



Confederation of Indian Industry

CII

National Energy Award for  
Excellence in Energy Management

Under Metal Sector

**Best Energy Efficient Organisation**  
**Utkal Alumina International Limited**

Kundan Singh, Manager

Nayan Kumar, Asst. Engineer

Khitish Pradhan, Manager

WHO  
WE  
ARE



**We are a wholly-owned subsidiary of Hindalco, equipped with**

- Advanced technology from Rio-Tinto-Alcan
- One of the best quality bauxite ores in the world
- Firmly integrated logistics across mines and refinery

**We commenced operations in 2013, supplying to Hindalco's aluminium smelters and exporting any surplus output.**

## Capacity spectrum

**1.5 MTPA**

(expandable to 3 MTPA)

**ALUMINA REFINERY**

**5.3 MTPA**

(expandable to 8.5 MTPA)

**BAUXITE MINING**

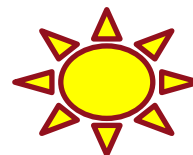
**3 x 30 MW**

(expandable to 150 MW)

**CO-GENERATION POWER PLANT**

## Brownfield

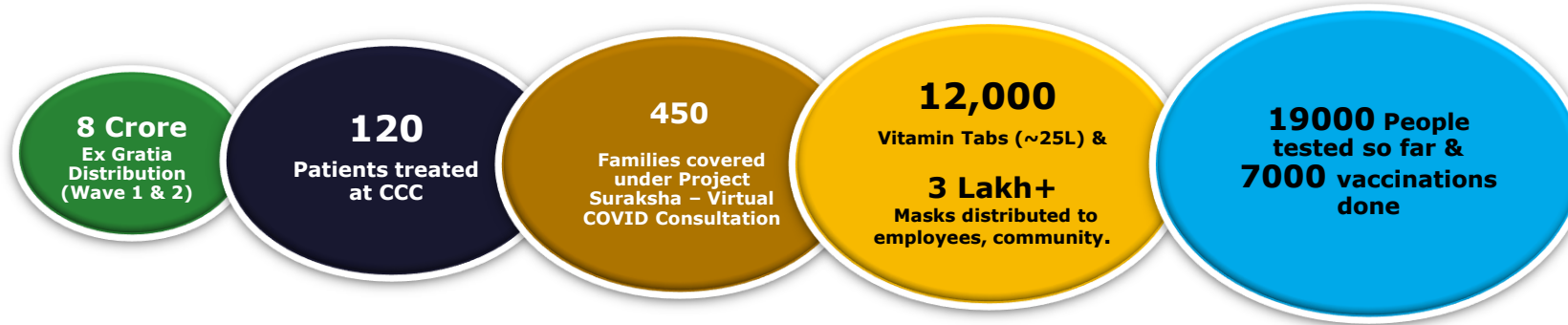
**0.5 MTPA capacity addition is in progress**



