

# REVOLUTIONIZING GREEN PRACTICES: BIO-METHANATION'S ROLE IN PULP & PAPER MILLS

Towards Net Zero Emissions and a Sustainable Future

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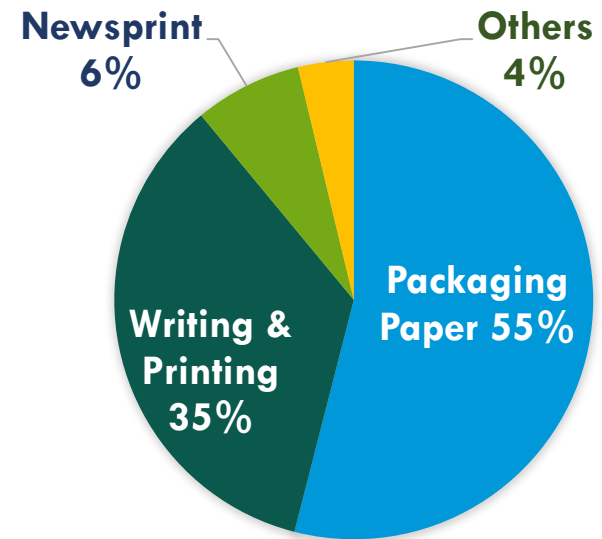


59<sup>TH</sup> AGM AND SEMINAR 2024  
23<sup>RD</sup> – 24<sup>TH</sup> FEBRUARY 2024  
KOLKATA

# Overview of Indian Paper Mills (2021-22)\*

No. of Mills		912
Total Installed Capacity, million tons	29.11	
Operating Installed Capacity , million tons	25.28	
Production of Paper, Paperboard and Newsprint , million tons	22.43	
Consumption (in million tons)	21.07	
Capacity Utilization, %	~89	
No. of Operating units	38	
No. of Mills Closed	368	
Idle installed capacity, million tons	5.51	
Per capita Consumption (kgs)	15.75	
Global Share	5.60 %	
Contribution From Different Segments (million tons)		
Wood Based	Agro Based	RCF Mills
4.32	1.31	16.80

- ❑ Total No. of paper mills in India having >200 TPD : 150
- ❑ Tentative order value: INR 10 Cr/plant
- ❑ Expected market size: 182.9 m USD
- ❑ Paques expected market capital (20%) –36.59m USD



\* Source : CPPRI Statistical Cell

# Indian Paper Industry Profile

## Fibrous Raw Material Used

- ✓ 15+ species of Wood
- ✓ Non-Woods: Bagasse, Rice Straw, Wheat Straw, Grasses/Reeds
- ✓ Waste Paper: White, Brown and Mixed
- ✓ Market Pulp

## Paper Grades Produced

- ✓ Packaging Papers & Coated/Uncoated Paperboards
- ✓ Coated/Uncoated Printing & Writing Papers
- ✓ Newsprint & Magazine Papers
- ✓ Tissues & Hygiene Papers
- ✓ Specialty Papers

# Stringent Regulation



# Pulp & Paper Industry Challenges (Cont.)



**Global Impact:** Russia-Ukraine events disrupt raw material supply and raise energy costs, increase of developed countries interest rate



**Sustainability & Compliance:** Balancing economic goals with eco-friendly practices and meeting regulations.



**Zero Liquid Discharge:** To reduce impact on receiving stream and facilitate water conservation



**Higher Increase in Energy Cost**



**Odor Control:** Enhancing quality control to combat odor issues in paper production

# Implications of ZLD with minimal technology intervention

Accumulation of TDS, COD, BOD, VFA, and other persistent contaminants in the closed water loop

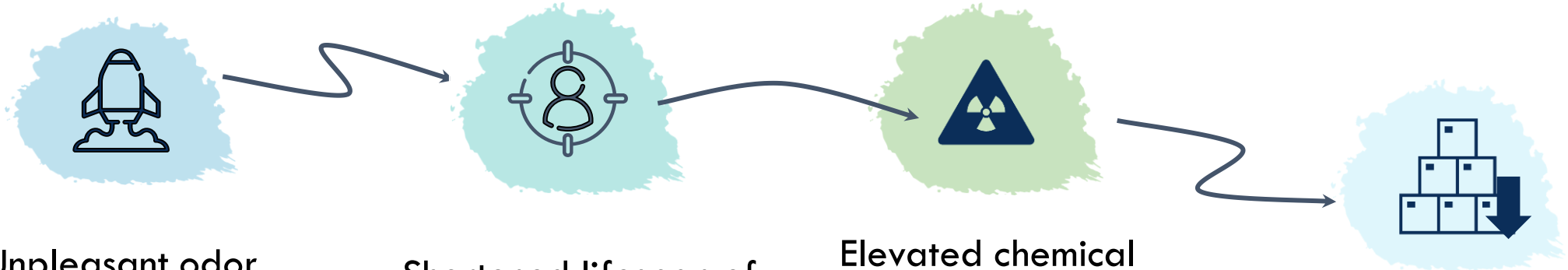
Formation of slime and odor-related concerns



Challenge to treat backwater using conventional ETP with biological treatment due to high buildup of pollution load due to recycling in the loop

Compromise with product quality, machine runnability, equipment's corrosion.

# Implications of ZLD with minimal technology intervention



Unpleasant odor caused by organic matter accumulation

Shortened lifespan of paper machine felt and wire.

Elevated chemical consumption and broke

Inorganic fouling hampers efficiency by reducing stock/liquor flow, causing production interruptions and quality defects in products like pulp and paper. Addressing these issues is crucial for maintaining smooth operations and ensuring high-quality end products.

