Submitted to

CII-GBC

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Presented By :

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GM (R & D and QC)

TNPL – "The Environmental benign unit"

- Promoted by Govt. of Tamil Nadu in 80's.
- World's largest bagasse based paper plant at single location & Largest exporter of the country. Largest exporter of Writing & Printing Paper from the country.
- ISO 9001:2015, ISO 14001:2015, ISO 27001:2013 & FSC FM, CW /COC Certified.
- Green Co Gold Rated from CII, Hyderabad.
- Uses "One million MT/A of Bagasse" which conserves 6.5 lakh MT/A of wood.
- 1.7 lakh MT/A of wood is being conserved by using 0.6 lakh MT/A of waste paper.
- Sequestering about 45,000 tCO_2e/A emission through 35.5 MW Wind Power.
- Reuse 80,000 MT/A of lime sludge & 50,000 MT/A of fly ash to produce 'CEMENT" thereby conserves 93,000 MT/A of lime stone.
- Utilize entire treated effluent to irrigate 1600 acres of land benefiting 430 farmers.
- Conserves 15 KL/D of furnace oil utilizing 25,000 m^3 of biogas generated by treating Bagasse wash water .
- Achieved 1,66,899 acres of Pulp wood plantation sequestering about 49.2 lakh tCO_2e emission.
- Utilize 1.8 lakh MT/A of Internally generated Agro waste as fuel in Boiler to conserve 45,000 MT/A of imported coal.

Slide – 1

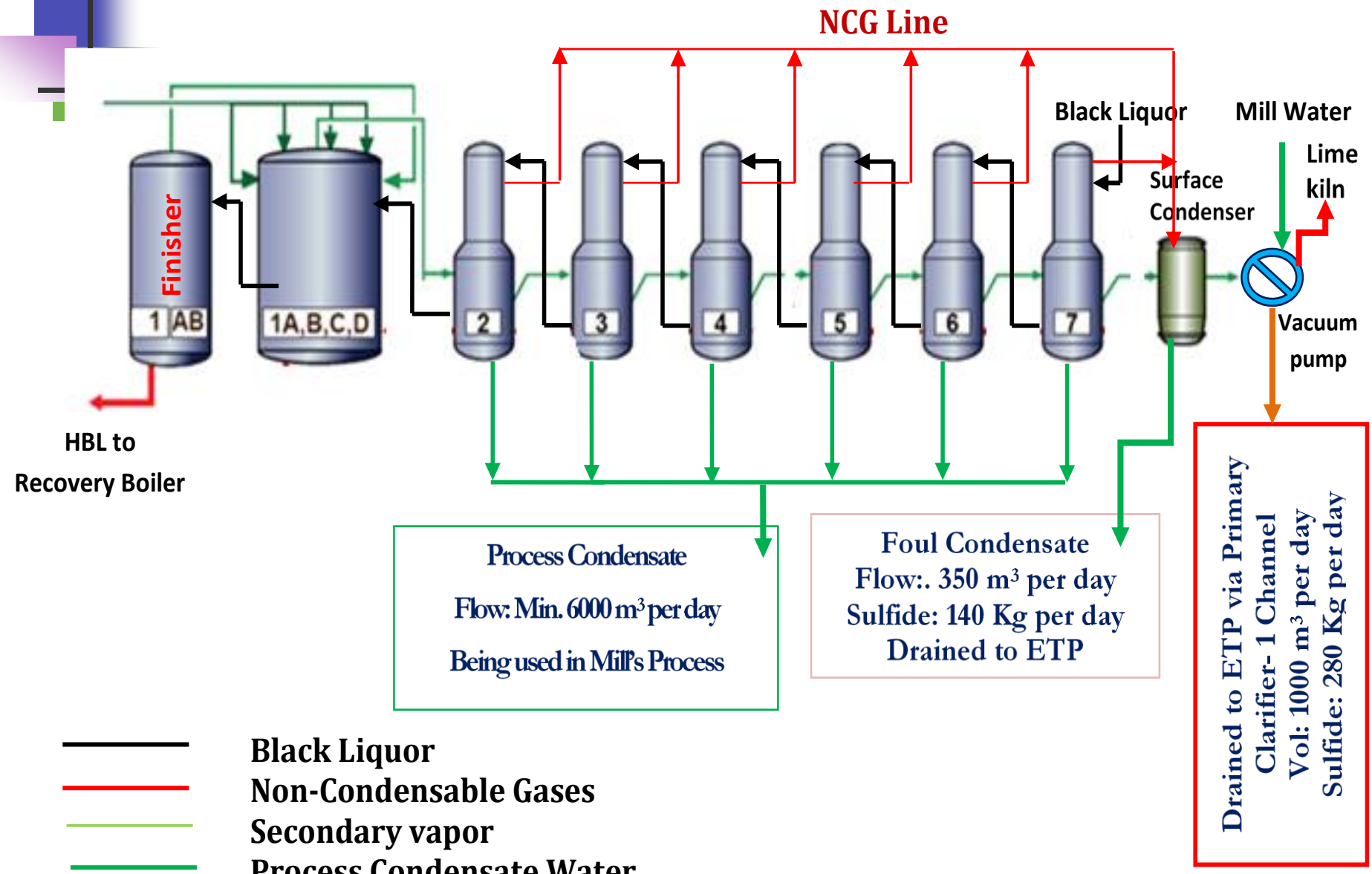
Project title	**In House designed Sulfide removal from the Evaporator Vacuum Pump Seal Water in Soda Recovery Plant by Low Cost Stripping Column and reuse the treated water.**
Trigger of the project	***The project was conceived at Middle Management level while analyzing the root causes of affecting the wastewater quality in Effluent Treatment Plant (ETP) and found out that the Sulfide contribution is very high in vacuum pump seal water generating from evaporator in the Soda Recovery Plant (SRP).***
Uniqueness of the project; is it a new concept?	**Reuse the treated water from Evaporator Vacuum Pump Seal Water (EVPSW) for process and utilize the generated Vent gas directly in Lime Kiln is *"First of its kind in Pulp and Paper Industry in India"***

