Seshasayee Paper and Boards Limited, Erode

ENERGY CONSUMPTION

IN PULP & PAPER SECTOR

IPPTA – Workshop, Saharanpur - 25.07.22

GANESH BHADTI, DIRECTOR (OPERATIONS)

B KARTHIK, AM (CHEMICAL RECOVERY)

SPB Infographics

- Flagship company of **SPB ESVIN group**
- Paper Products **Writing, Printing, Posters & Specially Boards**
- Help marginal farmers to plant over **16.40 crores** of seedlings every year in about **19,000 acres of land**
- **Carbon & wood positive**
- All our products are **100 % Recyclable & Biodegradable**

Presentation flow

- Energy & production scenario
  - Global & National
  - Pulp & Paper sector
- Net zero emissions
  - Global & National
  - Pulp and paper sector
- Energy Benchmarking – Global & National
- SPB's Scenario – Case studies
- Future projects marching to Net Zero Emissions

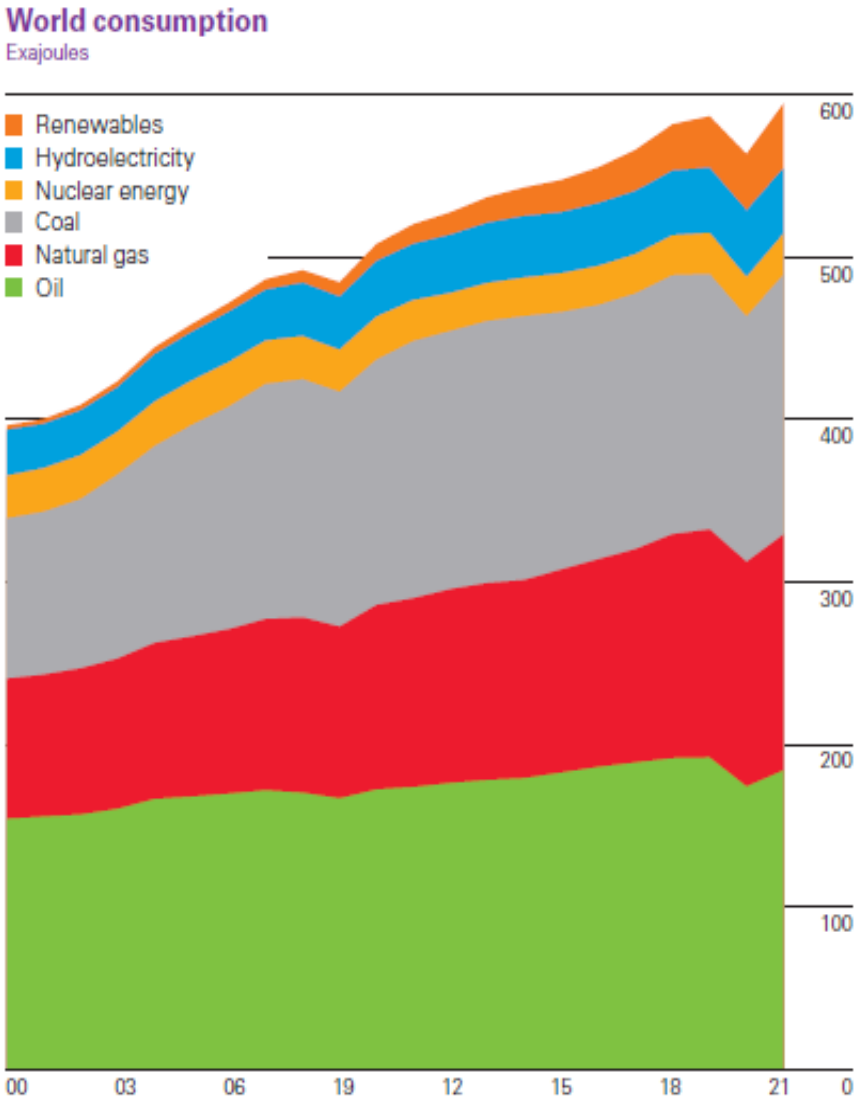
Energy & production scenario

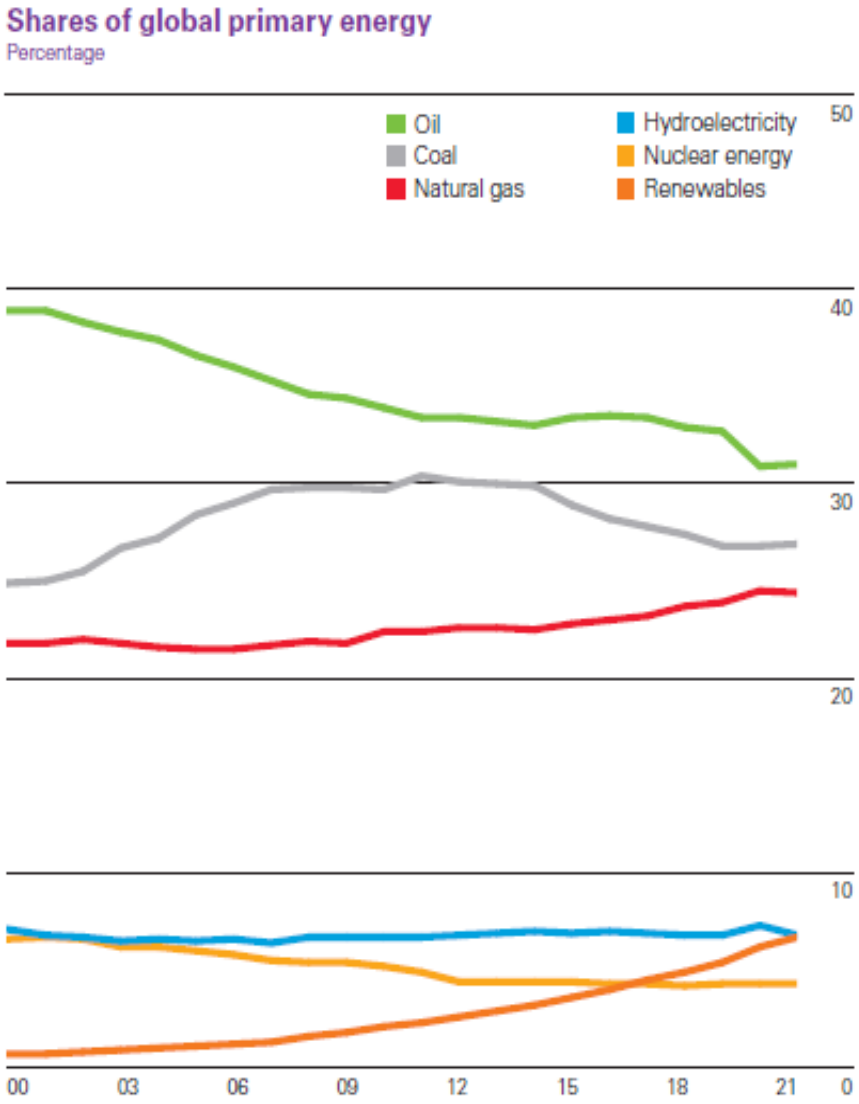
Global & National

Statistical review of world energy

- **Primary energy use** in 2021 was **1.3 %** above 2019 levels
- **Fossil fuels** accounted for 82 % of primary energy use last year, down from 83 % in 2019 and 85 % five years ago
- **Renewable energy increased** by over 8 EJ between 2019 and 2021
- **Carbon dioxide emissions** from energy use rose to **39.0 GtCO2e** in 2021 from **33.9 GtCO2e** in 2019 levels

Global energy scenario

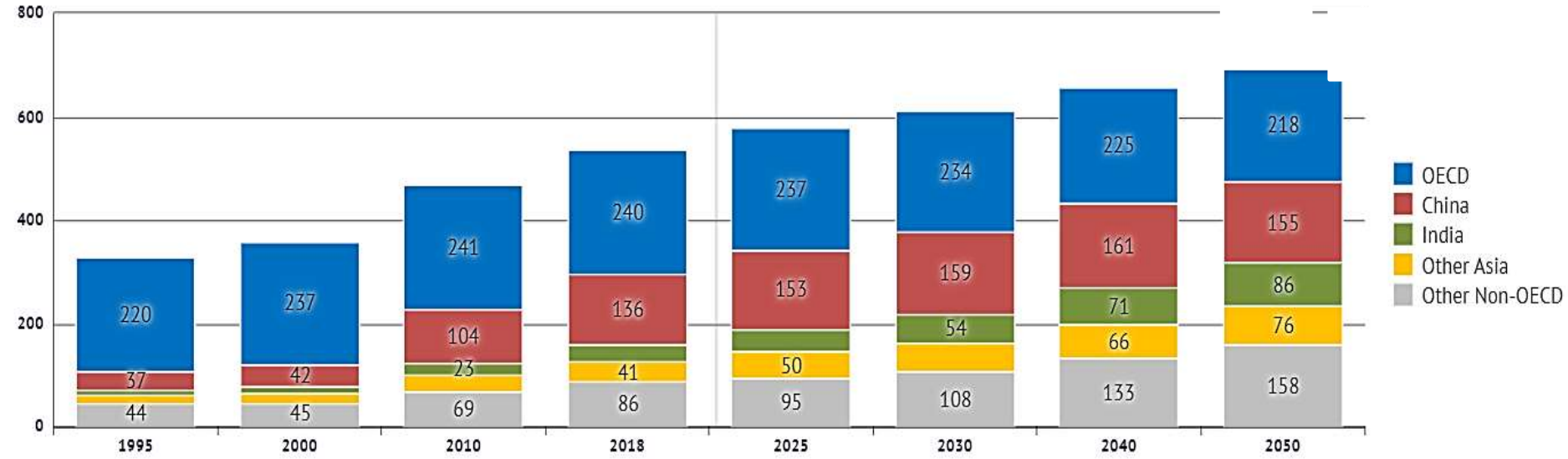




Source: bp.com bp Statistical Review of World Energy 2022

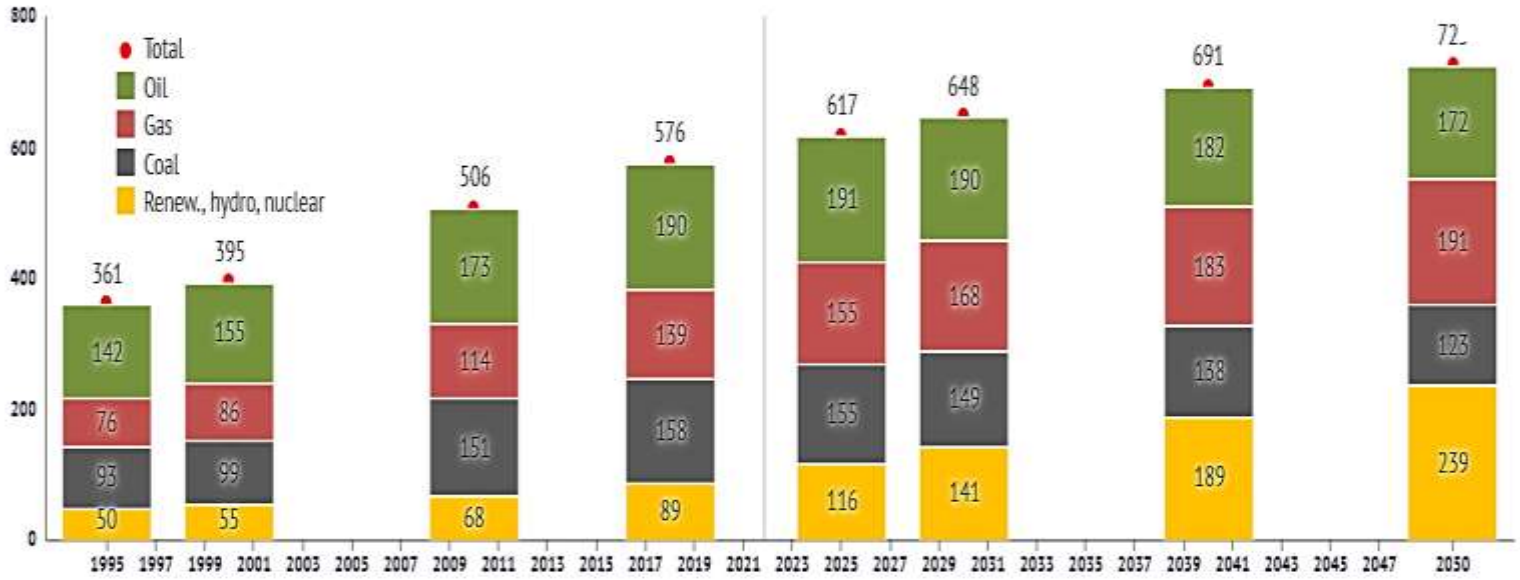
Primary Energy Demand by Region

Exajoules; Evolving Transition (1995-2018) and Business-as-usual (2025-2050) scenarios



Primary Energy Demand, 2018-2050

Exajoules; Evolving Transition (1995-2018) and Business-as-usual (2025-50) scenarios