# Green Practices in Pulp & Paper



## Key Components

Sustainable Fiber Sourcing  
Efficient Energy Utilization  
Waste Minimization and Recycling  
Efficient capacity utilization  
Closed-Loop Water Management

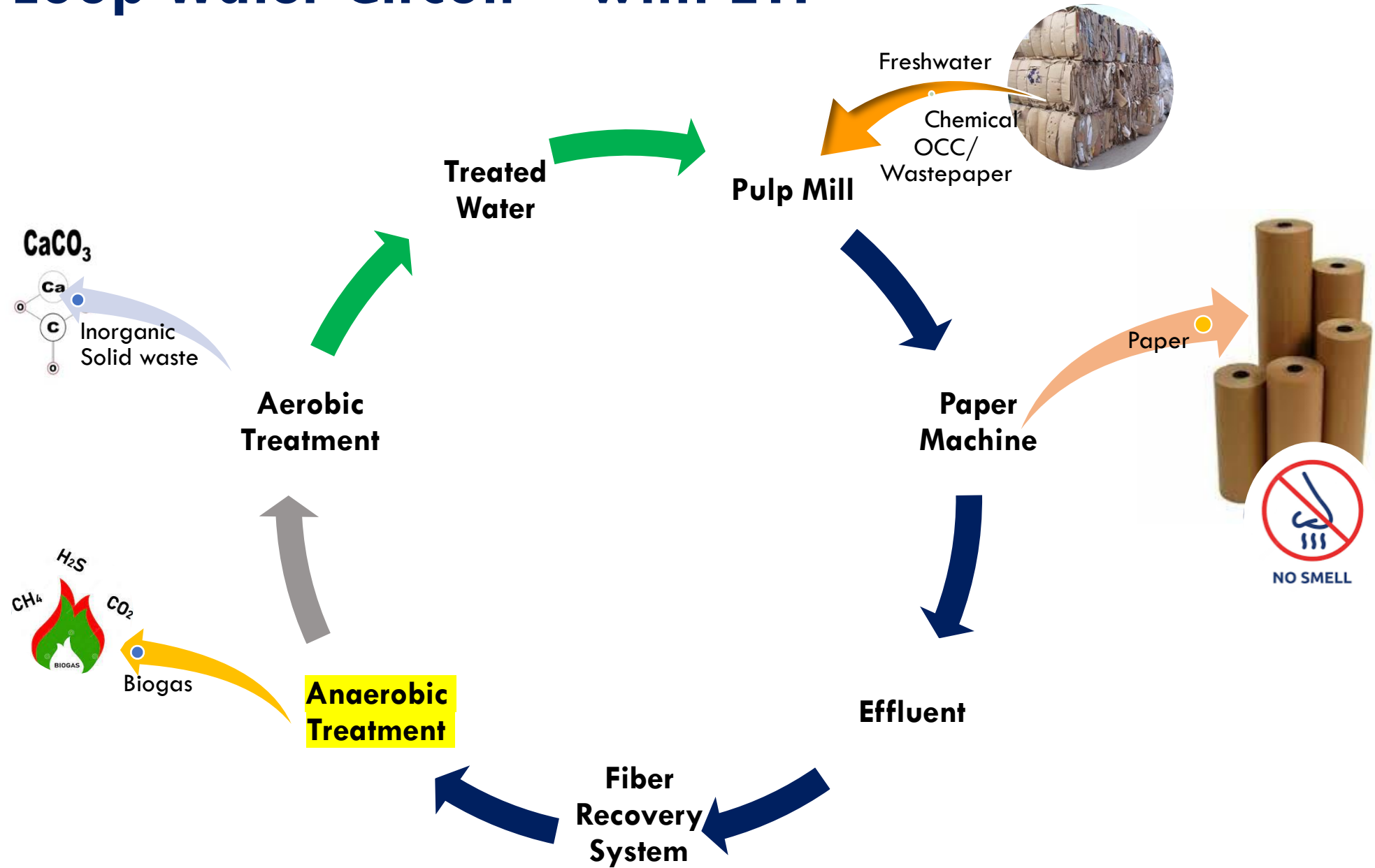


## Advantages

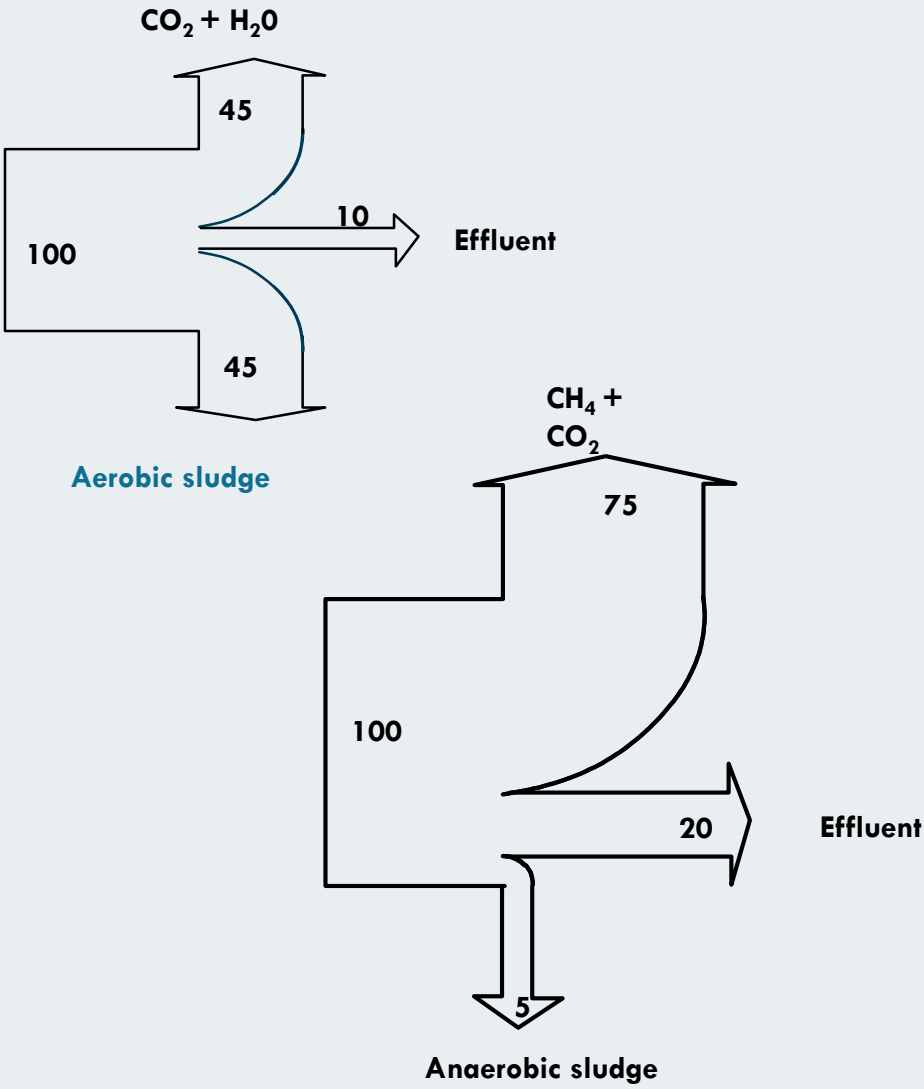
Reduced Environmental Impact  
Cost-Efficiency  
Market Leadership