Date of commencement	***Apr'2019***
Planned Date of Completion	***July'2019***
Actual Date of Completion	***Oct'2019***

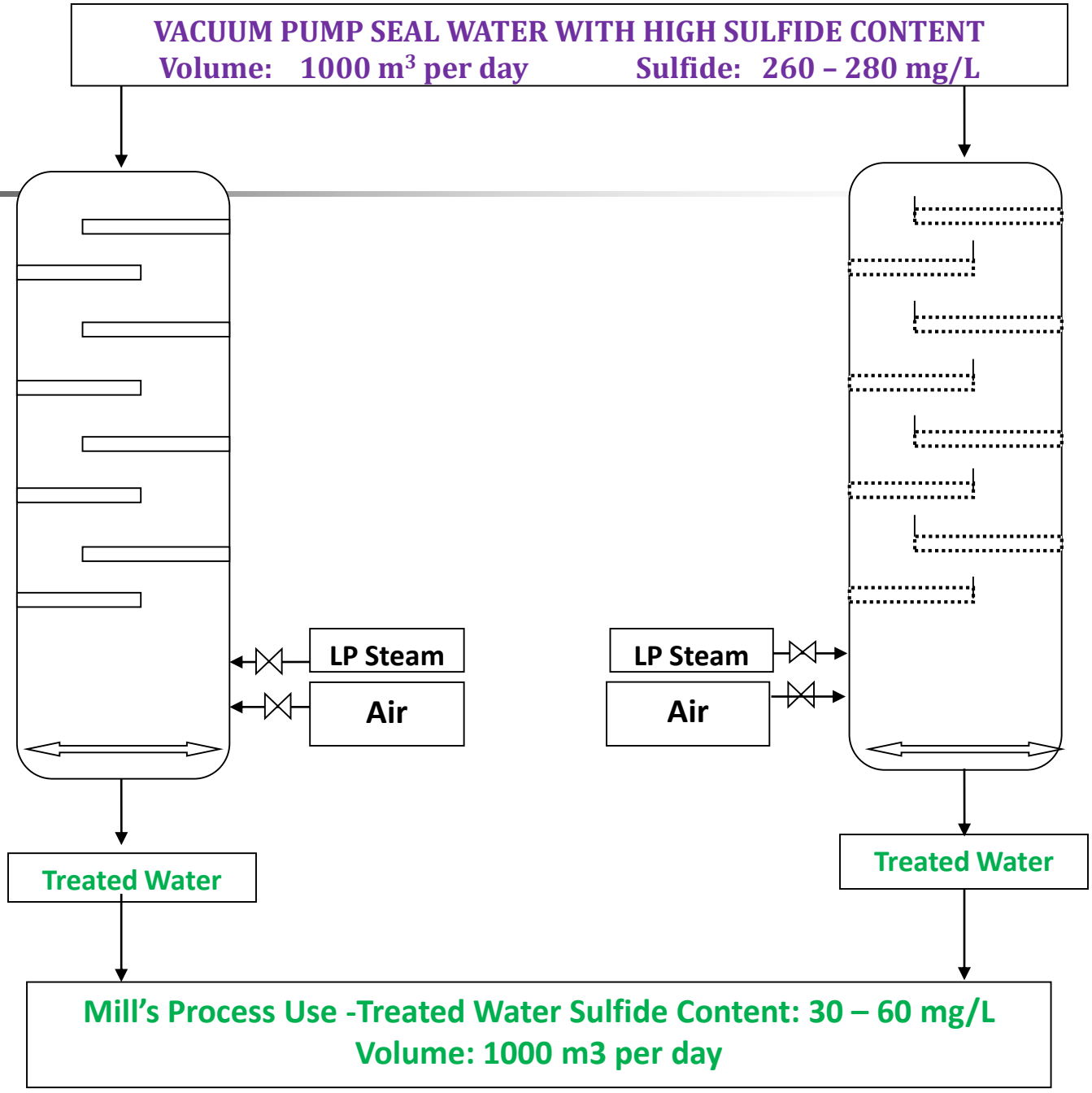
Major milestones of project:

Design	**Calculation of Sulphide**	***Apr'2019***
Phase 1	**Installation of Stripping Column**	***Apr' 2019 to Jun'2019***
Phase 2	**Installation of Additional Stripping Column**	***Jul'2019 to Oct'2019***
Performance	**Trial Run**	***Oct'2019 to Dec'2019***

