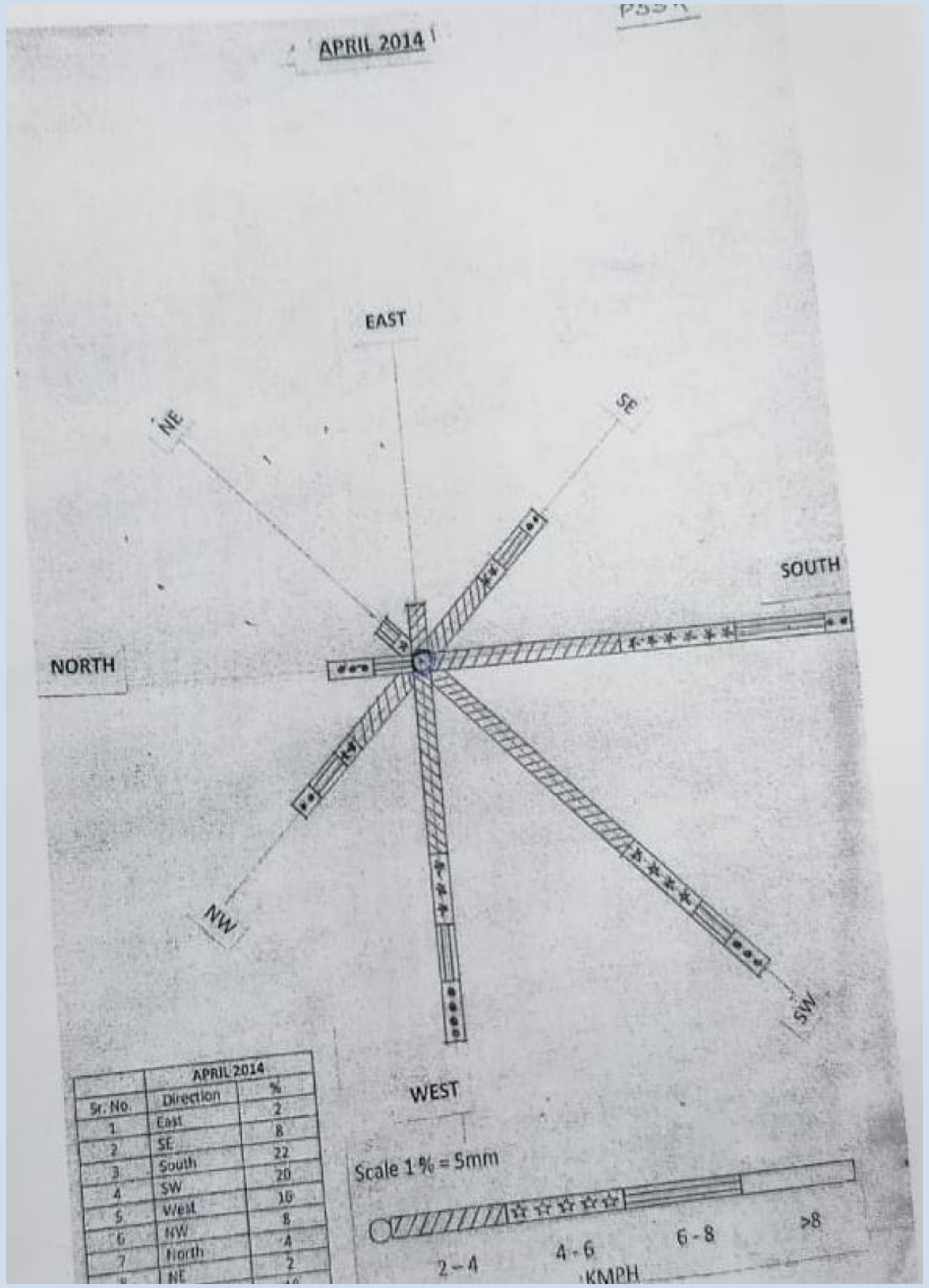
# USE OF WIND ROSE IN AIR POLLUTION

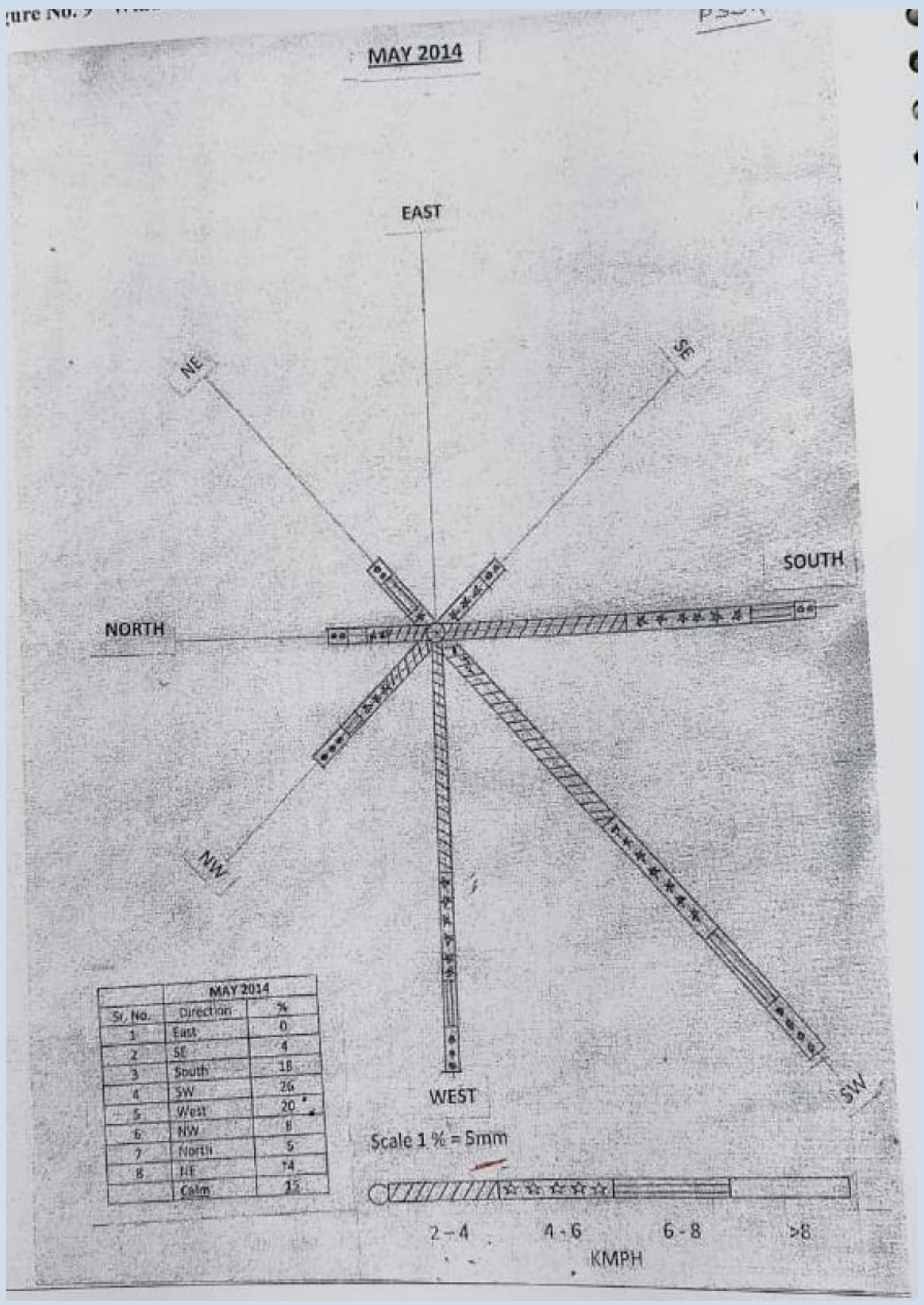
## WIND ROSE

A wind rose is a diagram that displays the distribution of wind direction over a specific period of time. It typically shows the frequency or intensity of winds coming from different directions. In meteorology, wind roses are used to understand the prevailing wind patterns at a particular location, which can be important for various applications such as navigation, aviation, and climate studies.

The wind rose is usually represented as a circular chart with the compass directions (North, South, East, West, and their intermediate points) marked around the perimeter. Each sector of the circle corresponds to a specific direction, and the length or width of the sectors can indicate how often winds come from that direction or how strong they are.




- From the wind rose diagram it is clear that the predominant wind direction is from sector SW-NW.
- Hence the villages in the SW-NW direction, may receive the plume for 50% of the time.
- Remaining receptors shall be receiving the plume for less than 30% of the time.

# Stack Height

Stack height calculations in the sugar industry, are crucial for ensuring that emissions from industrial processes are dispersed properly to minimize air pollution and meet environmental regulations.

**Factors Influencing Stack Height**

1. **Emission Rate:** The amount of pollutants being emitted from the stack.
2. **Stack Gas Temperature:** The temperature of the gases exiting the stack, which affects how the gases rise and disperse.
3. **Stack Diameter:** Affects the velocity of the gases as they exit the stack.
4. **Wind Speed and Direction:** These can influence how the plume disperses.
5. **Topography:** The geographical features of the area can affect dispersion.
6. **Ambient Air Quality Standards:** Regulations and standards set by environmental authorities for acceptable pollutant levels in the air.
7. **As per CPCB Norms, Physical stack height is maximum of the following**
8. i) Hmin= 30mts
9. Hmin= 74Q0.27…Q…PM emission rate in T/Hr
10. Hmin= 14Q0.3 …..Q….SO2 emission rate in Kg/Hr

EXAMPLE OF DETERMATION OF STACK HEIGHT FOR 55 TPH & 67 Kg/Sqcm BOILER
For Bagasse as Fuel

Characteristics of Bagasse
SO, content-Traces
Ash content-2.0%

Fuel consumption-25.20 MT/hr

Calculation based on percentage ash content
Quantity of ash produced-25.20 MT/hr * 0.02= 0.504 MT/hr
Considering 20% ash below grating= 0.1008 MT/hr
Quantity emitted through boiler 0.504-0.1008 = 0.4032 MT/hr

Therefore, Height (H) = 74 $Q^{0.37}$
=74 $(0.4032^{0.37})$
=57.90 meters
Stack Height provided is 60 m.

Effective stack height= H eff= Physical stack height + plume rise

How to get SO2 emission Rate..

Suppose, we are burning the coal @5.45 T/Hr with 4.2% sulphur content

Then Sulphur emission= 5.45X 103 Kg/Hr X 4.2/ 100=229Kg/Hr

S +O2= SO2

32+ ( 16+16)= 64

Since for every 32 gms of sulphur releases 64 gram of SO2

Therefore SO2 emission rate =229X64/32 =458 Kg/Hr

This rate should be used in Calculating the stack height based on SO2 emission

# PERMISSIBLE LIMITS OF AIR POLLUTANTS ACCORDING TO NAAQS 2009

| Pollutant | Time Weighted Average | Concentration in Ambient Air | |
|---|---|---|---|
| | | Industrial, Residential, Rural, and Other Areas | Ecologically Sensitive Area (notified by Central Government) |
| Sulphur dioxide ($SO_2$), $\mu g/m^3$ | Annual 24 hours | 50<br>80 | 20<br>80 |
| Nitrogen dioxide ($NO_2$), $\mu g/m^3$ | Annual 24 hours | 40<br>80 | 30<br>80 |
| Particulate matter (< 10 $\mu m$) or $PM_{10}$, $\mu g/m^3$ | Annual 24 hours | 60<br>100 | 60<br>100 |
| Particulate matter (< 2.5 $\mu m$) or $PM_{2.5}$, $\mu g/m^3$ | Annual 24 hours | 40<br>60 | 40<br>60 |
| Ozone ($O_3$), $\mu g/m^3$ | 8 hours 1 hour | 100<br>180 | 100<br>180 |
| Lead (Pb), $\mu g/m^3$ | Annual 24 hours | 0.50<br>1.0 | 0.50<br>1.0 |
| Carbon monoxide (CO), $mg/m^3$ | 8 hours 1 hour | 02<br>04 | 02<br>04 |
| Ammonia ($NH_3$), $\mu g/m^3$ | Annual 24 hours | 100<br>400 | 100<br>400 |
| Benzene ($C_6H_6$), $\mu g/m^3$ | Annual | 05 | 05 |
| Benzo($\alpha$)Pyrene (BaP) – particulate phase only, $ng/m^3$ | Annual | 01 | 01 |
| Arsenic (As), $ng/m^3$ | Annual | 06 | 06 |
| Nickel (Ni), $ng/m^3$ | Annual | 20 | 20 |

## TECHNOLOGICAL SOLUTIONS : FOR AIR POLLUTION CONTROL

Advancements in technology can play a crucial role in mitigating the air pollution impacts of sugar production. Alternative energy sources, emission control systems, and waste management practices are some of the innovative solutions being explored.

## CONTROL TECHNOLOGY FOR PARTICULATES

Primary emissions of concern for bagasse fired boilers are PM.
Currently, there are four basic control devices used to reduce particulate emissions:

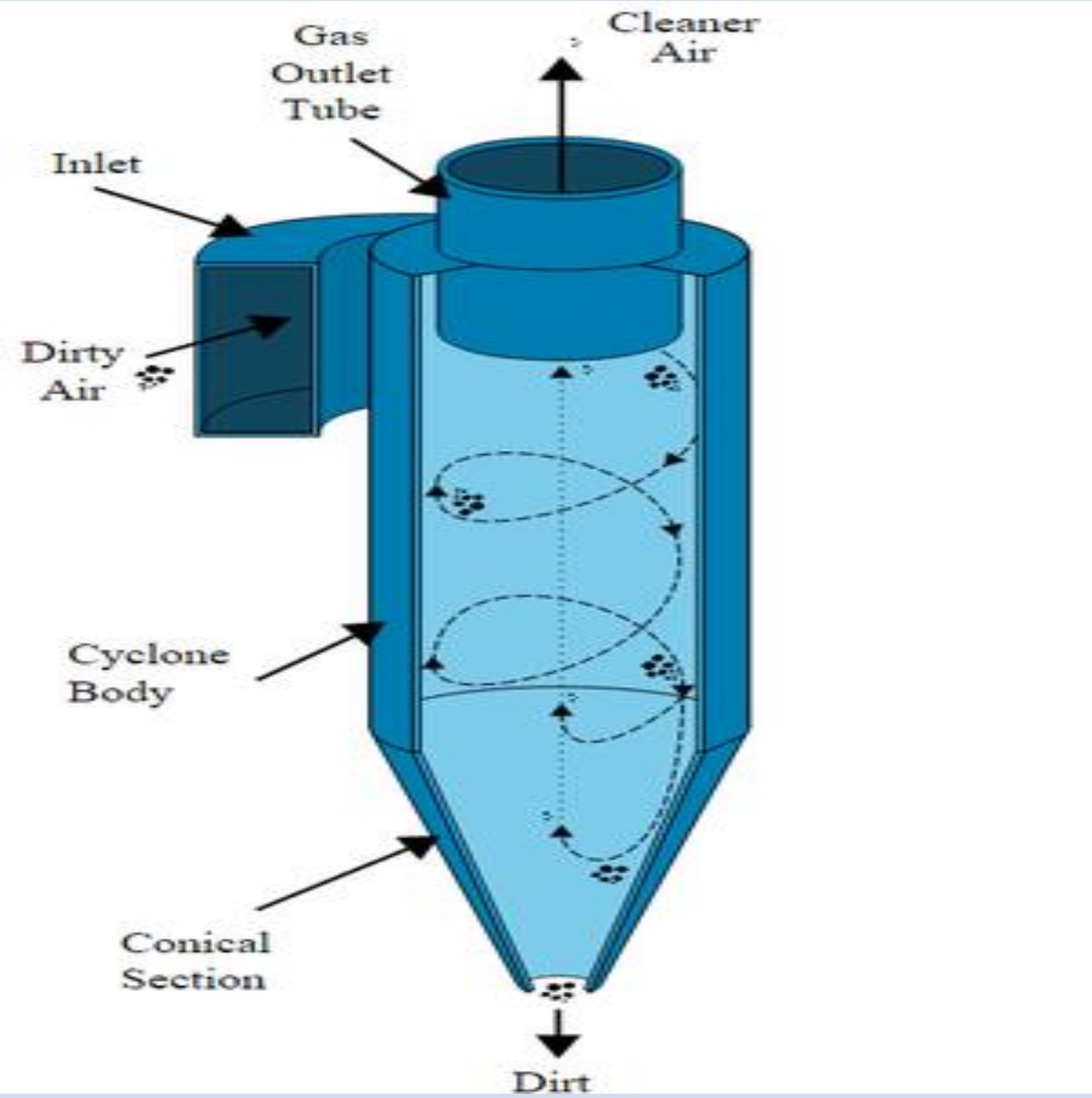
1) Mechanical collectors ( Or Cyclones)
2) Wet Scrubbers
3) Fabric Filters and
4) Electrostatic Precipitator.

