ASIAN PAINTS LTD
PENTA DIVISION, CUDDALORE - TAMILNADU

24TH NATIONAL AWARD

EXCELLENCE IN ENERGY MANAGEMENT 2023

ASIAN PAINTS LTD

PENTA DIVISION,
CUDDALORE -
TAMILNADU

- **TEAM MEMBERS**

1 S.SAMPATHKUMAR – Senior Manager – Plant Engineering

2 ALKESH MODI – Manager – Plant Engineering

3 M.ARUNKUMAR – Asst. Manager – Technical Services

ABOUT OUR GROUP

#1 Paint company in India

60+ Countries served

27 In house paint manufacturing facilities worldwide

42 Beautiful home stores in India

240+ scientists driving innovation

1,730,000 Installed in-house decorative paint manufacturing capacity in India (KL per annum)

80+ YEARS OF DELIVERING A JOY

PAINT MANUFACTURING LOCATIONS IN INDIA#
(Installed capacity/annum)

Decorative coatings

Rohtak, Haryana
400,000 KL

Kasna, Uttar Pradesh
80,000 KL

Ankleshwar, Gujarat
130,000 KL

Khandala, Maharashtra
300,000 KL

Patancheru, Telangana
80,000 KL

Visakhapatnam, Andhra Pradesh
300,000 KL

Mysuru, Karnataka
300,000 KL

Sriperumbudur, Tamil Nadu
140,000 KL

Chemical

Cuddalore, Tamil Nadu
8,760 MT*

Industrial Coatings

Sarigam, Gujarat
(Facility of subsidiary company)
7,200 MT

Taloja, Maharashtra
14,000 KL

ASIAN PAINTS LTD PENTA DIVISION

- Asian paints Ltd Penta Division Manufactures Specialty Grades chemical for the past 36 years.

- Producing Various grades of Pentaerythritol
  1. Tech Pentaerythritol
  2. Mono Pentaerythritol
  3. Di Pentaerythritol
  4. Sodium formate

- Catering to Alkyd resin, Aircraft specialty lubricant additive, PVC stabilizers , Explosives, Leather Tanning and Oil drilling industries

- Pentaerythritol - 8760 MT ,
  Sodium formate - 5250 MT.

