

Waste Water Treatment Technologies and Practices in Indian Pulp and Paper Industries

Dr. B. P. Thapliyal
Director



Central Pulp & Paper Research Institute

Saharanpur -247001 (U.P.) INDIA

Email : bipin_thapliyal@yahoo.com

www.cppri.org.in

Indian Paper Industry – A Brief

Number of Mills	850 +
Structure (operational mills ~ 600 mills)	Small Scale (< 50 tpd) ~ 250 Medium Scale (50-100 tpd) ~ 150 Large Scale (Above 100 -1200 tpd) ~ 200
Total Installed Capacity (MMT)	25.00
Operating Installed Capacity (MMT)	21.50
Production of paper, board & newsprint (MTPA)	17.33
Consumption of paper, board & newsprint (MTPA)	19.35
Per capita consumption (KG)	13.2
Export (MMT)	
Paper & Paper Board	0.97
Newsprint	-
Import (MMT)	
Paper & Paper Board	1.48
Newsprint	1.50

Ref : CPPRI Survey

Indian Paper Industry

Diverse Raw materials

15+ species of Wood

Non-Woods: Bagasse, Rice Straw, Wheat Straw, Grasses/ Reeds

Waste Papers: White, Brown and Mixed

Market Pulps

Diverse Processes

Mechanical Pulping

Chemical Pulping – Kraft Process generally for wood pulping

Chemical Pulping – Soda Process generally for Agro pulping

Recycled Fibre (RCF) Process – with or without De-Inking

Diverse Products

Packaging Papers & Coated/Uncoated Paperboards

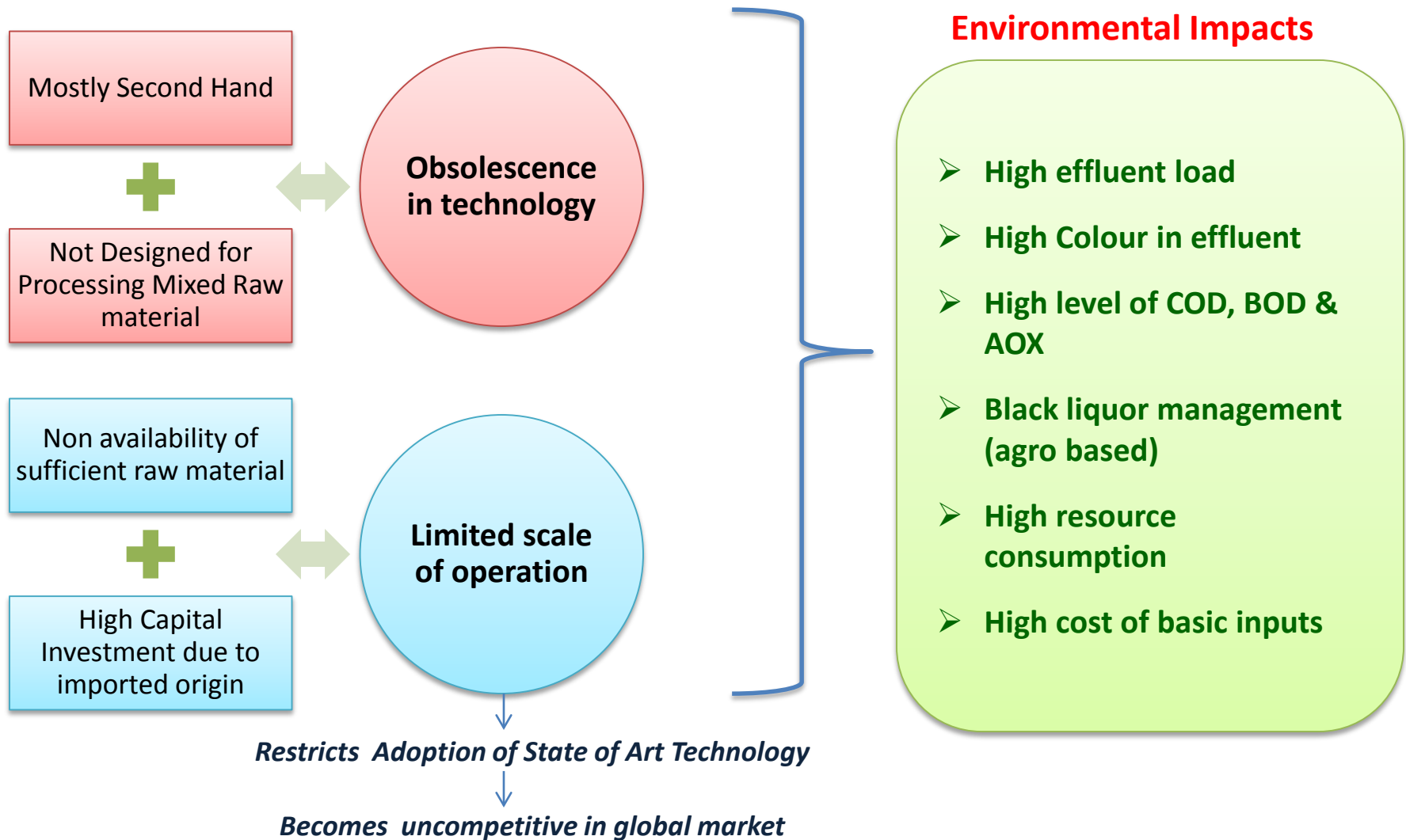
Coated/Uncoated Printing & Writing Papers