Total: **+17.50%**

Oil : **-9.95%**

Gas : **+23.22%**

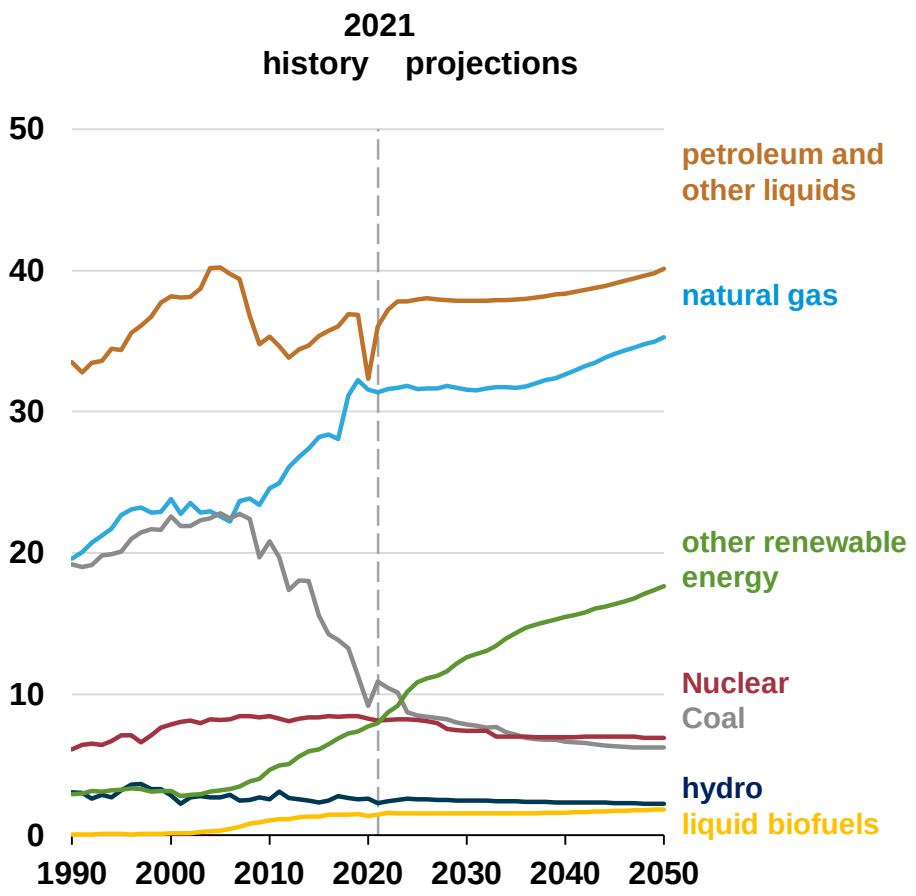
Coal: **-20.65%**

Renew: **+106.03%**

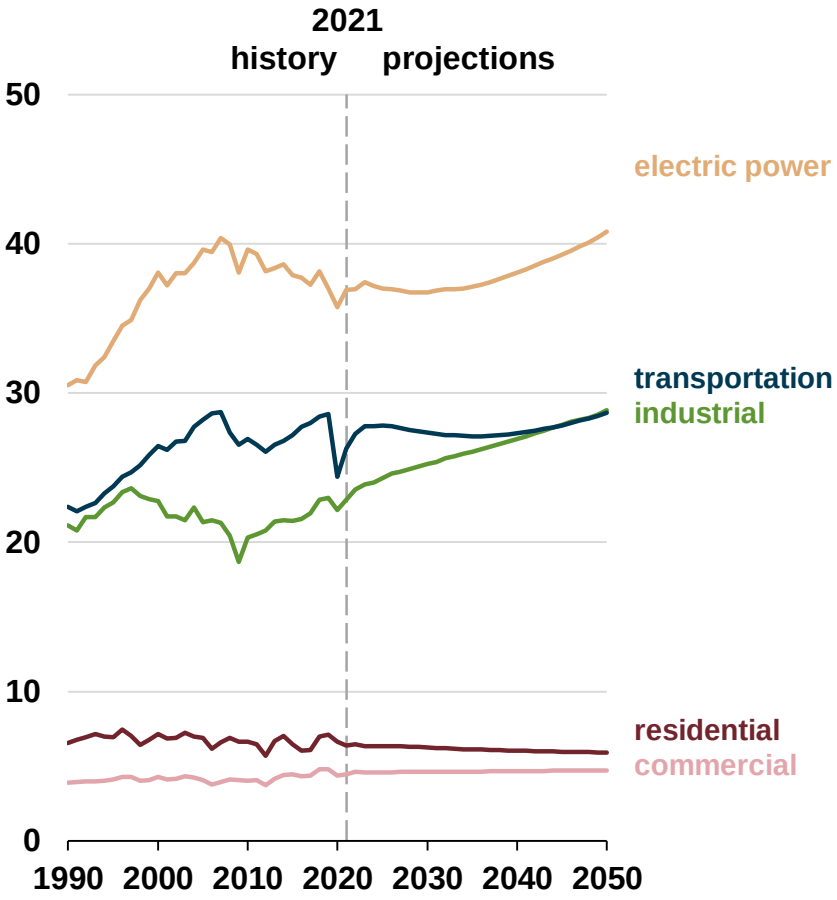
Source: bp.com bp Statistical Review of World Energy 2022

Projected World Energy consumption scenario by fuel & sector

Energy consumption by fuel (quadrillion BTU)



Energy consumption by sector (quadrillion BTU)



Global production scenario

- Post pandemic of COVID -19, industries resume to a faster growth rate
- Global manufacturing production a year-over-year output growth of **4.2 per cent** in the first quarter of 2022
- Industrial economies reported a similar annual output growth of 4.1 per cent, following an increase of 3.6 percent and 6.1 per cent in the last two quarters respectively
- This is demonstrating a decoupling of growth in energy consumption from growth in production.

Source: UNIDO Statistics data portal

World reserves of Fossil Fuels

- According to the latest British Petroleum (BP) Statistical Review of World Energy, total Global reserves, by fossil fuel are

Coal **1139 Billion Tons**

Oil **1707 Billion Barrels**

- At **today's level of extraction and production rates,** BP's estimated proved reserves, the fossil fuels would be **exhausted** as follows **Coal Year 2169**

Oil Year 2066

Source: bp.com
bp Statistical Review of World Energy 2022

National Energy Scenario

- Strong growth in primary energy by the renewables
- **Share of renewables** in primary energy will increase from **31 % to 66 % by 2050** from the present level
- **Electrification** - Power generation with solar and wind power accounting for **55 % to 95 % by 2050** of that growth.
- The Government of India has set a target of installing of installing **175 GW of renewable energy capacity by the year 2022**, which includes 100 GW from solar, 60 GW from wind, 10 GW from bio-power and 5 GW from small hydro-power

Source: bp.com/energyoutlook

National Production scenario

- Indian industries showing an **accelerated growth** post pandemic
- Manufacturing /Production in India averaged **5.89** percent from 2006 until 2022, reaching an all time high of 196 percent in April of 2021 and a record low of -66.60 percent in April of 2020
- Investments in the sector have been on the rise and initiatives like **'Make in India'** are aiming to turn the south Asian country into a global manufacturing hub
- Considering the April-March period of 2021-22-year, production expanded **11.3 percent** year-on-year.
- Industrial production in India grew **1.7 percent** year-on-year in February of 2022, but missed market expectations of a 2.6 percent rise

Source: tradingeconomics.com

Energy & production scenario

Pulp & Paper sector

Energy & Production scenario

- Primary energy use in pulp and paper grew an average **0.1 %** annually during 2010-2019.
- Paper and paper board output increased by **0.3 %** per year, demonstrating a decoupling of growth in energy consumption from growth in production.

Challenges

- Today, **Environment and Energy** are the two principal **challenges** for **sustainable development.**
- Managing the **Natural Resources** without any depletion and negative impact and **also making it available for future generation**

Energy Scenario in Pulp & Paper Industry

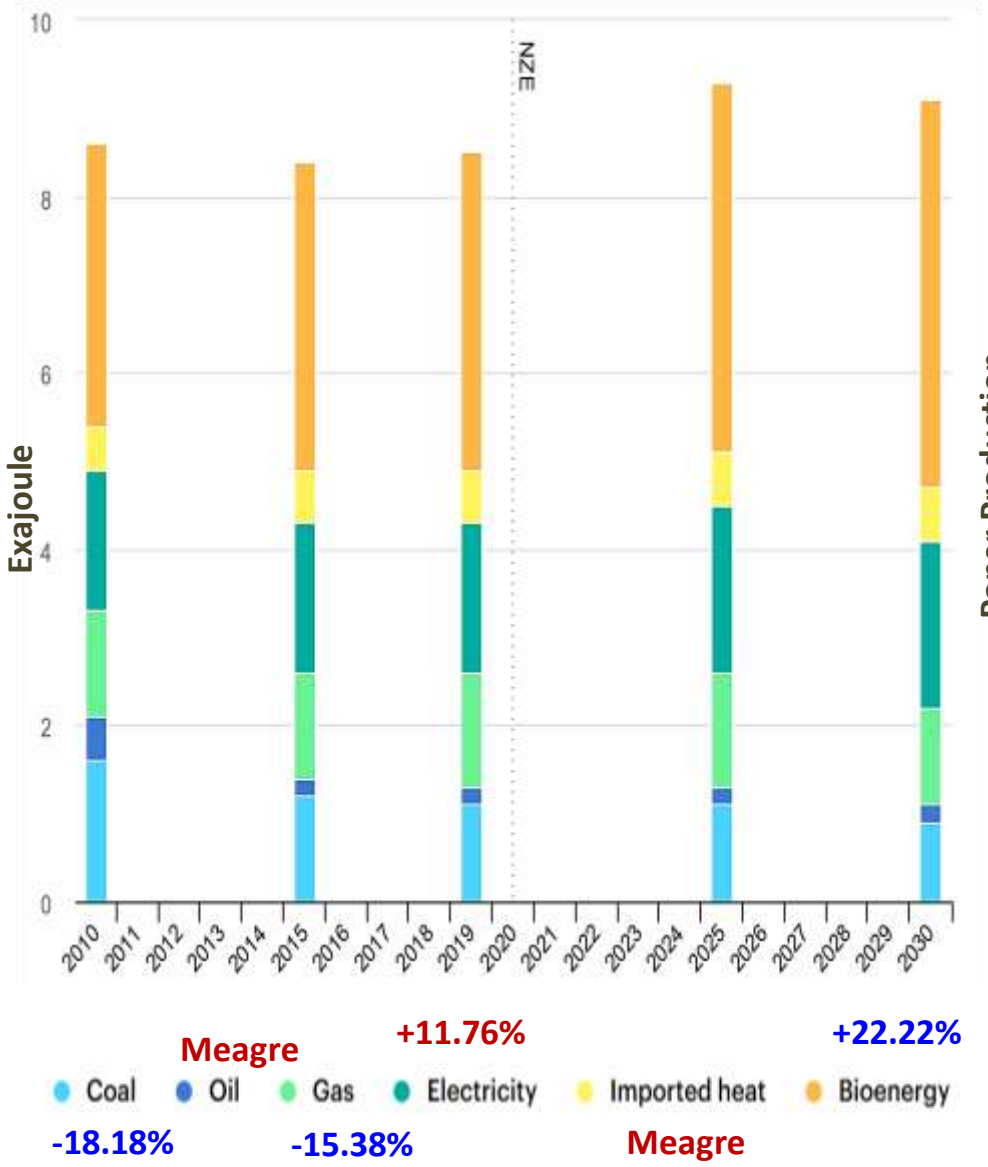
Financial Year	Total Production	Total Energy Consumption	Gross Domestic Product (GDP)	Energy Intensity
	million tonnes	million TOE	Billion USD	toe/ million USD
Average Baseline	7.38[12]	4.88	1,389	1.51
2015	17.03	10.65	2,102	2.03
2020	21.88	12.76	3,018	1.69
2025	29.28	16.02	4,233	1.51
2030	39.18	20.19	5,937	1.36

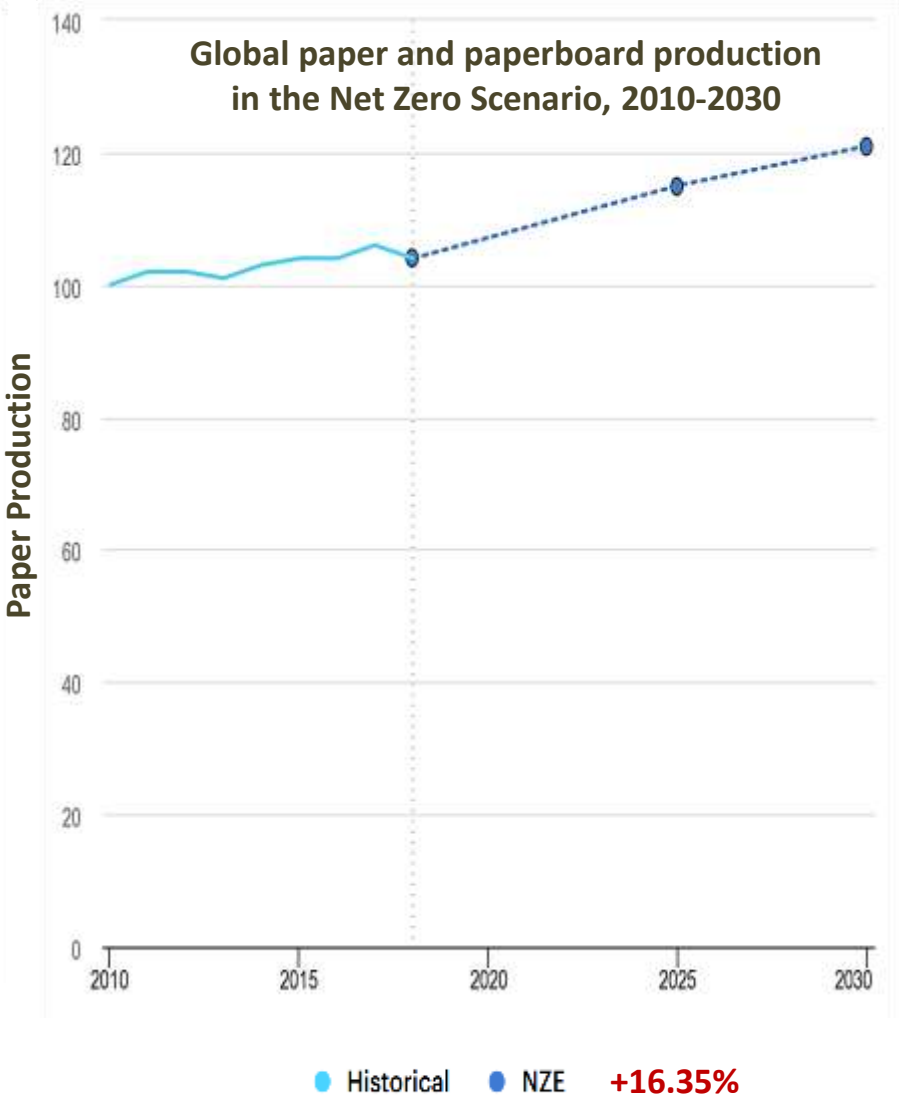
Source: BEE portal

Energy Scenario in Pulp & Paper Industry

- Biomass materials are the main feedstock to the pulp and paper industry. **Over the last almost two-decades the sector has experienced a decoupling of energy use from production due to energy efficiency improvements and process integration measures**
- Demand growth for paper and paperboard has recently accelerated and is **expected to continue rising driven by population and economic growth.**
- Efforts to curb demand and increase recycling can therefore help reduce energy and emissions.
- Improving the energy efficiency is one of the key strategies to reduce CO2 emissions in the sector.
- **Energy efficiency can be improved through higher on-site waste heat recovery and cogeneration.**