- ISO14001, ISO 9001 & ISO 45001 Certified

PROCESS FLOW - PENTAERYTHRITOL

REACTOR

STRIPPER

MEE EVAPORATOR

CRYSTALIZER

BELT FILTER

CAKE

ION EXCHANGE

DRYER

PRODUCT

BAGGING

PROCESS FLOW – SODIUM FORMATE

REACTOR

STRIPPER

FEE EVAPORATOR

CRYSTALIZER

BELT FILTER

ML

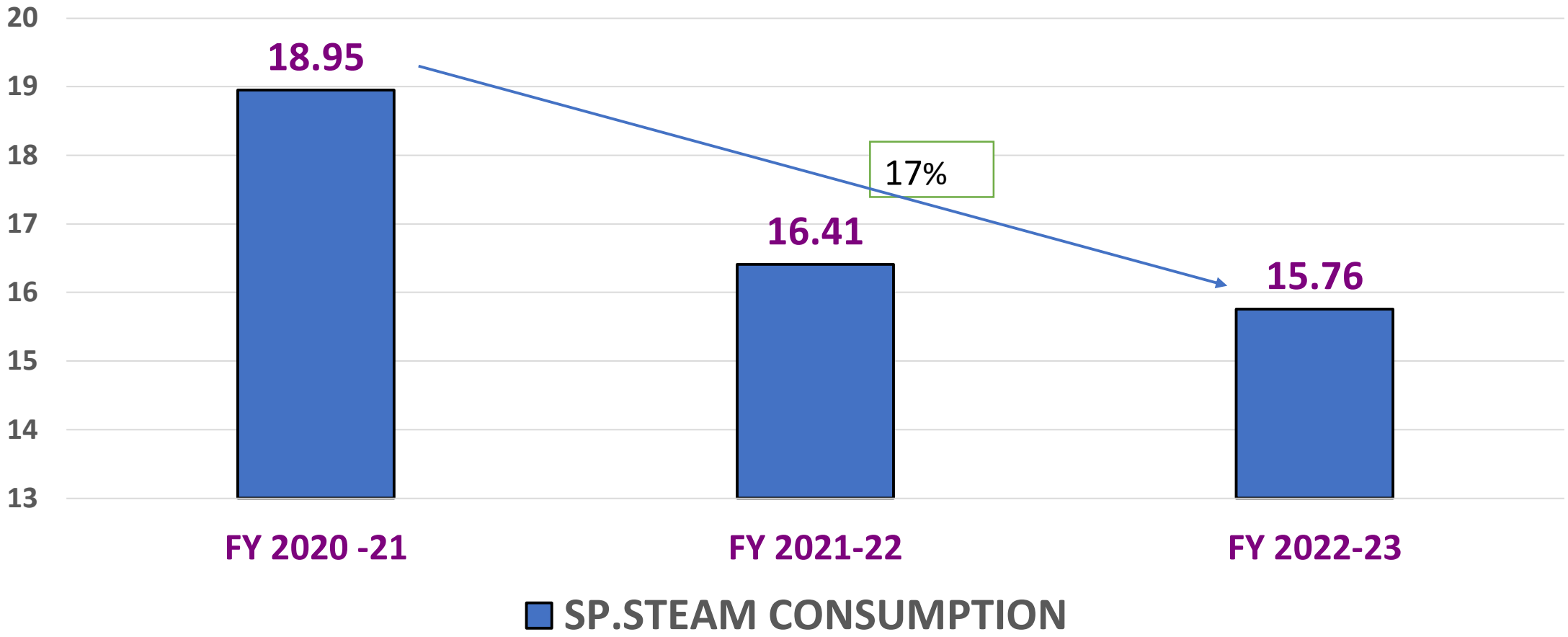
CRYSTALIZER

CENTRIFUGE

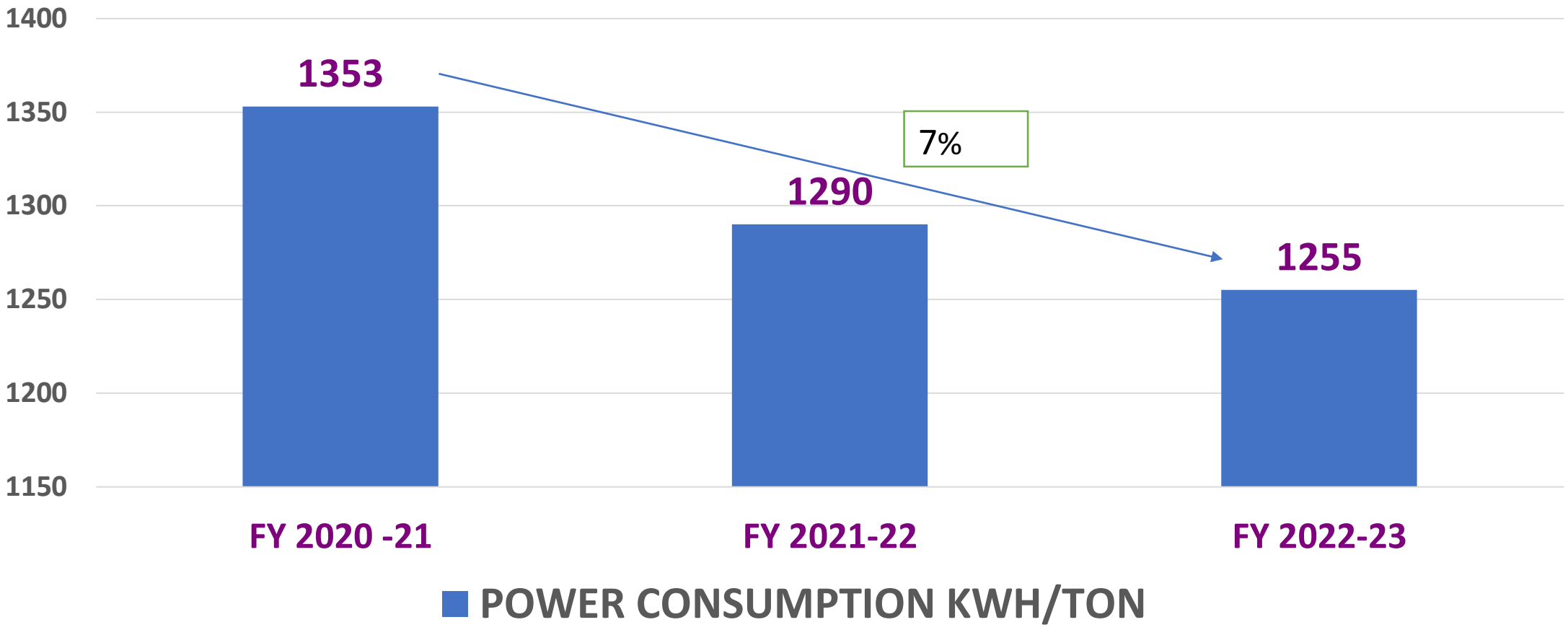
DRYER

BAGGING

SPECIFIC STEAM CONSUMPTION (MT / MT PRODUCT)



SPECIFIC POWER CONSUMPTION (KWH / MT OF PRODUCT)



ENERGY SAVINGS PROJECT IMPLEMENTED IN LAST THREE YEARS

YEAR	NUMBER OF ENERGY SAVINGS PROJECT	INVESTMENT (INR MILLION)	ELECTRICAL SAVINGS (MILLION KWH)	THERMAL SAVINGS (MILLION KCAL)	TOTAL SAVINGS (INR MILLION)	PAYBACK PERIOD IN MONTHS
FY 2020 -21	3	4.569	0.003	302	5.265	10
FY 2021 -22	5	10.26	0.042	3355	4.663	26
FY 2022 -23	9	1.49	0.088	12065	16.385	1

ENERGY SAVINGS PROJECT IMPLEMENTED IN FY 2020-21

YEAR	NAME OF ENERGY SAVINGS PROJECT	INV (INR LAKHS)	ELECTRICAL SAVINGS (KW /ANNUM)	THERMAL SAVINGS (TONS/ANNUM)	TOTAL SAVINGS (LAKHS/ANNUM)	PAYBACK PERIOD IN MONTHS
2020-21	Stripper Reboiler converted from Plate heat exchanger to Shell and Tube type	45	-	3974	63.59	14
2020-21	Di Dryer debottlenecking	1	-	1296	20.736	0.5
2020-21	Replacement of 125W MV lamp with 60W LED fitting (10 Nos.) in Fa, Methanol and Aa bullet area	0.6	2847	-	0.18	40

ENERGY SAVINGS PROJECT IMPLEMENTED IN FY 2021-22

YEAR	NAME OF ENERGY SAVINGS PROJECT	INV (INR LAKHS)	ELECTRICAL SAVINGS (KWH/ANNUM)	THERMAL SAVINGS (TONS/ANNUM)	TOTAL SAVINGS (LAKHS/ANNUM)	PAYBACK PERION IN MONTHS
2021-22	Stripper Packing Height increased from 10 m to 11.3 m in the Existing stripper column	10	-	4320	69	2
2021-22	Provision of VFD for M-206 agitator and speed reduced from 50Hz to 30Hz	0.44	11520	-	0.70	8
2021-22	Replacement of standard motor to IE3 motor 5 nos. (P-106-D 5HP, P-180 3HP, P-133 5HP, P-181-2 7.5HP, P-201-1 3HP	1.03	15360	-	0.97	13
2021-22	Replacement of 125W MV lamp with 60W LED fitting (10 Nos.) in Aa bullet area	0.6	2847	-	0.18	40
2021-22	Replacement of 165W SV lamp with 30W LED fitting in pole light (20Nos.)	0.55	11826	-	0.75	9

ENERGY SAVINGS PROJECT IMPLEMENTED IN FY 2022-23

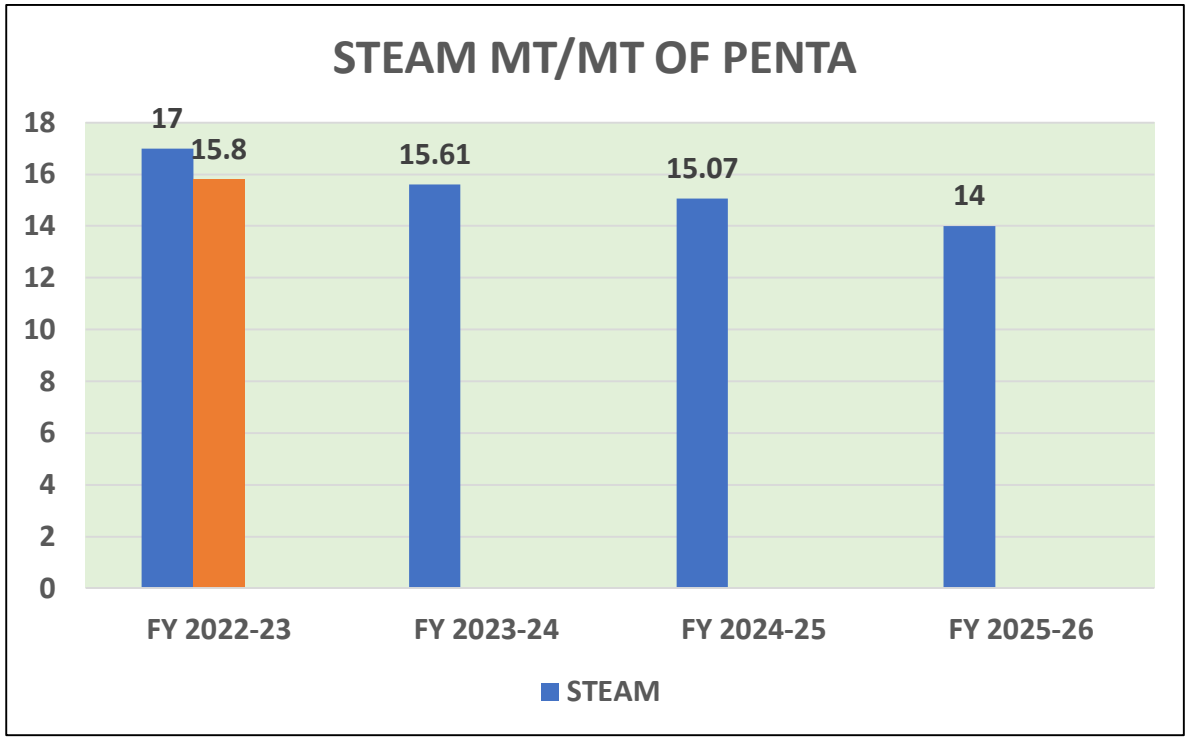
YEAR	NAME OF ENERGY SAVINGS PROJECT	INV (INR LAKHS)	ELECTRICAL SAVINGS (KWH/ANNUM)	THERMAL SAVINGS (TONS/ANNUM)	TOTAL SAVINGS (LAKHS/ANNUM)	PAYBACK PERION IN MONTHS
2022-23	Reduction of Water input by changing the Reaction Formulation	O.5	-	10134	162	1
2022-23	Automation of Fresh water input to the CBF cake tank	1.10	-	1140	18.24	1
2022-23	Heat recovery from the Stripper Vapor	6	-	1339	21.42	4
2022-23	Heat recovery from the DEE distillate	0.1	-	475	7.6	1
2022-23	Provision of transparent roof sheet in coal yard and Lighting circuit separation	1.7	6132	-	0.41	50