**5 MW Solar Plant commissioned**

**We are the lowest cost producer of high quality alumina in the world.**

## Welfare Summary:→



**Project Surya Prabha  
: 0.5 MT exp.  
Completed.  
Hydrate production  
started from Aug,  
2021**

**Highest ever  
Monthly hydrate  
production (July,  
21)**

**Oshapada  
Hospital served  
as COVID Care  
Centre during  
wave 1 & 2 and**

**50 beaded  
Covid care  
facility added**

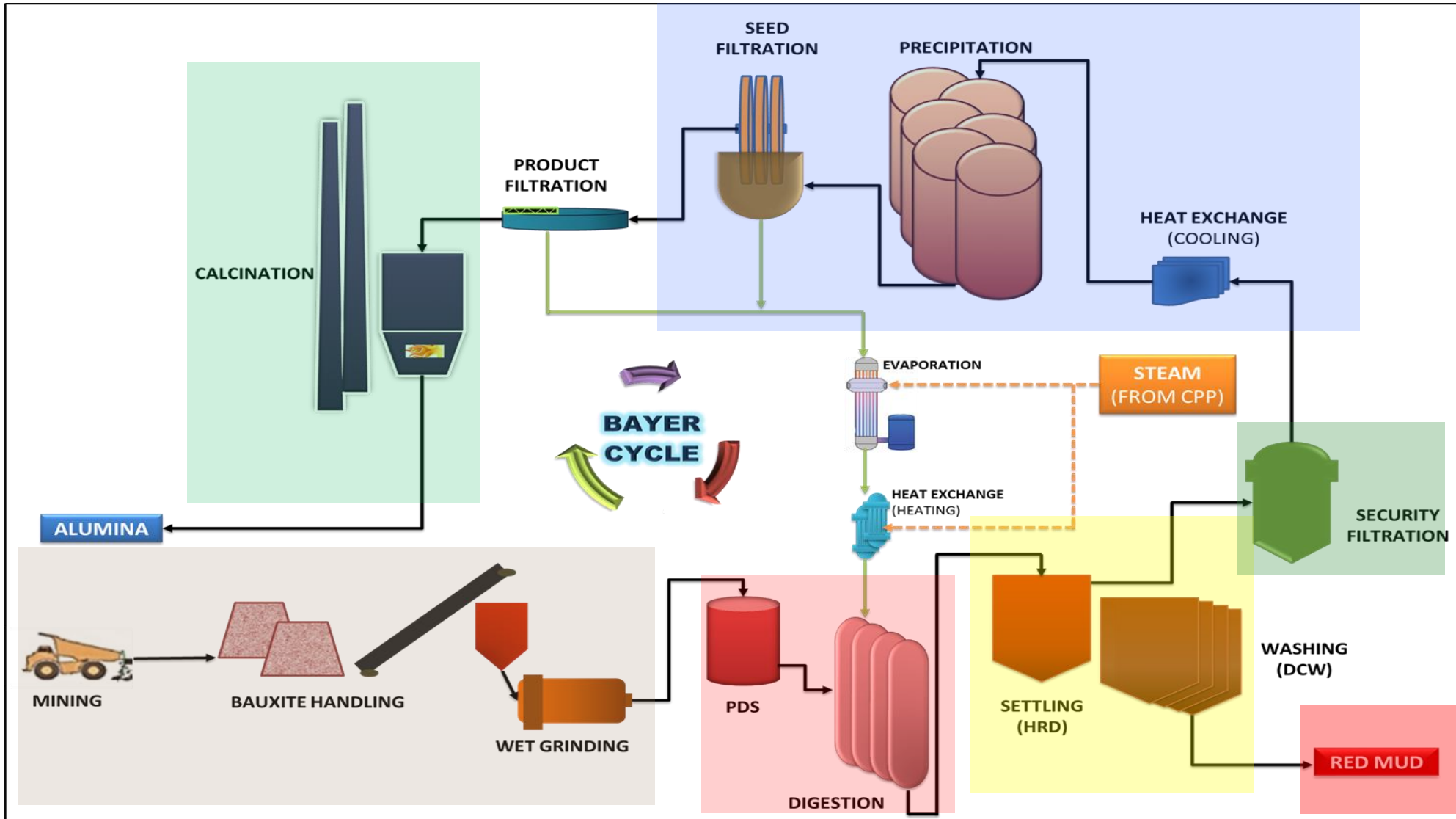
**Vitamin tablets &  
COVID Ex gratia  
Distribution  
(~8 Cr, ~12k  
tabs)**