The normal ash emission for bagasse fired boilers is 1500-1600 mg/Nm3.
The size distribution particle size from these boilers: For particle size < 10 µm, it is more than 60
and for particle size > 10 µm, it is less than 40%.

A Cyclone separator is an enclosed vertically placed cylinder with an inverted cone at the base.
The inlet is arranged with a tangential entry and an outlet arrangement at the top of the cylinde
The particulate containing the gas enters the cylinder through
the tangential inlet which gives a motion.
One variation of the multiple cyclone is to place two similar mechanical collectors in series.
The efficiency of the dual mechanical collector is improved over that of a single mechanic
collector. They have collection efficiency in the range of 20 to 60 % .
Multi cyclone works on the principle of centrifugal force for removal of ash particles.
Efficiency of cyclones to remove less than 10 µm particles is very less, and therefore ever

Mechanical Collectors or Cyclones use centrifugal separation to remove PM from flue gas streams.
At the entrance of the cyclone ,a spin is imparted to the particle-laden gas. This spin creates a centrifugal force which causes the PM to move away from the axis of rotation and towards the walls of the cyclone. The particles which contact the walls of the cyclone tube are directed to a dust collection hopper where they are deposited. Multi cyclone works on the principle of centrifugal force for removal of ash particles. Efficiency of cyclones to remove less than 10 μm particles is very less, and therefore overall efficiency of cyclone is less than 50%

Multicyclone system is low cost and is very simple to operate and needs minimal skilled operation.
The system involves no moving parts or liquid contact.
This results in to higher particulate matter emission rate i.e. > 150 mg/m3.
Those sugar industries which are going for cogeneration plant, shall be providing ESP units and therefore they may not require this type of conversion.
However those not opting for cogen plant in near future have to convert existing multi cyclones to wet scrubber.



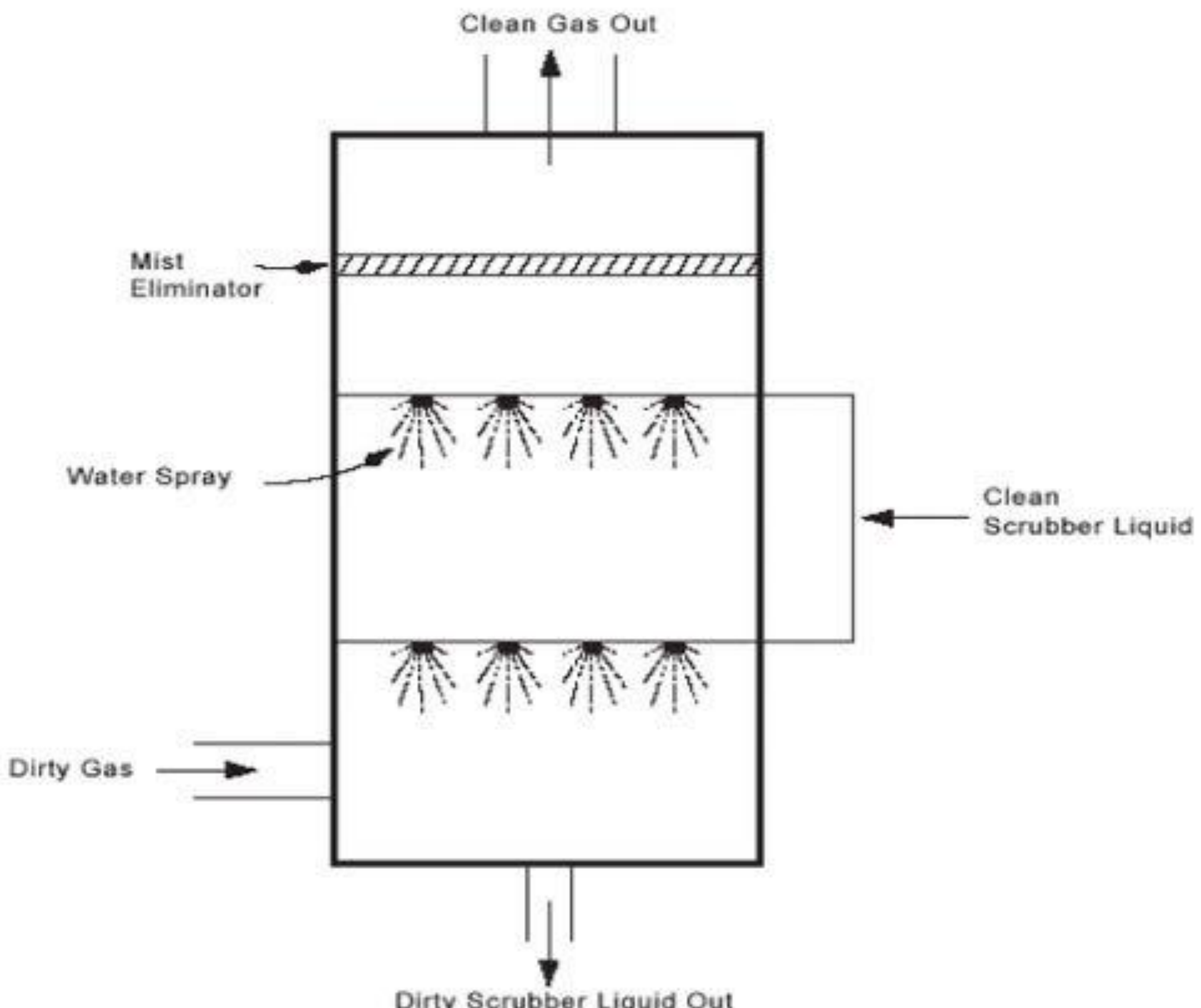
# Wet Scrubbers

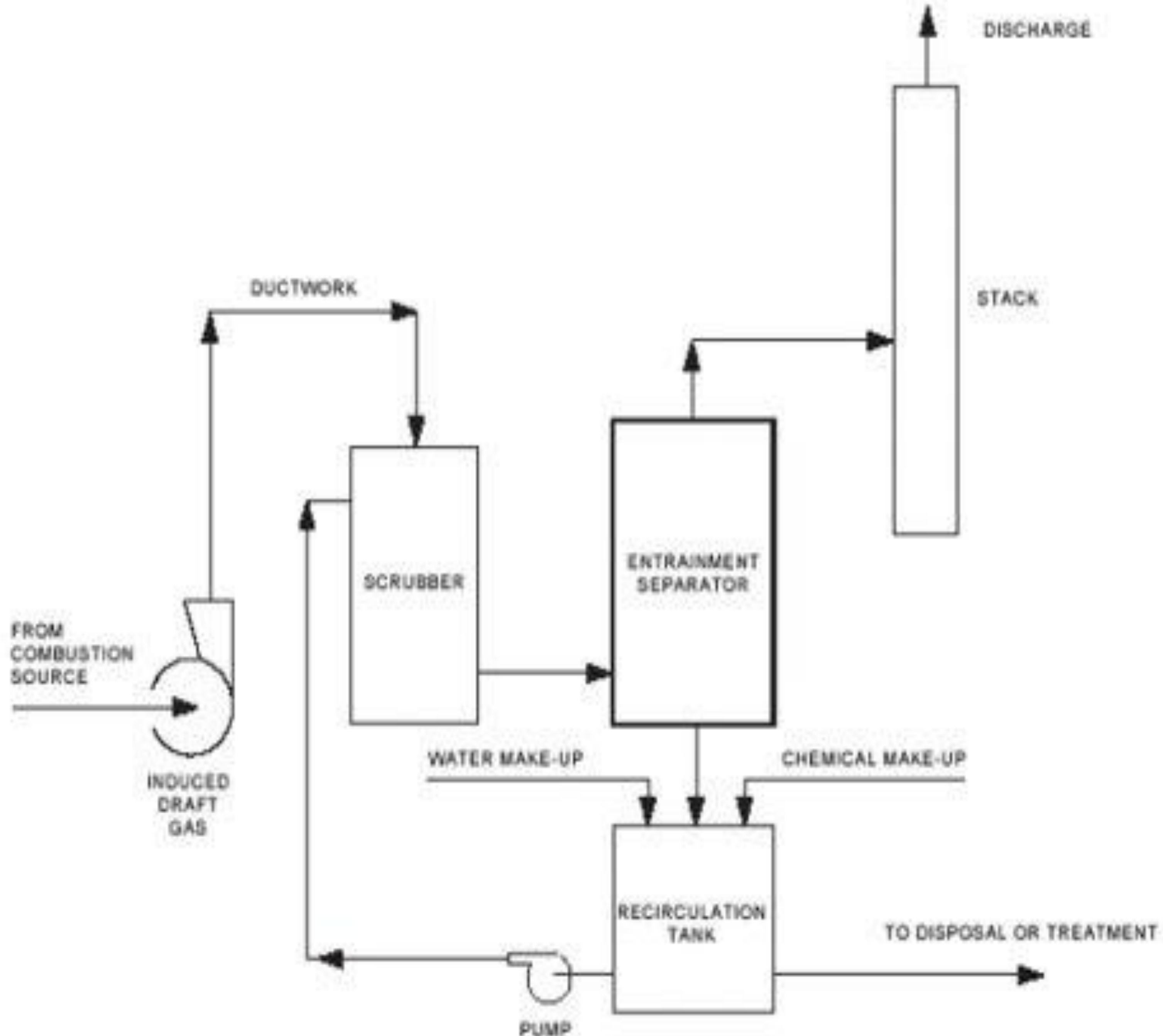
Wet Scrubbers is the collection device which uses an aqueous stream or slurry to remove particulate.
There are three basic mechanisms involved with collecting particulate matter in wet scrubber: The interception, Inertial impaction and diffusion of particle on droplets.

The interception and inertial impaction effects dominate at large particle diameters whereas diffusion effects dominate at small particle diameters. Wet Scrubbers are usually classified by energy consumption( In terms of gas phase pressure drop), Low energy scrubbers represented by spray chambers and spray towers have pressure drops of less than 1KPa( 5 inches of water)
Medium enery Scrubber such as impingement scrubbers have pressure drops of 1 to 4 Kpa
(5 to 15 inches of water).

High energy Scrubbers such as high pressure drop Venturi Scrubber have pressure drops exceeding 15 inches of water.
Greater removal of PM are possible with high energy Scrubber.
It is a wet collector with venturi meter shape. The gas is introduced through a venturi tube at throat velocity of 60 -100 mps. The scrubbing liquid (Water) sprays at just ahead of the venturi throat. The particulates are collected along with the falling water.

Its highly efficient for small particulates with PM collection efficiencies greater than 90%
Operational problems that can occur with wet scrubbers due to clogged spray nozzles,sludge deposits, dirty recirculation water, improper water levels.
The spray impingement scrubber is in greater use due to low energy requirement and less operation and maintenance problems.



# Electrostatic Precipitator (ESP)

Electrostatic precipitators are widely popular for the removal of very small size particulate matter and gaseous emissions

## Principal of ESP

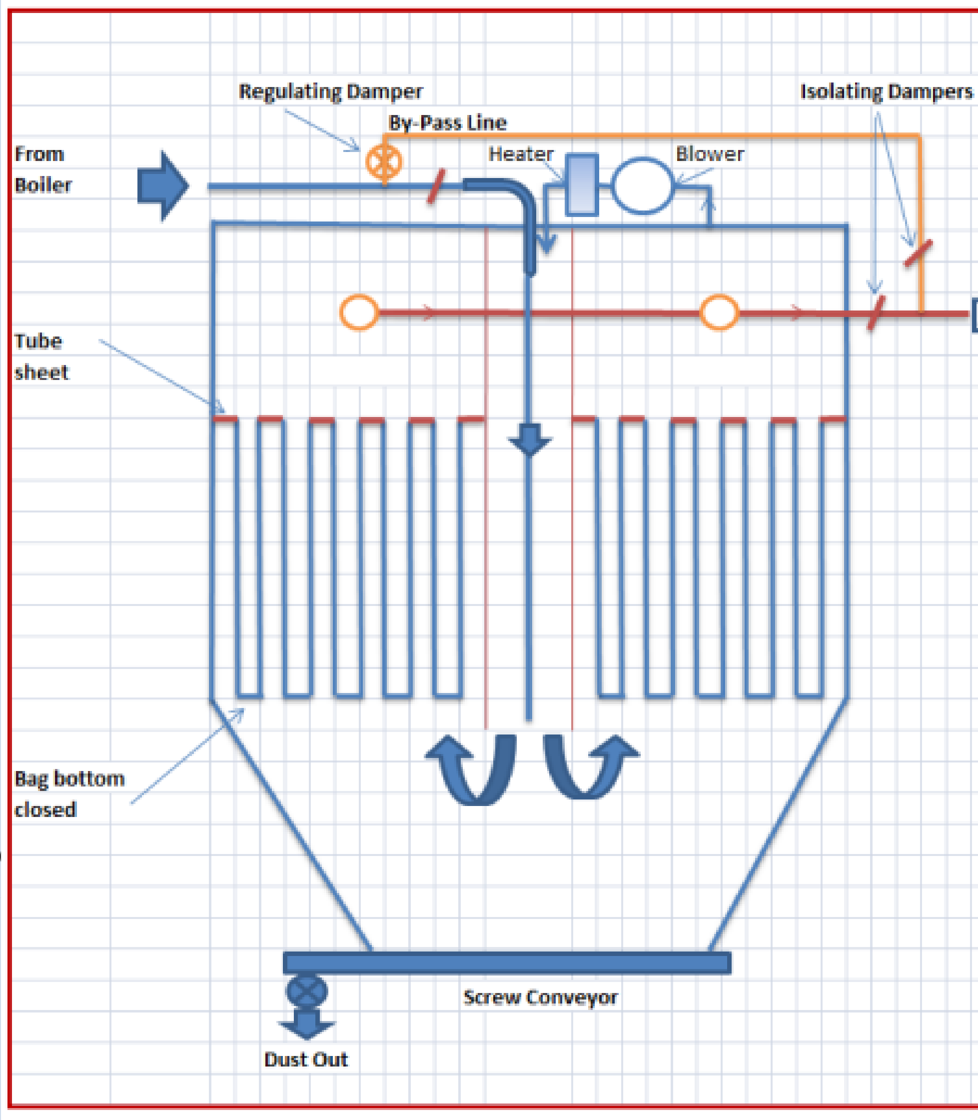
- The polluted gas stream is allowed to pass between two electrodes. One is negative charged high voltage electrode(wire) and other is positively charged plate or a cylinder. High potential difference(25-100 Kv)is maintained between them. Because of the high potential difference a powerful ionising field is formed. This creates an active glow zone called a CORONA.As the negative ion migrates towards collecting electrode(low potential electrode)they also charge the passing particulates. The electric field attract the particulates towards the collecting electrode(plate) and deposited there.
- High collection efficiency (>99%)
- Low pressure drop
- Removal of very small particulates(<0.01microns)
- High initial cost
- Skilled personal are required for design ,operation and maintenance
- More power consumption hence maintenance is costly.

# BAG FILTERS

Bag filters are used for removal of particles of size range of <10 microns.
These are arranged in an enclosure called as Bag House.
Size of each Bag is 120-400mm diameter and 2-10 mts long which are suspended.
The outlet ends of the Bags are open alternatively and attached to a manifold.
The polluted gas enters through the inlet pipe and the large particles will fall into hopper by gravity.
The gas flows into the Bags and leaves through the outlet pipe.
The particulate matter retained on the inside of the bag and form a cake.
The cake is cleaned periodically by the shaking mechanism and collected
also.

Suitable for small particulates(0.01Micron)

High pressure drop and high maintenance cost
Requires frequent cleaning
Fabric filtration is not currently used for controlling PM emissions from ba
Fired boilers due to the relative cost and possible fire danger.



