



Innovation in Effluent Colour Reduction & Generation of Vermicompost from Lignin Sludge



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Aditya Birla Group - Overview



BIG IN YOUR LIFE



**Globally,
Aditya Birla Group
is...**



#1 IN ALUMINIUM ROLLING



#1 RECYCLER OF ALUMINIUM



#2 IN CARBON BLACK
(based on installed production capacity)



#2 IN VISCOSE STAPLE FIBRE



#3 IN CEMENT
(EXCLUDING CHINA)

In
India,
the Group
is a leader in
various sectors



1 IN GREY CEMENT &
CONCRETE



1 FASHION RETAILER



1 IN CAUSTIC SODA &
SPECIALTY CHEMICALS



1 IN COPPER

1 IN VISCOSE
STAPLE FIBRE



COMBINED CAPACITY ACROSS THE TEXTILES VALUE CHAIN





BIRLA CELLULOSE

- Single-largest viscose staple fibre (VSF) producing site in the world
- Source traceability through blockchain-enabled GreenTrack™ technology
- Strong focus on research & development (R&D), with state-of-the-art facilities in India
- Liva™ tagged in 78 million fashion apparels
- 100% natural – manmade & biodegradable fibres having 360-degree sustainable green goals
- Major brands: Liva, Liva Eco, Liva Reviva, Birla Viscose, Birla Modal, Birla Excel, Liva Navyasa

Company Profile – Dissolving Grade Pulp Units



Harihar Poly Fibers Division, India

- Commissioned in 1972
- Main product is Rayon Grade Pulp, which is in turn raw material for Fiber Division for producing VSF



AV Cell, Canada

- ABG entered into a JV with Tembec Inc in 1998 and now 100% ABG company.
- It supports the local communities in their quest to innovate and excel



AV Nackawic, Canada

- Established in 2006
- Initially a joint venture but now a 100% AB company



Domsjo Fabriker, Sweden

- Became a part of ABG in 2011
- Produces specialty products such as 100% soft wood pulp, Lignin and ethanol