# Close Loop Water Circuit – with ETP



# Anaerobic versus Aerobic



## Key Benefits of Anaerobic vs Aerobic Treatment:



Substantial reduction in power consumption



Biogas energy & Promotes sustainability



Reduced CO2 emissions



Reduce sludge production and associated handling and disposal cost



Significantly reduced footprints 80%



Up to 90% reduction in power consumption

# Bio-Methanation Overview



## Key Components

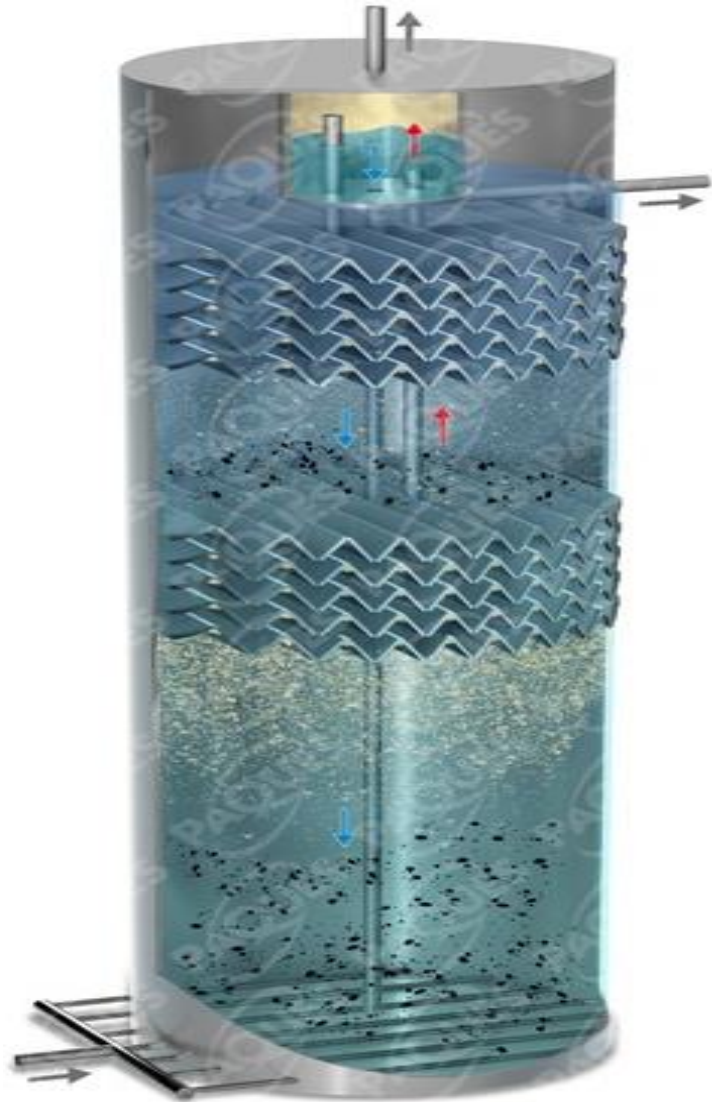
Anaerobic Conditions  
Organic Matter Breakdown  
Acetate Formation  
Methanation Process



## Advantages

Renewable Energy Source  
Less Sludge Production  
Waste Valorisation  
Reduced Environmental Impact

# High-rate Reactor Technology



**Compact Design  
and Footprint**



**Shorter  
Retention Time**



**Longevity of  
Internals**



**Quick ETP  
Stabilization**



**High Efficiency**



**Advanced  
Wastewater  
Treatment**



**Sustainable and  
Cost Effective**

# Case Study: Net Zero Emissions through Bio methanation

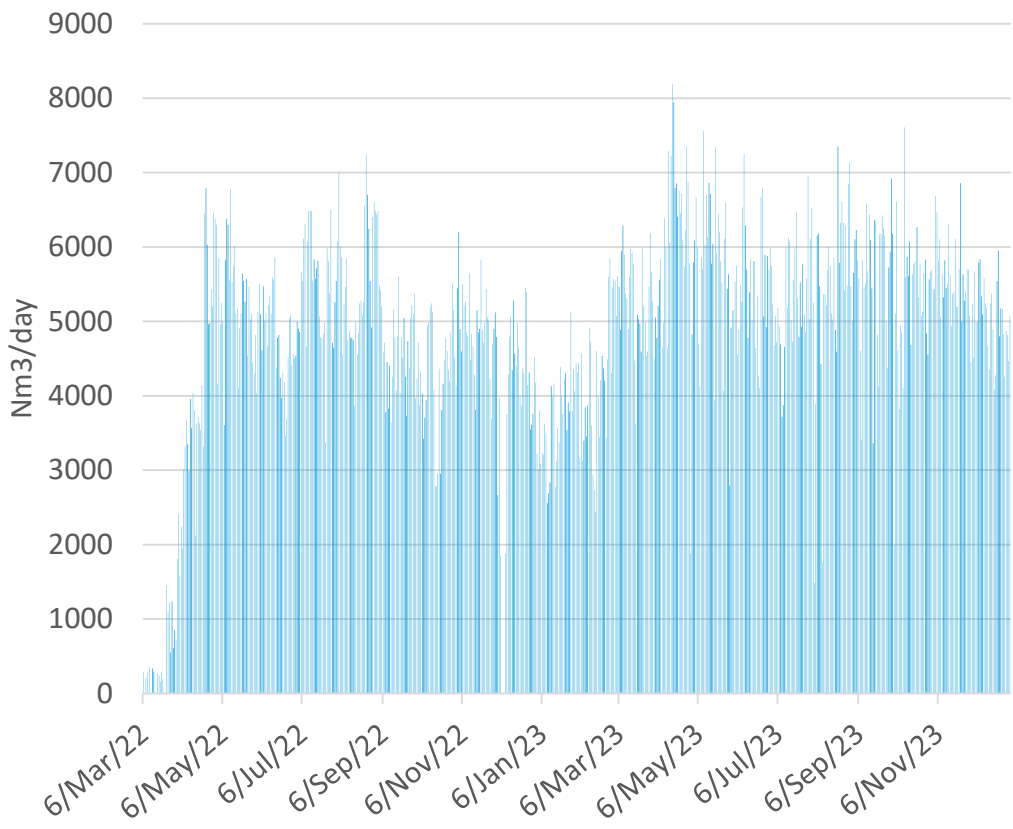
S. No	Site Location	Production capacity (TPD)	Raw material	Biogas generation (Nm3/d)	Biogas generation (Nm3/MT of paper produced)	Equivalent to ton CO2/annum
1	Sathyamangalam, Tamil Nadu	150	Wastepaper	2500	16.7	12755
2	Tirunelveli, Tamil Nadu	400	Wastepaper	5000	12.5	25510
3	Tumkuru, Karnataka	400	Wastepaper	6000	15	30612
4	Bengaluru, Karnataka	300	Wastepaper	3500	11.7	17857
5	Mysore, Karnataka	300	Wastepaper	3500	11.7	17857
6	Pehowa, Haryana	350	Wastepaper and wheat straw	5500	15.7	28061
7	Muzaffarnagar, Uttar Pradesh	400	Wastepaper, bagasse and wheat straw	6000	15	30612
8	Pune, Maharashtra	150	Wastepaper	2000	13.3	10204
9	Jamdol, Jharkhand	220	Wastepaper	3500	15.9	17857
10	Punjab	200	Wheat straw	2600	13	13265