**Won Gold Medal & 2<sup>nd</sup>  
Runner Apex award in  
India Green  
Manufacturing  
Challenge 20 - 21**

**Served the  
community  
within 50 km  
radius during  
COVID Crisis**

**Project  
Suraksha –  
Virtual COVID  
Consultation**

# Process Flow diagram



**Gate to Gate Energy Mapping: ~10 GJ/t**

## Fuel Input

Coal + HFO + Electricity Import + Solar



1,11,82,495 GJ

49,78,423 GJ

7,119 GJ

32,949 GJ

## Plant Boundary

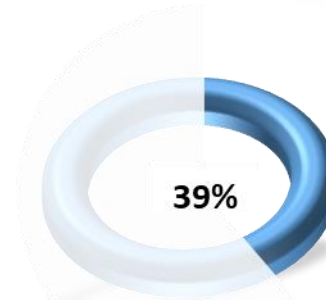
CGPP + Refinery

## Out Put

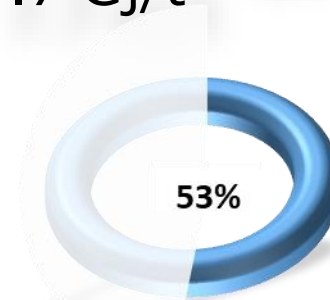


Calcined Alumina

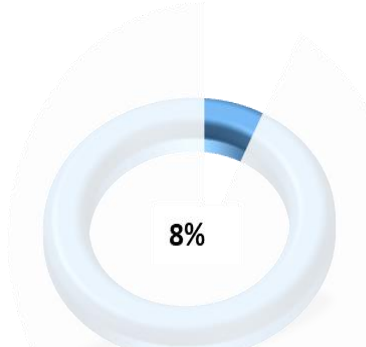
## Refinery Energy 7.7 GJ/t



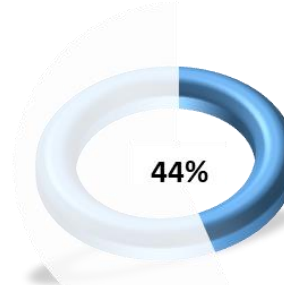
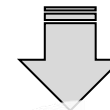
Thermal Calciner