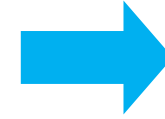
Pulp and Fibre Process



**Clonal Plantation
Centre**



Eucalyptus



Pulp Plant



Rayon Grade Pulp

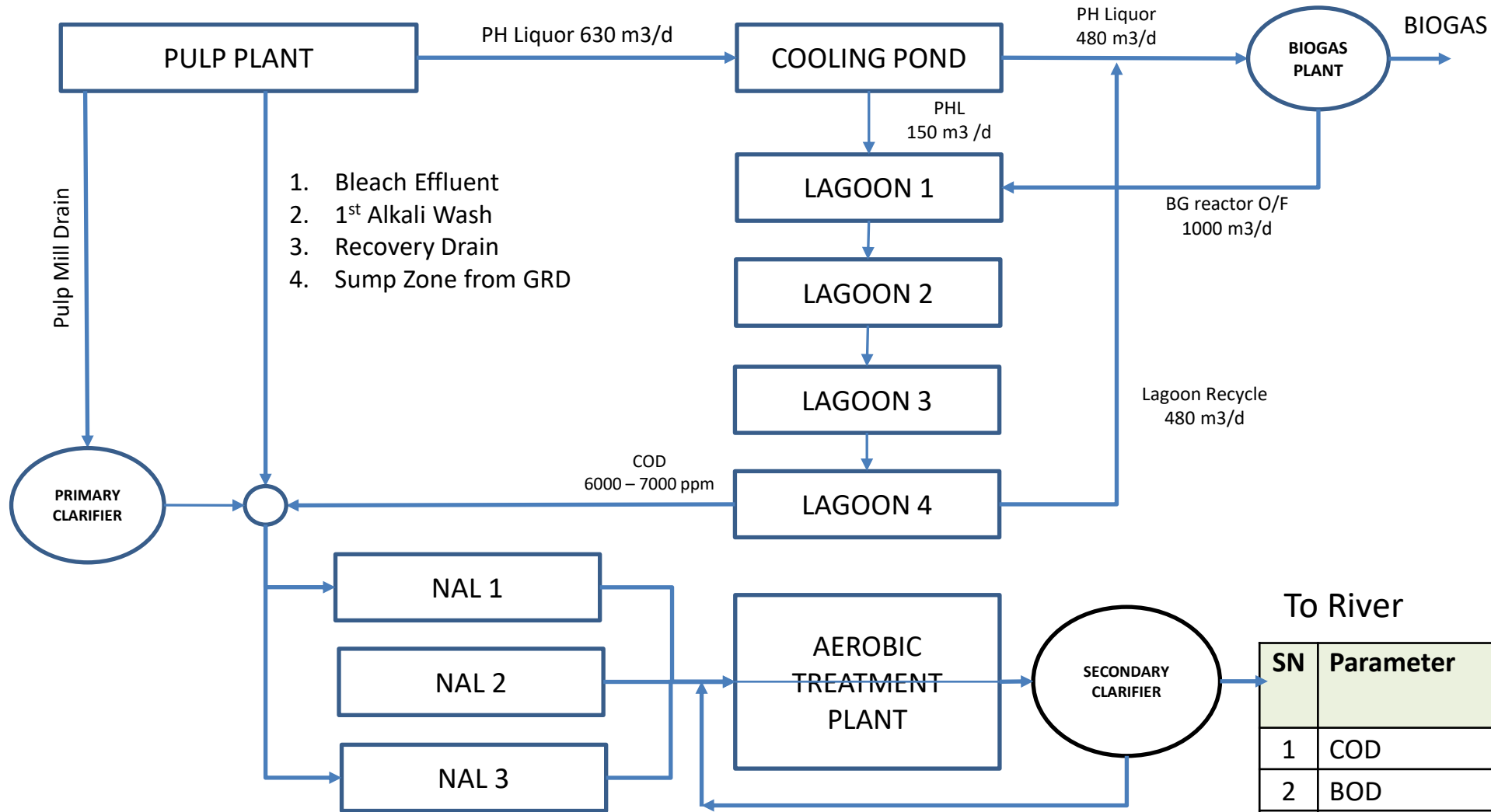


Fibre Plant



Viscose Staple Fibre

Effluent Treatment Process - Before



To River

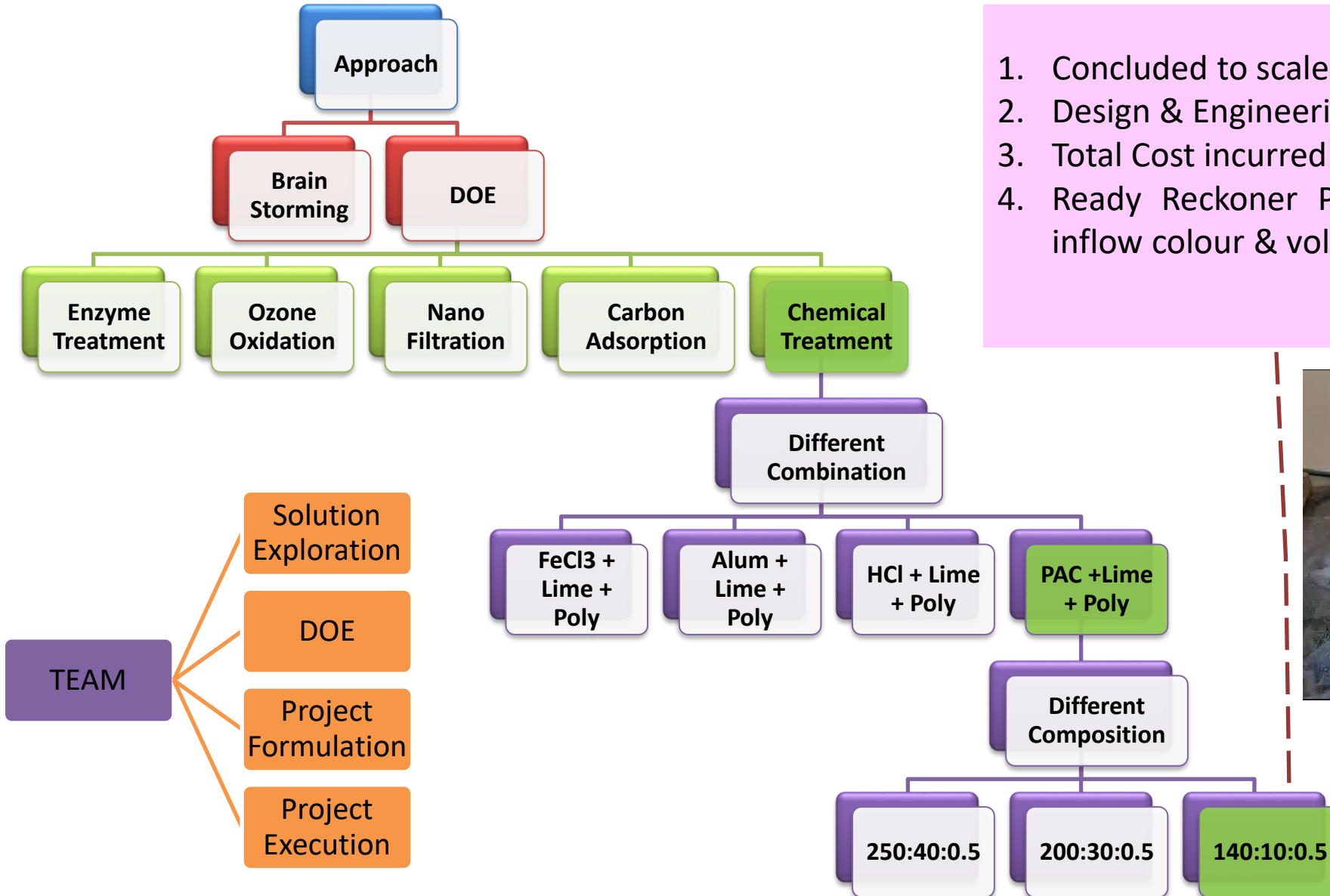
SN	Parameter	Unit	KSPCB Norms	Result
1	COD	ppm	< 250	230
2	BOD	ppm	< 30	26
3	TSS	ppm	<100	85
4	Inlet/Outlet Colour	PtCo	-	900