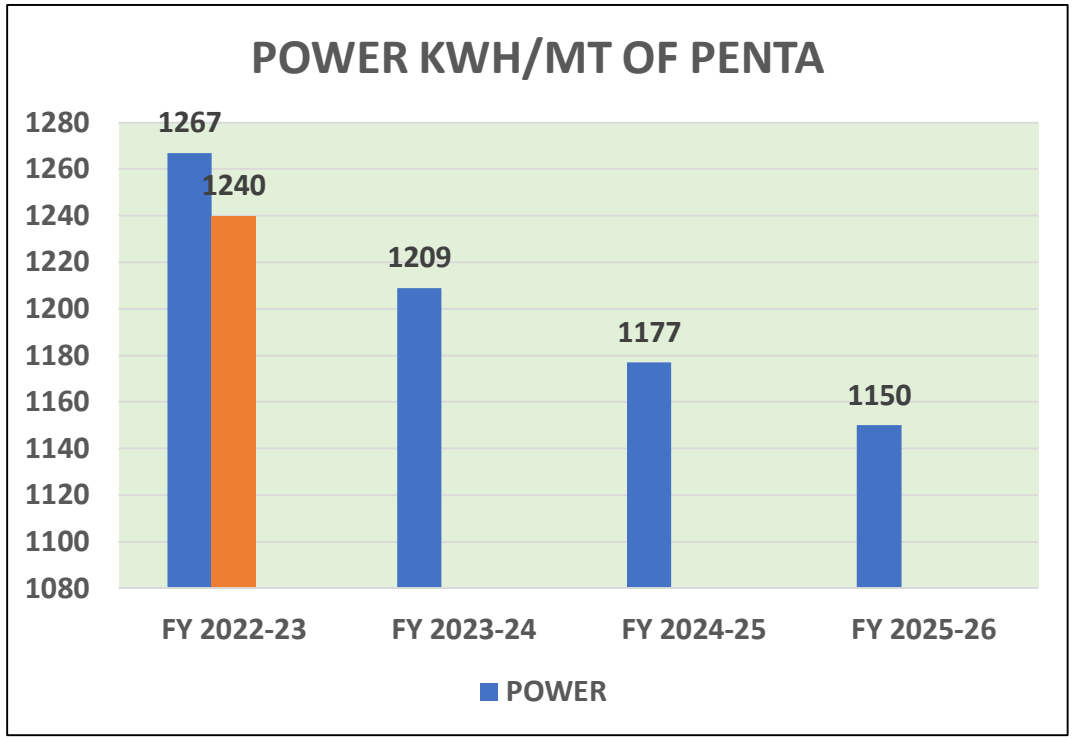
ENERGY SAVINGS PROJECT IMPLEMENTED IN FY 2022-23

YEAR	NAME OF ENERGY SAVINGS PROJECT	INV (INR LAKHS)	ELECTRICAL SAVINGS (KWH)	THERMAL SAVINGS (MILLION KCAL)	TOTAL SAVINGS (LAKHS/ANNUM)	PAYBACK PERION IN MONTHS
2022-23	Replacement of CT pump P-1610-B 75KW motor to 52KW motor	0.05	3840	-	0.25	3
2022-23	Replacement of standard motor 52KW to 30KW IE2 motor Off gas blower	0.1	11520	-	0.78	2
2022-23	Provision of VFD for CT fan 2 with temperature-based running	0.2	23040	-	1.56	2
2022-23	Provision of separate energy meter for monitoring and air leakage arresting	0.2	49920	-	3.34	1

INTERNAL BENCHMARK

Target Vs Actual





MAJOR ENCON PROJECTS PLANNED FY 23-24

Steam Header Augmentation

Elimination of High-pressure steam consumption in Process

Investment:

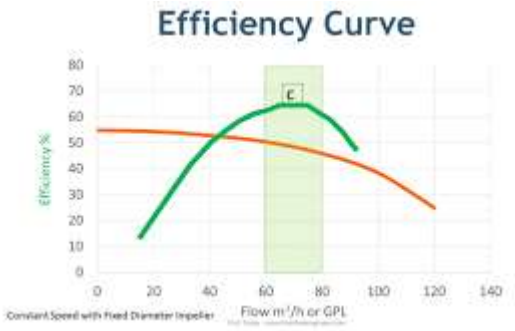
- 100 Lakh

Benefits:

- Generation of 84 Kwh
- Steam saving 4 TPD

Separate Pump for high head condenser

Provision of separate high efficiency pump for high head condenser



Investment:

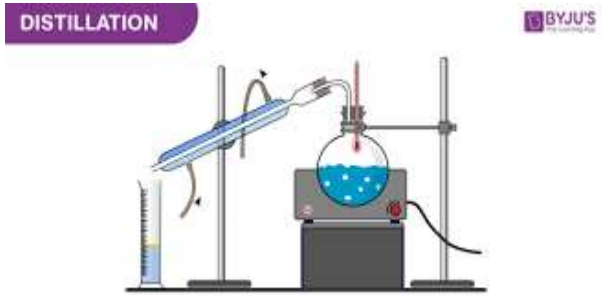
- 20 Lakh

Benefits:

- Generation of 30 Kwh

Distillation column feed location optimization

Distillation column internal packing's structure will be changed based on feed



Investment:

- 12 Lakh

Benefits:

- Steam Savings 3.6 TPD
- Generation of 0.2 Kwh

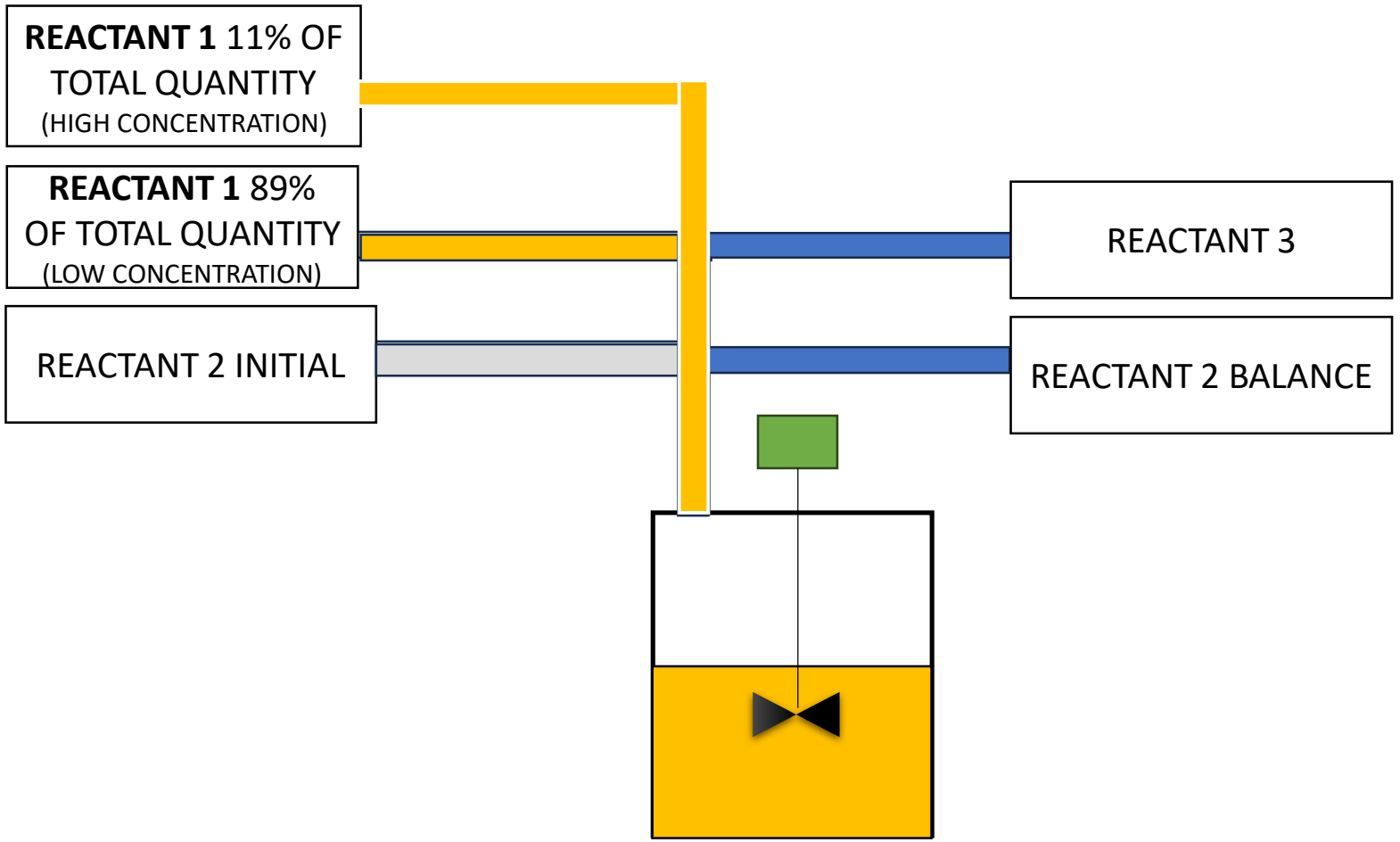
INNOVATIVE PROJECTS

1. Changes made in Raw material addition in Reactor based on Reaction Chemistry study to increase the yield

2. Stripper Debottlenecking

3. Stripper Reboiler Conversion

INNOVATIVE PROJECT 1



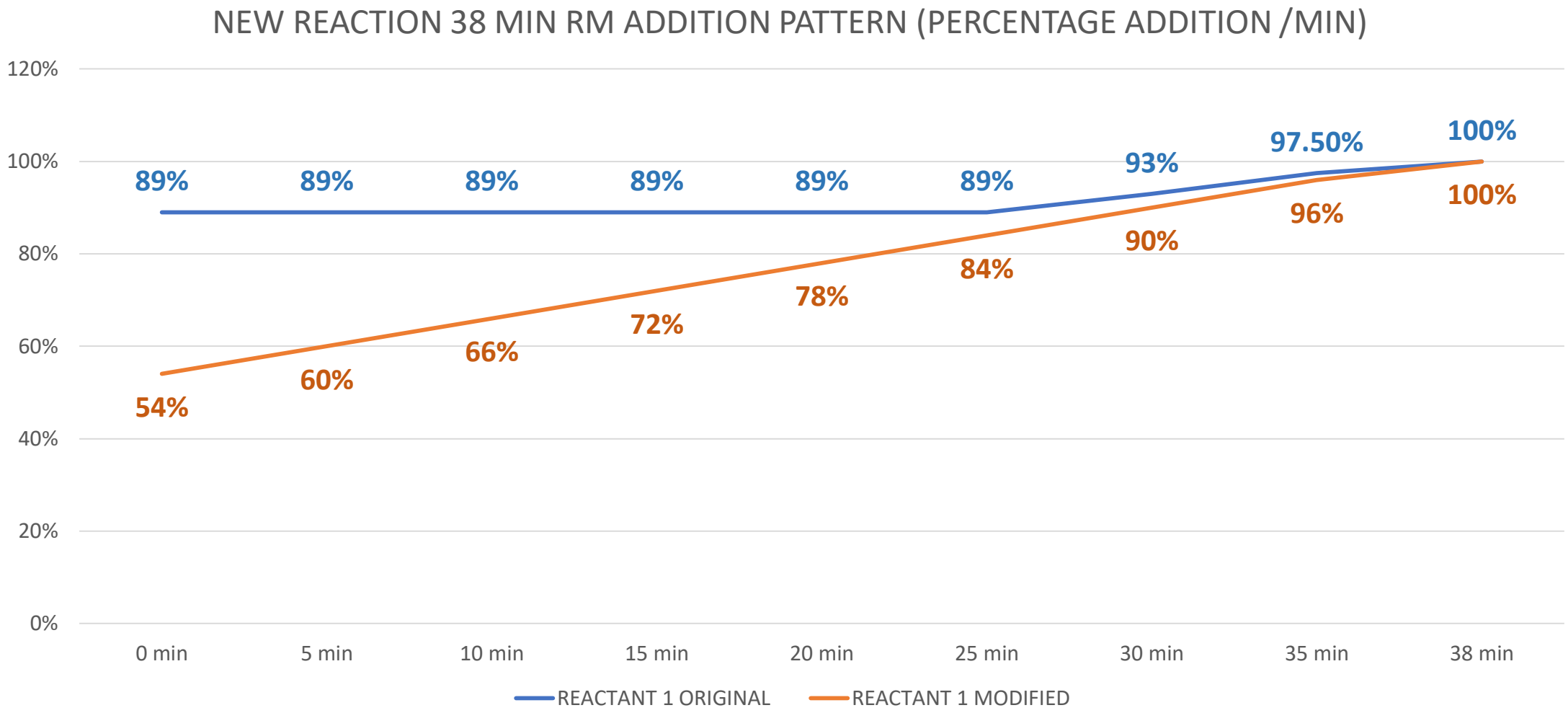
- REACTANT 1 ALDEHYDE DUMPED 89% BEFORE REACTION STARTS
- REACTANT 1 REAMINING 11% ALDEHYDE ADDED OVER THE COURSE OF REACTION
- REACTANT 2 ALKALI 50% ADDDED AT THE BEGINNING OF THE REACTION
- REACTANT 2 ALKALI REMAINING 50% ADDED THROUGHTOUT THE REACTION
- REACTANT 3 LIMITED REACTANT ADDED THROUGHTOUT THE REACTION

WATER INPUT TO SYSTEM 11214 KGS

WHY THE PROJECT IS INNOVATIVE ?

- Aldol Condensation reaction - when the Aldehyde concentration decreases the Product yield will increase
- **Le chatelier Principle** – "Changes in the temperature, pressure, volume, or concentration of a system will result in predictable and opposing changes in the system in order to achieve a new equilibrium state".
- **Maintaining the low aldehyde concentration throughout the reaction by changing the Reactant 1 addition increases the Product yield**
- **Increase in End temperature by 13 degC leads to opposing changes I,e. conversion of impurities into Desirable Product**
- Reaction output Total solids increased by 14%
- Resulting into reduction in steam requirement in the downstream process.