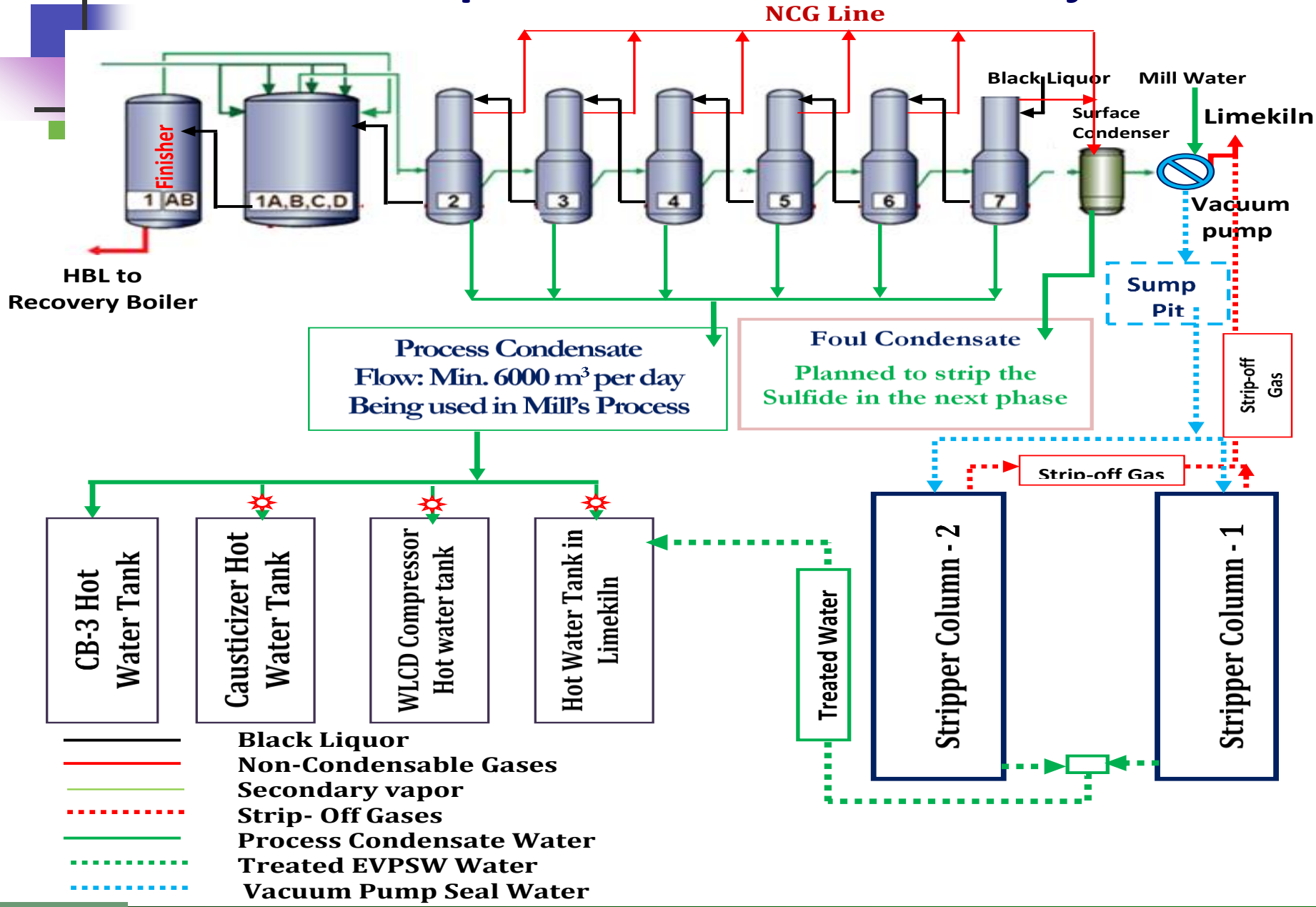
Before Implementation of the Project



Design of Stripping Column



After Implementation of the Project



Slide – 2 - A : Sulfide as S^{2-} as mg/L of Untreated and Treated EVPSW characteristics

Project Implementation	Period of Measurement		EVPSW Untreated	EVPSW Treated	Reduction in %
	From	To			
After Phase 1	01 Jun 2019	10 Oct 2019	270.2	74.3	72.5
After Phase 2	11 Oct 2019	22 Mar 2020	271.3	46.2	83.0

Slide – 2 - B : Sulfide as S^{2-} as mg/L of Activated Sludge Lagoon (ASL) Inlet and Secondary Clarifier Outlet (SCO)

Project Implementation	Period of Measurement		ASL Inlet	SCO
	From	To		
Before	01 Jun 2018	31 May 2019	24.3	1.8
After Phase 1	01 Jun 2019	10 Oct 2019	21.3	1.3
After Phase 2	11 Oct 2019	22 Mar 2020	16.9	0.9
Reduction in %			30.5	50.0