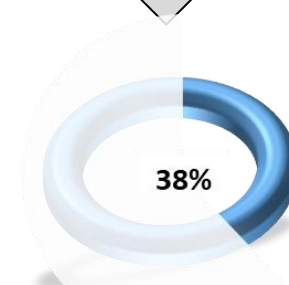
Thermal Hydrate



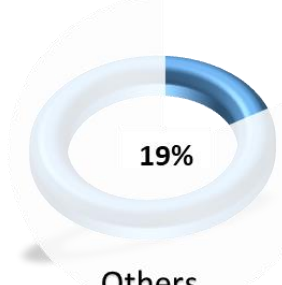
Electrical



Digestion



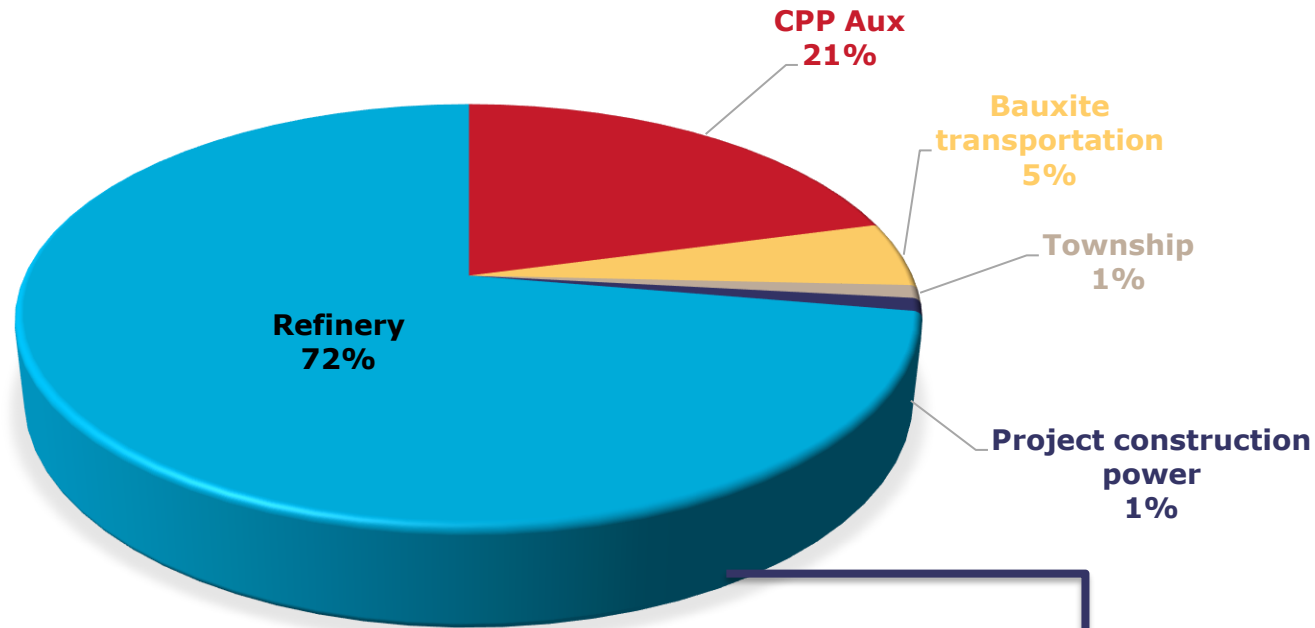
Evaporation



Others

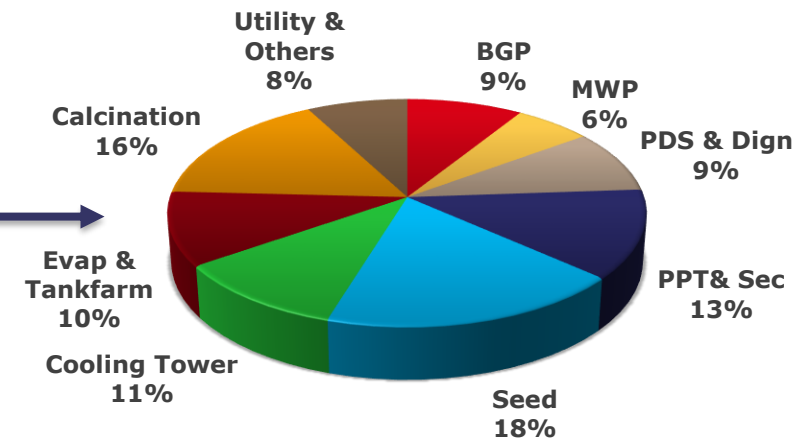
Mines - 0.04 GJ/T  
HSD - 71%, Electricity - 29%

## ELECTRICAL ENERGY DISTRIBUTION

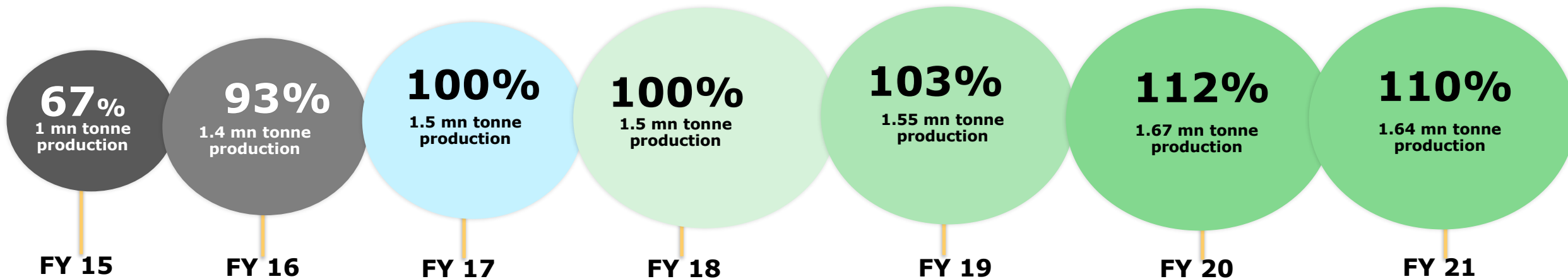


**Total Electrical Energy Consumption**  
**0.53 GJ/t**

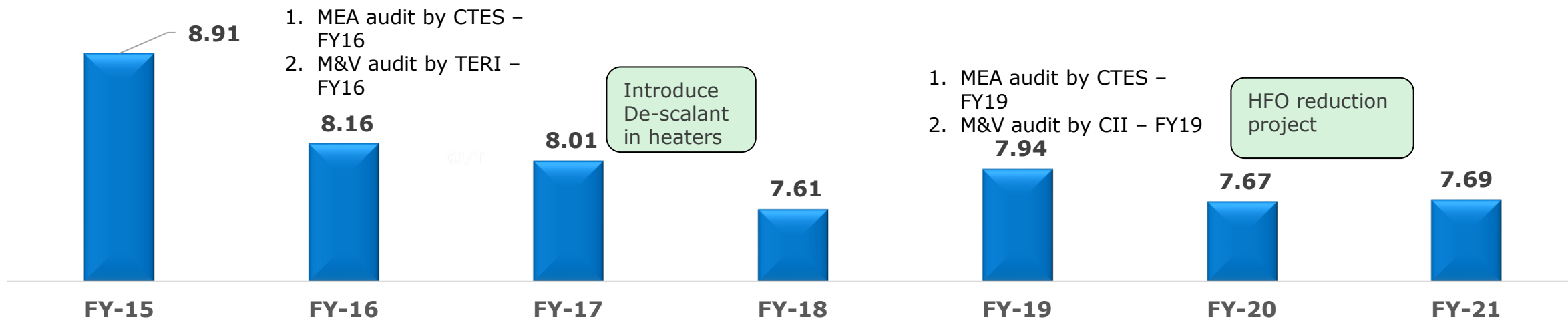
## Refinery Electrical Energy Distribution