Business Scenario

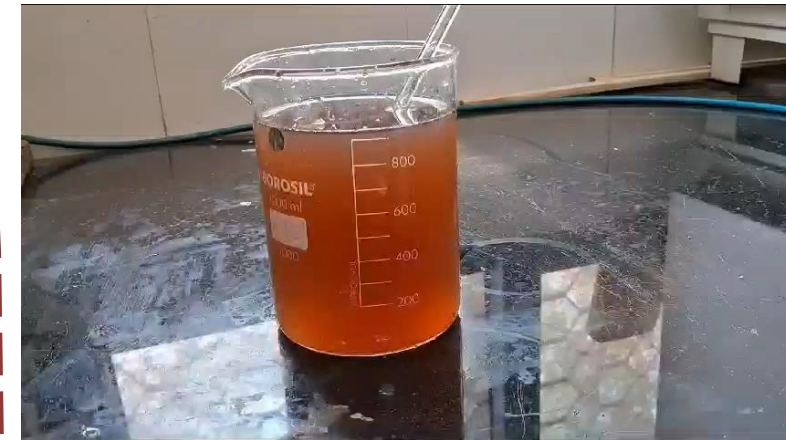


1. Colour of the treated effluent was an aesthetic issue, which was creating element of doubt on treatment.
2. Difficult to run the plant during lean / no flow – long term sustainability issue.
3. Brownish colour is mainly due to residual lignin.
4. Industry was forced to stop production every year for 13 days during Mylar Jatra (local festival) – leading to financial loss
5. Continuous pressure from society and statutory bodies – in a long run, image of the industry could be at stake.
6. Ready feasible solutions were not available.

Approach towards Effluent Colour Removal



1. Concluded to scale up PAC, Lime & Poly Combination
2. Design & Engineering by In-house Technical Team
3. Total Cost incurred Rs. 7.0 Cr
4. Ready Reckoner Prepared to operate based on the inflow colour & volume



Effluent Treatment Process - Post



Biological Reactor



Secondary Clarifier



Reaction Chamber



Tertiary Clarifier



Lignin Sludge



Treated Water



Online Monitoring



River

Tertiary Clarifier - Results

Before



900

Color (PtCoU)

↓ 81%

170

240

COD (PPM);
KSPCB Limits: Max 250

↓ 34%

160

26

BOD (PPM);
KSPCB Limits: Max 30

↓ 34%

17

90

TSS (PPM);
KSPCB Limits: Max 100

↓ 50%

45

4.1

DO (PPM);
KSPCB Limits: Min 4

↑ 9%

4.8

After



Vermicomposting from Lignin Sludge



- ✓ 12% DC
- ✓ 60 TPD
- ✓ GCV 2400 Kcal/Kg

Why Vermicompost?