Production Scenario in Pulp & Paper Industry



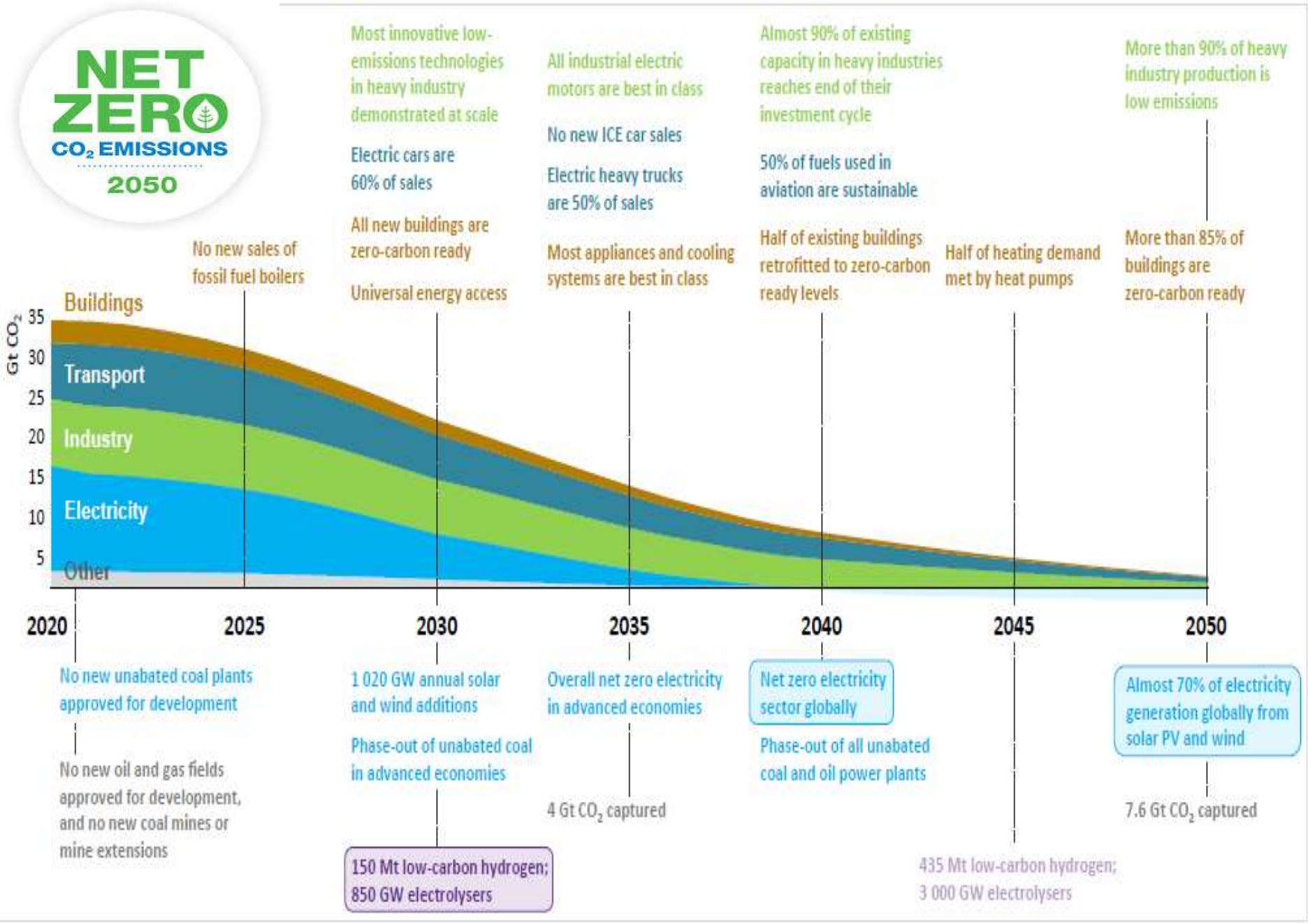


Net zero emissions

Global & National

About Net zero emissions

- Achieving an overall balance between greenhouse gas emissions produced and greenhouse gas emissions taken out of the atmosphere
- Also described as **'carbon neutrality'** and sometimes **'climate neutrality'**
- **Feasible pathways to achieve net-zero emissions**
  - Generate electricity without emissions
  - Use vehicles and equipment that are powered by electricity instead of fossil fuels
  - Use energy more efficiently
  - Remove carbon dioxide from the atmosphere



Source: iea.org

Net zero emissions

Pulp and paper sector

A race to zero – accelerating clean energy transitions

Net zero emissions & Pulp and paper sector

- Net Zero Emissions by 2050 Scenario, energy use **increases 0.5 %** per year to 2030 while annual paper production **expands 1.5 %**
- Greater the recycling, Lower is the energy consumption
- Producing paper from recycled sources would help reduce the energy intensity
- Using a higher share of bio energy and adopting waste heat recovery technologies

Paper Industry Projections

By 2030,

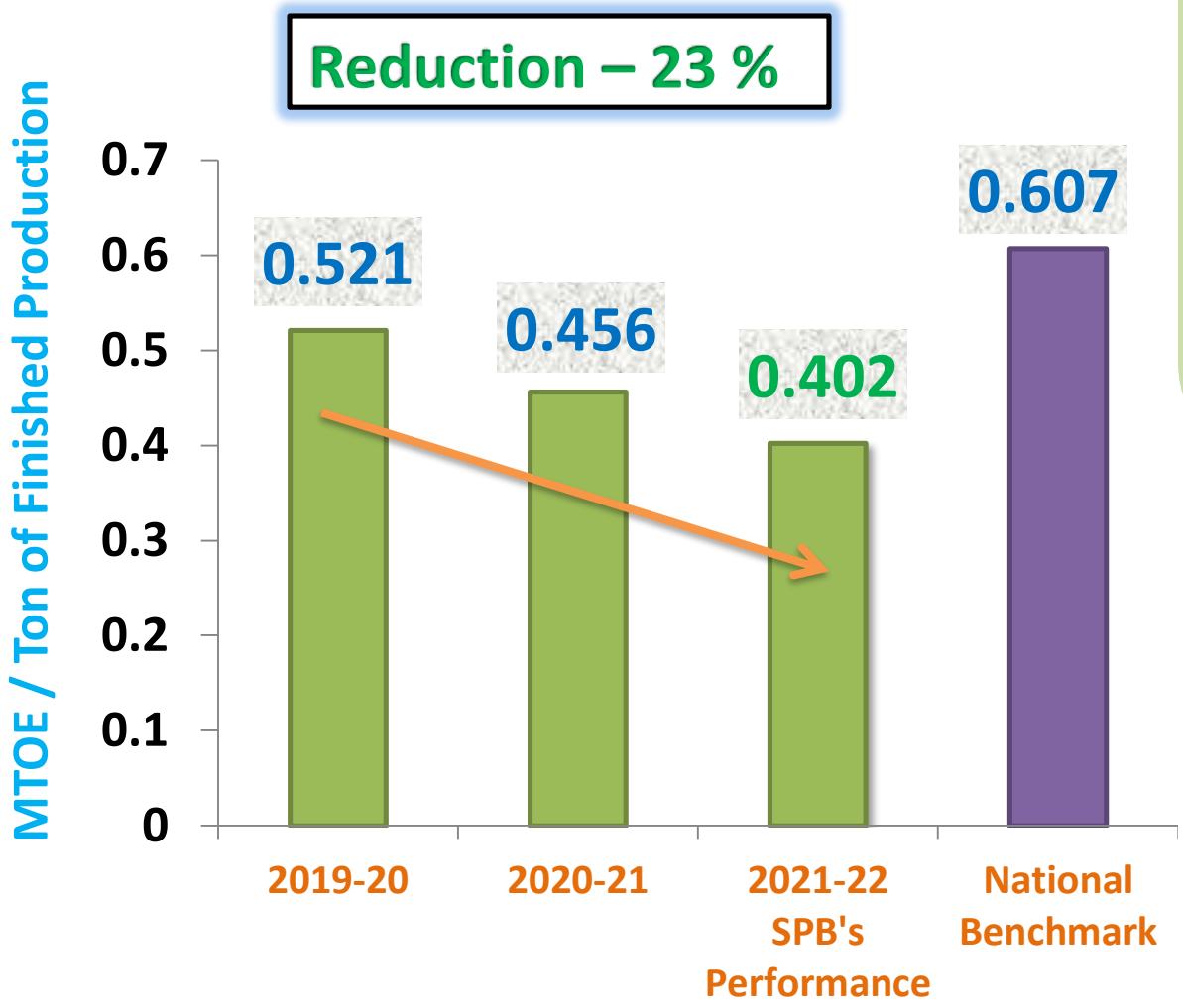
- Projected paper production increase is **+ 37 %** can be achieved with change in product mix.
- Reduced energy demand **(- 12 %)** and a significant reduction of fossil fuel CO2 emissions **(- 31 %)** together with increased use of renewable energy **(+ 25 %).**
- The total employment remains the same considering higher paper production even if the productivity of the employees increases **(+ 30 %).**

Energy Benchmarking

Global & National

- ✓ Fundamental to do a competitive analysis within mills of similar type producing the same products
- ✓ Helpful to perform Gap analysis and it will reveal the differences within mills
- ✓ It is mainly useful in energy efficiency studies and helps to provide directions in the search of energy conservation opportunities
- ✓ The consumption analysis carried out as a part of benchmarking study and also reveals many areas of process improvements with cost saving benefits and optimization