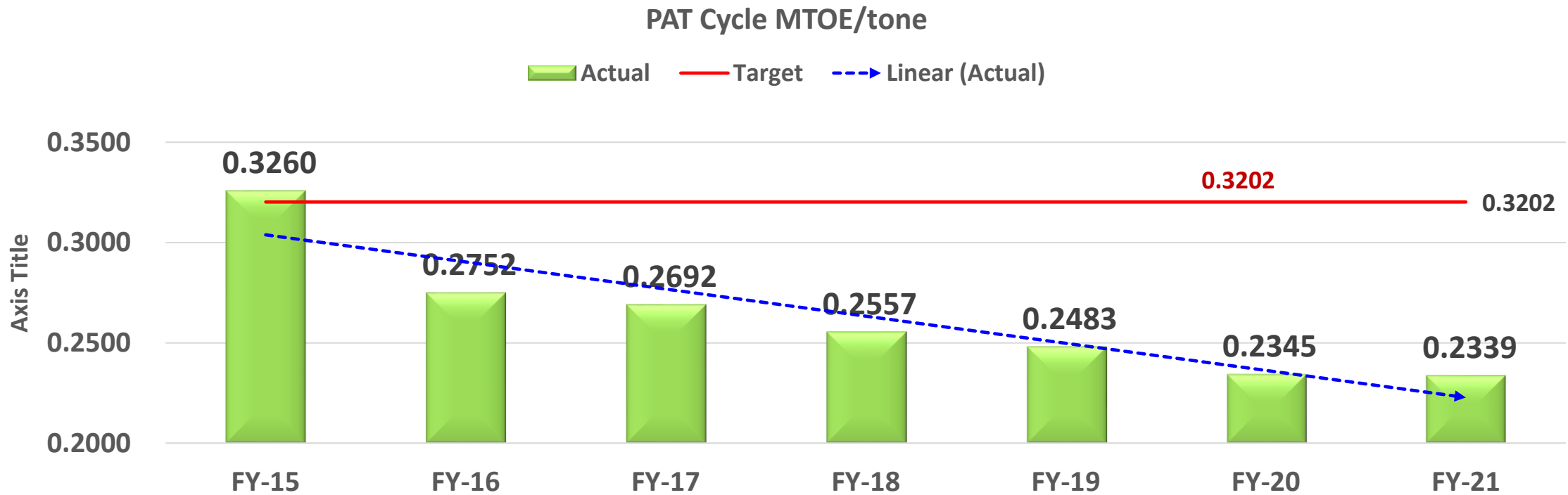
## Production at rated capacity and beyond