Newsprint & Magazine Papers

Tissues & Hygiene Papers

Specialty Papers

Technological Issues



Technological Issues

Major reasons for high water consumption

Low cost of water

Lack of optimum performance of pulp washers.

Carrying out of most operations at high dilution.

Lack of water audit / water balance / assessment of optimum water requirement

Lack of optimization of washer requirement on decker, pulp washers & paper m/c

Lack of fiber recovery units or low performance of existing fiber recovery units

Lack of adequate ETP facilities

Mental block in reuse / recycle of treated effluent / back water

Lack of awareness, trained manpower and monitoring facilities

ETP in Indian Paper Industry

Effluent Treatment Process Employed in Indian Paper Industry

Aerobic

For Treatment of Combined Effluent

Anaerobic

For Pretreatment of High Strength Agro residues Raw Material Washings and Pre-hydrolysis Liquor

Tertiary

Polishing the Quality of Treated Effluent and meet Stringent Norms in Ganga River Basin

- Chemical Treatment
- Physical treatment: Sand Filter, Dual Media Filter , Activated carbon Filter

Major Regulatory Agencies in India

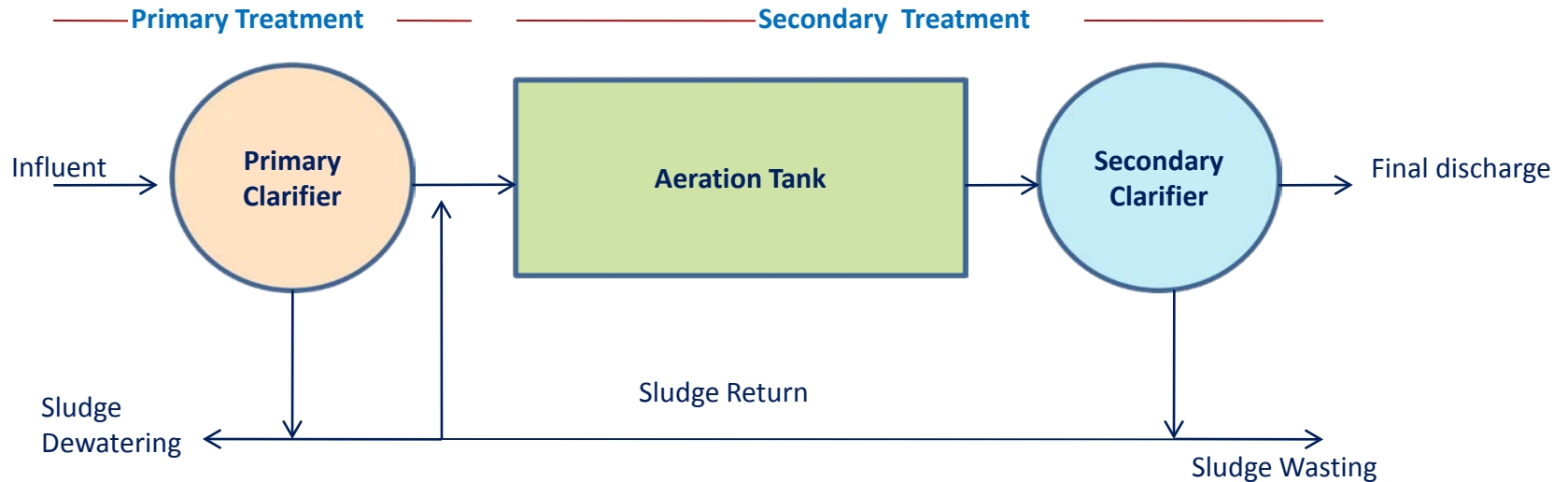
National Level: Central Pollution Control Board;

State level: State Pollution Control Boards

Parameter	Discharge Standards		
	General Standards	CPCB – Pulp & Paper Mills	
		Small Scale	Large Scale
Volume, m ³ /t	-	Agro based :200 (150)* Waste Paper: 75 (50)*	Writing & Printing: 200 (100)* Rayon grade/ News print: 150
pH	5.5-9.0	5.5 –9.0	7.0 - 8.5
BOD ₅ at 20°C mg/l	30 (Inland surface water) 350 (Public Sewer on land discharge) 100 (Land for irrigation) 100 (Marine / Coastal areas)	30 (inland discharge) 100 (on land discharge)	30
COD, mg/l	250 (inland surface water) -(Public Sewer on land discharge) -(Land for irrigation) 250 (Marine / Coastal areas)	Not specified	250
SS, mg/l	100 (inland surface water) 600 (Public Sewer on land discharge) 200 (Land for irrigation)	100	50
TOCl, kg/t _{paper}	-	Not specified	2.0
AOX	-	2.0	1.0
SAR	-	26	-

General Effluent Treatment Practices in Indian Paper Industry

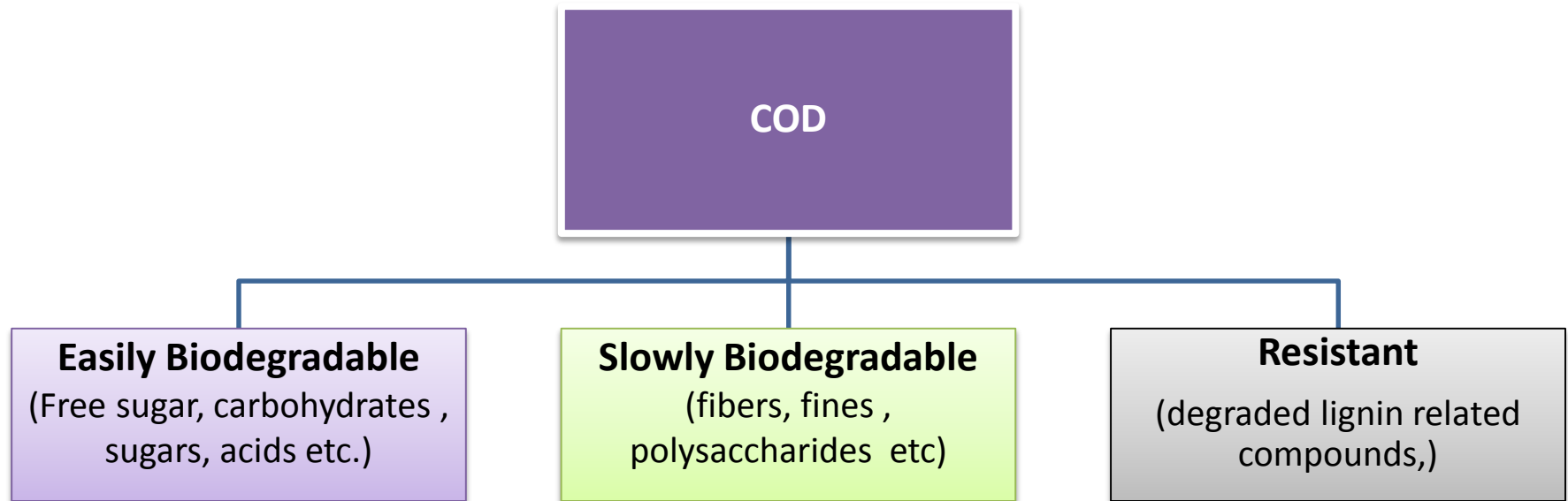
Activated Sludge Process:



Limitations of Biological Treatment Process :

- Biological system i.e. ASP is effective for removal of degradable compounds contributing BOD .
- Around 85-90 % of the total COD in finally treated effluent is mainly due to bio refractory compounds like degraded lignin , extractives etc.
- **Not able to reduce the colour and TDS of the effluent**

Biological Nature of Oxygen Consuming Pollutants



Need for Tertiary Treatment Options

- **To meet the water consumption and discharge norms**
- **Primary & Secondary Treatment Measures – effective for pollution reduction but not effective to treat waste water for reuse into the process**
- **Need to adopt tertiary treatment options to treat waste water up to a level making it suitable for reuse into the process**
- **Selection of tertiary treatment option depend upon the end application of treated effluent**

Stringent Environmental Norms

- *Specifically for Pulp & Paper Mills in River Ganga Basin*
- *New Environmental Norms on same lines likely to be introduced soon on National Level*

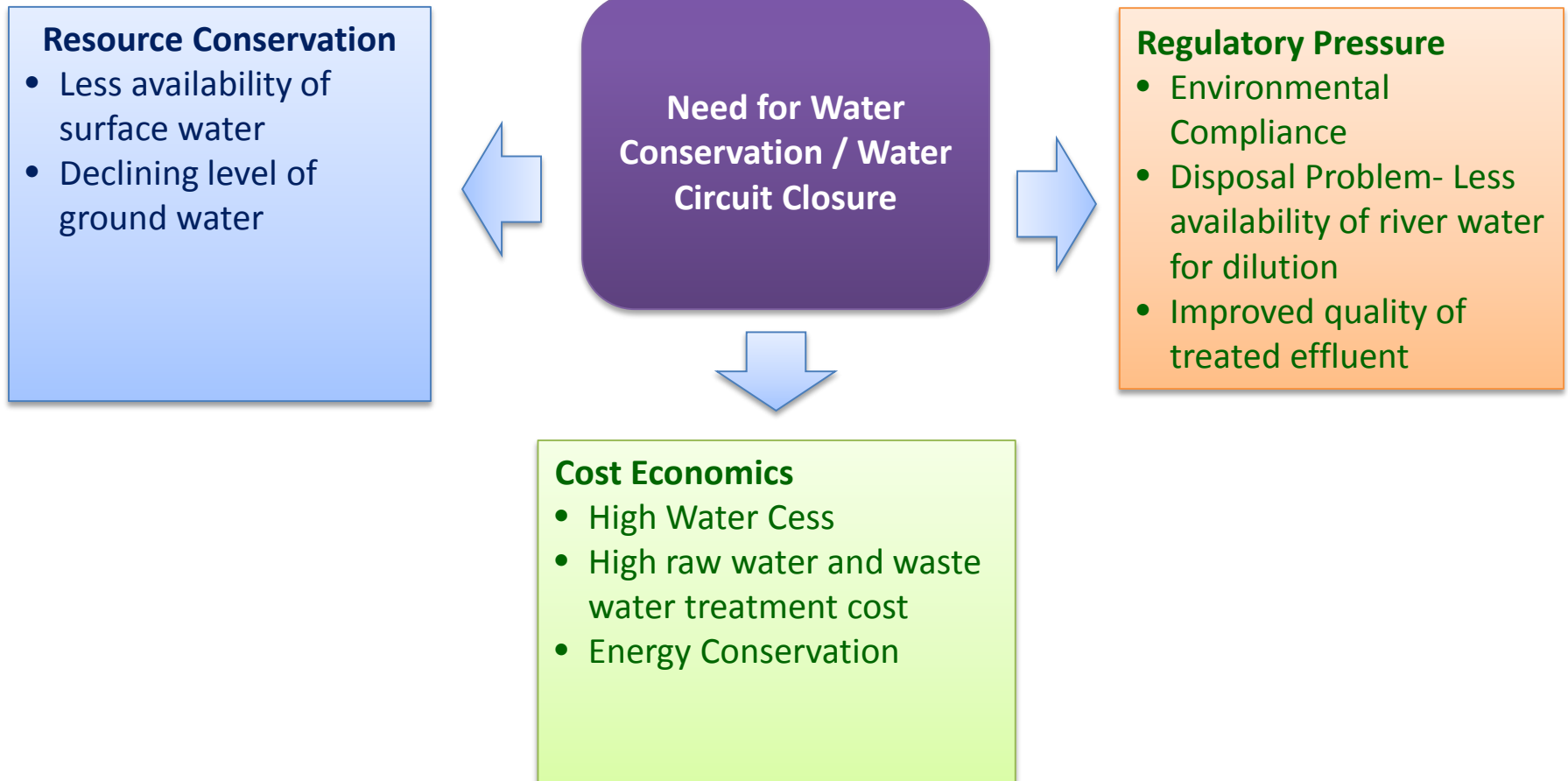
Mill Category	Fresh Water Consumption m ³ /t paper	Waste Water Discharge m ³ /t paper
A1 (Wood Bld.)	50	40
A2 (Wood unbld)	25	20
B1 (Agro Bld)	50	40
B2 (Agro Kraft)	25	20
C1(RCF Bld)	15	10
C2 (RCF Kraft)	10	6
D (Splty Paper)	50	40