OVERALL ENERGY CONSUMPTION & SEC TREND



KEY HIGHLIGHTS

Drop in EnergyConsumption

10 %

Increase in paper production

13 %

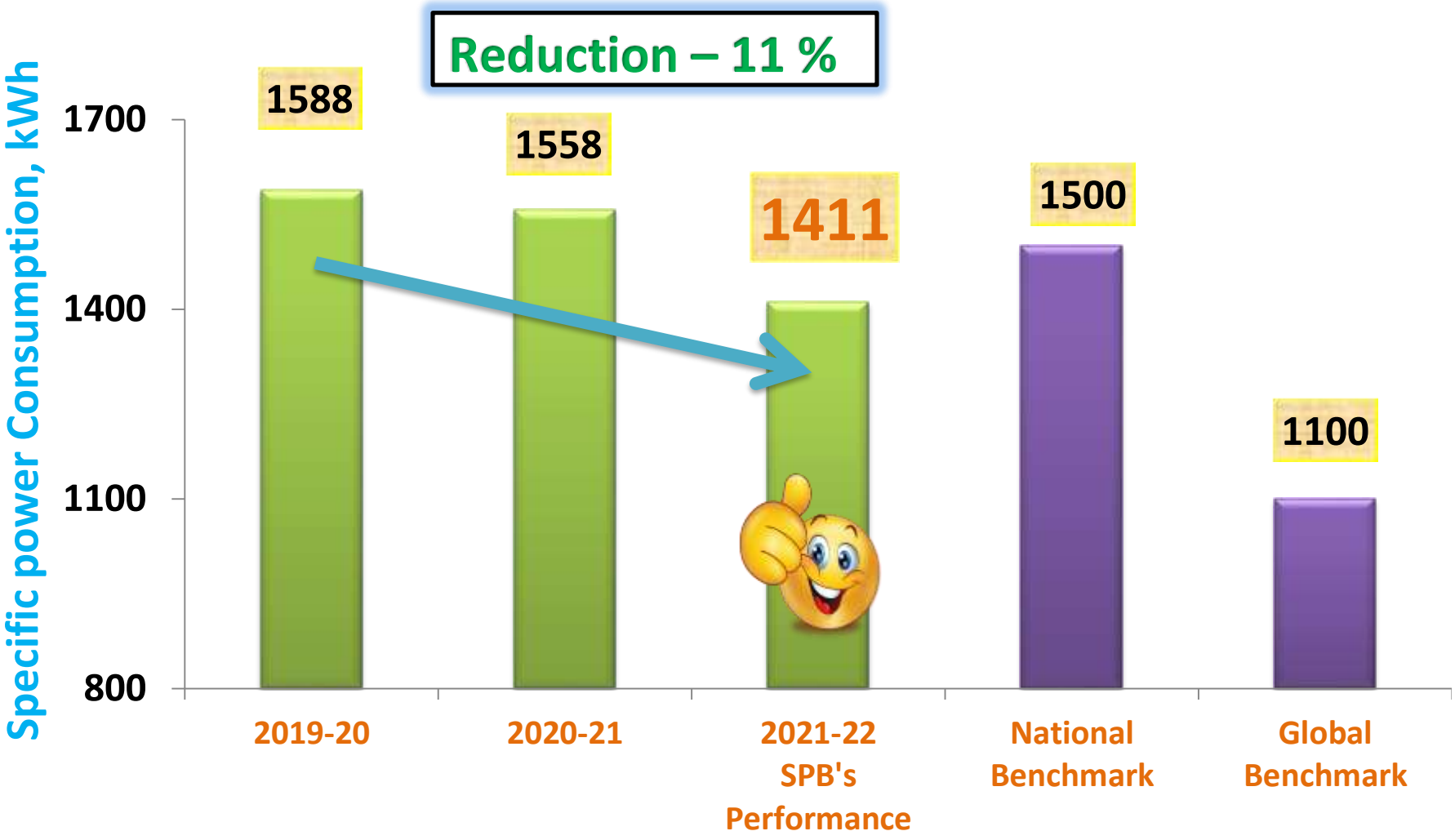
Drop in Specific Energy Consumption

23 %

Production Data (Tons)	
2019-20	125313
2020-21	112489
2021-22	141707

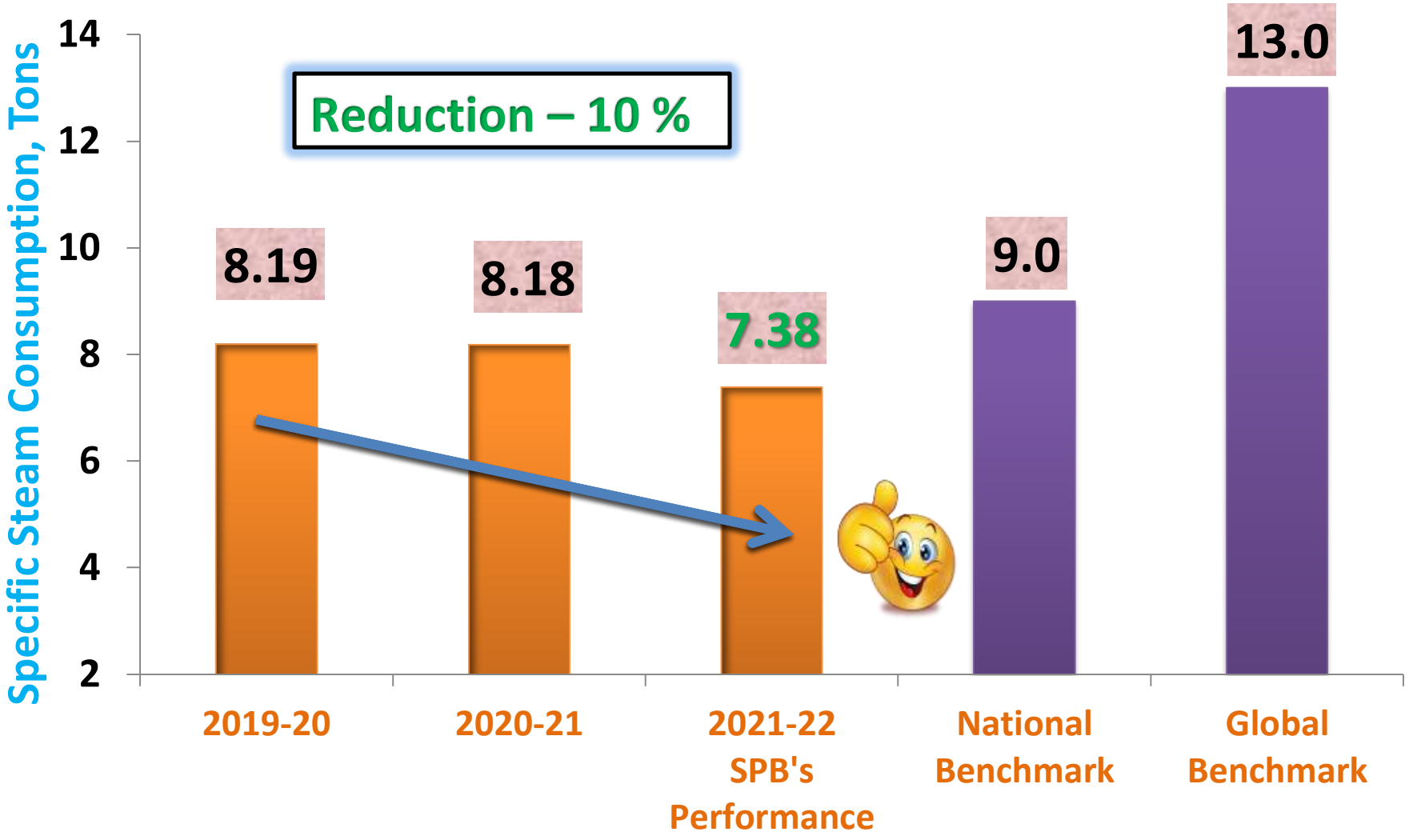
ENERGY BENCHMARKING

Specific Power Consumption Trend



ENERGY BENCHMARKING

Specific Steam Consumption Trend



SPB's Scenario

Case studies

Our Manufacturing Focuses on

- Minimizing Environmental impact and Global Warming
- Elimination of Wastes
- Maximizing Green Resources in our Business
- Sustainable Development
- Improvement in performance efficiency and profitability

OUR APPROACH

TOWARDS

ENERGY BENCHMARKING

&

NET ZERO EMISSIONS

- ENERGY EFFICIENCY
- BEHAVIOURAL CHANGE
- ELECTRIFICATION
- RENEWABLES

1. Energy Efficiency

- **There are still opportunities for energy efficiency improvements.**
- Energy management systems best-in-class industrial equipment such as electric motors, variable speed drives, heaters are installed, and process integration options such as waste heat recovery are **exploited to their maximum economic potentials in the period to 2030 in the NZE.**

2. Behavioural Change

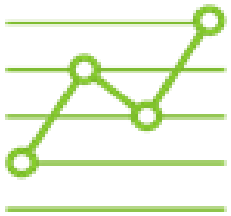
- There are three main types of behavioural change included in the NZE.
    1. Reducing excessive or wasteful energy use
    2. Transport mode switching
    3. Materials efficiency gains

3. Electrification

- The acceleration of electricity demand growth from **2% per year over the past decade to 3% per year through to 2050,** together with a significantly increased share of variable renewable electricity generation, **means that annual electricity sector investment in the NZE is three times higher on average than in recent years.**
- The rise in electricity demand also calls for extensive efforts to ensure the stability and flexibility of electricity supply through demand-side management, **the operation of flexible low-emissions sources of generation including hydropower and bioenergy, and battery storage.**

4. Renewables

- In industry, **bioenergy is the most important direct renewable energy source for low and medium-temperature needs in the NZE.** Solar thermal and geothermal also produce low temperature heat for use in non-energy-intensive industries and ancillary or downstream processes in heavy industries.
- Bioenergy, solar thermal and geothermal together provide about **15% of industry heat demand in 2030, roughly double their share in 2010, and this increases to 40% in 2050.**
- The indirect use of renewable energy via electricity adds 15% to the contribution that renewables make to total industry energy use in 2050.



Process & resource efficiency

Circular Economy

Energy Management Systems

Environmental Performance

Net Zero Emissions

Targets

Sustainability

Theme	Case studies focusing on benchmarking & Net Zero emissions
Energy efficiency (Thermal)	Installation of Black Liquor – White Liquor Spiral Heat Exchanger - RDH
	Installation of indirect heater for heavy black liquor in recovery boiler ➢ Benchmarking in steam per ton of dry solids
Energy efficiency (Green Energy)	Process Reengineering in Evaporation plant
	Modification of existing digester in wood pulp mill
Renewables	Bio gas firing in Lime Kiln (Foul condensate from Evaporation plant + Pith filtrate from Agro pulp mill) ➢ Benchmarking in specific fuel consumption ➢ Share of renewable energy in our mill

Case study 1 - Installation of Black Liquor – White Liquor Spiral Heat Exchanger - RDH

Trigger for this project:

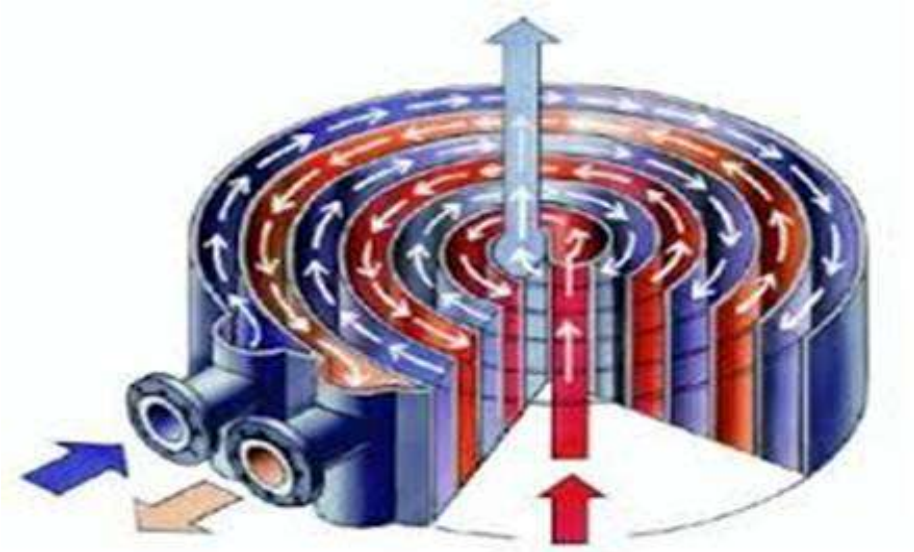
- White liquor temperature could not be maintained in RDH station with the conventional shell and tube heat exchanger.
- This had necessitated looking into alternate advanced heat exchanger with state of the art technology.

Spiral Heat Exchanger (SHE) :

- Single flow channel and 100% pure counter current flow heat exchange concept, produces flow path with high shear rate and turbulence resulting in high heat transfer co-efficient and low fouling tendency

Advantages of SHE

- The continuous curving flow channel produced, results in intense scrubbing effect that prevents fouling of deposits formation
- The resultant overall heat exchange can be anywhere from 30 to 50% higher than in conventional shell and tube heat exchanger
- Eliminates leakages – Intra, external & bypassing – Unlike S&T heat exchanger
- Compact unit –low footprint



Performance highlights		
Parameter	**Present**	**Earlier**
Heat Exchanger	Spiral Heat Exchanger	Shell & Tube
White liquor outlet temperature	100 - 120 ^{o}C	85 – 100 ^{o}C
WBL supply temperature to Chemical recovery Complex	82 ^{o}C	90 ^{o}C

Outcomes	
Steam savings	25 TPD
Annual steam savings	9125 Tonnes
Cost savings	45.62 Lakhs

Replication Potential : Can be replicated by all industries

Case study 2 - Installation of MP steam indirect heater for heavy black liquor

Trigger for this project:

- Heavy Black liquor is heated with direct and indirect heat exchangers.
- In existing LP steam Indirect heater, the heater gain is only 5 Deg C. The firing temperature is further increased with the MP steam through a direct heater upto 130 Deg C
- MP steam entry into the boiler can be avoided

Indirect Heat Exchanger

- Existing indirect heater uses LP steam as a heating medium which meets the demand for 580 TPD of HBL firing
- New MP steam indirect heater designed and installed to meet up our future requirement upto 950 TPD