REACTION STEPS (Original Vs Modified)

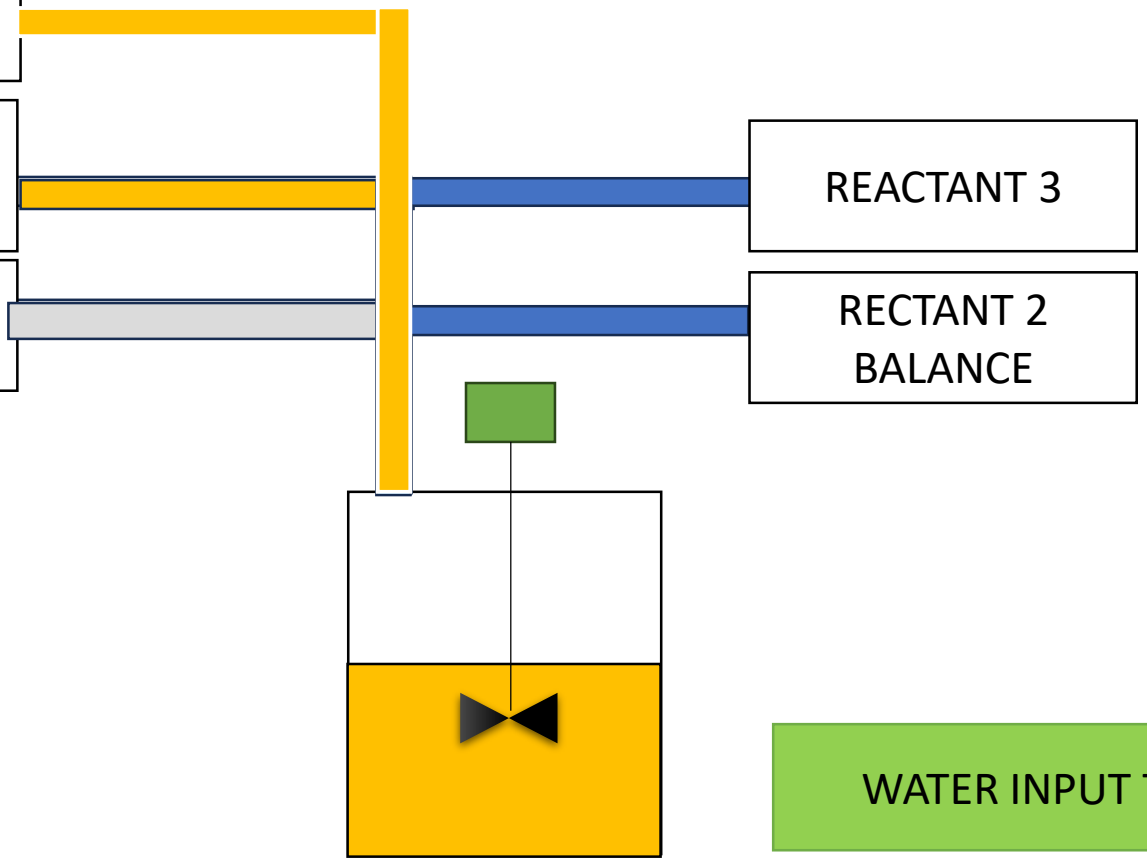


REACTION STEPS (Modified)

REACTANT 1: 46% 0F TOTAL QTY (HIGH CONCEN)

REACTANT 1: 54% OF TOTAL QTY (LOW CONCN)

REACTANT 2 INITIAL



REACTANT 3

RECTANT 2 BALANCE

0th min – R1 FILLING

3rd min – R2 INITIAL FILLING

8TH min REACTION

13TH min R1 FRESH ADDITION

45TH min TRANSFER

WATER INPUT TO SYSTEM 9587 KGS

REDUCTION IN WATER PER BATCH 1627 KGS

ENERGY SAVINGS

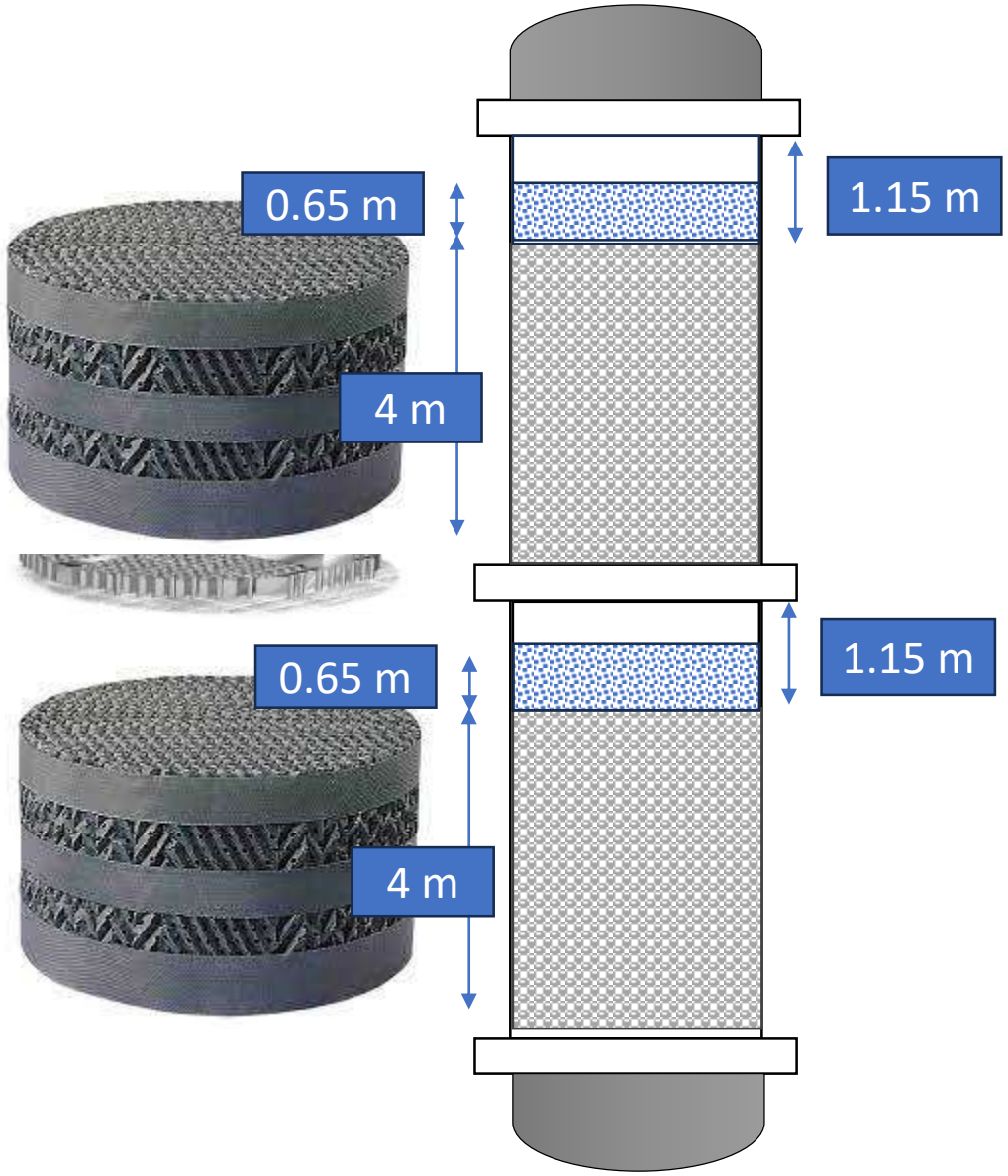
SECTION	UNIT	STEAM REQUIREMENT IN ORIGINAL REACTION FORMULATION	STEAM REQUIREMENT IN MODIFIED REACTION FORMULATION
STRIPPER	Kg/Hr	6560	5750
DISTILLATION COLUMN	KG/HR	800	700
EVAPORATOR	KG/HR	2100	1800
TOTAL STEAM	KG/HR	9460	8250
STEAM SAVINGS	KG/HR	**1210**	