- Lignin Sludge is very rich in Carbon
- Good Market value for Organic Farming
- Easily blended with other nutrients which are rich in N & P to achieve C:N

- Aerial drying not effective in rainy season
- Required huge area
- Non availability of effective drying technology

Burning in Boiler

Brainstorming

- Any solution must be sustainable
- Eco Friendly
- Use of carbon content from lignin
- Vermicompost (VC)

- Prepared VC Beds with C:N:P Combinations
- Suitable ratios achieved 25C: 1N
- Growth of earth worms & texture of VC were encouraging

Solution

Execution and Scale up

Phase – 1 : 20 beds of size (4 X 16 X 3 ft)

- Lignin sludge is natural dried up to 50-60%.
- Lignin Sludge transferred to Vermicompost Bed (3-4 tons per bed).
- Add – 200 kg Cow dung / Bed.
- Add - 50 Kg Earthworms / bed.
- Water Sprayed on alternate Days.
- Vermicompost ready in 50 - 60 Days.

Initially vermicomposting process started with 500 kg/day generation. In Phase - 2 system upgraded to 40 beds and producing 1.0 TPD vermicompost. In Phase-3 expanding to 3.0 TPD vermicompost generation.



Vermicomposting Process



Sludge Thickening
in Mono belt Press



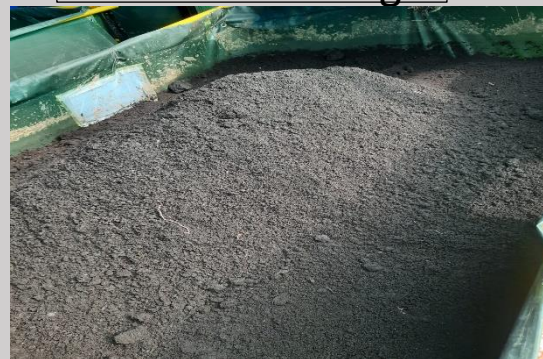
Lignin Sludge @
12% Dry Content



90% Sludge
mixed with
10% cow dung



Vermi Compost
Post Processing



Vermi Compost Ready
to Deliver



Nutrient	Content
Organic Carbon	9.15 to 17.98%
Total Nitrogen (N)	1.5 to 2.10%
Total Phosphorus (P)	1.0 to 1.5%
Total Potassium (K)	0.60%
Ca and Mg	22.0 to 70.0 meq/100 g
Available S	128 to 548 ppm
Copper	100 ppm
Iron	1800 ppm
Zinc	50 ppm

Tertiary Clarifier & Vermicomposting Results

SN	Parameter	Unit	KSPCB Norms	Before TC	After TC		
					FY22	FY23	FY24
1	COD	ppm	< 250	230	164	162	153
2	BOD	ppm	< 30	26	17	18	18
3	TSS	ppm	<100	85	52	42	45
4	Inlet/Outlet Colour	PtCo	-	900	247	293	250
5	Cost of Tertiary treatment	Rs/TP	-	-	391	378	416
6	Vermi Compost generation	Tons	-	-	13.68	56.82	96.01
7	Revenue from Vermi Compost	Rs. Lakhs	-	-	0.55	2.69	5.76

Rewards & Recognition



FROST & SULLIVAN

Project Evaluation
& Recognition Program

2021 Edition



Received 1st Prize from Frost & Sullivan
in 2021 for Colour removal Project

Benefits, Learnings and Way Forward

Learnings:

- Liquid PAC can be used i.p.o powdered to optimize the cost.
- More the worms, lesser is the period and weekly once mixing of beds for speedy process
- Earth worms are very active @ around 50 % bed moisture and under the shade.

Benefits:

1. Continuous running of Pulp Plant during Mylar Jatra, one of the major milestones, which led to flexible ASD planning.
2. Downstream river water aesthetic issue eliminated and industry image improved.
3. Vermicompost is an Eco-Friendly natural Organic Fertilizer and Free from chemical inputs and promotes better root growth and Nutrient absorption.
4. Improves the water retention capacity of the soil because of its high organic matter content and improves the nutrient status of Soil, both macro and micro nutrients.

Way Forward:

Increasing the Vermi Compost manufacturing capacity to 3.0 TPD.

Conclusion



Colourless Effluent



Vermicompost

Best Ecological Practices are Best Economical Practices