Stringent Environmental Norms

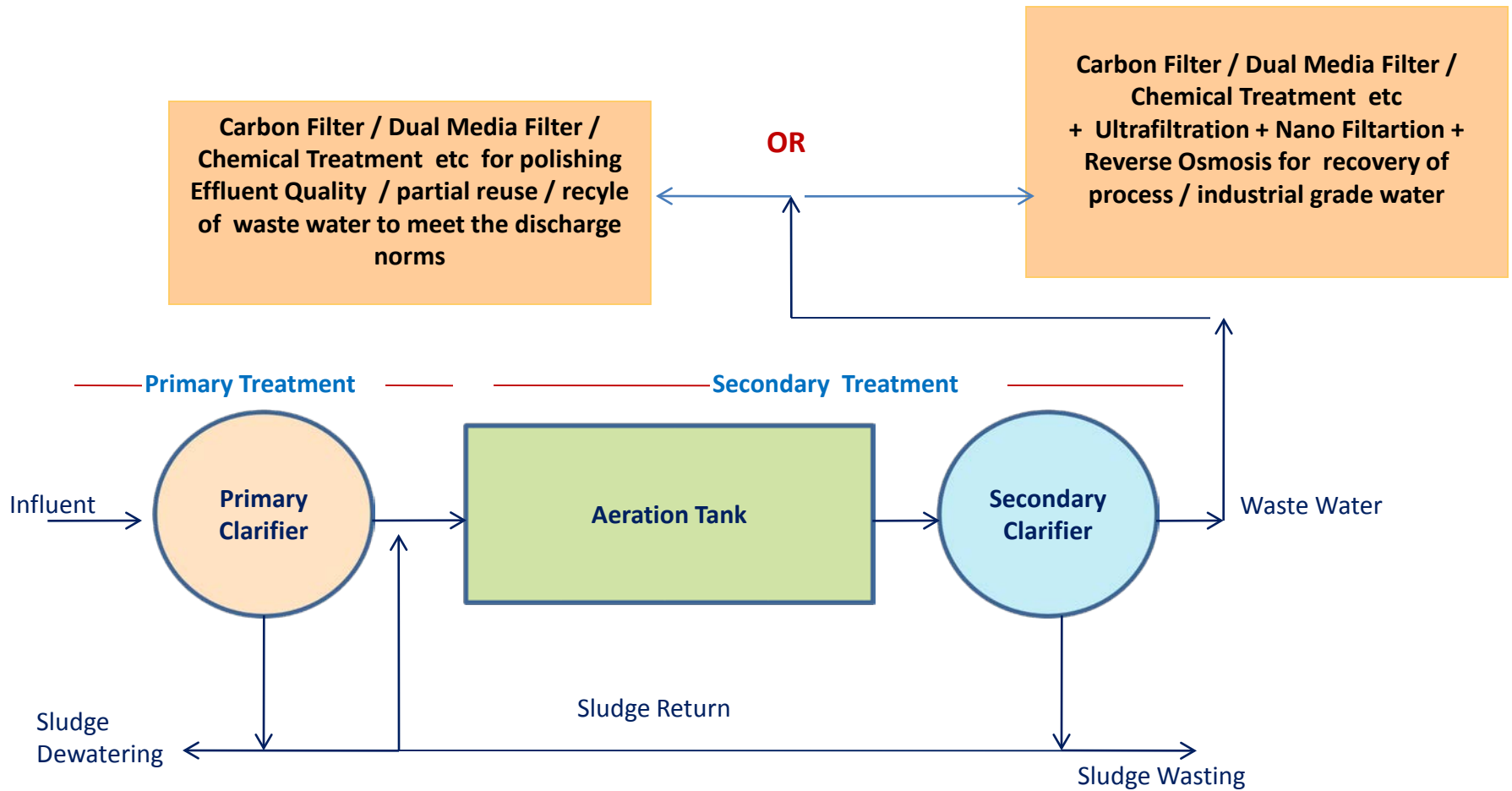
- *Specifically for Pulp & Paper Mills in River Ganga Basin*
- *New Environmental Norms on same lines likely to be introduced soon on National Level*

Parameters	Discharge norms for Integrated Pulp & Paper Mills Producing Chemical Pulp	Discharge norms for RCF based Mills
pH	6.5-8.5	6.5-8.5
TSS,mg/l	< 30	< 30
TDS, mg/l	< 1800	< 1600
COD, mg/l	< 200	< 150
BOD , mg/l	< 20	< 20
Colour , PCU	< 250	< 150
AOX , mg/l	< 8	-
SAR	< 10	< 8

Stringent Environmental Norms



Tertiary Treatment (EOP)



Fiber Recovery Units for Back water Reuse & Recycling & Reducing Pollution Load to ETP