INNOVATION 2
STRIPPER DEBOTTLENECKING

Theory of Constraints: Steps

- Goldratt's Five Steps
  1. Identify the systems constraints
  2. Decide how to exploit the constraints – Get the most
  3. Subordinate everything else to the exploitation of constraints – Treat the constraint as a king.
  4. **(Evaluate various alternatives to) Elevate the systems constraint -spend more money to make more money**
  5. If in the previous steps , A constrain has been broken go back to Step 1 repeat the process

INNOVATIVE 2 – STRIPPER DEBOTTLENECKING



- PROJECT DETAILS

"Achieve the intended purity in Stripper column by increasing the packing height in the empty space available in the existing column"

WHY THE PROJECT IS INNOVATIVE

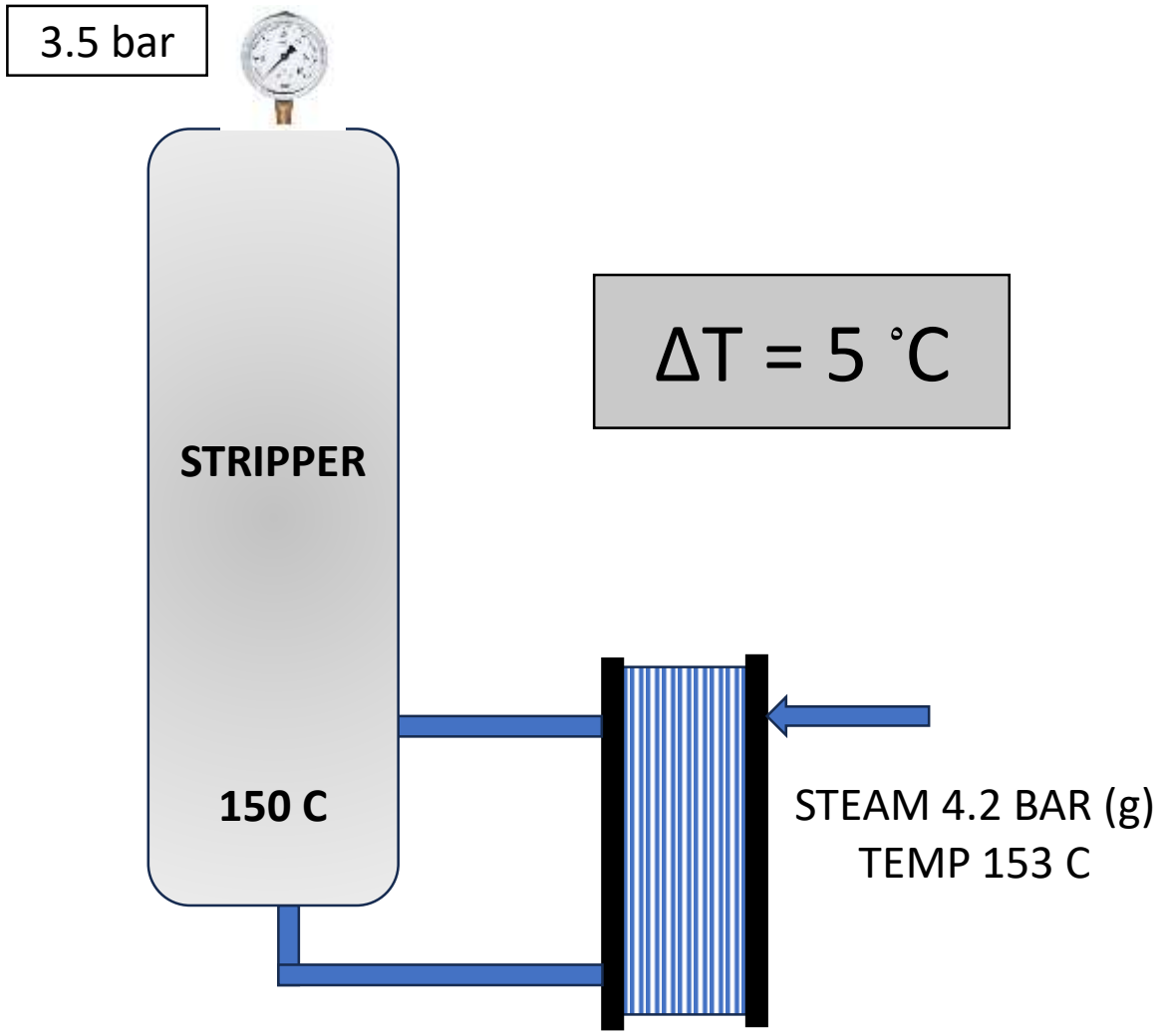
- Stripper column is the Major Steam consumption equipment in our Process
- The Purpose of the stripper is to remove the excess Reactant from Reactor output.
- The stripper column was designed to operate with 40% evaporation rate to achieve the bottom purity, i.e., <0.1% Aldehyde in the stripper bottom
- To maximize the throughput , The stripper operated at its fullest capacity (I,e. 13000 kg/hr feed and 6700 kg/hr steam), but due to capacity limitation even at increased evaporation rate of 44%, **achieved bottom purity of 0.12%.**
- To achieve the purity ,reduce the steam consumption and to increase the throughput we increased the packing height of 1.3 m in the existing stripper column in the available space with no major investment.

INNOVATIVE 2 – BENIFITS OF THE PROJECT

S:NO	OPERATING PARAMETERS	BEFORE	AFTER	SAVINGS
1	Feed rate maximum	13000 kg/hr.	13000 Kg/hr.	
2	Evaporation Rate	44%	40%	
3	Steam flow Kg/hr	6700	6135	565 kg/hr.
4	Stripper Bottom quality	0.12 % Fa	0.05 % fa	
Note: Innovation 2 gives the additional benefit of 32% increase in stripper Capacity & Steam reduction by 9%				

INNOVATION 3
STRIPPER REBOILER

STRIPPER REBOILER



- **PROBLEM STATEMENT**

Stripper reboiler PHE leaking frequently because of Acidic environment at a Operating temperature of 150 C.