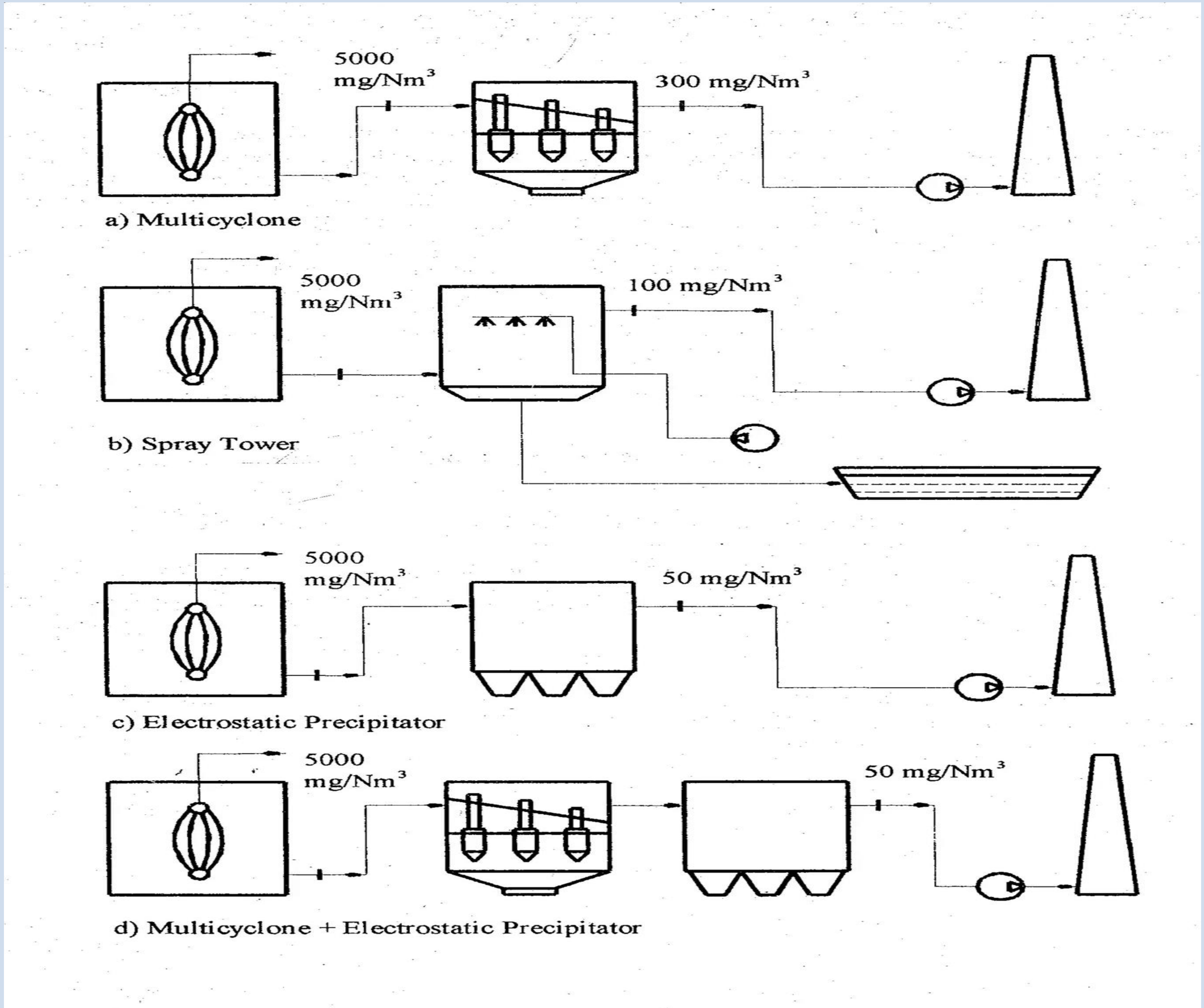
# Sugar Dust Collector and Filtration

Sugar dust is a common byproduct of sugar handling and processing operations. Sugar dust collectors are specifically designed to capture and contain sugar dust, preventing its release into the atmosphere. This not only Improves air quality but also reduces the risk of dust explosions and enhances workplace safety.

**Sugar Dust Filtration**: Sugar dust filtration systems ensure that the air exhausted from sugar mills is thoroughly filtered before being discharged. This filtration process traps fine sugar particles, ensuring compliance with environmental regulations and reducing the impact on surrounding communities.

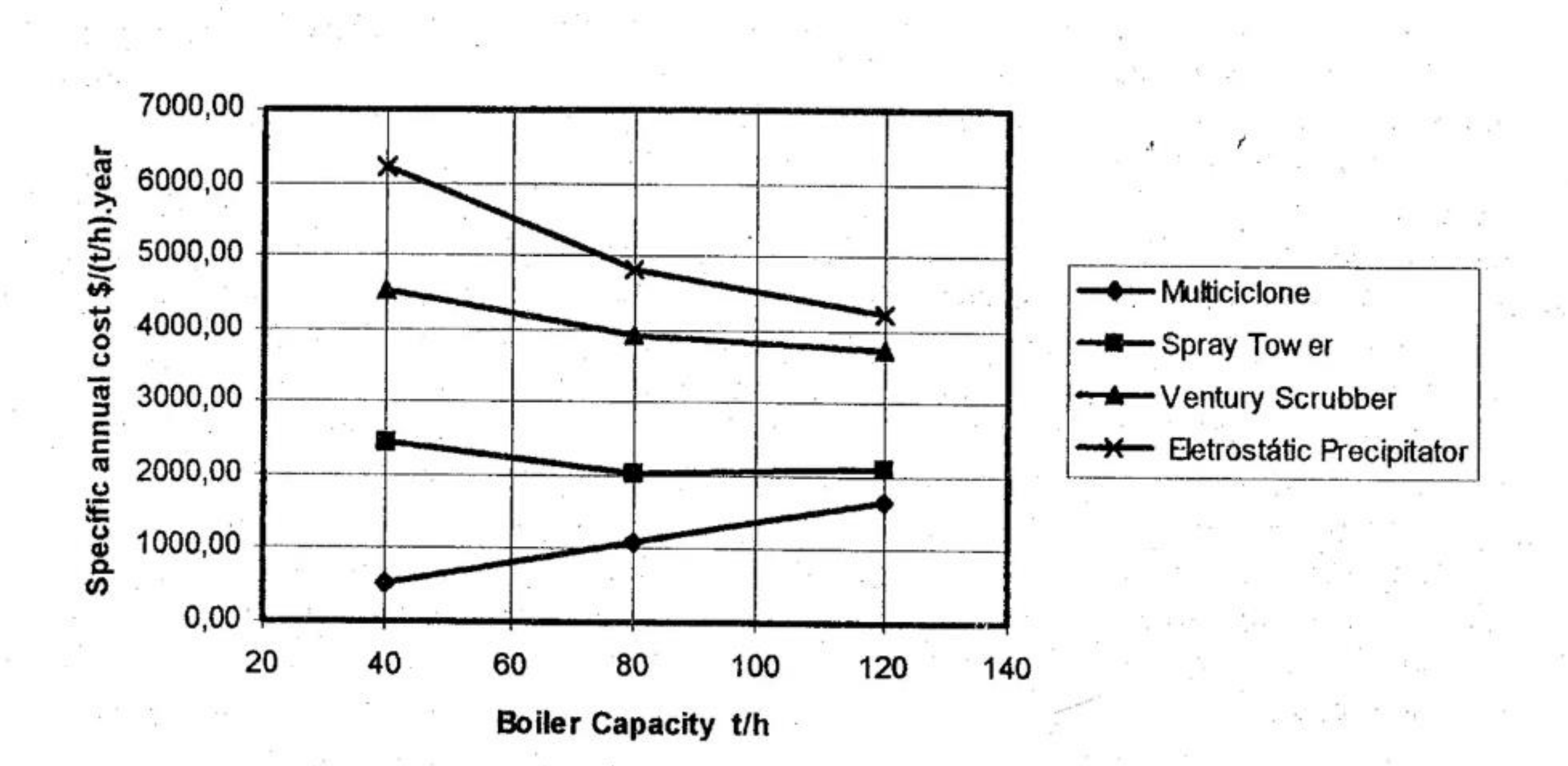
**Sugar Fabric Collectors:** Sugar fabric collectors are utilized to separate fine sugar particles from the flue gases produced during the combustion of bagasse. These collectors are efficient in capturing sugar particles, promoting cleaner emissions and better air quality.

# Particulate emission control configuration for bagasse boilers



# TECHNOECONOMICAL ANALYSIS OF DIFFERENT PARTICULATE CONTROL OPTIONS

A techno economical analysis is carried out to compare different options for bagasse boilers particulate separators. The specific annual cost of particulate separation measured in \$/(t/h), and also the specific investment and the specific operational cost were calculated and used as a tool in the analysis, Three boiler capacities were considered for the calculations: 40, 80 and120 t/h, the typical commercial range for bagasse boilers. A flue gas temperature of 250°C and an excess of air of 45% were assumed.



It is shown that electrostatic precipitator and venturi scrubbers have the greater annual specific cost, which decreases with the increase in the boiler capacity. It is observed also that electrostatic precipitator specific annual cost has the tendency to reach that of ventury scrubber values for steam capacities of about 120 t/h. On the other hand, multicyclone and spray tower specific annual cost remains approximately constant.

Electrostatic precipitators have the higher annual specific costs compared with other particulate separation technologies: this decreases for large boiler capacities, making them more suitable for utilization.

Spray tower wet scrubbers are the most widespread technology for particulate separation in bagasse boilers.

| • Separator | • Advantages | Limitations |
|---|---|---|
| • Cyclones | • Low cost<br>• High temperature operation<br>• Low maintenance cost (lack of moving parts) | • Low efficiency, mainly for small particles (5 to 10 am) |
| • Wet scrubbers | • Can be used for inflammable and explosive particulates.<br>• Particulate removal and absorption at the same time.<br>• Variable removal efficiency. | • Corrosion<br>• Secondary pollution<br>• High Power consumption for higher collection efficiency |
| • Electrostatic precipitators | • Gas cooling.<br>• High efficiency.<br>• Can treat great gas volumes with a small pressure drop.<br>• Dry and wet separation.<br>• Wide range of operational temperature.<br>• Low operation costs. | • Low flexibility.<br>• High investment cost.<br>• Great space needs for installation |
| • Bag filter | • High collection efficiency<br>• Simple Construction & operation<br>• Dry dust disposal | • Operating limits – High temperature, humidity.<br>• High maintenance cost – bag replacement |

## Air Pollution from Boiler – Serious Concern

Flue gases from spent wash fired Boiler exhaust gases are highly corrosive and dust is very sticky in nature posing problems in proper dedusting before venting to atmosphere.

Typical Process parameters:

- Gas temperature 180- 220 Deg.C
- $SO_2$ content 1500 ppm
- Acid dew point temp. 165- 175 Deg.C
- High moisture in gas 18-20 % (v/v)
- Hygroscopic dust $K_2O$ – 28 to 45%
- Bulk density of dust 150 kg/m3 (coal ash 800 kg/m3)
- Start-up with coal & then switch to SW firing
- Maintaining the Diff. Pressure across the Filter

# Distillery Spent-Wash Boiler Exhaust Gases

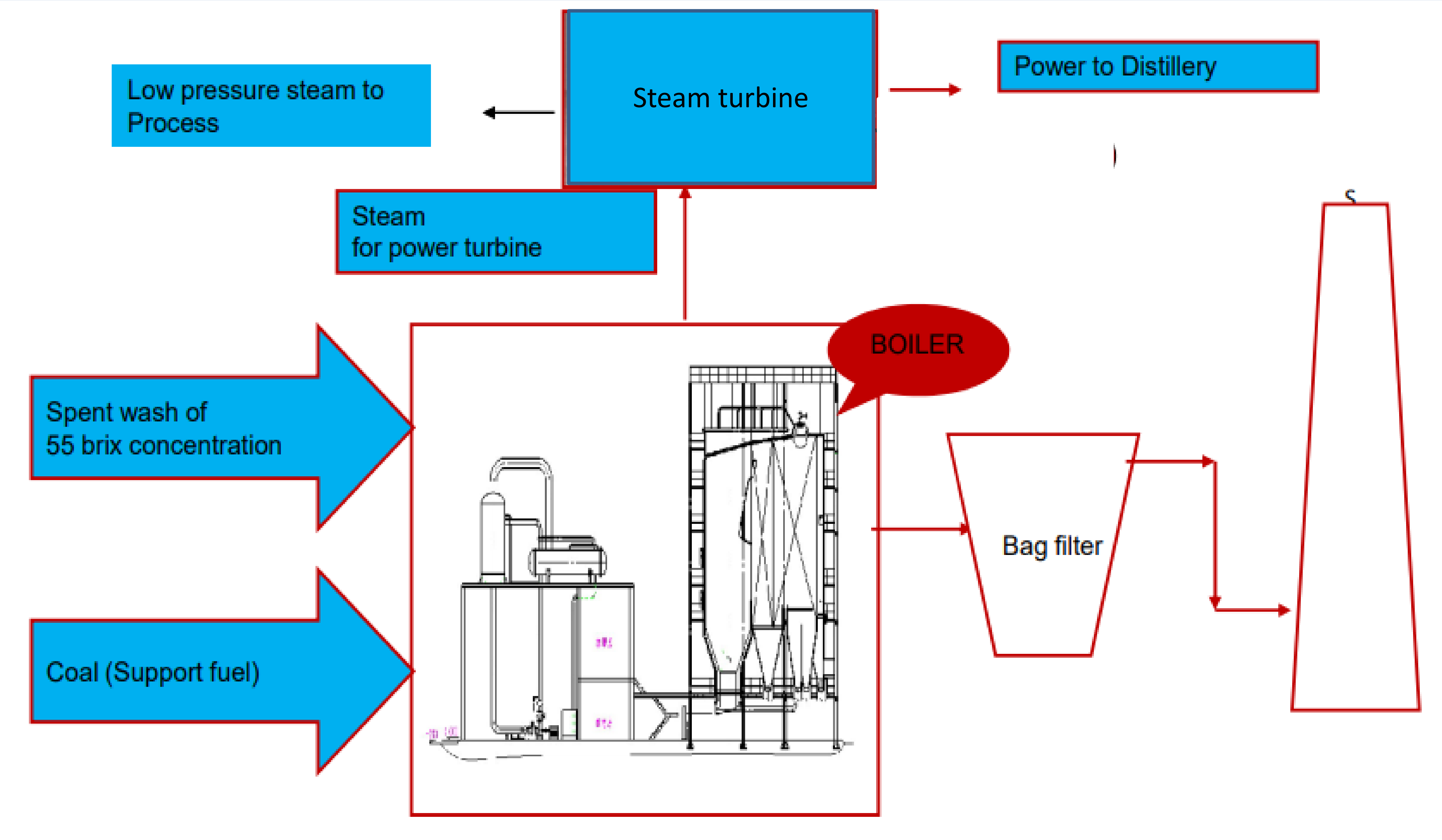
Flue gases from spent wash fired Boiler exhaust gases are highly corrosive and dust is very sticky in nature posing problems in proper deducting before venting to atmosphere.

Distilleries are under pressure from government /society for the polluting effluents (spent wash/spent grain) from their core process and to sustain ‘Zero effluent discharge’ (ZED) norm. Since existing disposal methods – biomethanisation and biocomposting – are unable to meet the ZED norms, hence the need for an alternative solution of concentrating & firing the spent wash/spent grain in a specially designed Boilers.

The benefits of this new technology are:

- Disposal by burning of effluent discharge in a safe and environmentally acceptable practice (by meeting ZED norm)
- Steam generation for meeting the process steam and electricity requirements of distillery.
- Fly ash collected in Bag filter is rich in potash content and can be sold as fertilizer.

# Spent Wash Incineration Boiler Typical Flow Sheet



# A Case study for converting existing cyclone to wet scrubber

Sugar factories are having bagasse fired boilers with multi cyclones for controlling fly ash emissions. Multicyclone system is low cost and is very simple to operate and needs minimal skilled operation. The system involves no moving parts or liquid contact. Hence many industries implemented the scheme. However this control equipment has very low efficiency of ash removal. Also it has got some inherent drawbacks. This results in to higher particulate matter emission rate i.e. > 150 mg/m3. This has compelled the regulating agency to make wet scrubber or ESP system as compulsory option for sugar industry. Those sugar industries which are going for cogeneration plant, shall be providing ESP units and therefore they may not require this type of conversion. However those not opting for cogen plant in near future have to convert existing multi cyclones to wet scrubber. Due to limited particulate matter removal efficiency of multi cyclones, PM emission exceeds the Emission Standard prescribed by Pollution Control Board.