## Specific Energy over the year, GJ/T of Alumina







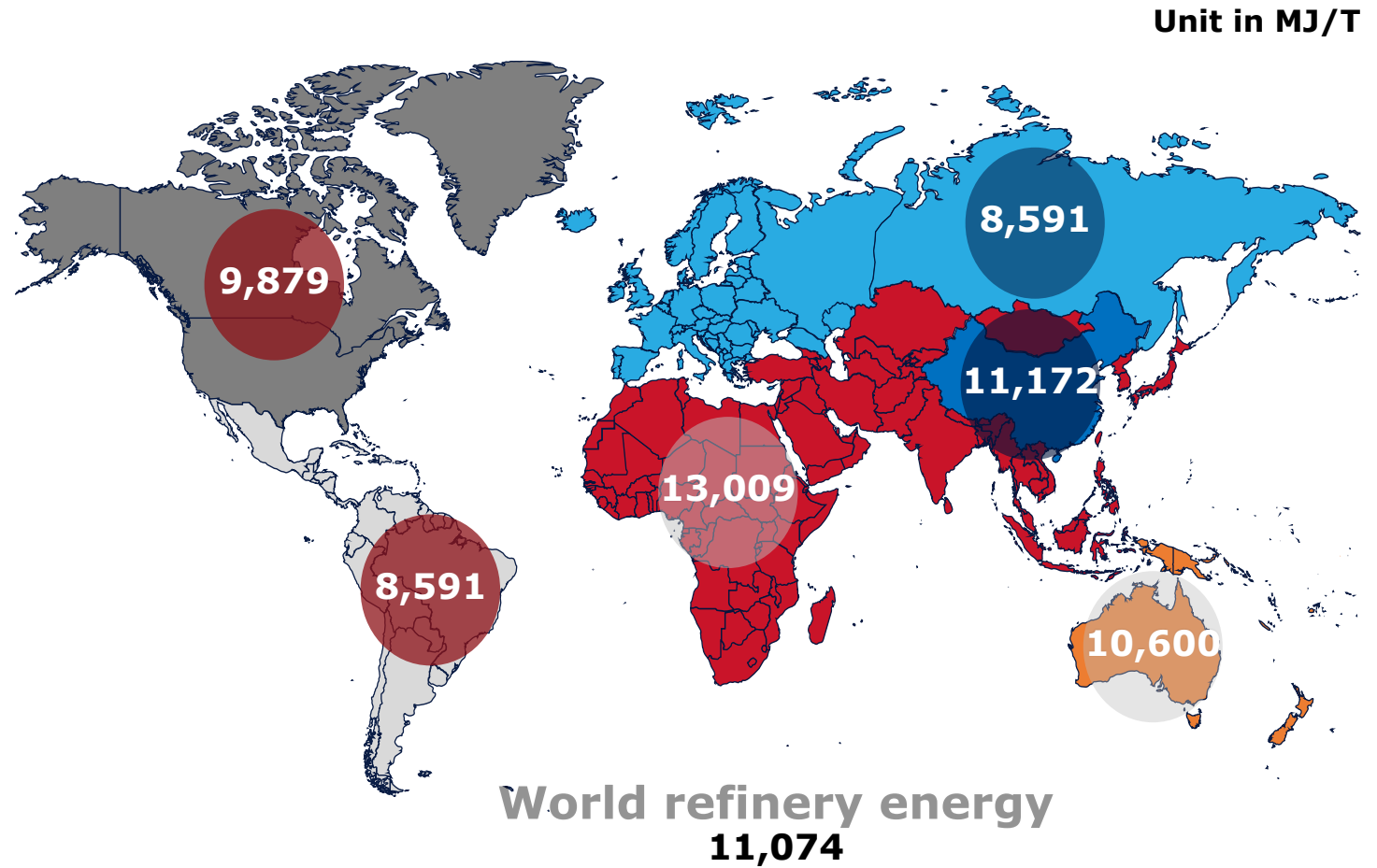
- **26% energy reduction in pat cycle II for FY-20** from base line year FY-15
- **58,762 nos ESCERTs allotted** to the plant
- **Achieved 12% reduction in specific GHG emission** from base year of FY-17