**Ton CO<sub>2</sub> emission saved/annum**

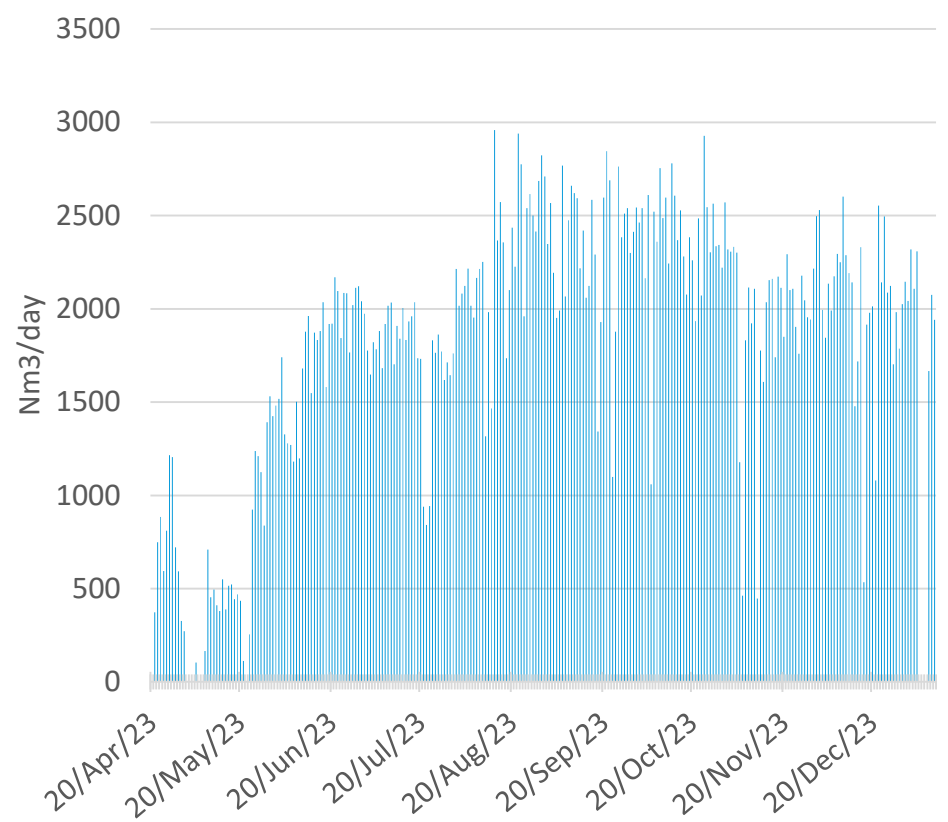
**204591**

# Sustainability of Biomethanation: Biogas Generation at Pulp & Paper Industries

Biogas generation (Nm<sup>3</sup>/day) site at Haryana

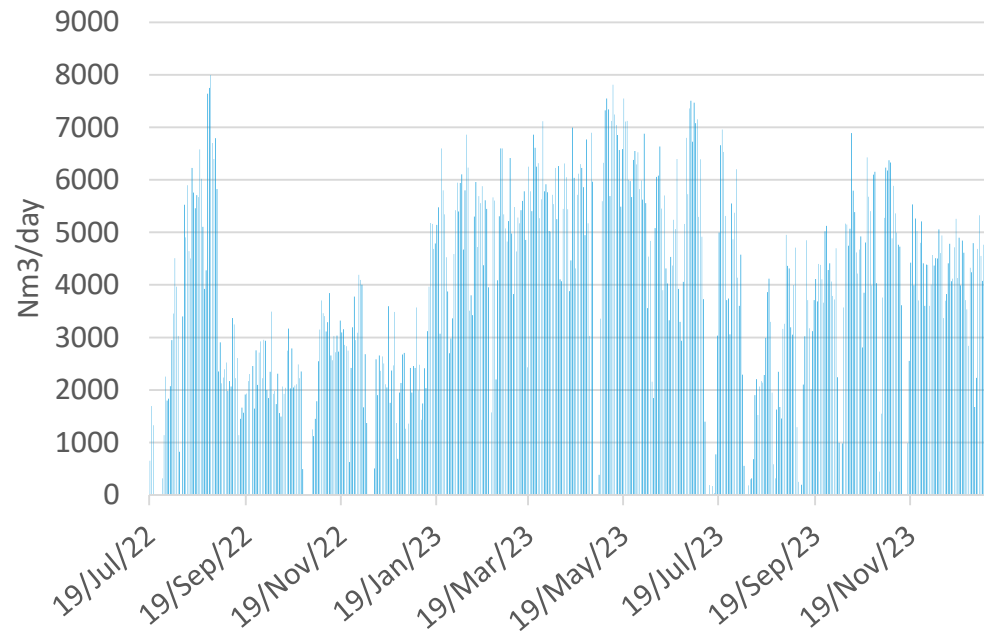


Biogas generation (Nm<sup>3</sup>/day) site at Punjab

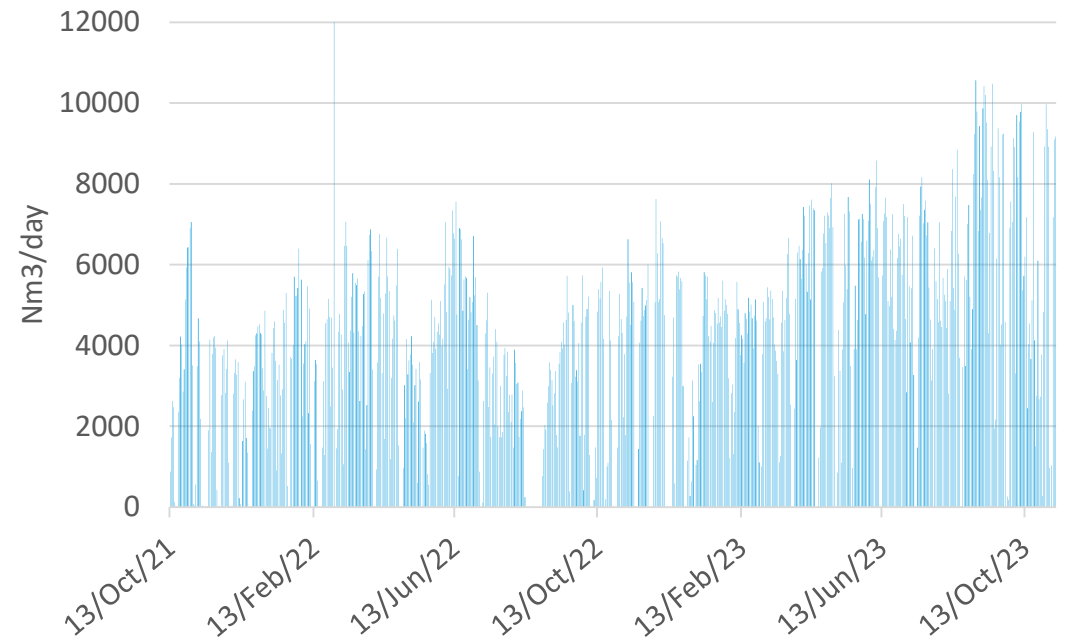