Slide – 2 – C : Cost Economics

Sl. No.	Parameter	UOM	Value
1	Savings of Treated Water	m^3/day	1000
2	No. of Days of Operations per year	No	330
3	Savings of Water	m^3/year	3,30,000
4	Cost of Water	Rs/m^3	7.63
5	Cost savings/year	Rs in lakh	25.2
6	Investment Cost	Rs in lakh	12.9
7	Payback period	months	6

- 83% Reduction in Sulfide concentration as S^{2-} (mg/L) in the Treated EVPSW characteristics.
- 30.5% and 50% Reduction in Sulfide concentration as S^{2-} (mg/L) in Activated Sludge Lagoon (ASL) Inlet and Secondary Clarifier outlet (SCO), respectively in Effluent Treatment Plant.
- Recycling waste water of 1000 m^3 per day for process.

Slide – 3 : Intangible Benefits

- 1.5 lakh m^3 of Stripped off Gas per year fired in Lime kiln along with NCG gas and Furnace oil.
- Effluent odor elimination

Parameter	Threshold odor number
EVPSW Untreated	100
EVPSW Treated	7.0
Reduction	93 %

- Meeting legislative requirements and reducing Pollution loads.
- Reduce the Sulphide concentration in Effluent Treatment Plant which enhances Dissolved Oxygen of final discharged effluent thereby reduction of COD is observed.
- Reduces Sulfide toxicity to microorganism in Effluent Treatment Plant.

Slide – 4 : Replication Potential

Replication potential and progress of project assimilation cross functional / within group companies: This Project can be replicated in any Integrated Pulp and Paper Industry in India as well as across the globe.

Evidence on where and when implemented with photos before/after

Photographs of Planning & Commissioning TNPL's in-house Sulfide stripping column

TNPL SODA RECOVERY PLANT SULFIDE STRIPPER COLUMN	
MAKE	TAMIL NADU NEWSPRINT AND PAPERS LIMITED, KAGITHAPURAM.
TREATING LIQUID	EVAPORATOR VACUUM PUMP SEAL WATER
TREATMENT CAPACITY	1000 m^3 PER DAY
METHOD OF STRIPPING	AIR / STEAM
COLUMN TYPE	VERTICAL SPRAY TRAYED COLUMN
DIMENSIONS OF THE COLUMN	HEIGHT – 10 M DIA : Column 1: 600 mm / Column 2: 900 mm
SULFIDE REDUCTION EFFICIENCY	≥ 80%
COMMISSIONED YEAR	2019

Slide – 4 – A : Replication Potential- What next for spreading benefits?

- **Stripping off Sulphide from Foul Condensate : Installation of Low Cost Stripping Column is planned to remove the sulphide from Foul Condensate of Soda Recovery Plant.**
- **Demonstrated this project to Joint Chief Environment Engineer, Salem. He appreciated this project on the reduction of Pollution load with less cost & instructed TNPL to submit this project to TNPCB so that it can be forwarded to other industries.**
- **Every year, awards and best efforts of TNPL are submitted to Managing Director and Chairman of TNPL for onward submission to Government of Tamil Nadu. The highlights of this In-house Innovative Project is one of the best efforts submitted to them.**

Slide – 5 : Replication Potential of Project within sector

Steps initiated, Achievement sharing mode: demo/forum/seminars),Other knowledge sharing platforms

- **Transfer the knowledge and the work carried out to all the employees of TNPL,**
- **Availability of Hard and Soft copy of project in Technical Library.**
- **Availability of Soft copy of project is made available in TNPL Intranet http://dms.tnpl.com:8080/share/page/**
- **Publishing the project in the Compilation of Continual Improvement Projects of TNPL.**

Transfer the knowledge and the work carried out to other Industries

- **Approval accorded from Top Management to submit this project as a Technical Paper in**
- ***The forthcoming Indian Pulp and Paper Industry Technical Association (IPPTA) Journal,***
- ***Environment Best Practise manual by CII-GBC &***
- **Advancement in operation and maintenance of waste water treatment plants by M/s National Productivity Council, New Delhi.**

Slide - 6: Challenges faced and brief on countering

Technical and Maintenance related :

Quantification of Sulphide removal :

- The project developed by in-house.
- Difficulties persisted in designing the quantification of sulphide removal.
- One stripping column is installed initially with the mostly available waste material in the scrap yard. Performance of the equipment and quantity of sulphide removal was estimated.
- One more additional stripping column was installed based on the experience of the first one.
- Treated water was fully utilized for process which ultimately reduces the liquid effluent discharge.