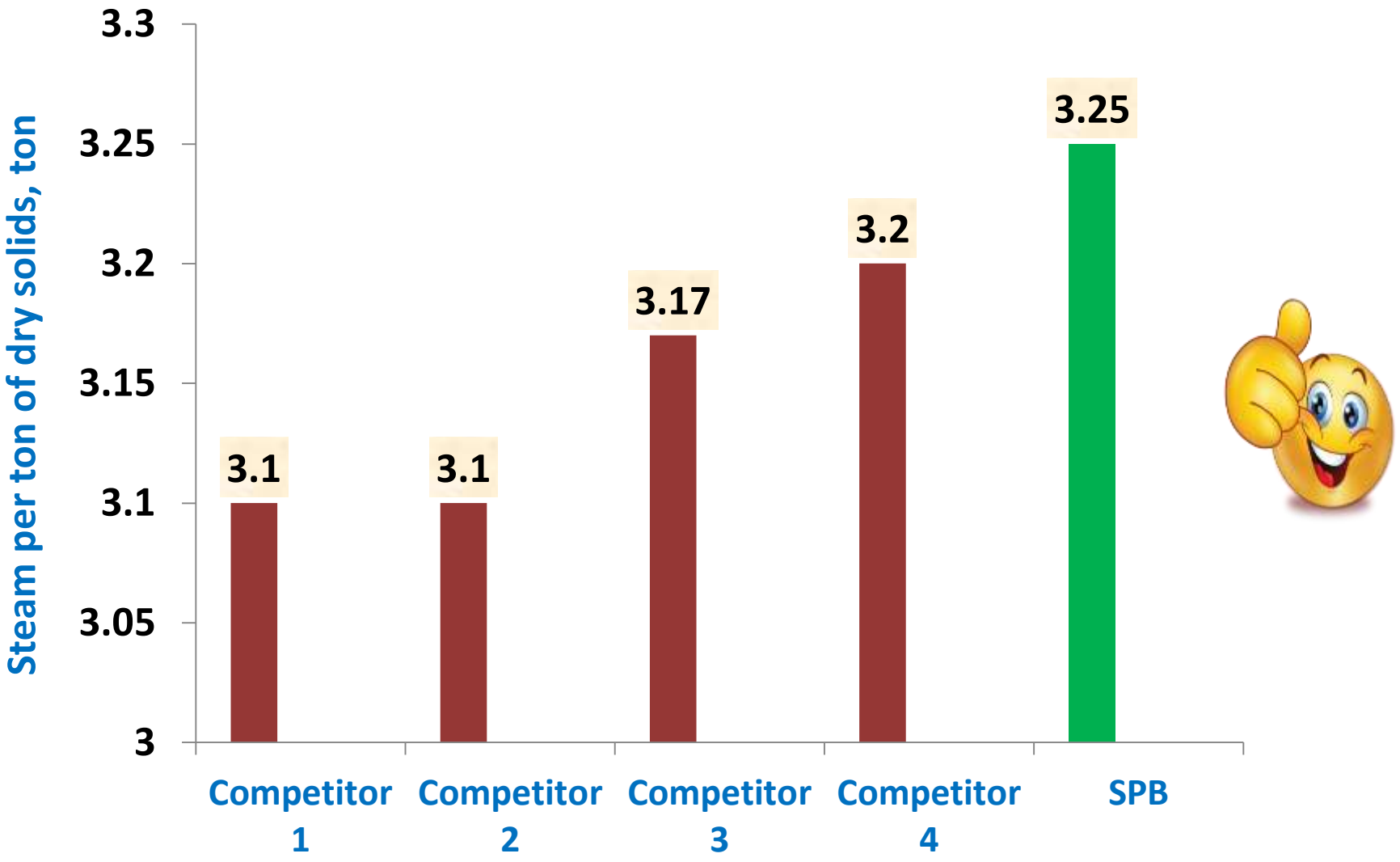
Outcomes

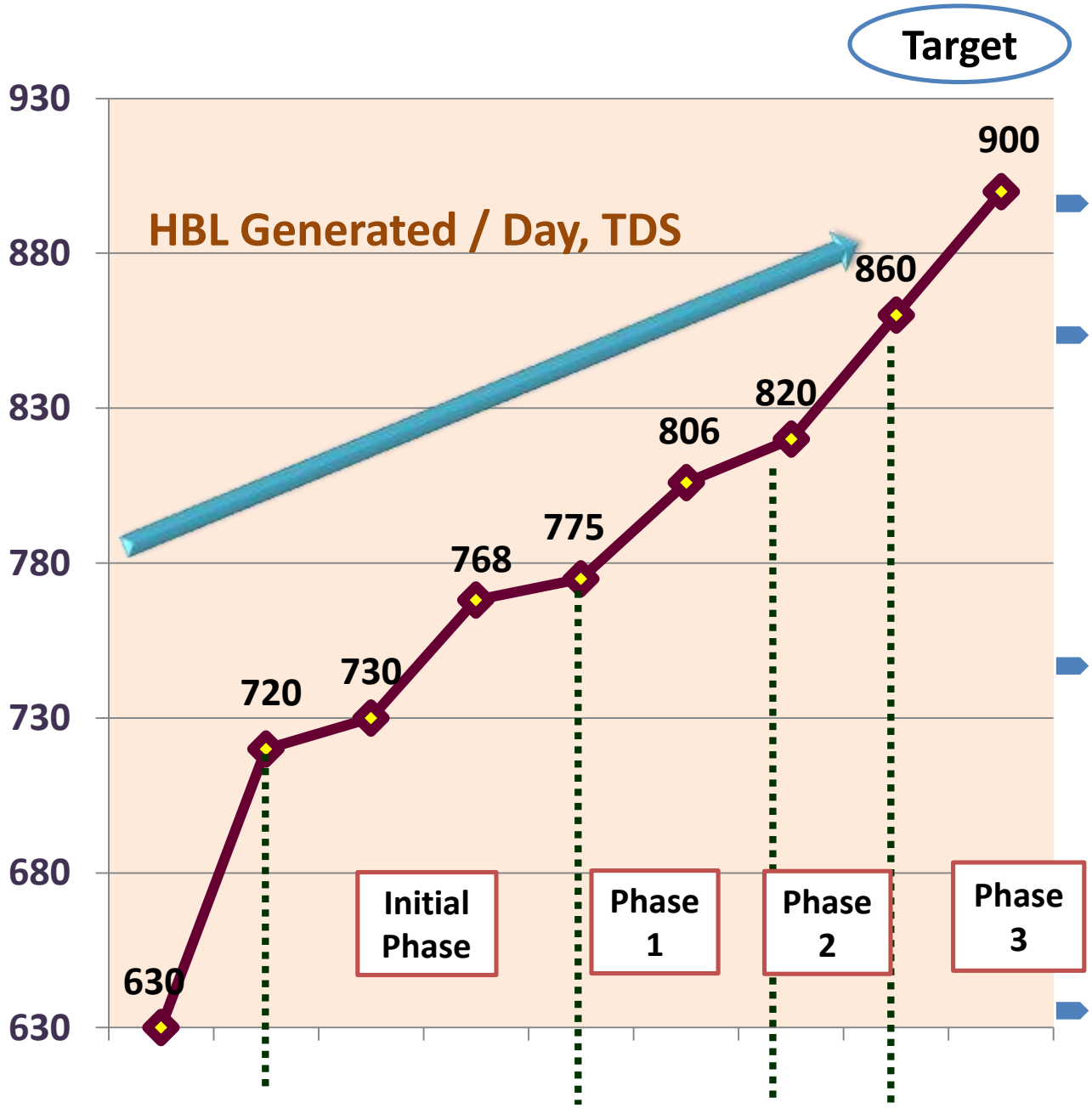
- The delta T of 15 Deg C, which was raised through direct steam, is now increased through the New Indirect Heat Exchanger
- MP steam entry to boiler of about 20 TPD is avoided
- The condensate is collected and taken back to the DM water
- Steam per ton of solids raised from 3 to 3.15 immediately on commissioning & presently upto 3.25 tons

HBL fired	**950 TPD**
Extra Steam generation @ 0.1 t/t	**95 TPD**
Annual cost savings	**260 lakhs**

Replication Potential : Can be replicated by all industries

BENCHMARKING IN STEAM PER TON OF DRY SOLIDS





Phase 1

- Shifting of Ash crystallization
- Diversion of vapour from PCFT 1 to CAL#3 vapour header

Phase 2

- Running CAL 2A and 2B, liquor in series and vapour in parallel mode

Phase 3

- Digester modification

Case study 3 - Enhancing Black liquor Evaporation capacity through Process Reengineering

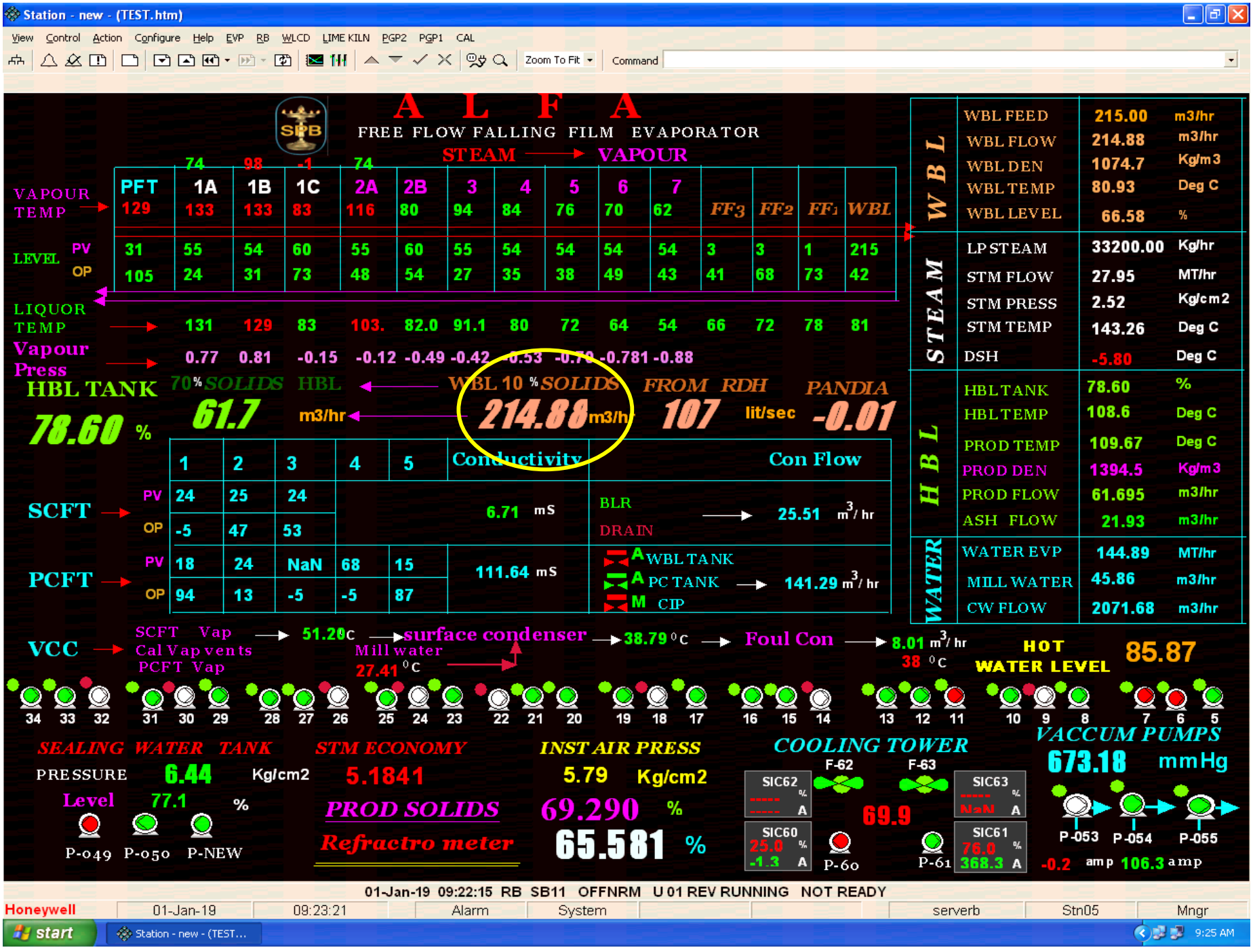
Trigger for the Project

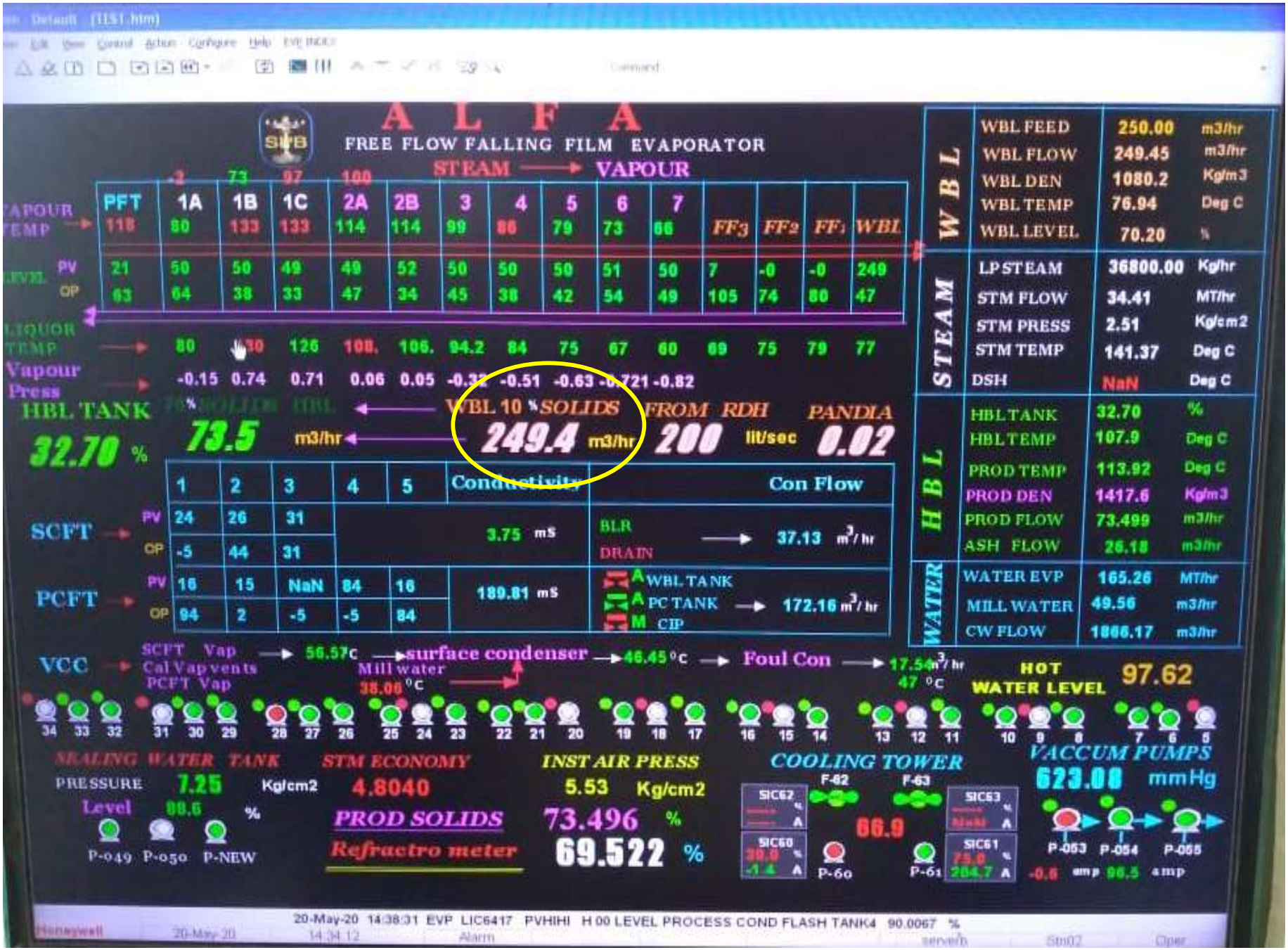
- **Strong need for enhancing the pulp production for sustainability.**
- To increase the Renewable Energy and to reduce the fossil fuel.
- Over all cost reduction by substituting imported pulp with virgin pulp.

Challenges faced

- **All suppliers including OEM supplier (Alfa Laval) recommended for major investment and modification in the system.**
- **To find a new way to debottleneck the capacity limitation.**

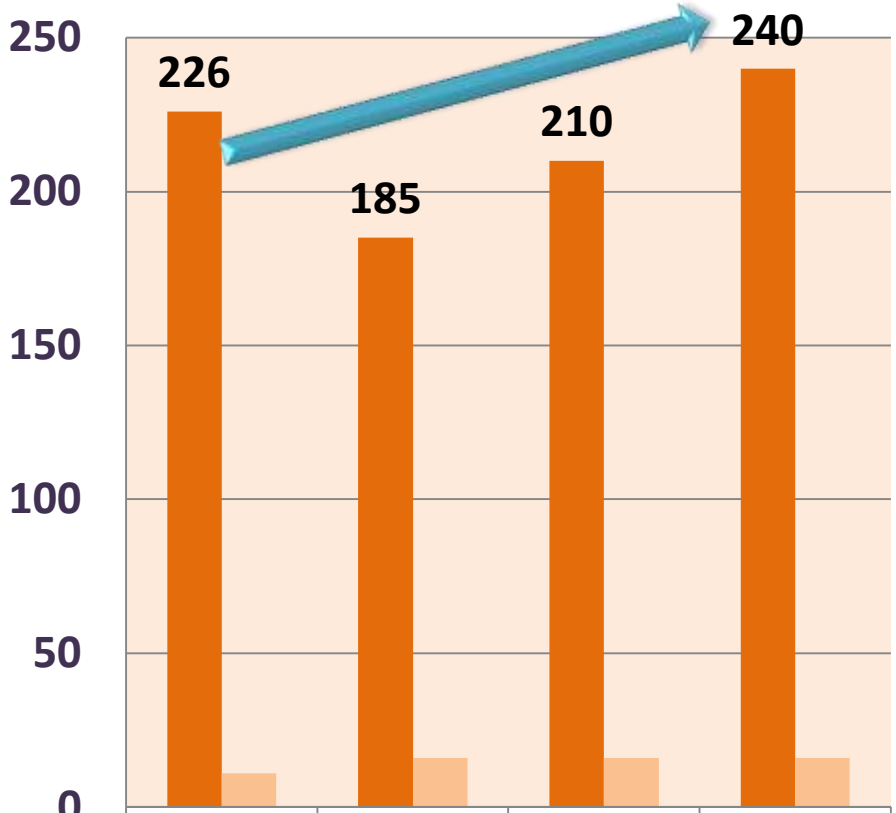
Changes Made	Before (m3 / hr)	After (m3 / hr)	Advantages
Shifting of Ash crystallization	210	210	BLS fired 806 tpd, tube jamming in 1st effect reduced from 800 tubes to 180 tubes and cleaning frequency increased to 55 days from 35 days
Diversion of vapour from PCFT# 1 to CAL#3 vapour header	210	215	BLS fired at 810 tpd.
Running CAL 2A and 2B, liquor in series and vapour in parallel mode.	215	260	BLS fired at 860 tpd. We anticipate that with the given figures we may able to fire 900 tpd of solids firing.