# Sustainability of Biomethanation: Biogas Generation at Pulp & Paper Industries

Biogas generation (Nm<sup>3</sup>/day) site at Uttar Pradesh

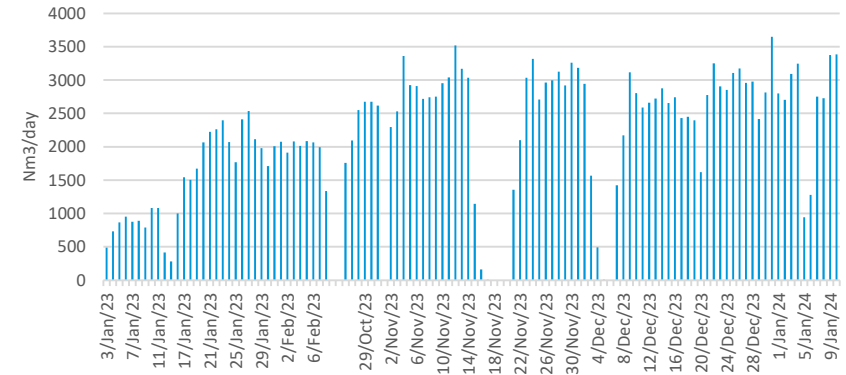


Biogas (Nm<sup>3</sup>/day) site at Karnataka

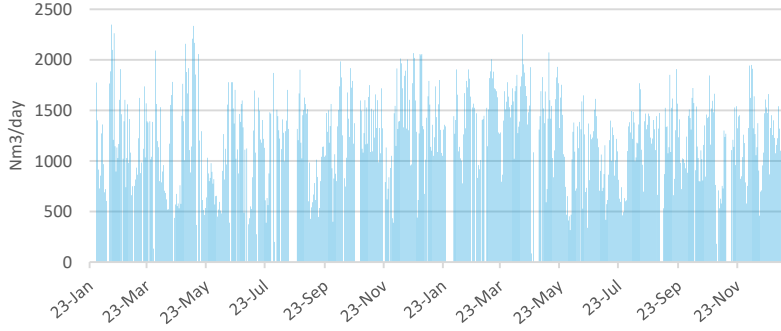


# Sustainability of Biomethanation: Biogas Generation in Pulp & Paper Industries

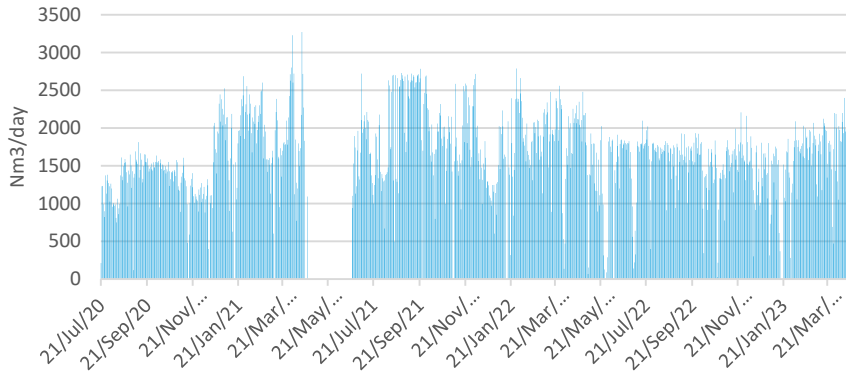
Biogas generation (Nm3/day) site at Jharkhand