A most efficient and low cost system for converting the existing multi cyclones to wet scrubbers of higher PM removal efficiency are being designed(more than 90%). This system shall be an excellent and cost effective alternative.

**Performance of the existing system of multi cyclones** –

- The normal ash emission for bagasse fired boilers is 1500-1600 mg/Nm3.
- The size distribution particle size from these boilers: For particle size < 10 μm, it is more than 60%, and for particle size > 10 μm, it is less than 40%.
- Multi cyclone works on the principle of centrifugal force for removal of ash particles.
- Efficiency of cyclones to remove less than 10 um particles is very less, and therefore overall efficiency of cyclone is less than 50% and does not meet the Emission standard of 150 mg/Nm3.Therefore to achieve more than 90% efficiency we must go for wet scrubber.
- In addition to this the existing cyclone systems have problems like clogging, damage to cyclone pipes etc.

**Salient features of system are as given below:**

Benefits of the new system:

- Most economical system as existing cyclone components are put to use.
- Minimum fabrication work involved.
- Flexible system for installation with attachment assembly.
- Existing ID fan capacity sufficient to take care of pressure drop.
- Installation time is very less.
- No ware and tear of components and hence minimum replacement cost.
- Ash Removal efficiency more than 90%.
- Particulate matter emission shall be less than 150 mg/Nm3.
- Satisfaction of regulatory norms.

**Additional works required-**

- Screen for ash and water separation, storage cum settling tank for separating the remaining ash from water.
- Pumps for recirculation of settled water for scrubbing
- Disposal arrangement for settled ash.

**Operational Aspects**

- Overall dust collection efficiency more than 90%.
- Particulate matter emission will be below 150 mg/Nm3.
- Less pressure drop.

Budgetary Cost-

Approximate cost of conversion of cyclone (site dependent)= Rs. 15 lakhs.

Cost of additional works as mentioned above (site dependent)

Total cost of the scheme (site dependent) = Rs. 25-30 lakhs (Approx.)

# A CASE STUDY

**Design of Spray Tower for augmenting the efficiency of existing cyclone**

A. Existing arrangement-

As per information given by the company air pollution control system for dust collection is As as given below:

- Dust collector-Size-1.25 m x 1.50 m. x 1.80 m depth. The box is provided with a slant plate to separate the dust.
- Cyclone Multicyclone box of size 0.80 m x 2.20 m. x 2.30 m. depth. No. of cyclone provided are 24 of 0.25 m diameter.
- LD fan of 25 HP capacity with air displacement capacity of 880 $m^3$/hr with 600 mbar pressure.
- The flue gas duct is connected to. stack of 2.40 m. diameter and 30 m. height.
- Present system does give particulate matter removal efficiency of maximum 50%

Hence there is a need to augment the existing particulate matter control system.

B. Augmentation of existing system-

There is little scope to modify the existing cyclone system. There it is better to provide a separate spray tower absorber before cyclone to improve the efficiency of particulate matter collection from 50% to more than 90%.

The flue gas from spray tower shall be taken to cyclone before joining it to stack. Spray tower can be located before cyclone and the existing dust collector box can be removed.

C. Spray Tower system-

- Flue gas flow rate 880 $m^3$/hr le 0.25 m/s. Pressure 600 mbar BHP-25
- Size of the tower0.35 m. x 0.35 m. x 2.50 m. depth.
- Flue gas shall be entering in to tower from bottom and shall be taken out from top.
- However we can recycle 75% of the water derived from settling of slurry. Hence make up water required shall be only 3.75 m/day

Water spray system-

- Liquid flow rate = 0.25 lit/s ie, 0.9 $m^3$/hr. Pipe inlet dia. 15 mm. No. of lateral -3.
- Pipe material S.S. 316.
- 9 no. of Nozzles shall be provided with equal spacing of 12 cms. From each other. Nozzle dia. 2.50 mm. Type of nozzle Full cone nozzle with 60 spray angle at 2 bar pressure.
- Material of nozzle-Brass/$5316/PVDF/PVC
- Demister at the top of the tower to arrest the moisture entrapped in the flue gas shall be less than 50 mm WG
- Pressure drop developed in the system Total water input required-15 $m^3$ day

D. Pressure drop calculation:

The pressure drop in the spray tower system shall be less than 25 mm of WG. Hence existing ID fan capacity is sufficient for the scrubber operation.

E. Ash slurry collection & transfer system:

Total ash produced from the system 2.50 T/day. Ash collected in dust collector (90%) 2.25 T/day Density of ash=0.30 T/$m^2$ Hence Ash volume=7.50 $m^3$/day

Slurry Collection system for Spray Tower: As per site condition

F. Scrubbing water pipe line from fresh water sump near ash pits: As per site condition.

Ash slurry pumps, Scrubbing water pumps: As per site condition.

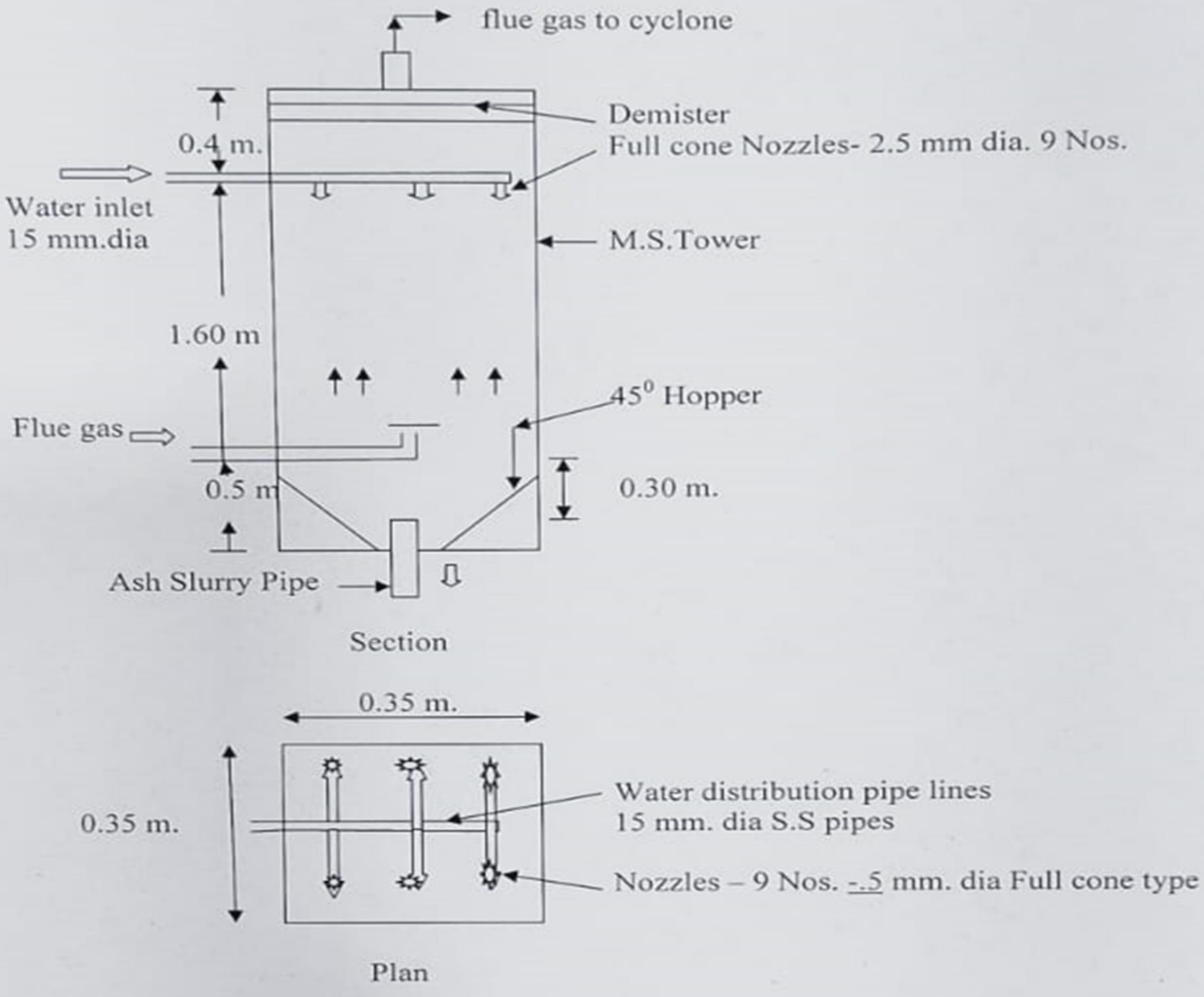
G. Particulate matter removal efficiency:

After addition of spray tower, the particulate matter removal efficiency shall be more than 90%. Hence the emission of particulate matter shall be less than 150 mg/Nm as prescribed by the State Pollution Control Board.

H. System Summary --

| Sr.No | | |
|---|---|---|
| | ID Fan Capacity | 1 No. 880 $m^3$ /hr - 0.25 $m^3$ / s |
| | Stack – 1 no. | 30 m. height, 2.4 m.Dia. |
| | Ash generated | 2.50 T/day |
| | Ash collected in APC | 1.250 T/day |
| | No. of Cyclone | 24 |
| | Flue gas flow rate $Q_G$ | 0.25 $m^3$/s |
| | Water flow rate $Q_L$ | 0.25 Lit / s i.e, 15 $m^3$/ day |
| | Water recycle possible | 11.25 $m^3$ /d |
| | Make up water required | 3.75 $m^3$/day |

**Schematic arrangement of spray tower ---**



# TOWARD A CLEANER SUGAR INDUSTRY

By addressing the air pollution challenges associated with sugar production through a combination of technological innovations, sustainable practices, regulatory reforms, and collaborative e orts, the industry can work towards a more environmentally responsible future.

# THANK YOU FOR TODAY

Do you have any questions?

Email : rameshdod@gmail.com

Phone No. : 9822842902

# MAHATMA PHULE KRUSHI VIDHYAPEET KRUSHI MAHAVIDHYALAYA, PUNE

# MITCON CONSULTANCY & ENGINEERING SERVICES LTD., PUNE

# SUGAR COMMISSIONER OFFICE, PUNE

# &

# THE ENVIRONMENT ASSOCIATION OF MAHARASHTRA

JOINTLY ORGANIZED TWO DAYS SUMMIT ON

**"ROLE OF SUGAR AND ALLIED INDUSTRIES IN CIRCULAR ECONOMY & SUSTAINABILITY"**

VENUE : DR. SHIRNAME HALL, AGRICULTURE COLLEGE, PUNE

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## TOPIC:CASE STUDY ON SPRAY POND OVERFLOW TREATMENT PLANT


**MR. SAGAR B. PATIL : MANAGER ENVIRONMENT**

**M/S KRANTIAGRANI DR. G. D. BAPU LAD S.S.K. LTD., KUNDAL, TAL. PALUS, DIST. SANGLI**

## INTRODUCTION

In the sugar industry, a spray pond is an essential unit for cooling the hot water generated during the sugar extraction process. By dispersing this hot water over a large surface area through sprays, the pond facilitates heat loss via evaporation and convection. However, the overflow from the spray pond is a major source of water pollution from a sugar mill. According to the guidelines of the Ministry of Environment, Forest, and Climate Change (MoEF&CC) and the Central Pollution Control Board (CPCB), it is mandatory to treat the spray pond overflow before discharge.

The charter outlines four options for treating spray pond overflow, and the sugar mill has installed a **separate treatment plant of capacity 850 cum/day** for the spray pond overflow treatment involving **two stages of biological treatment**: anaerobic and aerobic processes followed by tertiary treatment.

# INTRODUCTION OF THE SUGAR MILL

**M/s. Krantiagrani Dr. G.D. Bapu Lad Sahakari Sakhar Karkhana Ltd**. is a cooperative sugar mill located in Village Kundal, Taluka Palus, District Sangli, Maharashtra. The mill was established under the dynamic leadership of the late freedom fighter Krantiagrani Dr. G.D. Bapu Lad. It is currently guided by the visionary leadership of former Chairman and MLA Mr. Arun Ganapati Lad and Chairman Mr. Sharad Lad.

**Sugar Factory Crushing Capacity :**

Sugar unit : 8500 TCD

Co-generation unit : 19.70 MW

Distillery unit : 260 KLPD

**Spray Pond Overflow Effluent quantity :**

Sugar mill effluent refers to the wastewater generated during the sugar production process. This effluent typically contains high levels of organic matter, including sugars, suspended solids, and various pollutants. On the major source of effluent generation is spray pond overflow the quantity of this effluent is equal to the other effluent sources which is nearly 100 Lit/tone of cane crush and which is mandatory to treat before discharge

## AVERAGE INLET & OUTLET QUALITY & QUANTITY OF THE SPRAY POND OVERFLOW

| # | Characteristics. | Inlet Value | Outlet Value | Discharge Norms |
|---|---|---|---|---|
| 1 | pH | 4.5 - 6.5 | 5.5-9.5 | 5.5-9.5 |
| 2 | Suspended Solids, mg/L | 400-600 | <100 | 100 |
| 3 | Total Dissolved Solis, Max., mg/L | 1500-2000 | <2100 | 2100 |
| 4 | BOD, 5 days at 20 $^{o}$ C, mg/L | 500-700 | <30 | 30 |
| 5 | COD, mg/L, Max. | 1000-1500 | <250 | 250 |
| 6 | Sulphate | 1000-1200 | <1000 | 1000 |

# IMPACT OF DISCHARGING SPRAY POND OVERFLOW EFFLUENT WITHOUT TREATMENT

The overflow discharge from sugar industry spray ponds can have significant environmental impacts if not properly treated. Here’s a breakdown of some potential effects on land:

**Soil Contamination**: Sugar industry effluents often contain high levels of organic and inorganic compounds when these substances overflow and come into contact with soil, they can alter its chemical composition, potentially leading to contamination with heavy metals and other pollutants.

**Nutrient Imbalance**: The discharge might introduce excess nutrients, such as nitrogen and phosphorus, into the soil. This can disrupt the natural nutrient balance, leading to issues like soil degradation and reduced fertility.

**Soil pH Changes**: The acidic or alkaline nature of the effluent can alter the soil pH. This shift can affect the availability of nutrients and the health of plants.

**Groundwater Contamination**: If the overflow seeps into the groundwater, it can lead to contamination of water resources. This can pose risks to drinking water quality and affect ecosystems dependent on groundwater.

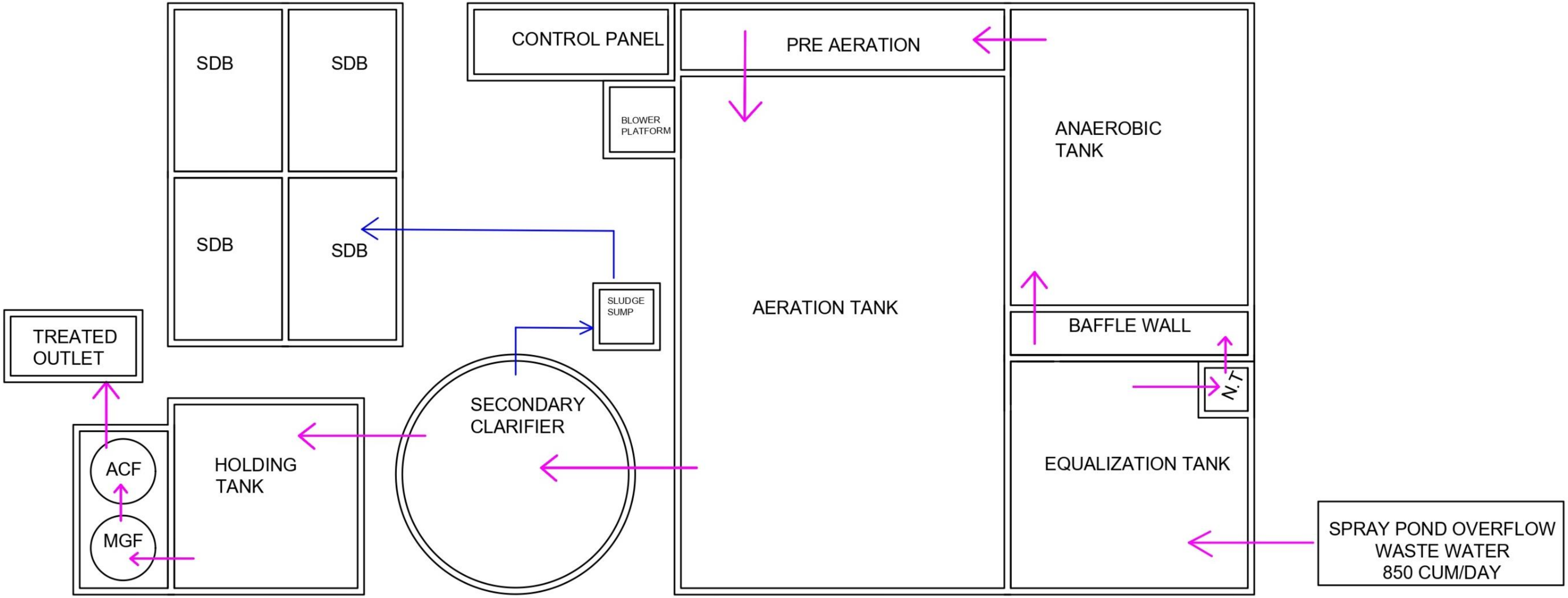
**Health Risks**: Persistent exposure to contaminated soil or water can pose health risks to humans, including potential issues related to waterborne diseases or chemical exposure.