Station - new - (TEST.htm)
View Control Action Configure Help EVP RB WLCD LIME KILN PGP2 PGP1 CAL
Zoom To Fit
Command
A L F A
FREE FLOW FALLING FILM EVAPORATOR
STEAM → VAPOUR
74 98 -1 74
PFT 1A 1B 1C 2A 2B 3 4 5 6 7 FF3 FF2 FF1 WBL
VAPOUR TEMP → 129 133 133 83 116 80 94 84 76 70 62
LEVEL PV 31 55 54 60 55 60 55 54 54 54 54 3 3 1 215
OP 105 24 31 73 48 54 27 35 38 49 43 41 68 73 42
LIQUOR TEMP → 131 129 83 103. 82.0 91.1 80 72 64 54 66 72 78 81
Vapour Press → 0.77 0.81 -0.15 -0.12 -0.49 -0.42 -0.53 -0.70 -0.781 -0.88
HBL TANK 78.60 %
70% SOLIDS HBL 61.7 m3/hr
WBL 10 % SOLIDS 214.88 m3/hr
FROM RDH 107 lit/sec
PANDIA -0.01
1 2 3 4 5 Conductivity Con Flow
SCFT PV 24 25 24 6.71 mS BLR DRAIN → 25.51 m3/hr
OP -5 47 53
PCFT PV 18 24 NaN 68 15 111.64 mS A WBL TANK A PC TANK M CIP → 141.29 m3/hr
OP 94 13 -5 -5 87
WBL
WBL FEED 215.00 m3/hr
WBL FLOW 214.88 m3/hr
WBL DEN 1074.7 Kg/m3
WBL TEMP 80.93 Deg C
WBL LEVEL 66.58 %
STEAM
LP STEAM 33200.00 Kg/hr
STM FLOW 27.95 MT/hr
STM PRESS 2.52 Kg/cm2
STM TEMP 143.26 Deg C
DSH -5.80 Deg C
HBL
HBL TANK 78.60 %
HBL TEMP 108.6 Deg C
PROD TEMP 109.67 Deg C
PROD DEN 1394.5 Kg/m3
PROD FLOW 61.695 m3/hr
ASH FLOW 21.93 m3/hr
WATER
WATER EVP 144.89 MT/hr
MILL WATER 45.86 m3/hr
CW FLOW 2071.68 m3/hr
VCC
SCFT Vap
Cal Vap vents
PCFT Vap
51.20C
Mill water 27.41 °C
surface condenser
38.79 °C
Foul Con → 8.01 m3/hr 38 °C
HOT WATER LEVEL 85.87
34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5
SEALING WATER TANK
PRESSURE 6.44 Kg/cm2
Level 77.1 %
P-049 P-050 P-NEW
STM ECONOMY 5.1841
PROD SOLIDS 69.290 %
Refractro meter 65.581 %
INST AIR PRESS 5.79 Kg/cm2
COOLING TOWER
F-62 F-63
SIC62 SIC63 SIC60 25.0 -1.3 A SIC61 76.0 368.3 A
69.9
P-60 P-61
VACCUM PUMPS 673.18 mmHg
P-053 P-054 P-055
-0.2 amp 106.3 amp
01-Jan-19 09:22:15 RB SB11 OFFNRM U 01 REV RUNNING NOT READY
Honeywell 01-Jan-19 09:23:21 Alarm System serverb Stn05 Mngr
start Station - new - (TEST... 9:25 AM


ALFA
FREE FLOW FALLING FILM EVAPORATOR
STEAM → VAPOUR
PFT 1A 1B 1C 2A 2B 3 4 5 6 7 FF3 FF2 FF1 WBL
VAPOUR TEMP
LEVEL PV OP
LIQUOR TEMP
Vapour Press
HBL TANK 32.70 %
WBL 10 % SOLIDS FROM RDH 249.4 m3/hr
73.5 m3/hr
PANDIA 200 lit/sec 0.02
SCFT PV OP
PCFT PV OP
Conductivity 3.75 mS
189.81 mS
Con Flow
BLR DRAIN → 37.13 m3/hr
WBL TANK
PC TANK → 172.16 m3/hr
CIP
VCC
SCFT Vap → 56.57°C → surface condenser → 46.45°C → Foul Con → 17.54 m3/hr 47°C
Cal Vap vents
PCFT Vap
Mill water 38.00°C
HOT WATER LEVEL 97.62
SEALING WATER TANK
PRESSURE 7.25 Kg/cm2
Level 88.6 %
P-049 P-050 P-NEW
STM ECONOMY 4.8040
PROD SOLIDS
Refractro meter
INST AIR PRESS 5.53 Kg/cm2
73.496 %
69.522 %
COOLING TOWER
F-62 F-63
SIC62 SIC63 SIC60 SIC61
86.9
P-60 P-61
VACCUM PUMPS 623.00 mmHg
P-053 P-054 P-055
-0.6 amp 96.5 amp
WBL FEED 250.00 m3/hr
WBL FLOW 249.45 m3/hr
WBL DEN 1080.2 Kg/m3
WBL TEMP 76.94 Deg C
WBL LEVEL 70.20 %
LP STEAM 36800.00 Kg/hr
STM FLOW 34.41 MT/hr
STM PRESS 2.51 Kg/cm2
STM TEMP 141.37 Deg C
DSH NaN Deg C
HBL TANK 32.70 %
HBL TEMP 107.9 Deg C
PROD TEMP 113.92 Deg C
PROD DEN 1417.6 Kg/m3
PROD FLOW 73.499 m3/hr
ASH FLOW 26.18 m3/hr
WATER EVP 165.26 MT/hr
MILL WATER 49.56 m3/hr
CW FLOW 1866.17 m3/hr
20-May-20 14:38:31 EVP LIC6417 PVHIHI H 00 LEVEL PROCESS COND FLASH TANK4 90.0067 %

Increase in WBL Processing rate

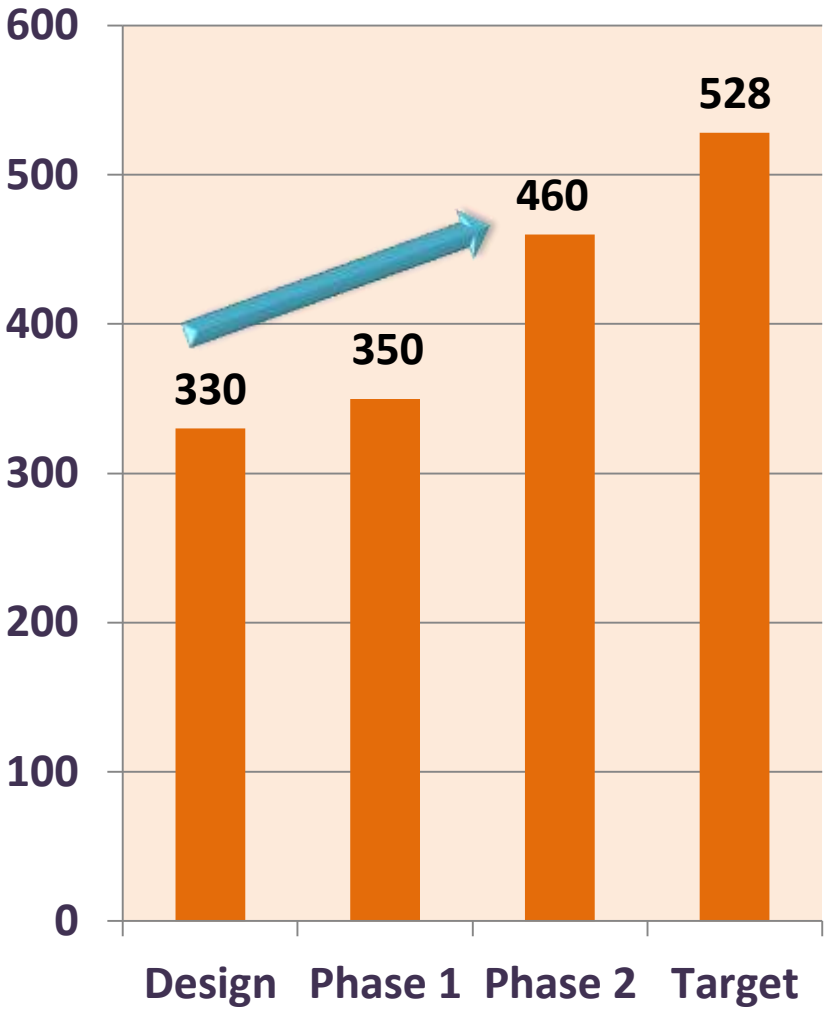
45 % Increase in Inlet Solids



	Design	Phase 1	Phase 2	Phase 3
m3 / hr	226	185	210	240
% Solids	11	16	16	16

Increase in Pulp Production, TPD

31 % Increase



Outcomes achieved by the project

Description	UOM	Value
Investment	Rs. Lacs	24
Savings	Rs. Crores	8.15
Increase in Pulp Production (Unbleached)	TPD	350 to 460

Replication Potential – Can be considered by all Integrated Pulp & Paper Mill

Case study 4

Digester Modification

- Increased Pulp production from 380 to 430 tpd
- An unique approach where in design of digester was challenged
- An unique route with the help of in house team
- All the modifications were done in a period of 6 months time in phases with minimum investment
- Strengthening our sustainability practices

Trigger for the Project

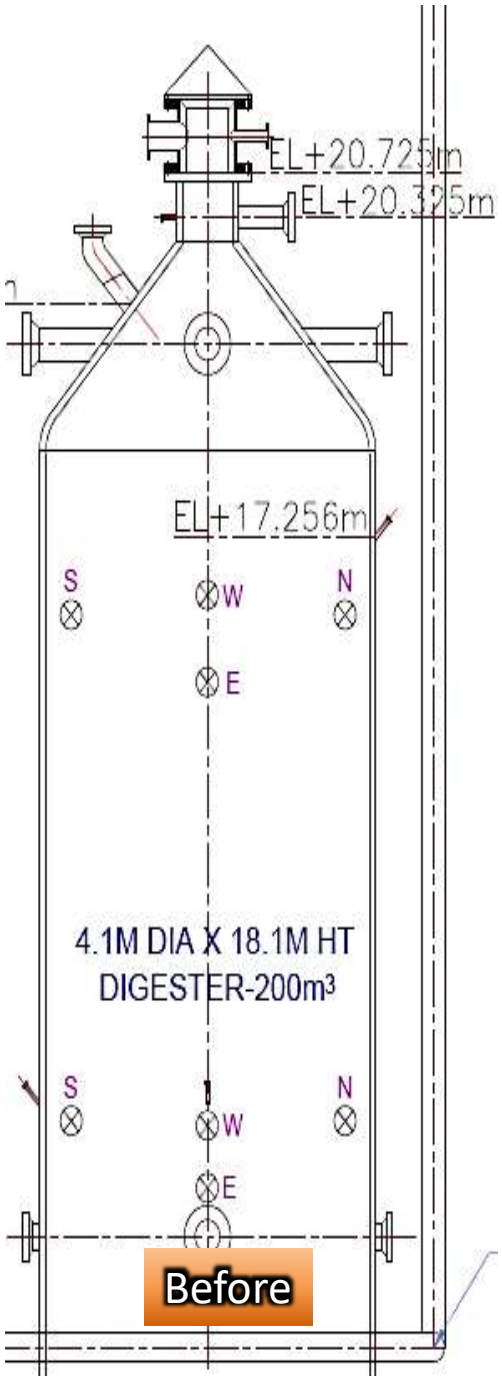
- Need for enhancing Green Energy
- Substitution of imported pulp with own pulp
- Reduction in GHG

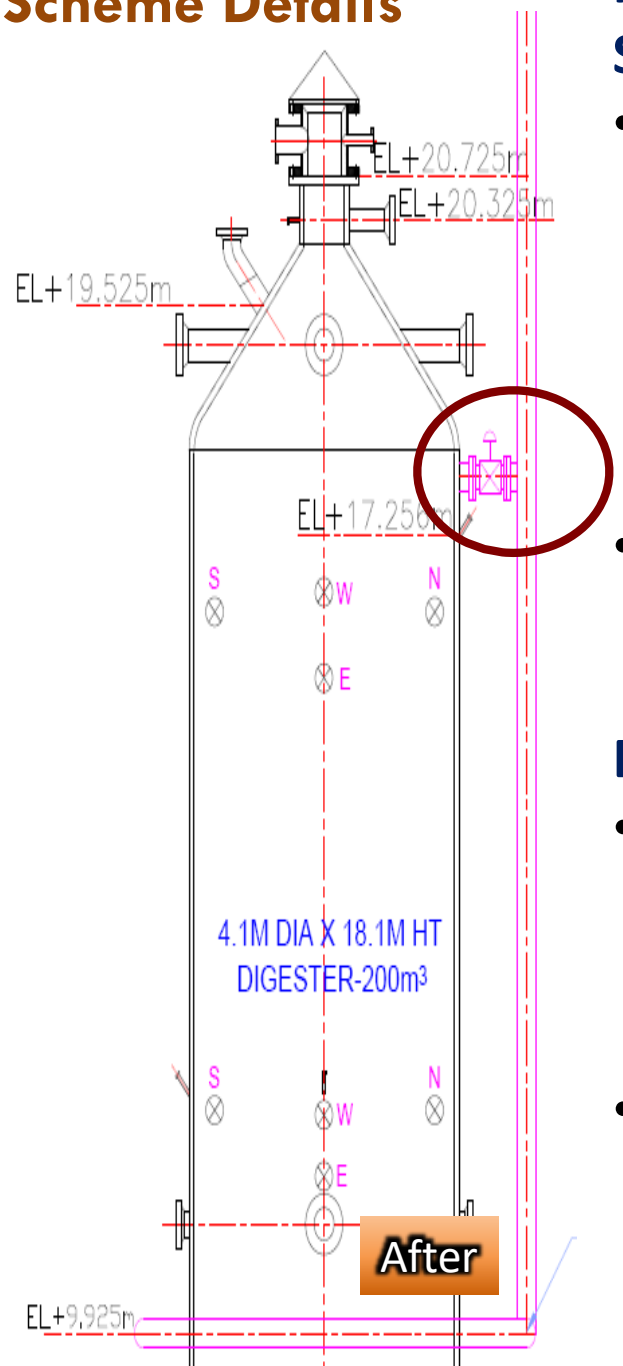
Introduction

- We are sort of pulp to match paper production. Major modifications in paper machines recently has increased the pulp demand further.
- Moreover, necessity of generating more green power is the need of the hour.
- To address this issues, following modifications were thought of.

1. **To have top air evacuation in one digester with dual logic** with the existing system (With middle and top valve openings).
2. **Enlarging the middle header from 12” diameter to 16” diameter** control valve in one digester with self-draining.
3. **Enlargement of discharge line nozzle size from 300 mm diameter to 500 mm diameter** by replacing discharge valve.