DAF Units



Spray Filter



Sedicell

Filters as Tertiary Treatment Options for Reuse & Recycling of Treated Effluent



Activated Carbon Filter



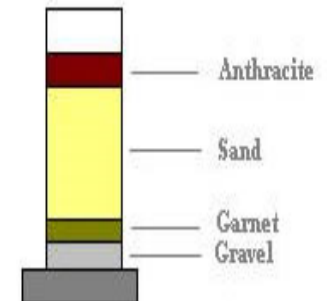
Micron Filter



Pressure Sand Filter



Dual Media Filter



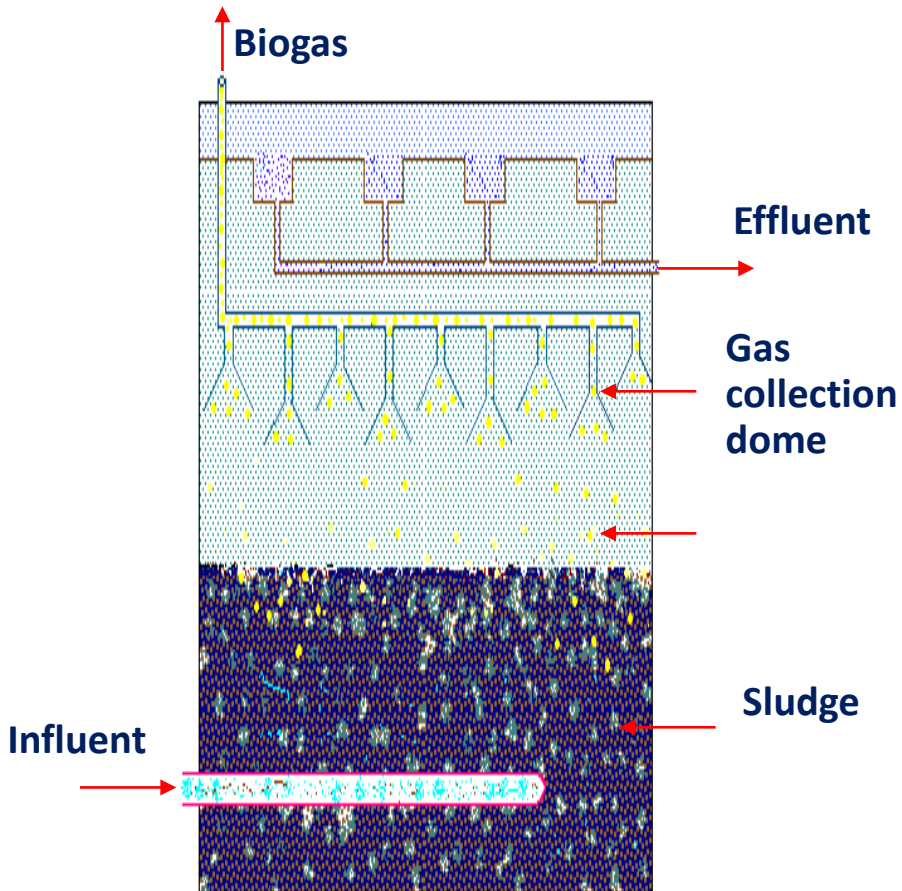
Multi Media Filter

Real Time On line Monitoring of Treated Effluent Quality - Mandatory for Indian Paper Industry



All the monitors are linked to Central Server of Regulatory Bodies

Anaerobic Bioreactor Configuration in Indian Paper Industry



Benefits of Bio-methanation:

- Reduce pollution load to subsequent ETP
- Co-generation of energy as biogas rich in methane
- Recovery of Biogas reduces GHG emission responsible for global warming
- Benefits of Carbon Credits

Recent Trends in Indian Pulp & Paper Mills for Improved Environmental Management



Installation of Borewell Flow meter/
Electronic Flow meter



Setting up of ETP Lab & Trained manpower



Installation of Paper Machine Showers of
Specified Diameter



Installation of On line Monitoring system

Recent Trends in Indian Pulp & Paper Mills for Improved Environmental Management



Installation of Chemical recovery System by Agro Based Mills



Installation of Tertiary Treatment System



Installation of Diffused Aeration System



Installation of Fiber Recovery System

Way Forward

Membrane Systems - Treated Effluent



Process Water Quality



ZLD




Ultra filtration



Reverse Osmosis

Requirements of Indian Paper Industry

- **Cost effective and techno-economic alternative treatment options**
- **Cost effective color and TDS removal technologies**
- **Solid waste disposal and management or conversion to value added products**
- **Demonstration of such technologies on pilot/mill scale**



Thank You
ありがとうございました