**Odor and Aesthetic Issues**: The overflow can produce unpleasant odors and create unsightly conditions. This can affect local communities and reduce the quality of life for nearby residents.

## DESIGN PARAMETERS CONSIDERED FOR DESIGNING OF TREATMENT PLANT

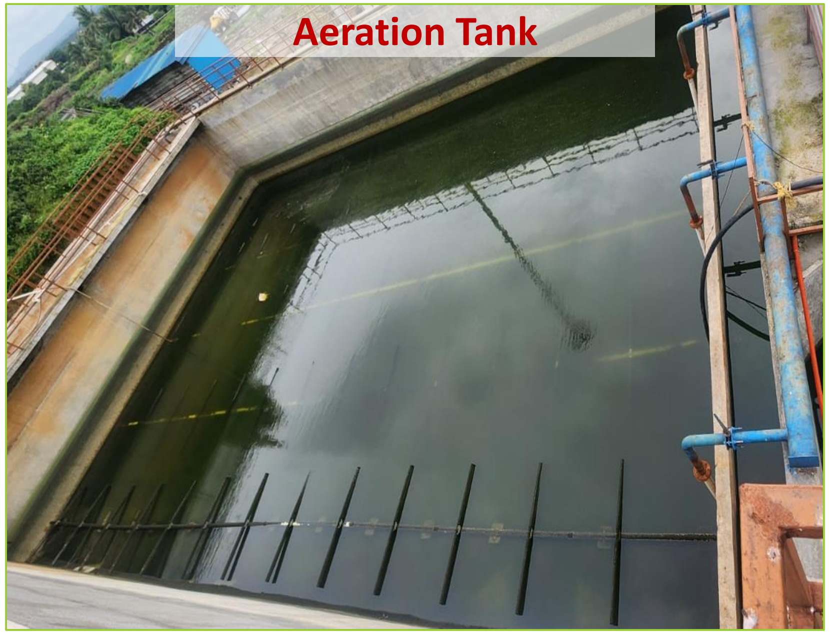
| # | Parameter | Concentration |
|---|---|---|
| **1** | **Quantity** | **800-850 $m^3$/day** |
| 2 | pH | 6.5 -8.5 |
| 3 | Temperature | 40 - 50 0C |
| 4 | BOD | 2000 mg/l |
| 5 | COD | 4000 mg/l |
| 6 | TDS | 600 – 1800 mg/l |
| 7 | Sulphate | 1000-1200 Mg/l |

# TREATMENT PLANT LAYOUT: CAPACITY 850 CUM/DAY



# PHOTOGRAPHS OF THE PLANT









Treated Water Collection Tank


Treated Water


Treated Water

# ELECTRICITY, CHEMICAL AND MAN POWER REQUIREMENT DURING OPERATION

## POWER CONSUMPTION

| Units | Power Consumption in HP | Power Consumption in KW/hr |
|---|---|---|
| Feed Pumps: 2 No's (1 w + 1 S) | 7 | 5.21 |
| Sludge Withdrawal Pumps: 4 No's (2 w + 2 S) | 4 | 2.98 |
| Air Blower: 2 No's (1 w + 1 S) | 25 | 18.64 |
| Clarifier Mechanism 1 Nos | 1 | 0.74 |
| Filter Feed Pump | 10 | 7.45 |
| **Total** | **47 HP** | **35.02 KW/Hr** |

## CHEMICAL CONSUMPTION

| Urea/Day | DAP/Day |
|---|---|
| 4.0 KG | 2.0 KG |

## DAILY MANPOWER CONSUMPTION

| Chemist/Day | Operator/Day |
|---|---|
| 1 No | 3 Nos |

# OPERATIONAL COST ESTIMATION

## Electricity consumption

- Electrify consumption per Hr: 35.02 KW
- Daily electricity consumption : 35.02 x 24 hr : 840.84 Kw
- Rate of electricity per Kw: Rs. 4.25 /-
- Total cost per day : 840.84 x 4.25 : **Rs. 3,572.04 /-**

## Chemical consumption (Urea & DAP)

- Urea consumption per day: 4.00 Kg
- Cost of urea per Kg : Rs. 5.4 /-
- **Daily cost of Urea : 4.00 Kg X Rs. 5.4 : Rs. 21.60 /-**
- DAP consumption per day: 2.00 Kg
- Cost of urea per Kg : Rs. 30.00 /-
- **Daily cost of Urea : 2.00 Kg X Rs. 30 : Rs. 60.00 /-**
- **Total cost of Urea & DAP : Rs. 21.60 + 60.00 : Rs. 81.60 /-**

## Man power requirement

- 1 Chemist : Rs. 500 /- per Day
- 3 no's operator : Rs. 1200 per Day (400/Person)
- Total Cost: **Rs. 1700 /- Per Day**

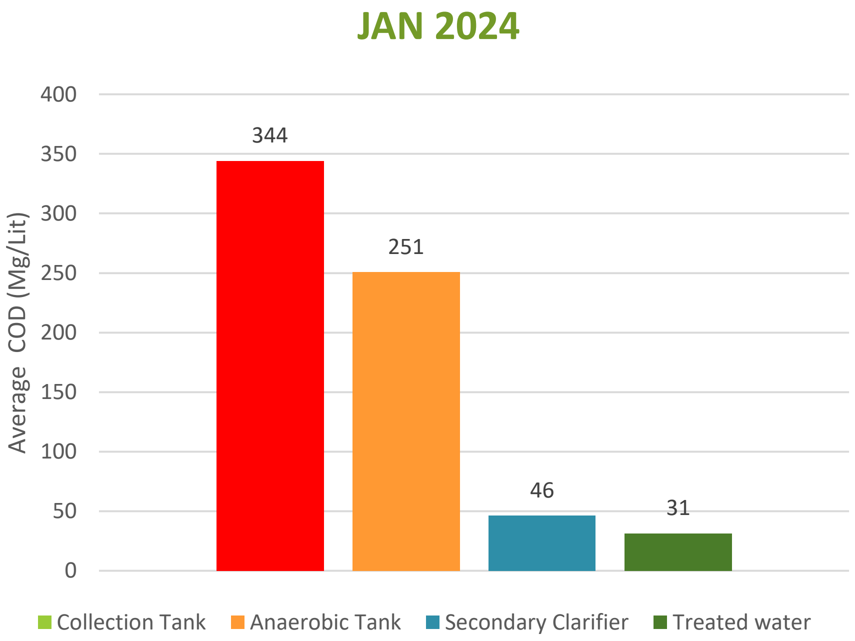

## Man power requirement

- 1 Chemist : Rs. 500 /- per Day
- 3 no's operator : Rs. 1200 per Day (400/Person)
- Total Cost: **Rs. 1700 /- Per Day**

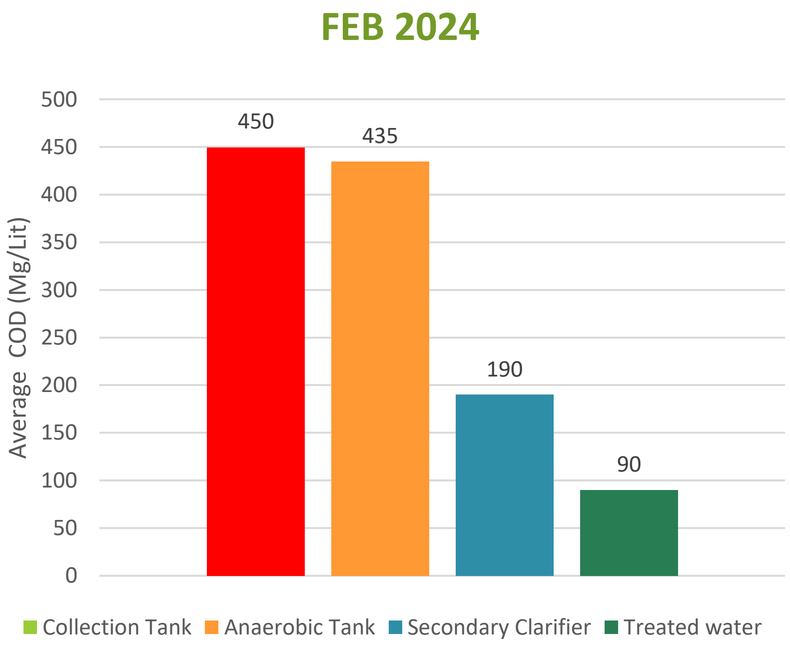

## Total Daily Operational Cost

| Particulars | Cost in Rs. |
|---|---|
| Electricity consumption | 3,572.04 /- |
| Chemical consumption | 81.60 /- |
| Manpower | 1700.00/- |
| **Total Cost/Day** | **5353.64/-** |

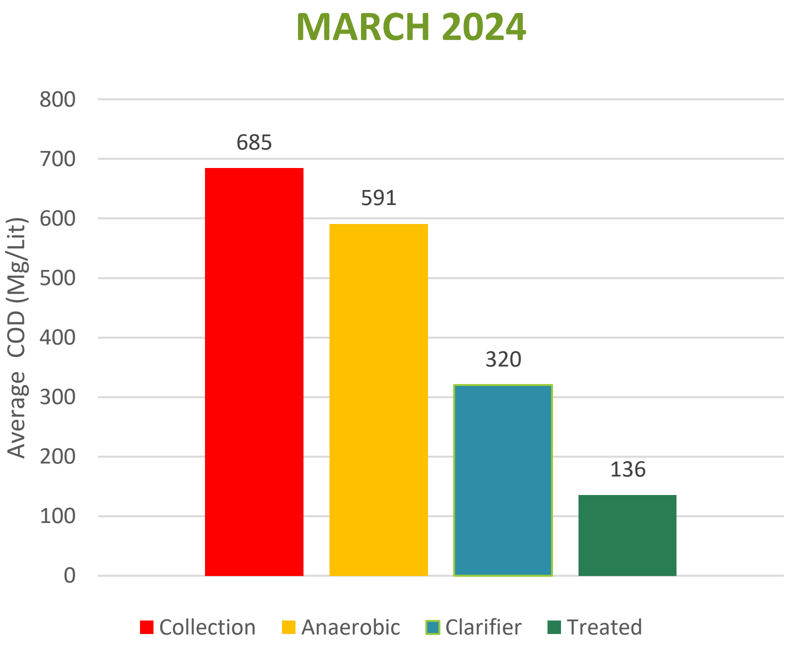
# COD ANALYSIS IN THE SEASON 2024




Up to 90 % COD Reduction observed

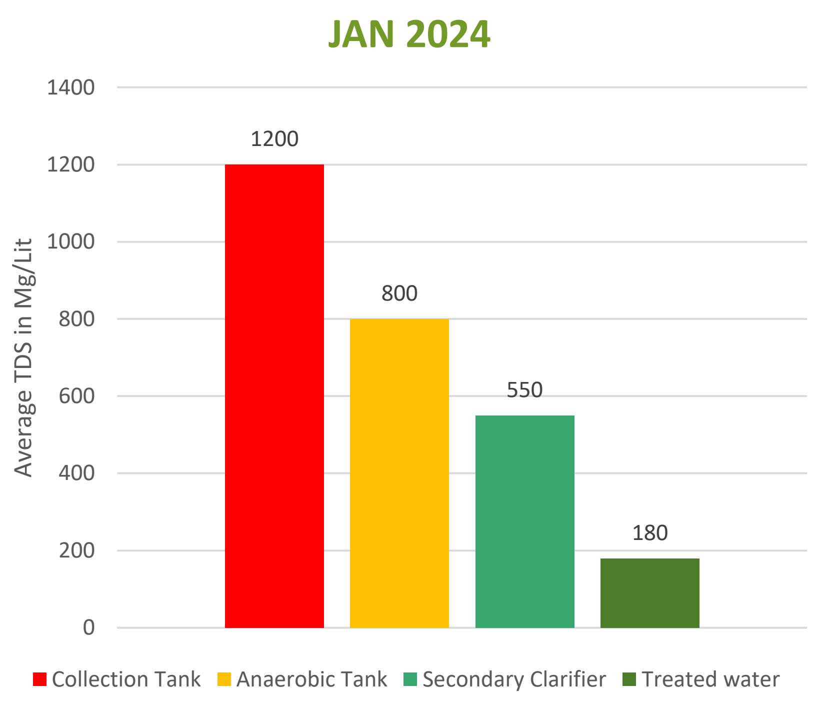



Up to 80 % COD Reduction observed

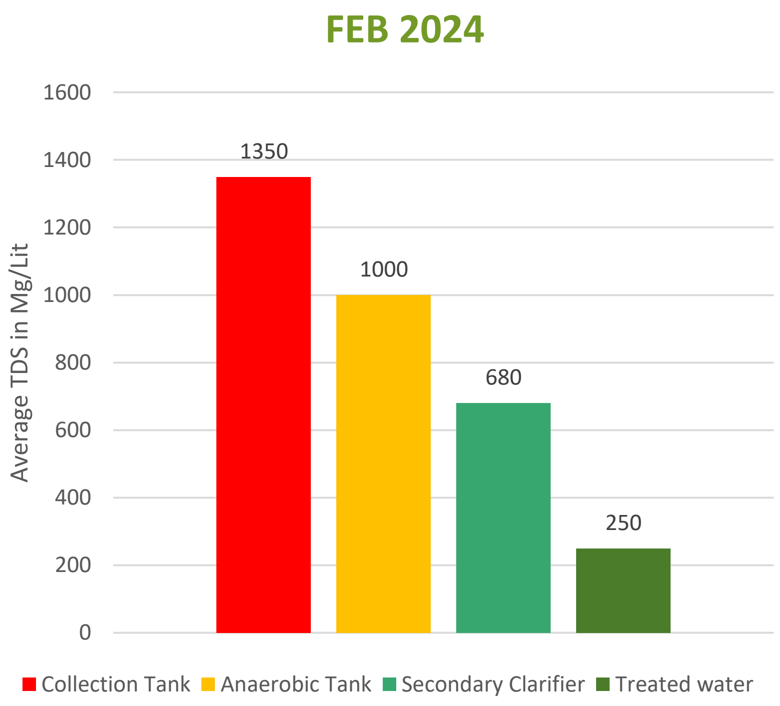



Up to 80 % COD Reduction observed

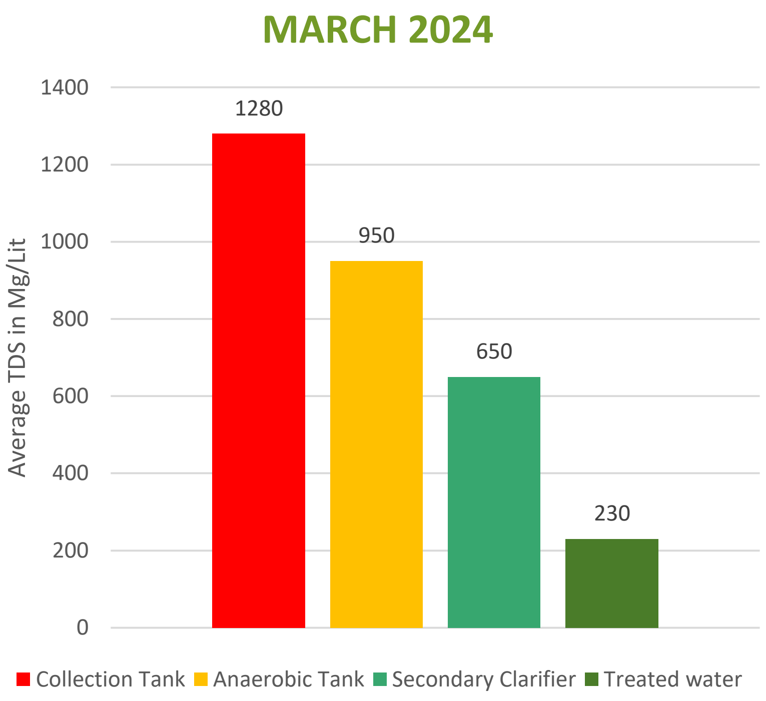
# TDS ANALYSIS IN THE SEASON 2024




Up to 85 % COD Reduction observed




Up to 81 % COD Reduction observed




Up to 82 % COD Reduction observed

# TREATED WATER RECYCLING AND COST BENEFIT ANLYSIS

During the 2024 season, the plant has operated for approximately 120 days at 90-100% capacity, managing a daily flow of 800-850 cubic meters for treatment. The overflow from the treated spray pond is now reused to makeup at the spray pond, a process that previously relied on fresh water. Additionally, this treated overflow is repurposed for various applications, including ash quenching, wet scrubber makeup, road sprinkling, and greenbelt development. This approach has reduced fresh water consumption and, consequently, the cost of procuring fresh water.