Scheme Details





Modification – 1 (Chip fill Sequence)

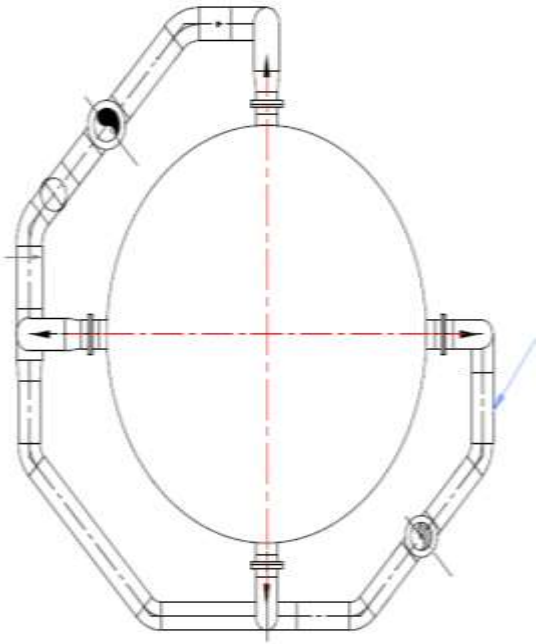
- To have top air evacuation in one digester with dual logic with the existing system (With middle and top valve openings)
- Investment – Rs. 24.51 Lacs

Benefits Achieved

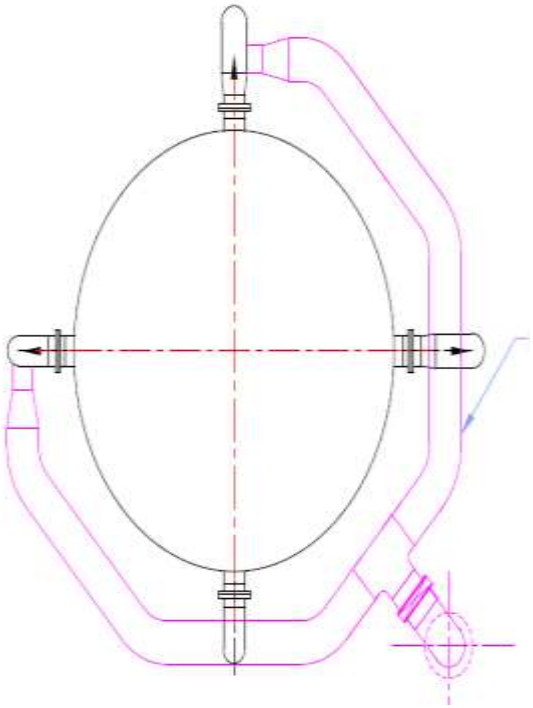
- Chip fill quantity in digester increased by **1.5 Tons / digester**
- Chip fill time reduction achieved is by **7 minutes minimum** (from 32 minutes to 25 minutes)

Scheme Details

Before



After



Modification – 2 (TTT Sequence)

- Enlarging the middle header from 12” diameter to 16” diameter control valve in one digester with self draining.

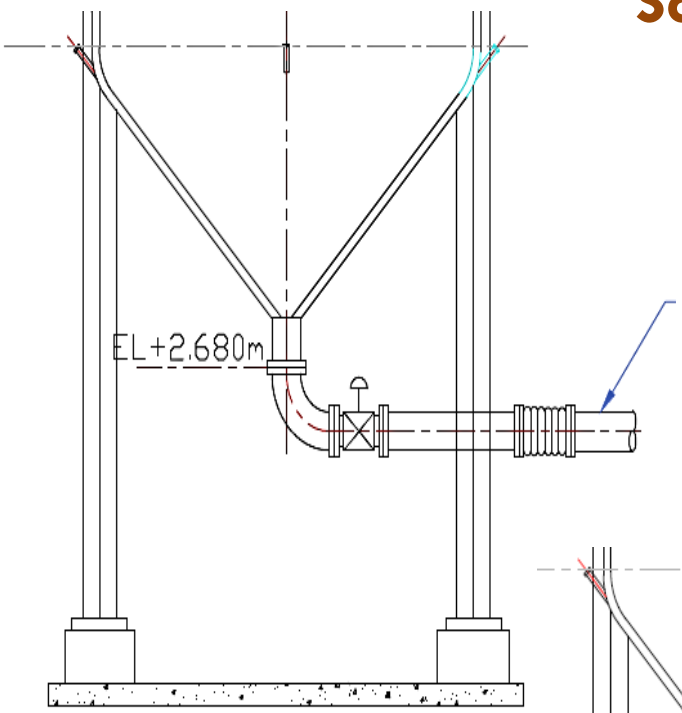
- Investment – Rs. 34.07 Lacs

Benefits Achieved

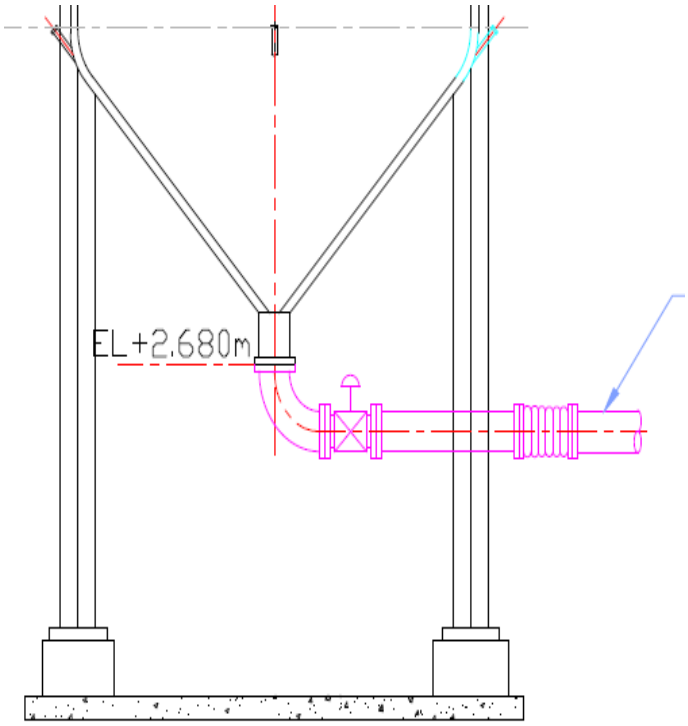
- Circulation volume increased from **130 LPS to 180 LPS**
- TTT time cycle reduced by **15 mins / cycle.**
- **Uniform Temperature profile achieved.**

Scheme Details

Before



After



Modification – 3 (Pump out Sequence)

- Enlargement of discharge line nozzle size from 300mm diameter to 500mm diameter by replacing discharge valve.
- Investment – Rs. 101.52 Lacs

Benefits Achieved

- Clean pump out in **one stroke**
- Cycle time reduction from **310 minutes to 290 minutes**/pump out
- **Displacement liquor entry under low velocity.**

Outcomes achieved by the project

Description	UOM	Values
Increase in Pulp Production	TPD	380 to 430
Increase in Green Energy	%	6
Investment	Rs. Lacs	148
Savings	Rs. Crores	8.15

“Replication Potential – Yes can be horizontally applied”

Case study 5

Bio-gas firing in Rotary Lime Kiln

"An Unconventional Solution to Conventional Problem"

- Our "Unique way of handling foul condensate" and fire as partial fuel replacement in Lime kiln.
- It was developed with the help of In-house team and utilising the existing facilities.
- Care being taken for mitigating H_2S by addition of Ferric chloride.
- Low Investment.
- By this, we have reduced 20% load to ETP, and furnace oil reduction of about 3 to 3.5 KL / Day

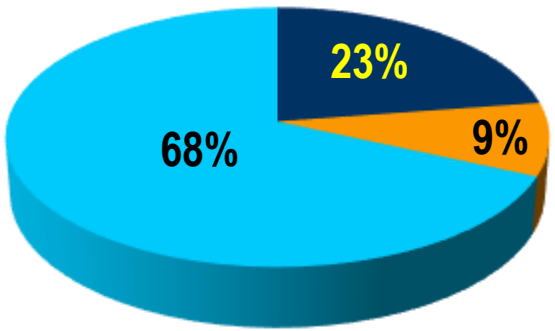
Bio-gas firing in Rotary Lime Kiln

Trigger for the Project

- To assess the organic load for effective treatment, the environmental cell analyzed the various parameters to minimize the load to ETP at source.
- Based on the study it is found that the pith filtrate from Bagasse pulp mill and foul condensate from SRP tops the list.

Stream	m^3 / day	PPM	TPD
Foul Condensate	360	16000	5.4
Bagasse Filtrate	340	5620	2.2
Total	700	-	7.6

% of COD Contribution Mill Wide



Foul Condensate Evaporator Vacuum Pump sealing water Rest of the Mill Effluents

Foul Condensate ➡ A Source of Energy

- Foul Condensate generated from Evaporators contain reduced Sulphur gas, Methanol, Turpentine etc

  - Foul Condensate Generation 8000 Kg / Hour
  - Methanol 7.5 Kg / Tonne of Pulp
  - Turpentine 0.50 Kg / Tonne of Pulp
  - TRS 1.20 Kg / Tonne of Pulp

- Negative impact to the Environment via VOC and Odour
- Untreated Foul Condensate is let out to the sewer creating huge impact to the Environment by means of high BOD

How to handle Foul Condensate

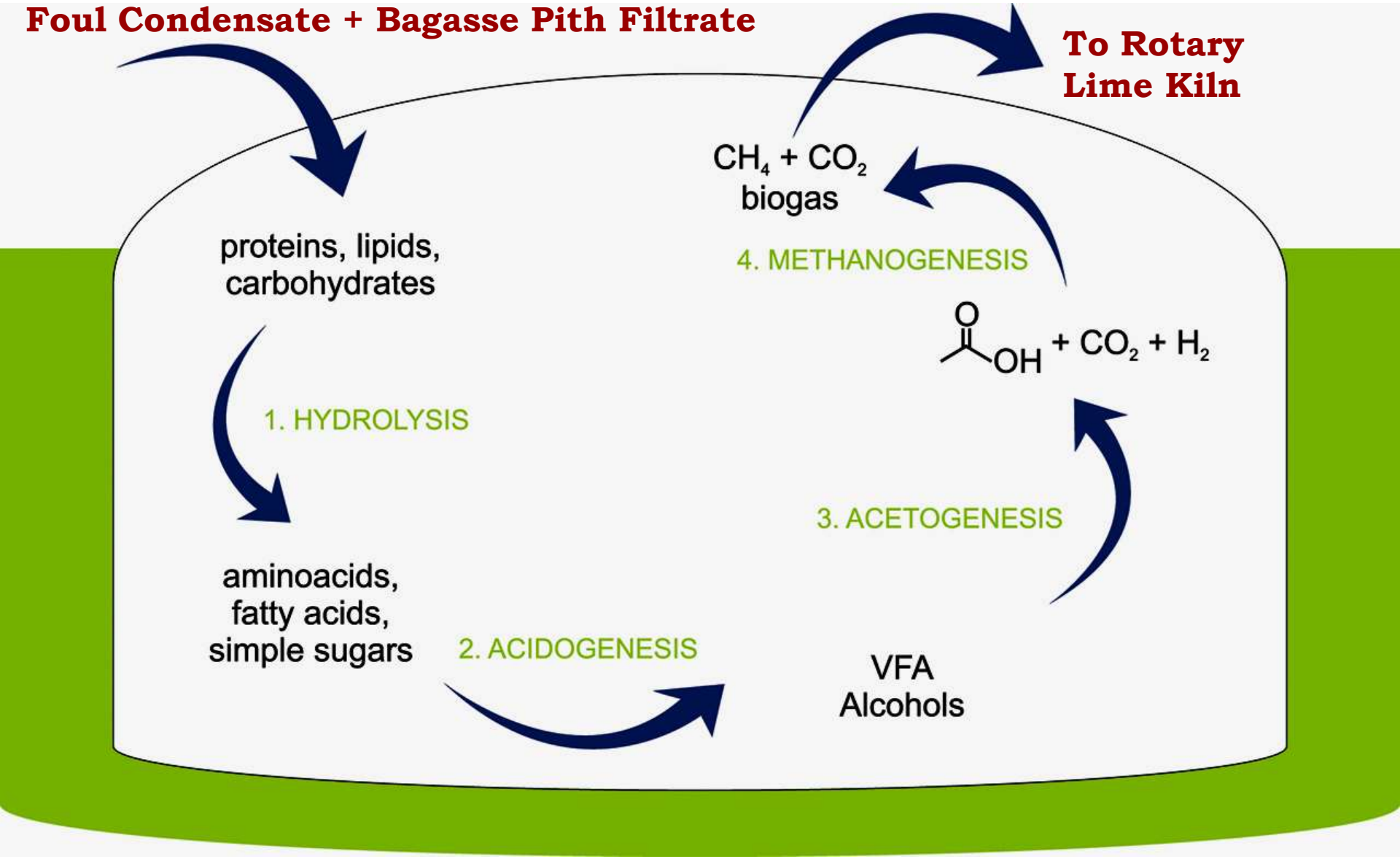
Parameters	Conventional Steam Stripping	Uniqueness Treatment in Anaerobic Lagoon
Methodology	To install an Expensive Stripper Column in Black Liquor Evaporation plant	The Treatment of foul condensate along with Bagasse effluent biologically for generation of bio gas
Motive Energy	Consumes energy to generate energy	Uses natural phenomena
Initial cost	High	Moderate
O & M cost	High	Low
Recovery of water	Yes	No
Foot Print	Minimum	High