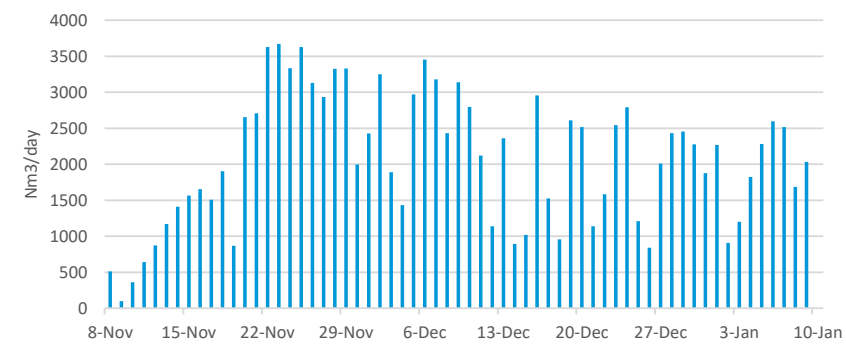
Biogas (Nm3/day) site at Maharashtra



Biogas generation (Nm3/day) site at Tamil Nadu



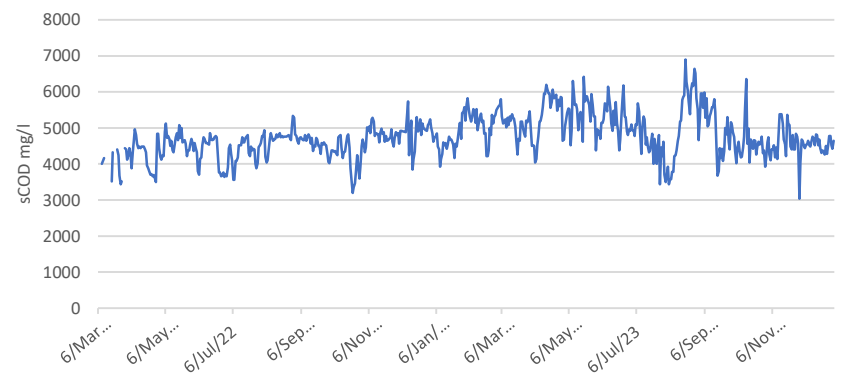
Biogas (Nm3/day) site at Karnataka



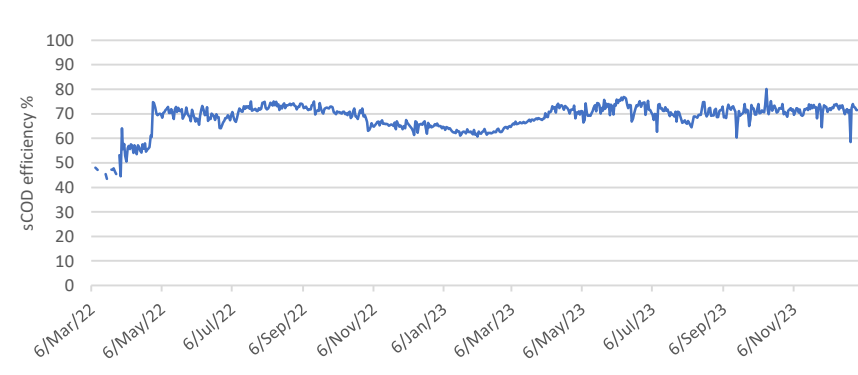


# Influent sCOD concentration Vs sCOD removal efficiency in Paper mill

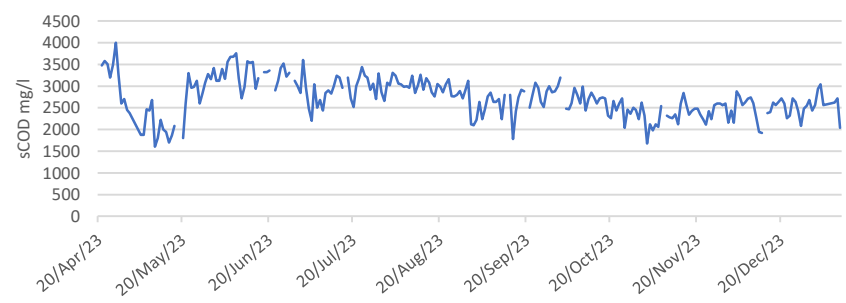
Influent sCOD (mg/l) site at Haryana



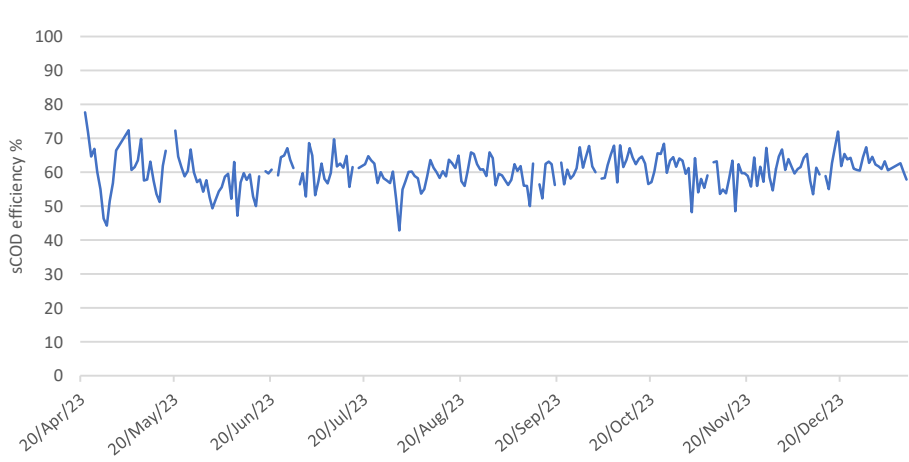
sCOD removal efficiency (%) site at Haryana