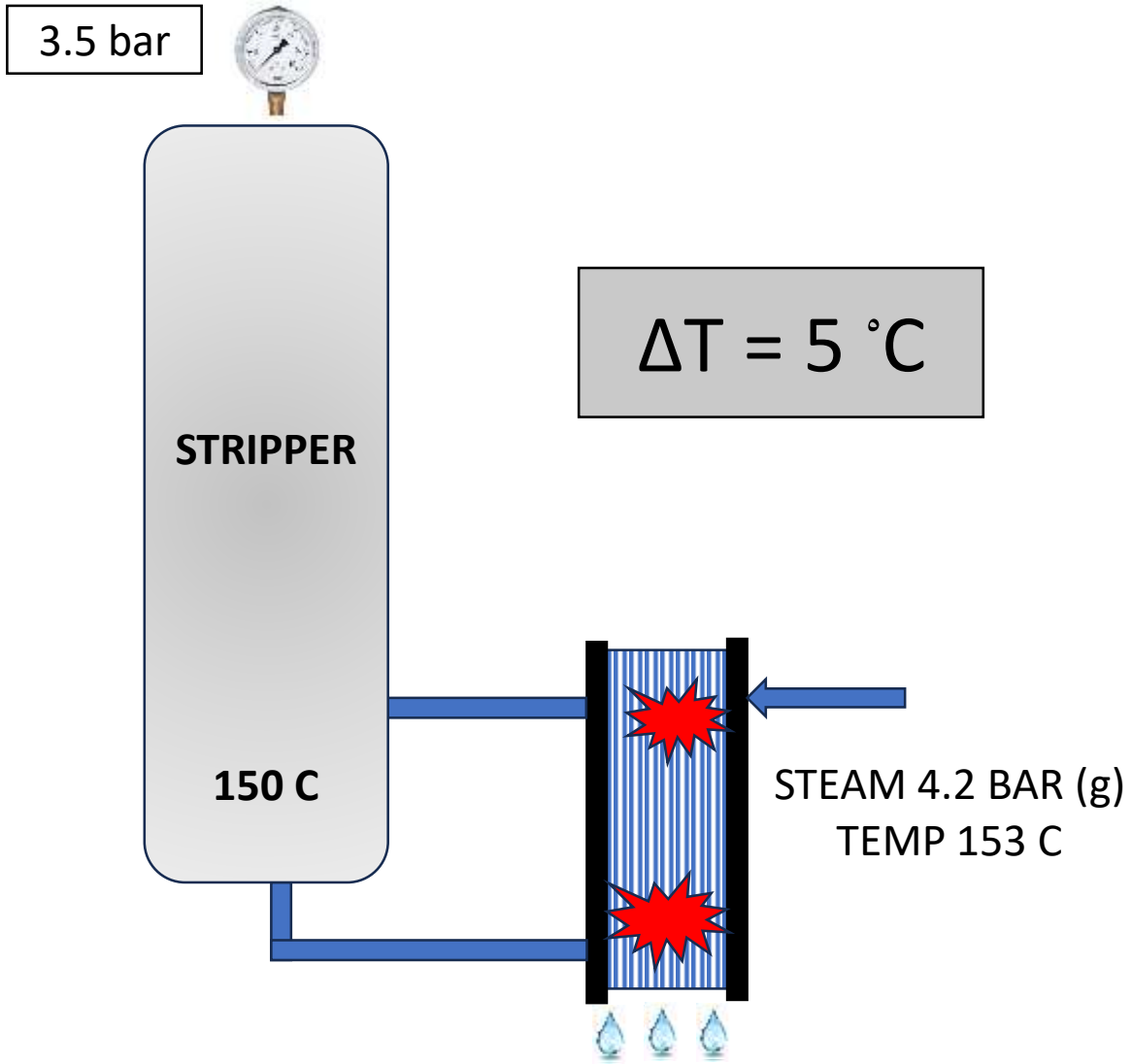
PHE unable to replace with Shell and Tube heat exchanger due to

1.Less delta T

- Limitation in condensing the stripper vapor

2.Space constraint.