Based on flow meter data, the total volume of treated spray pond overflow recycled during the last season was about 95,406 cubic meters. The cost of industrial fresh water is Rs. 22.00 per cubic meter, plus an additional 20% local cess amounting to approximately Rs. 4.40 per cubic meter, bringing the total cost to Rs. 26.40 per cubic meter.

**Cost-Benefit Analysis for the 2024 Season:**

- Total recycled treated water : 95,406 cubic meters
- Cost of fresh water per cubic meter (including cess) : Rs. 26.40 /-
- **Total cost saving: 95,406 x 26.40 = Rs. 25,18,718.40 /-**

# THANK YOU

**CONTACT DETAILS:**


- Name : Mr. Sagar B Patil
- Designation: Manager Environment at M/s Krantiagrani Dr. G D Bapu Lad SSKL, Kundal Sangli
- Mob. No: 9860271729
- Email: patilsagar167@gmail.com , krantisugar.env@gmail.com


# Operational Troubleshooting of ETP & STP.

## Dr. E. P. Alhat, Vice President, MITCON

WWW.MITCONINDIA.COM

# Effluent Treatment Plant

## Operational Troubleshooting


Dr. E.P.Alhat
MITCON- EME


MITCON

# Reasons for Poor Operations of ETP

01 Design Defects

02 Excess use of raw water in Process

03 Resulting In Increase In Hydraulic Load

04 Excess use of cooling water

05 Lack of stand-by arrangements

06 Minimal efforts towards establishment of EMC

07 Absence of on-site laboratory facilities

08 Poor coordination

09 Workers unaware on usage of excess water

10 Lack of waste management culture

11 Management’s views w.r.t. Pollution Control Systems

12 Lack of qualified, skilled and technically experienced personnel

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# Interesting Facts

1. Most of the Industry have Activated Sludge Process type of treatment technology to treats their effluent.

2. The activated sludge process is an aerobic, biological process which uses the metabolic reactions of microorganisms to attain an acceptable effluent quality by removing substances exerting an oxygen demand.

3. This treatment is usually considered to be a secondary treatment process and follows a primary settling basin.

4. The organic matter serves as a carbon and energy source for growth and is converted into microbial cell tissue and oxidized end products (mainly $CO_2$).

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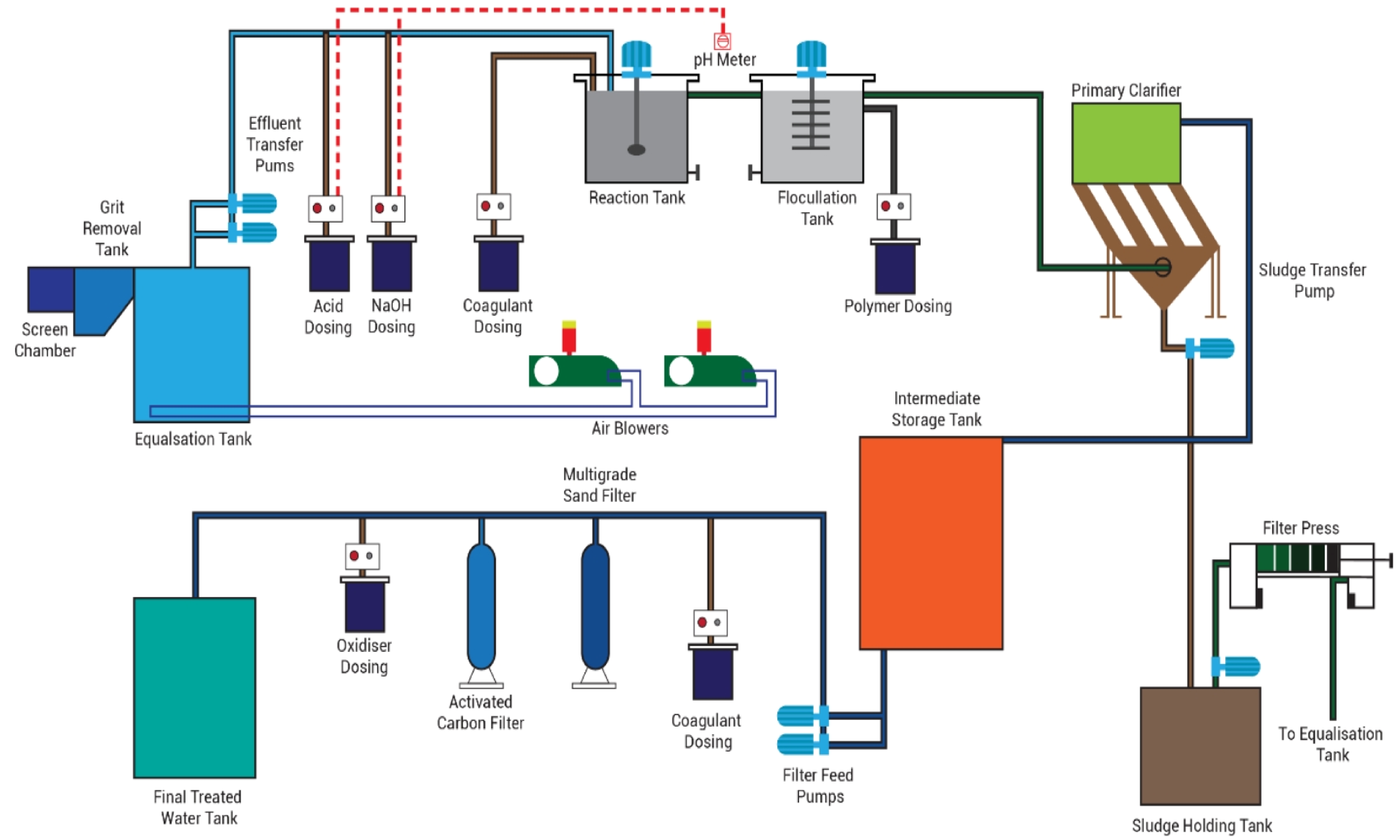
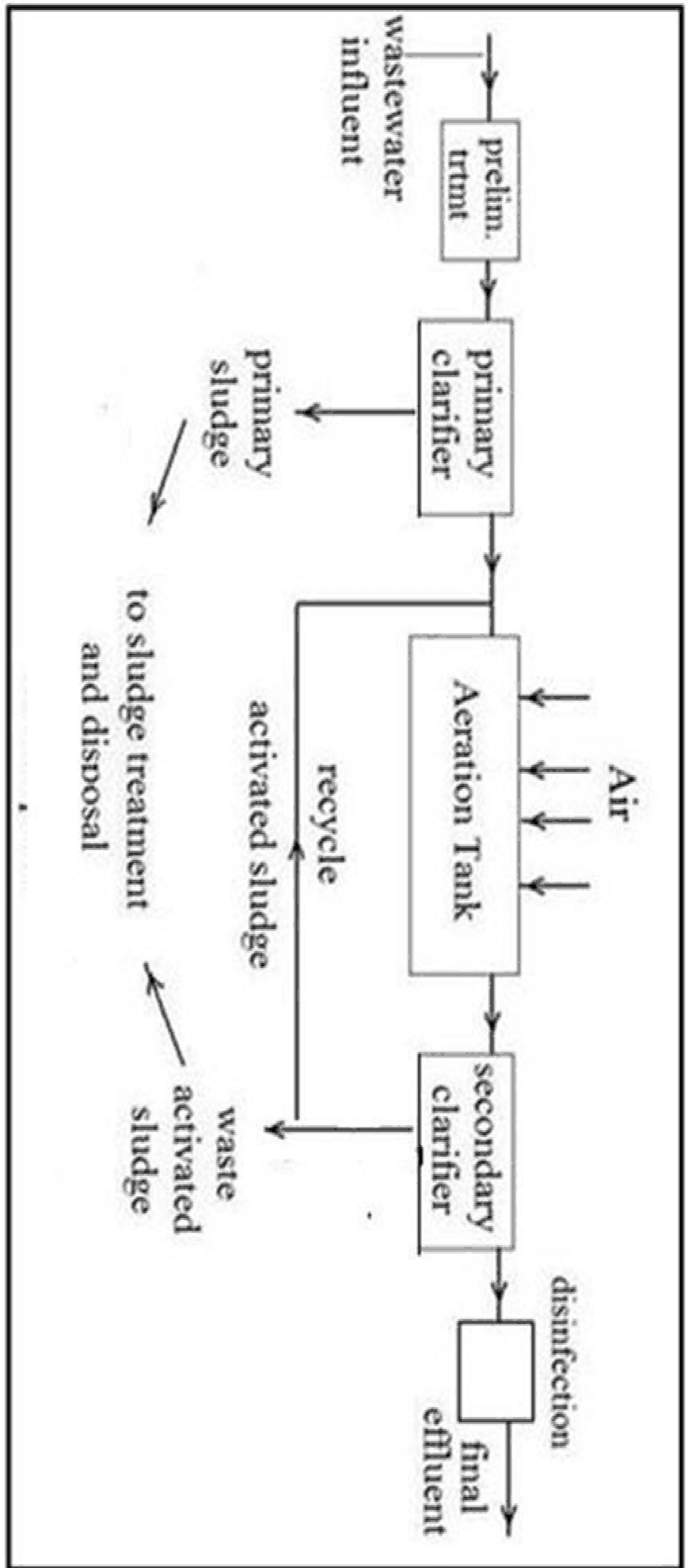
ETP
(Only Chemical Treatment)



# The Start-up Of An Effluent Treatment Plant (ETP)

- Fill Up The Aeration Tank Up To 1/3 With Fresh Water
- Increase The DO Of Water (More Than 2-3 Ppm)
- Add Isolated Culture If Available Or Cow-dung
- Aeration Tank Becomes of Brown Color
- Feed  A Primary Treated Effluent And Increase The Flow Gradually
- Fill Up The Secondary Clarifier With Freshwater
- Allow The Effluent From Aeration Tank To Flow To The Secondary Clarifier
- Recycle Sludge Of Secondary Clarifier To Maintain  MLSS 2500-3000 Ppm

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# Troubleshooting in ETP Operation

1. Foaming On Aeration Tank
2. Septic Or Sour Odour
3. Sludge Rising
4. Sludge Settle Slowly
5. Increase In Ammonia Level
6. Pin-floc On Clarifier

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# Foaming on Aeration Tank

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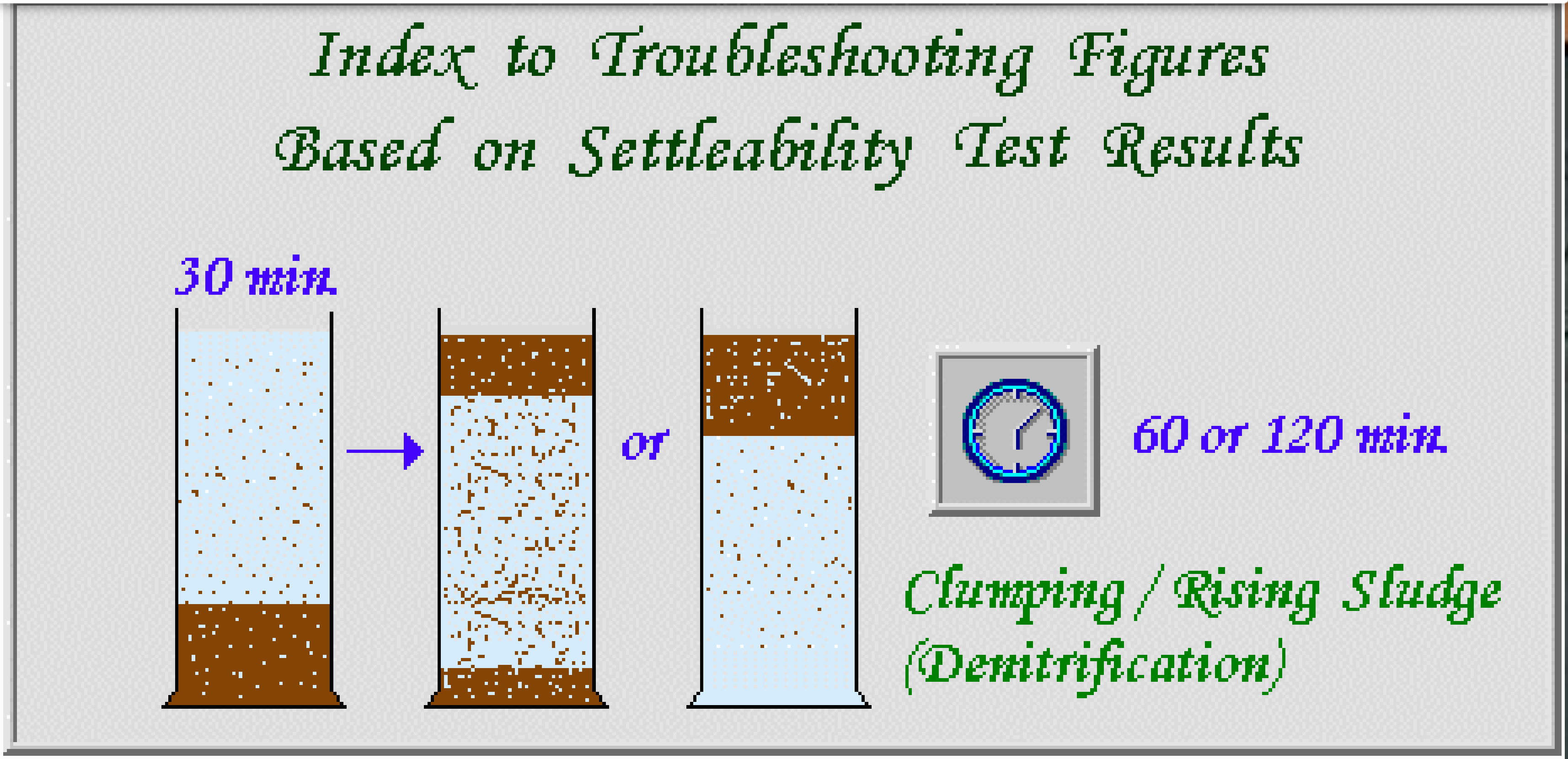
| Observations | Probable Cause | Necessary Check | Remedies |
|---|---|---|---|
| **Stiff And White Foam On An Aeration Tank Surface** | 1. Young sludge overloaded aeration tank<br>2. Low MLSS<br>3. Excessive sludge wasting from process<br>4. Unfavorable conditions such as highly toxic waste(metals or bactericide)<br>5. Improper influent waste water | 1. Calculate F/M<br>2. Check secondary clarifier effluent for solid carry over. Effluent will look cloudy.<br>3. Check and monitor DO | 1. Do not waste sludge from the process for a few days.<br>2. Increases F/M.<br>3. Maintain DO level between 2 - 3mg/l Adequate mixing in the aeration tank.<br>4. Maintain sludge blanket depth of 1 to 3 feet from clarifier floor.<br>5. Seed the process with healthy activated sludge from a well operating plant. |
| **Shiny, Dark Brown Foam On Aeration Tank Surface.** | 1. Aeration tank approaching under loaded (low F/M) condition due to insufficient sludge wasting from the process. | 1. Increasing MLVSS, mg/lit<br>2. Increasing SRT<br>3. Decreasing F/M<br>4. Decreasing DO level for the same aeration<br>5. Decreasing wasting rates<br>6. Increasing temperatures | 1. Increase wasting rates of recycling sludge |
| **Thick Scummy, Dark Brown Foam On Aeration Tank Surface** | 1. Aeration tank is critically over loaded<br>2. F/M too low<br>3. Scum entering aeration tanks<br>4. Filamentous organism (Nocardia) | 1. Increasing MLVSS<br>2. Decreasing F/M<br>3. Decreasing sludge wasting rate<br>4. Decreasing aeration tank effluent pH<br>5. Check secondary influent for oil and grease.<br>6. Primary scum collection system.<br>7. Examination of mixed liquor. | 1. Equalize influent and return rates to each aeration tank.<br>2. Improve primary scum capture.<br>3. Physically remove aeration tank foam and clarifier scum<br>4. Do not recycle remove foam and scum through the plant<br>5. Increase Nutrients dose |
| **Dark Brown Almost Blackish Sludgy Foam On Aeration Tank Surface. Mixed Liquor Color Is Very Dark Brown To Almost Black.** | 1. D O level decrease | 1. Check aeration equipment. | 1. Repairs leaks or clean diffusers<br>2. Clean blades of rags or rise if mechanical air system. |
| **Septic Or Sour Odor From Aeration Tank** | 1. Decrease in DO level.<br>2. Rising filamentous bulking | 1. Check MLVSS | 1. If too high, adjust MLVSS to proper F/ M. if at proper F/M put another aeration ta reduce MLVSS. |