Influent sCOD (mg/l) site at Punjab

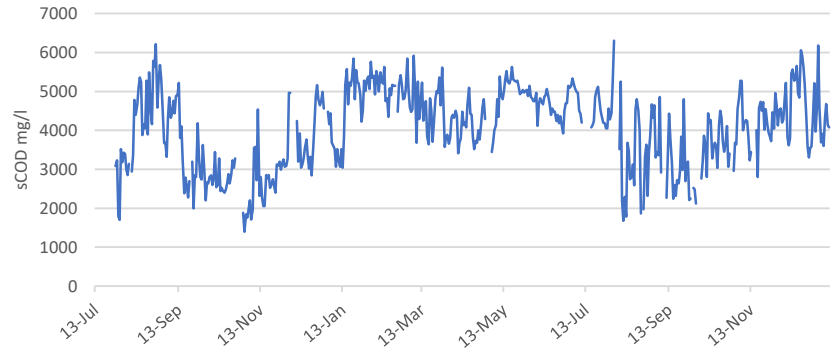


sCOD removal efficiency (%) site at Punjab

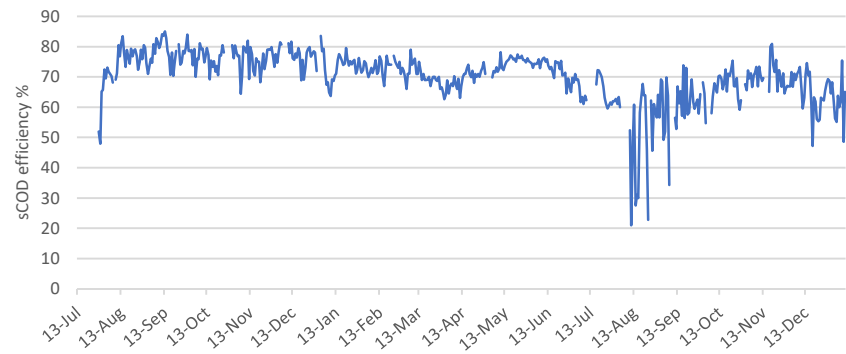


# Influent sCOD concentration Vs sCOD removal efficiency in Paper mill

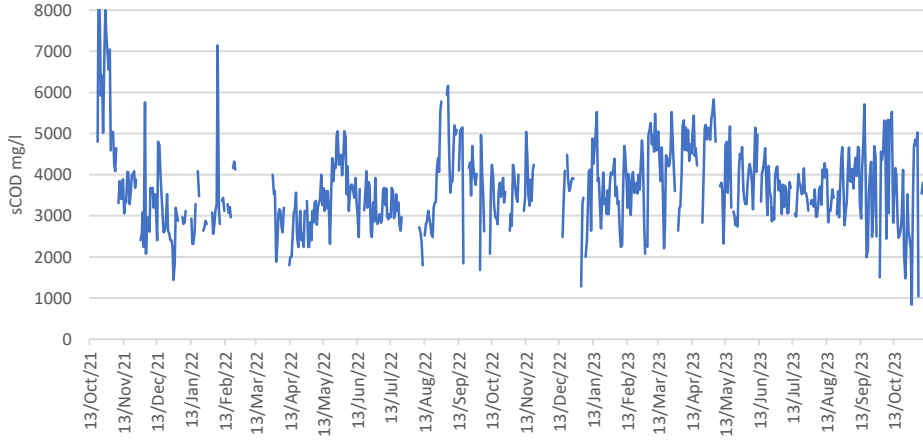
Influent sCOD (mg/l) site at Uttar Pradesh



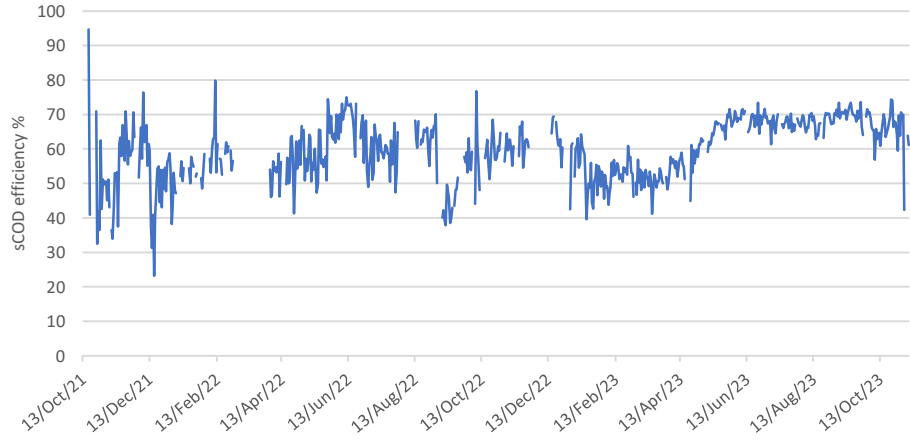
sCOD removal efficiency (%) site at Uttar Pradesh