Conventional – Steam Stripping

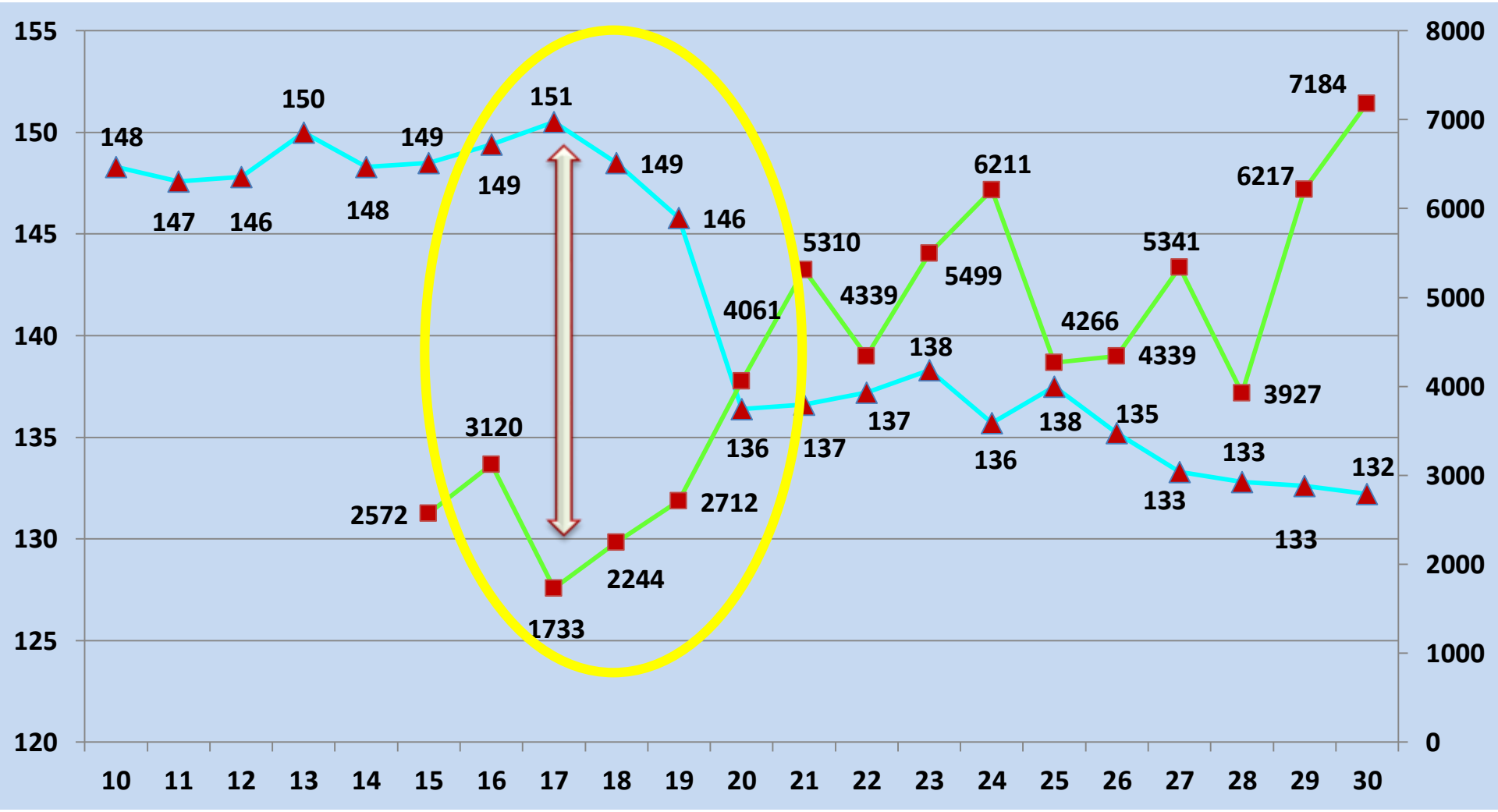
Uniqueness – Treatment in Anaerobic Lagoon

Scheme Details

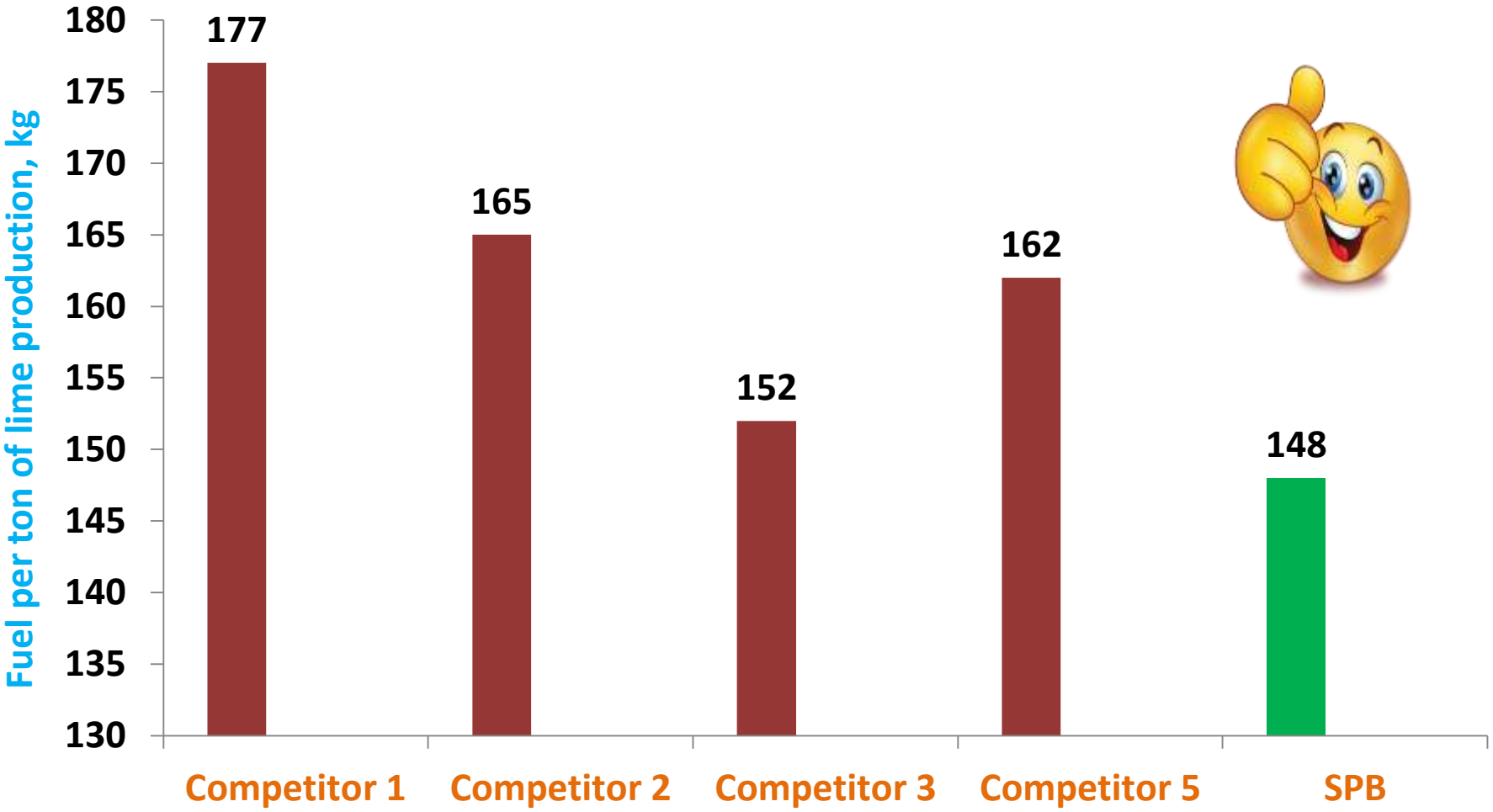
- An anaerobic lagoon was installed early in 1984 to treat the High BOD effluent from Bagasse plant.
- The biogas generated was let to the atmosphere without any collection device.
- In 2013, a suitable supplier was identified to make a balloon cover above the anaerobic lagoon to collect the bio gas and was pumped by a blower to the power boilers to a tune of 2000 Nm3/day.


Foul Condensate + Bagasse Pith Filtrate
To Rotary Lime Kiln
$CH_4 + CO_2$ biogas
4. METHANOGENESIS
proteins, lipids, carbohydrates
$+ CO_2 + H_2$
1. HYDROLYSIS
3. ACETOGENESIS
aminoacids, fatty acids, simple sugars
2. ACIDOGENESIS
VFA Alcohols

Kiln Fuel reduction analysis – Day wise Energy consumption monitoring



BENCHMARKING
SPECIFIC FUEL CONSUMPTION



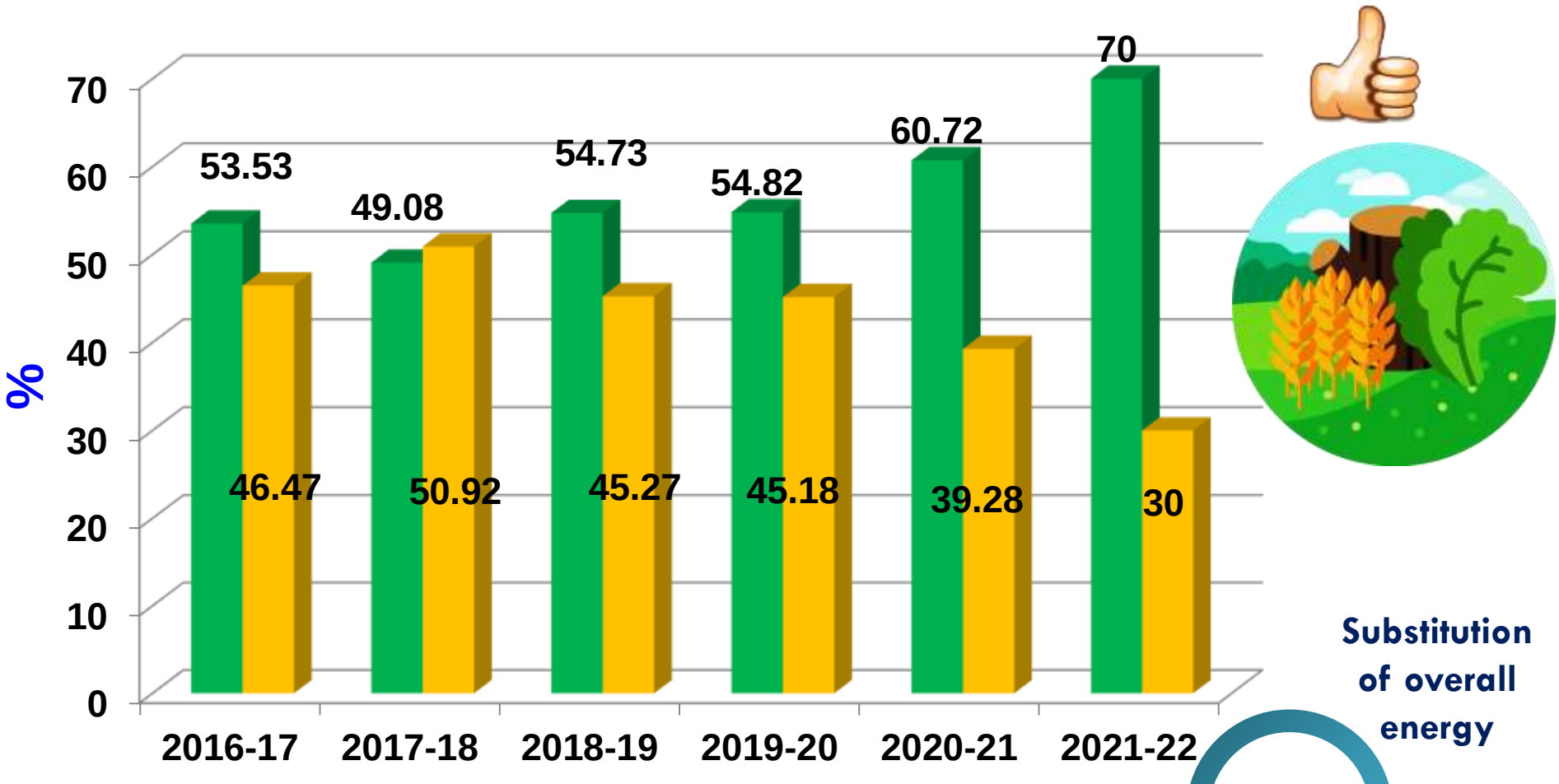
Outcome achieved by Project Implementation

Description	UOM	QTY
Furnace oil reduction	KL / day	3 – 3.5
Savings	Rs in Crores / Annum	3.6

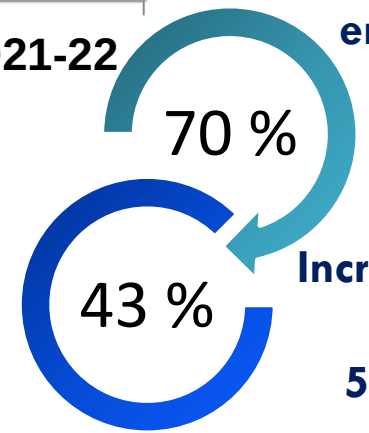
- ☆ Elimination of odor nuisance
- ☆ Reduced energy and nutrient consumption in the aeration system

Replication Potential – Can be replicated by all Integrated Pulp & Paper Mill

UTILIZATION OF RENEWABLE ENERGY SOURCES



Substitution of overall energy



Increased in last 5 years

"Generation of Green Energy by firing black liquor in Recovery Boiler"

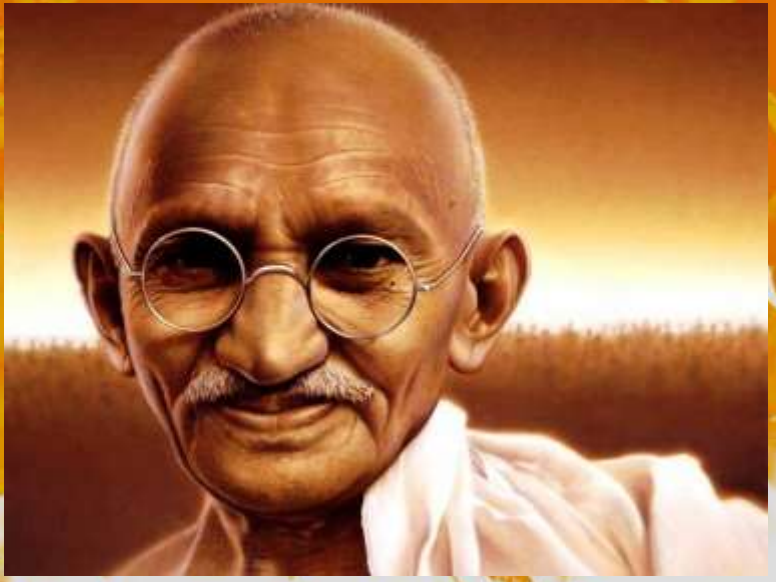
Highlights from case studies

- Steam saving from Spiral heat Exchanger – **25 TPD**
- Green steam generation from recovery boiler after installation of MP steam indirect heater – **95 TPD**
- Process re-engineering in Evaporation plant – **5% increase in RE share.**
- Digester modification to enhance pulp production and Green Energy – **32 TPD pulp production increased & 4% increase in RE share**
- Usage of Bio fuel to reduce fossil fuel consumption in CPP – **40 TPD coal reduction**
- Usage of Bio gas to reduce fossil fuel consumption in Lime kiln – **3.5 TPD Furnace oil reduction**

Future Projects towards Net Zero Emissions

Future projects

- In situ PCC Plant
- Increase bio energy
- Group captive solar power
- Doubling the present bagasse pulp production
- Application of “Pinch analysis technology” across the mill



Be the change you wish to see in the world.

Mahatma Gandhi

Thank You