# Sludge Rising & Sludge Settlement




| Observations | Probable Cause | Necessary Check | Remedies |
|---|---|---|---|
| • **Mixed liquor settles slowly and compact poorly in settle-ability test, but supernatant is fairly clear.**<br>• **Microscopic examination shows few or no filamentous organisms.**<br>• **Sudden increase in SVI.**<br>• **Sudden decrease in SDI.** | 1. High F/M .<br>2. Wastewater nutrients deficiencies causing filaments bulling<br>3. Wide fluctuations in raw waste water pH, or aeration tank pH less than 6.5<br>4. Septic waste water with sulfide. | 1. Changing MLVSS, mg/lit<br>2. Changing SRT<br>3. Changing F/M<br>4. Changing DO & pH levels<br>5. Changing influent BOD.<br>6. Available nutrients levels in influents and effluent wastewater. | 1. Decrease wasting of sludge<br>2. Use settling agent<br>3. Chlorine, H2O2 and polymers addition to the satisfactorily control poor settling due to viscous activated sludge<br>4. Decrease returns sludge rate. |
| **Pin floc in clarifier effluent** | 1. Long SRT, high nitrified fraction causing to rapid settling for good solids capture. | 1. Wasting rate ,<br>2. Recharge factor<br>3. Turbidity. | 1. Decrease SRT by increasing sludge wasting . |
| **Decrease in nitrification system pH, with loss of nitrification.** | 1. Insufficient addition of lime to offset drop in pH | 1. Alkalinity in influent<br>2. Influent pH | 1. If alkalinity less than 20 to 50 mg/lit<br>2. increase lime doses. |
| **Effluent ammonia level exceeds permit value** | 1. DO concentration level limiting nitrification<br>2. Cold temperature is limiting nitrification.<br>3. Check rate of sludge wasting. | 1. Checks DO. minimum DO in nitrification system should be 2mg/lit or more<br>2. Check influent TKN concentration and flow | 1. Increase aeration or decrease loading on nitrification tanks.<br>2. Increase biological population (MLVSS) in nitrification tank by rising MLVSS concentration or adding lime<br>3. Increase pH with alkaline source |
| **Pin floc in clarifier effluent** | 1. Long SRT, high nitrified fraction causing to rapid settling for good solids capture. | 1. Wasting rate ,<br>2. Recharge factor<br>3. Turbidity. | 1. Decrease SRT by increasing sludge wasting . |

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# Anaerobic Treatment Troubleshooting

## Composition of Biogas

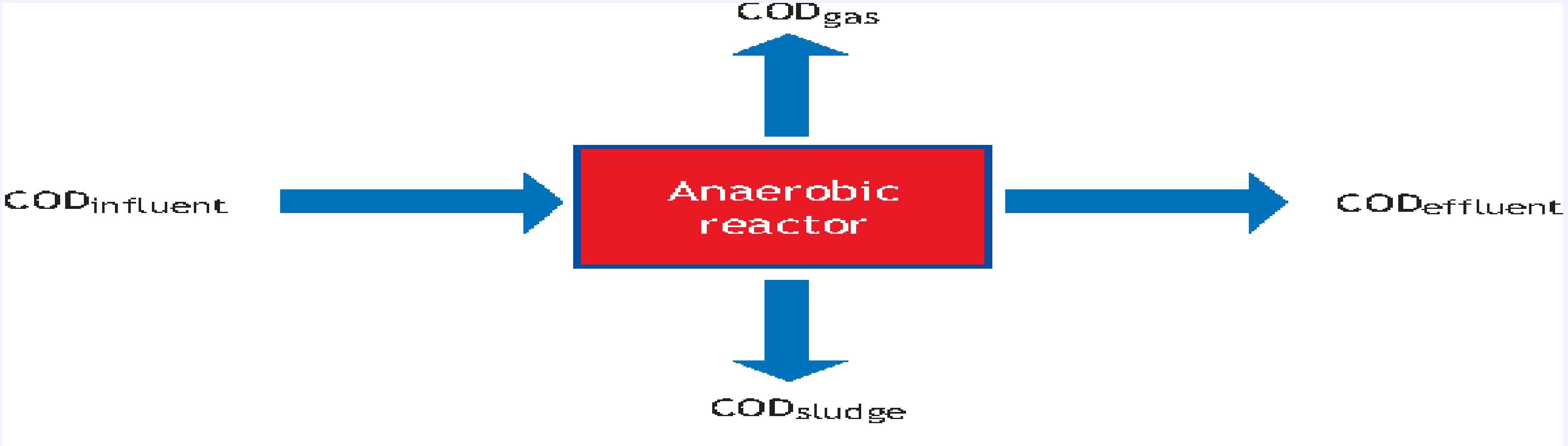
- Methane : 65%
- Hydrogen Sulfide : 1-2 %
- Carbon dioxide : 28 - 30%
- Lipids & proteins: Long chain fatty acids.
- Volatile acids: Acetic acid (CH3COOH) (Majorly
- Propionic acids, butyric acids etc.
- Fixed acids: Maleic acids, Lactic acids, Succinic acids etc.

## Reactions in followed In Acidogenesis

Lactate + 2H2O → Acetate + $CO_2$ + $H_2O$ - 4.2
Ethanol + H2O → Acetate + 2 $H_2$ + 9.6
Butyrate + 2H2O → 2 Acetate + 2 $H_2$ + 48.1
Propionate + 2H2O → Acetate + $3H_2O_2$ + $CO_2$ + 76.1

## Reactions in followed In Methane formation

Acetate CH3COOH → CH4 + CO2
Hydrogen 4H2 + CO2 → CH4 + 2H2 O2
Methanol 4CH3 OH2 → 3CH4 + CO2 + 2H2O




$$COD_{influent} = COD_{effluent} + COD_{gas} + COD_{sludge}$$

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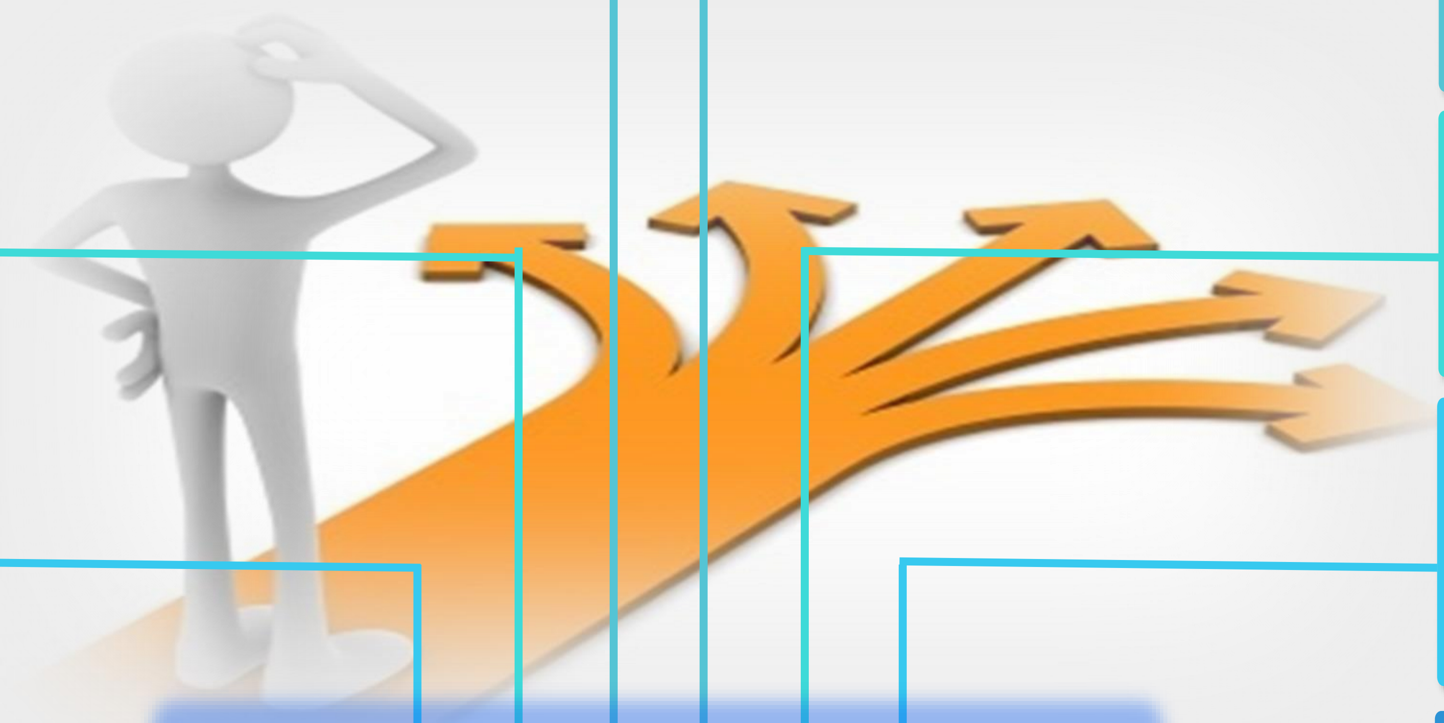
## FACTOR AFFECTING ANAEROBIC DIGESTION



- Wastewater Strength fluctuations.
- Composition fluctuations of organic compounds. (Suspended solids, Biodegradability).
- Temperature
- Presence of toxic compounds.
- Risk of formation of inorganic precipitates.
- Buffer capacity / pH.
- Availability of nutrients (N, P, Micronutrients).
- Toxicity

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**pH**

- Methanation affected
- pH is Increased- Bacterial Growth Decreased

**Temperature**

- Affect bacterial activity directly.
- Methane bacteria work at a temperature between 35 – 38 degree celcius.
- Fall in production starts at 20 degree celcius.
- Stops at 10 degree celcius.

**Loading Rate**

- The amount of raw material fed to digester per day per unit volume.
- 0.5 to 1.0 Kg of volatile solid per cubic meter per day.
- Or
- 0.05 to 0.1 Kg VSS (sludge) per Kg of COD per day

**Seeding**

- Bacteria required for acid fermentation & methane fermentation are artificially seeded with digested sludge, lagoon sludge, cow-dung etc.
- Beyond certain seed concentration gas production will decreases

**Uniform Feeding**

- One of the factors of good digestion is the uniform feeding of the digester, so that, micro-organisms are kept in a relatively constant organic solid concentration at all times.

**Nutrients**

- Nitrogen - 6-7 Kg/Ton of COD loaded
- Phosphorous - 10 – 15% of nitrogen requirement
- Sulphur requirement is easily met out by the available in effluent.

**Micro-nutrient**

- Ferric Chloride ($FeCl_2$)
- Nickel Chloride ($NiCl_2$)
- Cobalt Chloride ($COCl_2$)
- O.P. Acid (Ortho-Phosphoric acid)
- Ammonium Molybdate
- Zinc Sulphate ($ZnSO_4$)

**Mixing or Stirring**

- Since bacteria in the digester have very limited reach to their foods, it is necessary that, the slurry is properly mixed.
- Slight mixing improves the fermentation.
- A violet slurry agitation retards digestion

**Retention Time/ Period**

- The period of retention of the material for biogas generation inside the digester' i.e. 'time interval between. input & output.
- Depend upon feedstock & temp.
- Normal period- 10 – 20days.

**Toxicity**

- Digested slurry if allowed to remain in the digester beyond a certain time becomes toxic to microorganisms might cause fall in fermentation rate.

**Acid accumulation inside the digester**

- Intermediate products such as propionic acid, butyric acid, are produced during the process of bio-digestion.
- These cause in decrease in pH, especially when fresh feed material is added in large amount.
- The acid converted into methane.
- Acid accumulation is usually occurred in batch digestion system

# Troubleshooting

| Problem | Cause | Remedies |
| --- | --- | --- |
| **Increases Temperature** | 1. Raw effluent temperature may be high | 1. Check the Cooling water inlet<br>2. Cooling water outlet temp should be lower |
| **Decrease In pH** | 1. Raw effluent pH may be lower<br>2. Volatile Acids may have increased in the reactor | 1. Correct pH with neutralizing agent<br>2. Add neutralizing agent in spent wash. If require reduce the feed |
| **High V/ A Ratio Is** | 1. Low pH of reactor.<br>2. Due to less biomass in the reactor.<br>3. High / low reactor temperature.<br>4. Due to high solids discharge from parallel plate clarifier<br>5. Due to high yeast sludge feeding to the reactor.<br>6. Due to organic shocks loading. | 1. Check the reactor pH<br>2. Check the reactor biomass.<br>3. Check the reactor temperature.<br>4. Check parallel plate clarifier outlet TSS.<br>5. Check the yeast settling in settling tank & clean it.<br>6. Avoid the yeast sludge feeding to reactor.<br>7. Reduce the spent wash feeding to reactor.<br>8. Keep the reactor on recirculation and agitation for some days without spent wash feeding.<br>9. Start only Limewater whose pH is around 10 to 12 |
| **Feed Flow May Be Higher** | 1. Reactor may contain high TSS<br>2. Sludge quantity may have increased.<br>3. Reactor may contain high TSS<br>4. Sludge quantity may have increased | 1. Check desired flow rate & control it<br>2. proper operation of settling tank<br>3. Drain excess sludge through reactor drain points. (do not drain sludge during stoppage) |
| **Reactor Outlet COD Higher** | 1. Raw effluent COD may be higher<br>2. Flow rate may be higher<br>3. Sludge activity may be lower<br>4. Sludge washout from reactor<br>5. Sludge quantity may be reduced | 1. Check inlet COD & reduce the feed to match the organic load.<br>2. Check sludge characteristics. Add extra active sludge if required.<br>3. Check outlet TSS & control the same by intermittent shut down of agitators.<br>4. Check performance of parallel plate clarifier.<br>5. Check sludge profile of the reactor. |