Energy @ UAIL refinery

**14%**  
Energy Reduction (since Inception)

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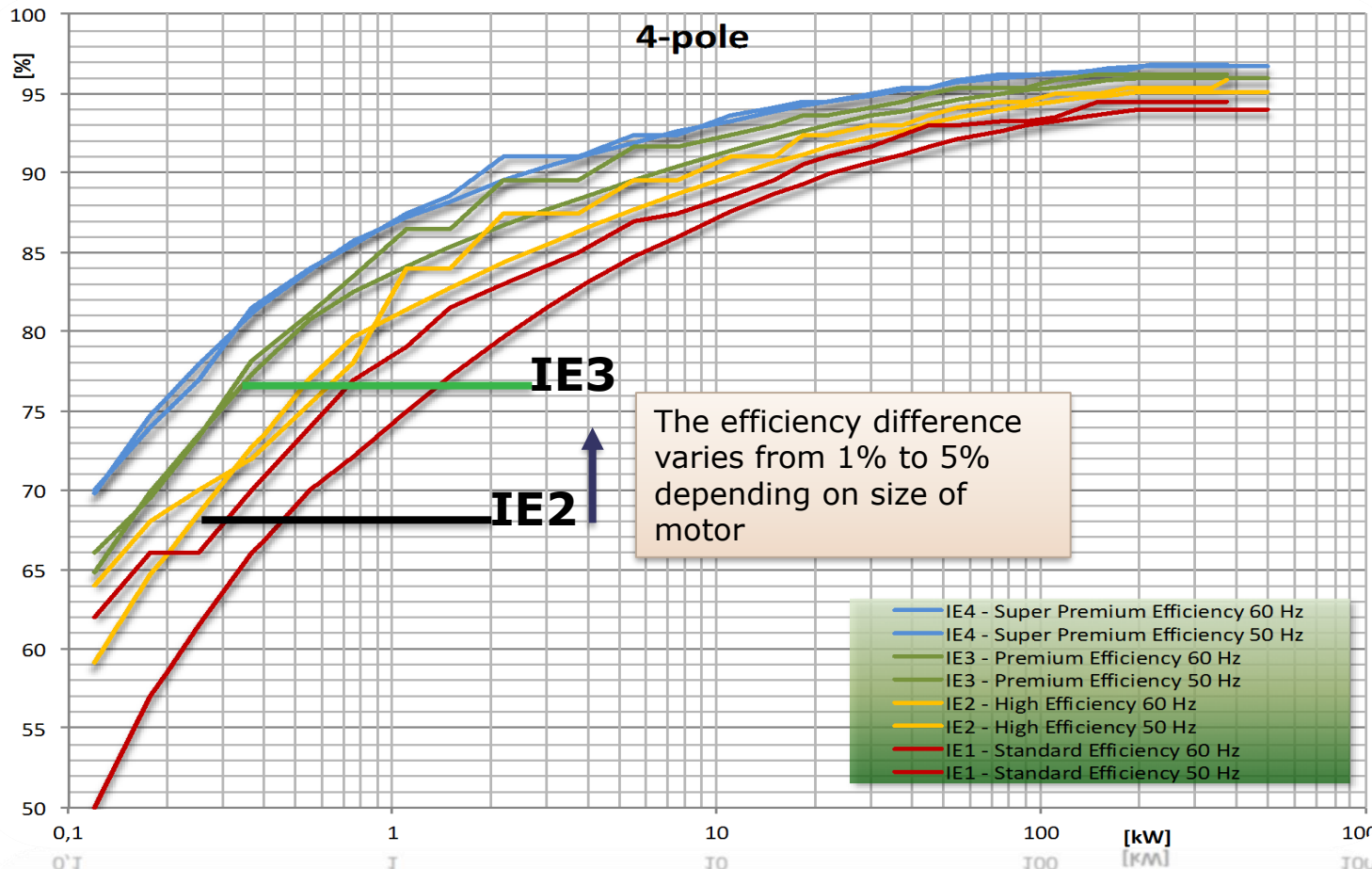
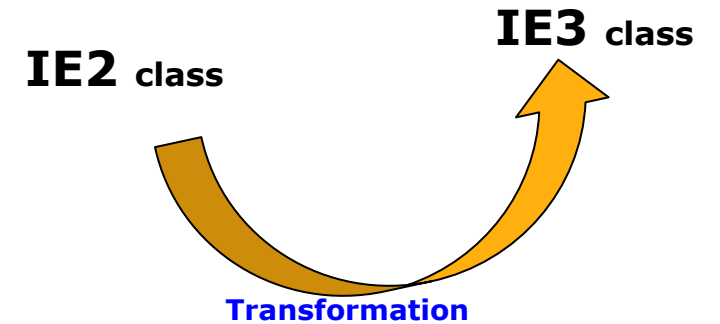
8.91 GJ/t **To** 7.69 GJ/t



Source: IAI World Aluminium

## Transformation of Low energy efficiency motors to High energy efficiency motors.

### Transformation of



- **2.6% motors converted to IE3 class**  
(Total 1200 motors with IE2)
- **Motor efficiency improved by 1.5%**
- **Approx. saving 67 Mwh/Yr (₹2.54 Lacs)**

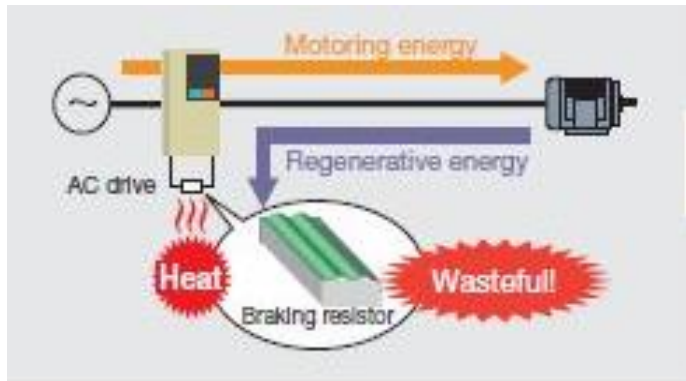
### Case Study-

- Replaced evaporation area old motor with IE3 motor
- Old motor power consumed with rated flow 98 Kw
- New motor power consumed at rated flow 96.5 Kw
- Power saved 12877 Kwh/ Yr (₹0.49 Lacs)