STRIPPER REBOILER

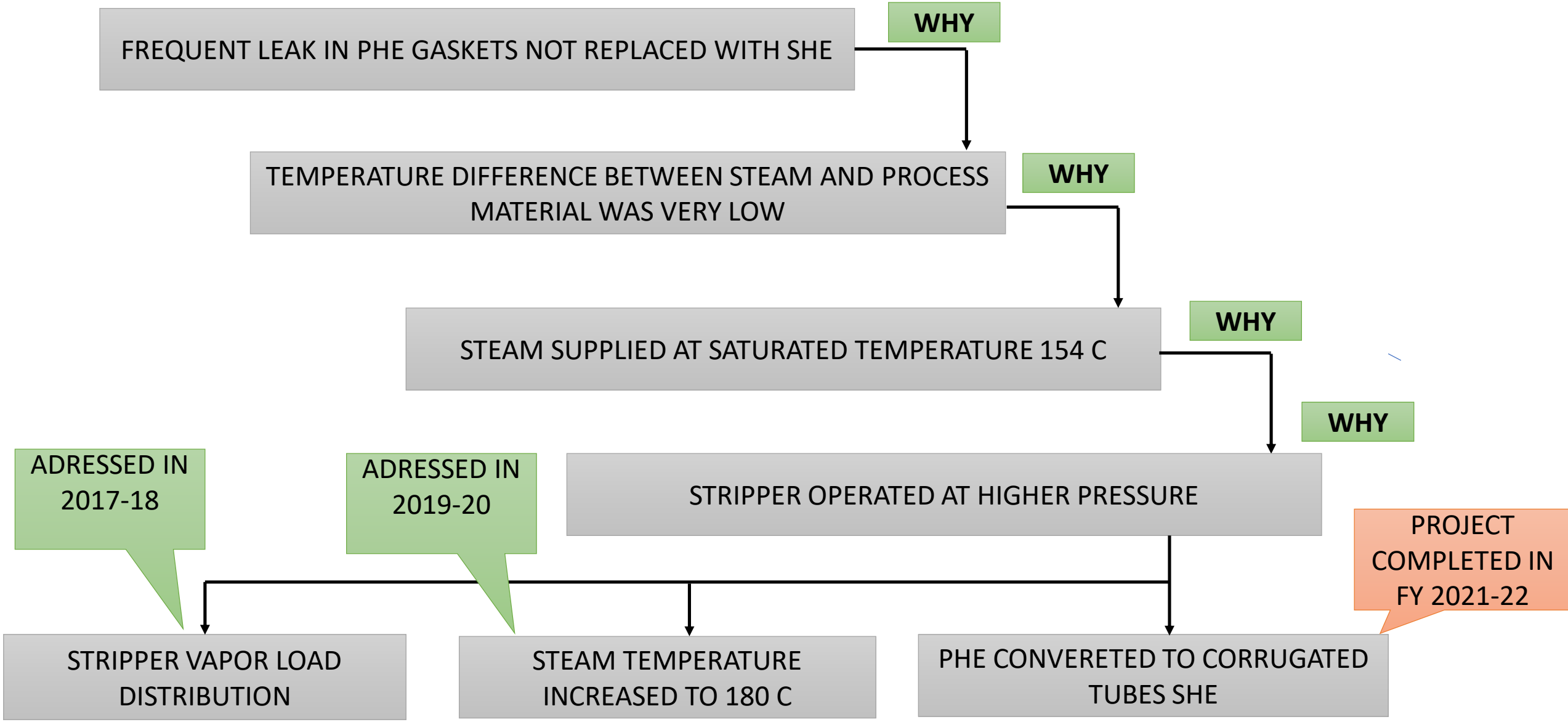


- **LOSSES**

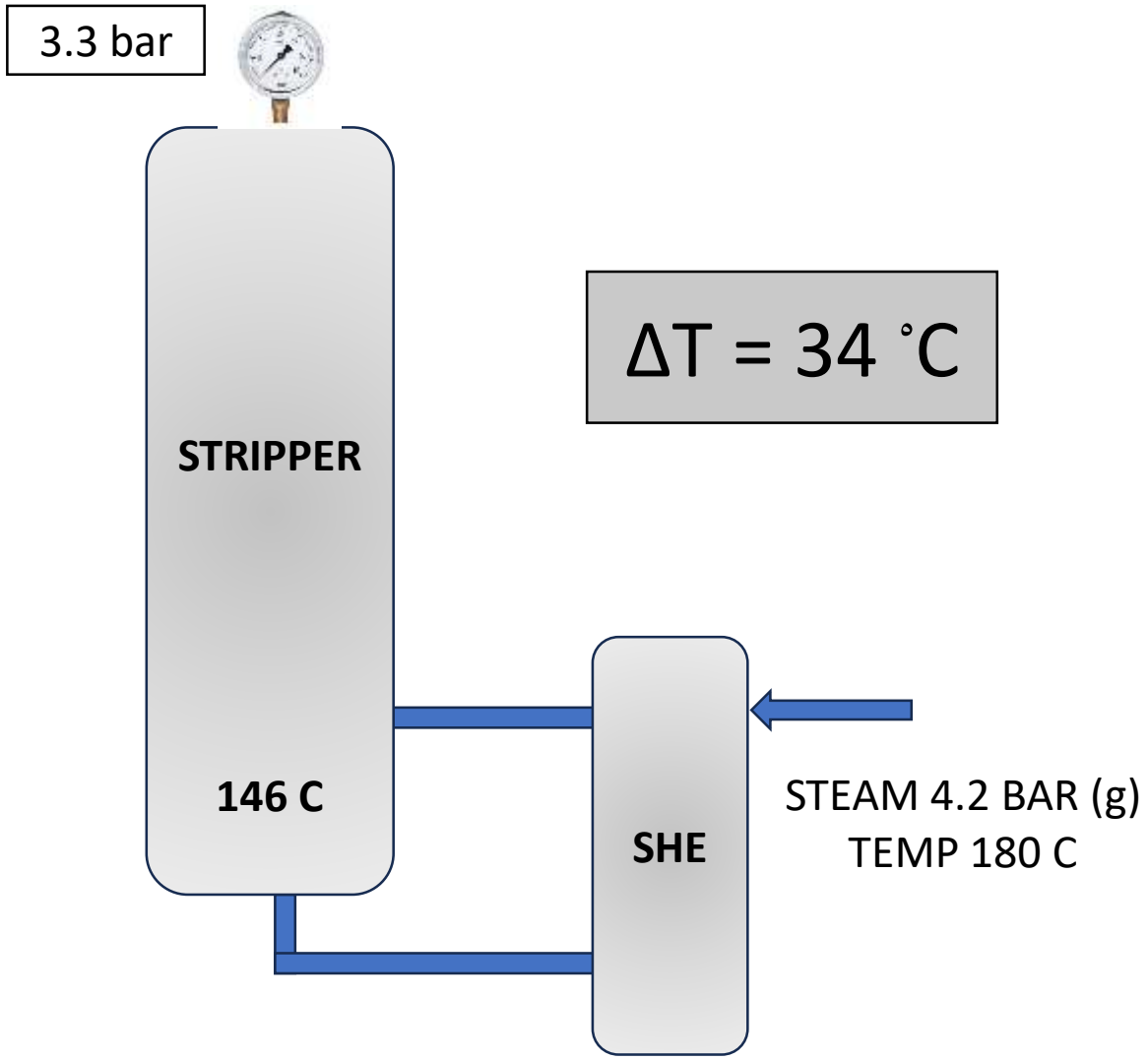
Gasket replacement once in six months

Loss of material & Loss of steam due to Gasket leaks

WHY? WHY? ANALYSIS FOR FREQUENT REBOILER LEAKING



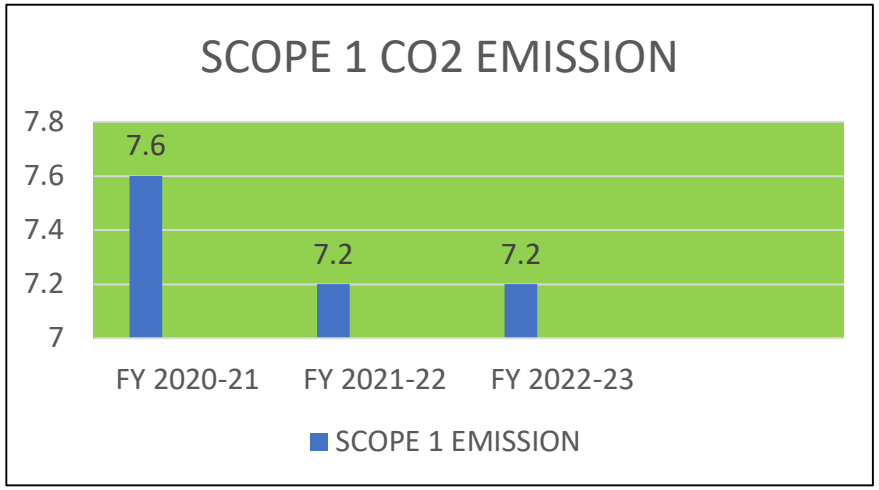
PROJECT SAVINGS

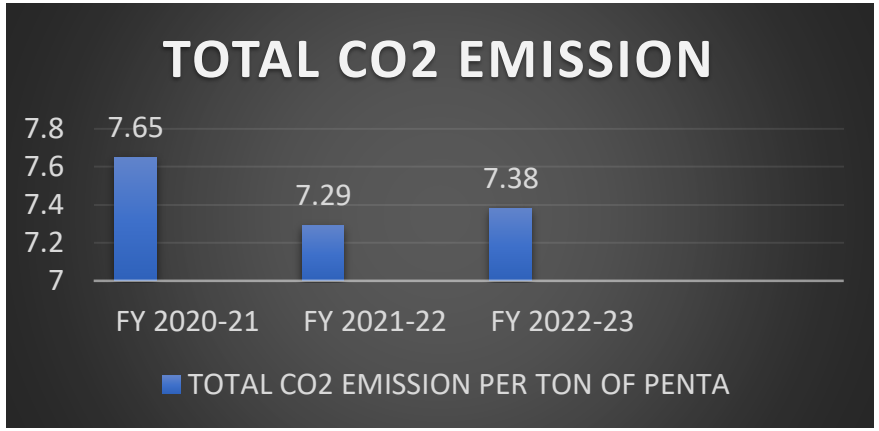


S:NO	PROBLEM RESSOLVED	SAVINGS (INR LAKHS)
1	FREQUENT GASKET REPLACEMNET	12.0
2	DIRECT STEAM LOSS	21.6
3	REPAIR COST	1.0
	TOTAL COST	34.6

Steam reduction by 550 kg/hr.

GHG INVENTORISATION





APPROACH & INITIATIVES

- Planning to replace grid power by solar power
- Adopted various energy conservation measures to reduce the steam and Power consumptions
- Exploring Biomass based boiler for future expansion.

50% Renewable Energy by 2030

AWARDS & RECOGNIZATIONS

- 2004 – EXCELLENT ENERGY EFFICIENT UNIT
- 2005 – INNOVATIVE PROJECT & MOST USEFUL PRESENTATION AWARD
- 2006 – INNOVATIVE PROJECT AWARD
- 2007 – EXCELLENT ENERGY EFFICEICENT UNIT
- 2008 – EXCELLENT ENERGY EFFICIENT UNIT
- 2011 – ENERGY EFFICIENT UNIT
- 2011 – ENVIRONMENTAL BEST PRACTISE
- 2012 – INNOVATIVE PROJECT AWARD
- 2012 – EXCELLENT ENERGY EFFICIENT UNIT
- 2015 – ENERGY EFFICIENT UNIT
- 2021 – FCCI AWARD

THANK YOU