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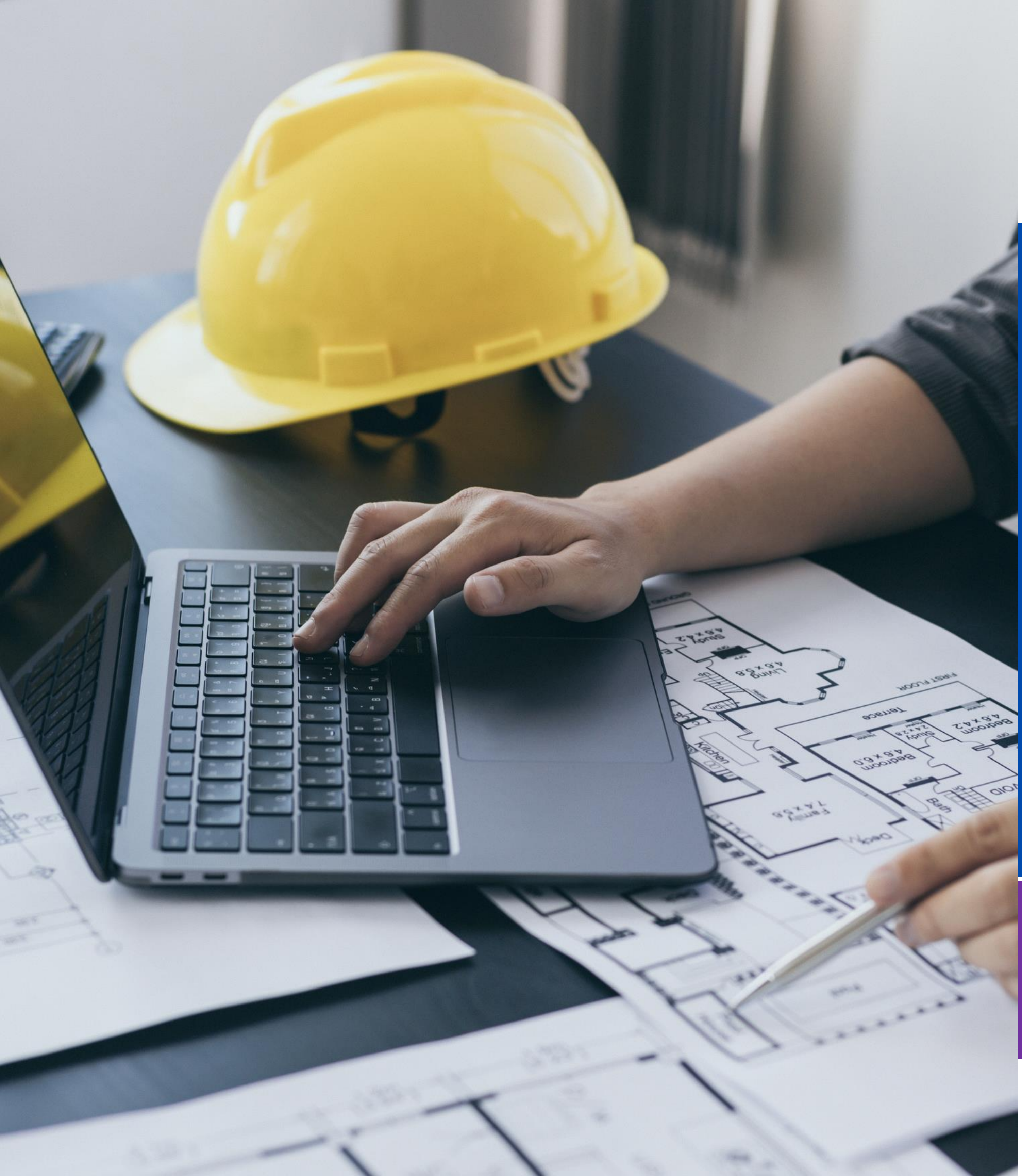

# THANK YOU FOR YOUR ATTENTION

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Solutions for Sustainable Tomorrow


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**400+**
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**14**
Countries Served

**52+**
Empanelled with Government bodies

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An ISO 9001:2015 Certified, SBTi registered, NSE Listed Company

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- Macro level assignments & promotional work with MNRE, IREDA, Winrock International India, USAID, UNDP, Financial Institutions & Banks
- International exposure in providing Consultancy & Engineering Services
- Participation in number of international events (UK, USA, Europe, Africa, UAE, Sri Lanka & Singapore)

**01** Energy Transition

**02** Biofuel & Green Chemistry

**03** Environment

**04** Business Advisory
- Banking & Financial Services

**05** Training
- Skill Development

**06** Infrastructure Consulting
- Shrikhande Consultant Limited

**07** Trusteeship
- MITCON Credentia

**08** Carbon Project Development
- MITCON NBS

**09** Satellite Monitoring
- PlanetEye Farm-AI
- PlanetEye Infra-AI

MITCON, a global consultant to businesses and organizations helps to navigate complexities of the environment, energy transition, business advisory, skill development and identify opportunities for cost-effective savings in operations keeping sustainable development goals (SDGs) at the core of its offerings.

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01

# ENERGY TRANSITION

## Capabilities

**Pre Execution:**

- Detail Engineering
- Substation / Evacuation
- Project Feasibility
- Policy & Regulatory work
- Detailed Project Report (DPR)
- Techno-Economic Viability Reports (TEV)
- Debt Syndication
- Project Design / Basic Design/ Energy Assessment
- RFP preparation & Management / Transaction Advisory / Bid Evaluation

**Project Execution:**

- Detailed Design / Drawings
- Transmission line & Switchyard Design
- Project Monitoring Consultancy (PMC)
- Permissions & approvals from Authorities
- Rehabilitation

**Post Commissioning Services:**

- O&M (service provisioning)
- Debt Refinancing
- Technical Due Diligence / Performance Enhancement
- Third Party audits / Financial valuation

## Connect with Team

**bd@mitconindia.com**
**02066289138**
**02066289165**

02

# BIOFUEL & GREEN CHEMISTRY

## Capabilities

- Market Research
- Basic And Detailed Engineering
- AI-based Satellite Monitoring Of Sugarcane
- Feasibility Studies (PFR/DFR)
- Detailed Project Report (DPR)
- Techno Economic Viability (TEV)
- Feedstock Survey & Sourcing Plan
- Pre-bid Basic Engineering Services
- Bid & tender Management
- Detailed Engineering Services
- Project Management Consultancy (PMC)
- EPCM/EPC Solutions
- Technical Audits of Plants
- Process, Efficiency Enhancements & Audits of Plants
- Troubleshooting Services
- Supervision Services During Erection, Construction & Commissioning
- Plant 3D Modelling, Virtual modelling

## Connect with Team

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# 03 ENVIRONMENT

## CONSULTANCY

- Pre-clearance Consult & Statutory work
- Site Suitability Studies for Industrial setups
- Environmental Impact Assessment (EIA)
- Environmental Social Impact Assessment (ESIA)
- Environment Management Plan (EMP)
- Environmental Clearance (EC)
- Consent to Establish & Consent to Operate
- Forest & Wildlife Clearance
- CRZ Clearance
- Biodiversity Assessment
- Remote Sensing & GIS Mapping
- Sound Planning
- Dam Break Analysis, Hydrology, Hydraulic Studies
- Environmental Due Diligence
- Post EC Compliance & Management
- Pollution Control Adequacy Reports
- Legal & Technical Representation
- Risk Assessment - Hazard and Operability (HAZOP) study
- Livelihood Restoration Plan
- Environmental Audit / Status Report
- Carbon/Water Footprint

## LABORATORY

- Baseline Environmental Monitoring
- Air Quality Monitoring
- Water Quality Analysis
- Noise Level Monitoring
- Insertion Loss
- Work zone Monitoring
- Soil, Compost & Fertilizer Analysis
- Sludge & Oil Analysis
- Solid Waste Characterization
- Hazardous Waste Analysis
- Stack Monitoring
- Illumination Survey
- Ventilation Survey
- Bio-Assay Test
- Food Testing & Nutritional Labelling
- PAH, Pesticides, VOC, Dioxin & Furan Analysis
- Lead & Asbestos Containing Material (ACM) Survey
- Installation of Online Pollution Monitoring System

## WASTE MANAGEMENT

- Site Survey & Field Data Collection
- Waste Characterization
- Design & Engineering of Plant/Site
- Techno Economic Viability Report (TEV)
- Techno Economic Feasibility Report (TEFR)
- Detailed Project Report (DPR)
- Transaction Advisory Services
- Project Management Consultancy for Municipal & Industrial Solid Waste, E-Waste, Plastic Waste, Collection & Transportation, Landfill, Biomining, Waste to Energy, Composting, Recycling.
- Lender's Independent Engineer
- Independent Engineer
- Vigilance Services
- Corporate Debt Restructure (CDR).
- Design & Implementation of Information Education & Communication (IEC) Activity
- EPR Action Plan as per Plastic Waste Management Rules 2018 & Subsequent Amendments
- Empaneled consultant for Swachh Bharat Mission 2.0

## TURNKEY

Concept to Commissioning of industrial / commercial / residential projects mainly:

- Effluent Treatment Plant (ETP)
- Sewage Treatment Plant (STP)
- Water Treatment Plan (WTP)
- Common Effluent Treatment Plant (CETP)
- Zero Liquid Discharge Plant (ZLD)
- Waste to Energy Plant
- Air Pollution Control system
- Corporate Environment Responsibility (CER) Execution
- Operation & Maintenance of WTP, ETP, STP, CETP & ZLD.

03

# ENVIRONMENT

## Accreditations

NABET QCI
**Accreditation by QCI-NABET**
16 Sectors

NABL
**TC-5108**
**Accredited by NABL**
135+ Parameters
(ISO/IES 17025:2017)

ISO 45001:2018
**ISO 45001:2018**
**(OHSAS)**

ICS

## Recognition

**Ministry of Environment, Forest & Climate Change**
S.O.2340(E) Dt. 16.06.2021

**Department of Agriculture Government of Maharashtra**

## Connect with Team

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emebusiness@mitconindia.com
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02066289406
02066289500
02066289405 (Laboratory)
02066289450 (Waste Management)

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04

# BUSINESS ADVISORY

## Capabilities

- Techno Economic Feasibility Study (TEFR)
- Detailed Project Report (DPR)
- Techno Economic Viability (TEV) Study for Green Field Project
- Expansion of Project, Debt Restructure / Resolution Plans.
- Lenders' Independent Engineer's (LIE) Services
- Cost Vetting of Projects
- Traffic Study for Tollable Highway Projects
- Monitoring agency for specialized monitoring as per IBA
- Technical Due Diligence
- Financial (Income) Due Diligence
- Peer Company Analysis
- Commercial Document Review Assistance

## Connect with Team

**advisory@mitconindia.com**
**020 66289128**
**02066289140**

05

# TRAINING - SKILL DEVELOPMENT

## Capabilities

- Pilot / Lab Scale/ Incubation Centre
- Technical Skill Training
- Entrepreneurship & Vocational Training
- Suryamitra Skill Development Training Programs
- Entrepreneurship Awareness Camps
- Entrepreneurship Development Programs
- Women Entrepreneurship Development Programs
- Technology-based Entrepreneurship Development Programs
- Faculty Development Programs
- Residential / Technical Entrepreneurship Development Programs
- Skill Development Programs under CSR

## Affiliations

N·S·D·C
National Skill Development Corporation
Transforming the skill landscape

Indian Institute of Banking & Finance

व्यवसाय शिक्षण व प्रशिक्षण संचालनालय, महाराष्ट्र राज्य
कौशल्यम् बलम्

Skill India
कौशल भारत-कुशल भारत

STARTUP INDIA
STAND UP India
Endeavour and Prosper

## Connect with Team

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**020-66289312**
**02066289516**

06

# INFRASTRUCTURE CONSULTING

## Capabilities

- Independent Engineer Consultancy
- Design Consultancy
- Project Management Services
- Authority Engineer for Supervision
- Special Third Party Independent Techno Financial Auditors
- EPCM – Engineering, Procurement, Construction Management & Project Management
- Design, PMC, DPR, Technical Audits of- Highways, bridges, skywalks, Flyovers, Institutional, Industrial, Commercial, Residential, Urban Infra, Metro, Stations Structures, Canals, Networks

## Connect with Team

**scpl@scplasia.com**
**02066289141**

07

# TRUSTEESHIP - MITCON CREDENTIA

## Capabilities

- Debenture Trustee
- Trustee to Alternative Investment Funds
- Scuritisation Trustee
- Collection and Payout Agent
- ESOP/ EWT Trustee
- Security Trustee
- TRA Agent
- Family Office Trustee
- Share Pledge Trustee
- Escrow Agent
- REIT + InvIT Trustee

## Connect with Team

**CredentiaGP@mitconcredentia.in**
**9833420217**

# 08 CARBON PROJECT DEVELOPMENT - MITCON NBS

## Capabilities

- ESG Reporting
- BRSR, LCA, Energy Audit
- Net-Zero Road Map & Climate Strategy Footprint
- Sector Specific Interventions
- Project Support – Implementation on Ground
- Carbon emissions, Carbon credits, Climate risk, Sustainable financing, Regulatory guidance
- Registration of projects into various registers like Verra, GCC, GS under UNFCC
- Validation/ Verification
- Start to End services in designing PDMR, Submission & Approval
- Issuance of Carbon Credits CCUs
- Trading / Monetization to the Best Bidders
- Agriculture / Non Agriculture Forestry, Biogas, Biofuels, RE & other NBS projects
- Measurement of Carbon Footprint
- Setting up of Roadmap & Target
- Exploring opportunities / Technologies
- Implementation of project inline with roadmap and target
- Offsetting the balance GHG emission or invest in clean energy projects

## Decarbonization

- Carbon footprint Assessment
- Carbon Neutrality
- Roadmap
- Net Zero Emission Strategy
- Carbon OffSets
- Carbon Capture & Sequestration
- Life Cycle Assessment
- Carbon Credits & Registry

## Sustainability Reporting

- GRI based ESG/Sustainability reporting
- Business Responsibility and Sustainability Report (BRSR)
- Environmental Social and Governance (ESG)
- Integrated reporting (IR)
- Carbon Disclosure Project (CDP)
- Sustainable Development Goals (SDG)

## Connect with Team

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# SATELLITE **MONITORING** -
## Planeteye Farm-AI I Planeteye Infra-AI

### Capabilities

- Soil Analysis
- Understanding of weather patterns to plan the optimal time to sowing.
- With GPS based technologies, use precision agriculture to specifically apply only the needed amount of fertilizers, herbicides, and seeds.
- Remotely monitor how the crops are developing from anywhere in the world, and estimate the potential yield at harvest time.
- To monitor agro-meteorological conditions such as temperature and precipitation, and their impacts on crop conditions and create advance intimations/warnings and possible mitigation actions. Remote Sensing and Digital Image Analysis: Remote Sensing, Earth Observation Sensors and Platforms, Spectral Signature, Image interpretation, Thermal & Microwave Remote Sensing, Digital Image Processing including Rectification and Registration, Enhancement, Classification and accuracy assessment techniques. along artificial intelligence and advance computational methods Global Navigation Satellite System: Introduction to GPS and GNSS, receivers, processing methods, errors and accuracy.
- Geographical Information System : GIS technology including but not limited to Data Inputting and Editing in GIS, GIS Data Models, GIS System Architecture, Geographic Data Standards and Policies, Topology and Spatial Relationship, Spatial Data Analysis, Spatial Data Quality, Spatial Data Errors, Map Projection and Advanced Geospatial Modelling.
- Remote sensing technologies along with artificial intelligence (AI) and advance computational methods for the monitoring of complete engineering services including feasibility studies, investigations, appraisal, estimate and reports, research, designs, calculations, drawings, specifications, inspectionand testing, construction.

### Connect with Team

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MITCON is a Science Based Targets initiative (SBTi) registered company and has incorporated the 17 SDGs (Sustainable Development Goals) in every work aspect.

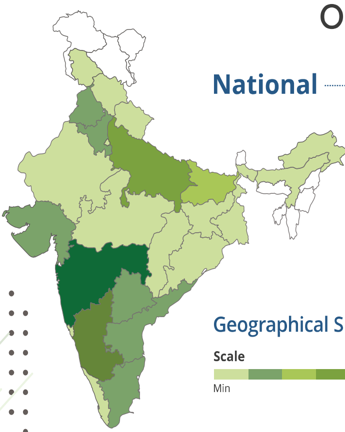

## OUR EMPANELLEMENTS

- Departments of various Central & State Governments
- MAHAPREIT
- NBFC's
- Private & Public Sector Banks
- Solar Energy Corporation of India
- IBA
- SMART
- USICEF
- NTPC
- IREDA
- REC
- PFC
- SIDBI
- MECON
- BEE
- PTC
- CIDCO
- Sugar Commissionerate of Maharashtra

... and counting

## OUR PRESENCE

### National



Geographical Spread

Scale

Min Max

### International

- Bhutan
- Comoros
- Congo (DRC)
- Ghana
- Kenya
- Mauritius
- Mozambique
- Nepal
- Sri Lanka
- Tanzania
- UAE
- Uganda
- United Kingdom
- Vietnam

Scan QR for more information

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MITCON CREDENTIA
PARTNER WITH TRUSTED CREDENTIALS

SHRIKHANDE CONSULTANTS LIMITED
TRUST | EXPERIENCE | QUALITY

PLANETEYE INFRA-AI

PlanetEye Farm-AI

MITCON NATURE BASED SOLUTIONS


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# GENERAL **NOTES**