Influent sCOD (mg/l) site at Karnataka

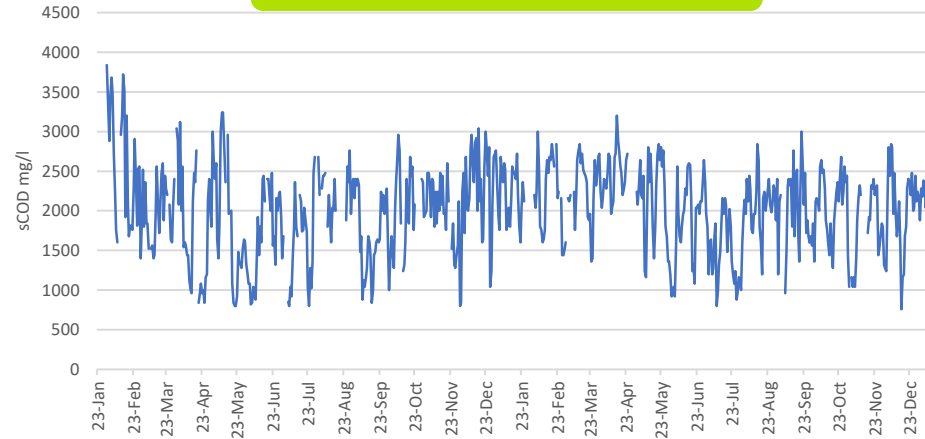


sCOD removal efficiency (%) site at Karnataka

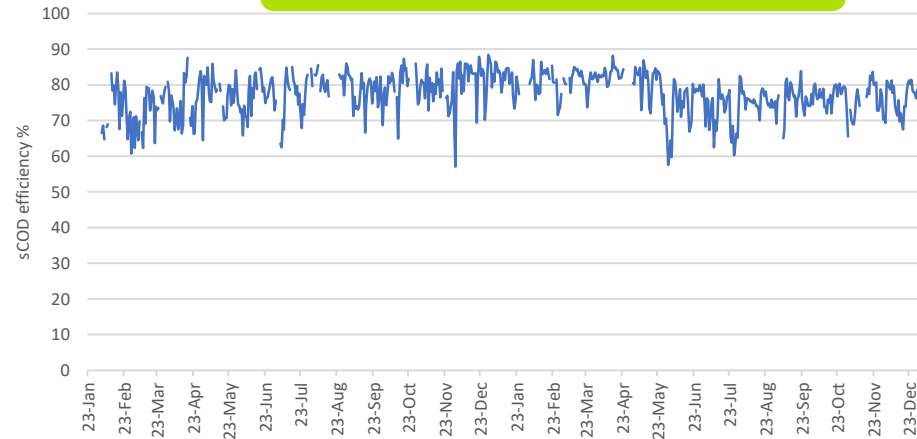


# Influent sCOD concentration Vs sCOD removal efficiency in Paper mill

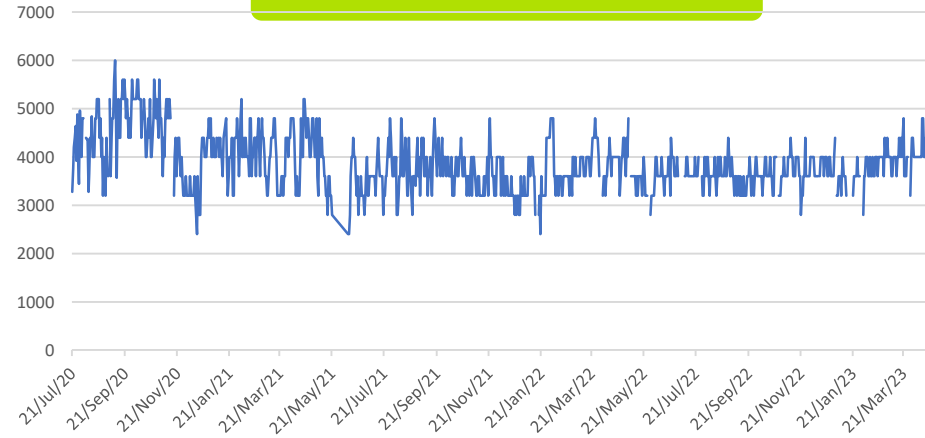
Influent sCOD (mg/l) site at Maharashtra



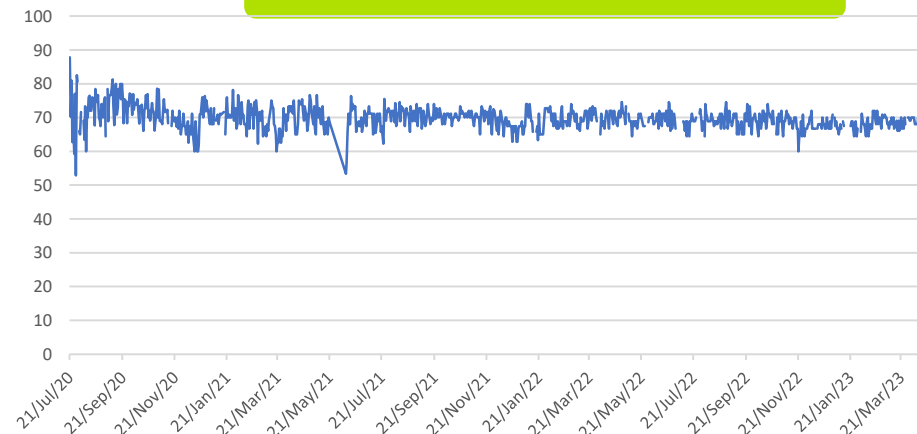
sCOD removal efficiency (%) site at Maharashtra



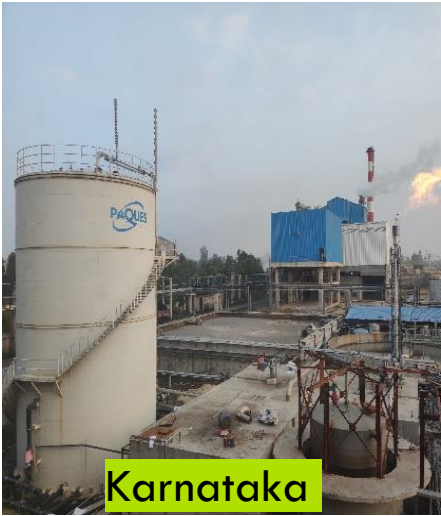
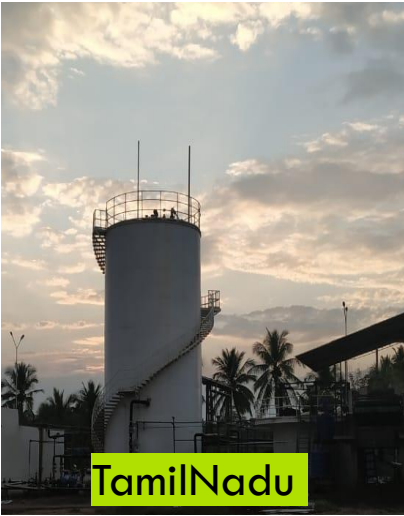
Influent sCOD (mg/l) site at TamilNadu



sCOD removal efficiency (%) site at Tamil Nadu



# BIOPAQ<sup>®</sup>IC and BIOPAQ<sup>®</sup>ICX Installation in Paper Industries





NON ACCREDITED TEST(S)

**TEST RESULT:**

**ARTICLE 3 OF EUROPEAN REGULATION NO. 1935/2004:**

**Method:** With reference to DIN 10955: 2023  
**Test condition:** 40°C for 10 days.  
**Test media:** Chocolate  
**No. of panelist:** 6

**Test Result:**

Test Media	Test Item	Result	Maximum Permissible Limit
Chocolate	Sensorial examination odour	0	2.5
	Sensorial examination taste	0	2.5
<b>Conclusion</b>		Pass	--

**Test condition:** 40°C for 10 days.  
**Test media:** Plain Bread  
**No. of panelist:** 6

**Test Result:**

Test Media	Test Item	Result	Maximum Permissible Limit
Plain Bread	Sensorial examination odour	0	2.5
	Sensorial examination taste	0	2.5
<b>Conclusion</b>		Pass	--

**Test condition:** 40°C for 10 days.  
**Test media:** Biscuits  
**No. of panelist:** 6

**Test Result:**

Test Media	Test Item	Result	Maximum Permissible Limit
Biscuits	Sensorial examination odour	0	2.5
	Sensorial examination taste	0	2.5
<b>Conclusion</b>		Pass	--

**Tested Item:** KRAFT PAPER

**Note:** 1. Intensity scale (rounded at 0.5):

- 0 – no perceptible difference
- 1 – just perceptible difference
- 2 – slight difference
- 3 – marked difference
- 4 – strong difference

2. Permissible Limit is according to German Food, Articles of Daily Use and Feed Code of September 1, 2005 (LFGB), Section 30& 31 with Amendments.

3. Testing has been performed as per customer request.

**Odour Free  
 Certificate –  
 Proof of  
 Sustainability**

# Conclusion

 Bio-methanation & Aerobic Treatment is a proven combination for pulp & paper industry

 Organic Pollutants to Valuable Biogas

 Improves Water Quality

 Ensuring sustainable operation of plant

 Additional Revenue through Green Energy

 Removes nutrient and ensure no Eutrophication effect in water bodies

 Reduces operational cost of the plant

 Contribution to Net Zero Emission

# THANK YOU



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