Capturing the entire volume of Vent gas in the Lime Kiln :

- After installation of Stripping column the water and gas separation takes place. The vent gas was routed to Lime kiln via existing NCG line. Difficulties faced in capturing the vent gas as vent gas was not moving forward since the line already contains NCG gas and forces us to let out the vent gas to the atmosphere.
- An additional ejector system was built by in-house team.
- Then the vent gas move forward along with the line containing NCG gas with slight modification in existing line size.
- Then Entire Vent gas received from the stripping column is fully utilized in the Lime Kiln.

Slide - 7: National Standard

Data summary pertaining to two competitors above you and two competitors below you

Treated discharged effluent Sulfide as S^{2-} (mg/L)

International	National	TNPL (After Implementation of the Project)
1.0#	2.0*	0.9

#http://extwprlegs1.fao.org/docs/pdf/tw164144.pdf

*https://www.tnpcb.gov.in/pdf/tnpcb_you2013.pdf

Sulphide as S^{2-} (mg/L). Available Data from Web

Company	Sample	Value
JK Paper Mills	Effluent Outlet	1.35

Slide - 8: Priority plans on fast track for +1 year and +2 year, including resource requirement

Plans	Resources Required in Lakh
Capturing the Sulphide in NCG gas by passing through the cooking liquor to enhance firing of NCG gas in Lime kiln	15
Installation of Low Cost Stripping Column to remove the sulphide from Foul Condensate of Soda Recovery Plant	5
Enrichment of Biogas quality by removing CO_2	15
Pretreatment of Hardwood and Chemical Bagasse plant effluent before feeding to MVR plant to reduce the scaling problem in MVR evaporator.	5
Conversion of TNPL bagasse pith and wood dust into wooden particle core plug and particle board	4

Slide - 9: Top ten best practices which will form the core of approach for +1 and +2 year

Top ten best practices
Flue Gas desulfurization(SO_2 reduction) in Power Boiler
Reduction of Hydrogen Peroxide consumption by Probiotics in DIP
Increase the First Pass Ash Retention and First Pass retention in all the Paper Machine through the addition of high cationic starch
Optimization of the Lime addition in the two stage causticizing process
Recovery of Sulphate from Recovery Boiler ESP Ash by removal of Chlorides
Hydrogen Peroxide consumption reduction by using Stabilizer trial in CBECF
Alternate to conventional Cement Floor at Bagasse storage yard by Pavement of CERAPLAST yard
Oxygen delignification stabilizer at HW ECF ODL stage in HW ECF plant
Reduction of Sulfuric acid in HW & CB ECF plant in bleaching stages
Peroxide stabilizer in the Hydrogen peroxide storage tank in HW ECF

Slide - 10: Major learning's from the project implementation.

- **Ensuring of Clean environment with less cost of investment.**
- **Trouble shooting are made easier without the support of External Agency.**
- **The capital cost reduction when the project was developed In House.**
- **Enhancing the Confidence Level of all the employees of TNPL towards achieving minimum impact to the environment.**

VIDEO on

IN HOUSE DESIGNED SULPHIDE REMOVAL FROM THE EVAPORATOR VACUUM PUMP SEAL WATER IN SODA RECOVERY PLANT BY LOW COST STRIPPING COLUMN AND REUSE THE TREATED WATER.

TNPL's Inhouse designed Stripper Column_7_Small.mp4

Thanking You