**Upcoming Brownfield project : All Motors with IE3 efficiency Class**

## Before:

- All EOTs and Elevators with brake resistor & chopper arrangement
- increases DC bus voltage



## After:

- “Regenerative Drive” installed at two identified location for trial, One EOT crane and Elevator
- 30kw regenerative drive used at PPT elevator and 15 KW at at EOT

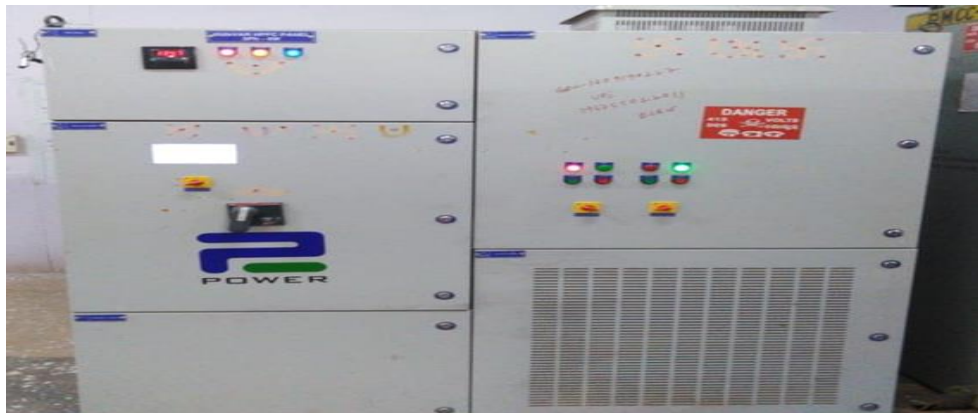


## Outcomes/Gain:

- Annual Energy Saving of 14.6 Mwh, (Rs 0.62 Lakh/Annum)

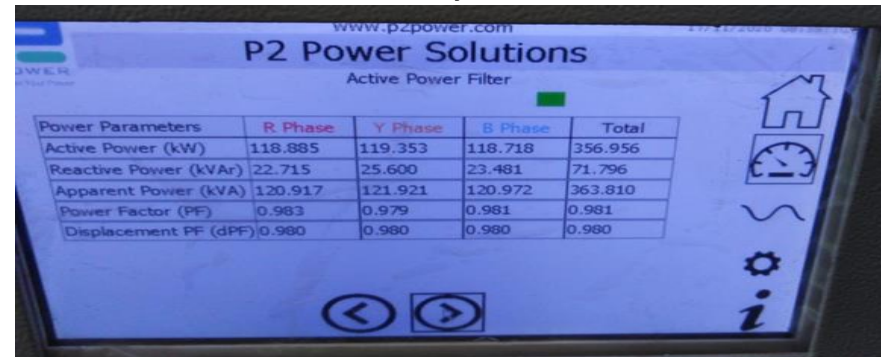
## Before

- Power factor of 0.78 at SS#3 and 0.72 at SS#6



## After

- 450KVAR HPFC installed at SS#3, now PF is 0.98
  - 350KVAR HPFC installed at SS#6, now PF is 0.98
- commissioned in January 2020



Power Parameters	R Phase	Y Phase	B Phase	Total
Active Power (kW)	118.885	119.353	118.718	356.956
Reactive Power (kVar)	22.715	25.600	23.481	71.796
Apparent Power (kVA)	120.917	121.921	120.972	363.810
Power Factor (PF)	0.983	0.979	0.981	0.981
Displacement PF (dPF)	0.980	0.980	0.980	0.980

- We have opted for HPFC instead of APFC
- This consists of fixed and variable capacitor banks
- This ensures optimum PF correction and faster response to variation in load

## Outcomes/Gain:

- Annual Energy Saving of 128 MWh, (Rs 4.86 Lakh/Annum)



**HPFC Panel**

# P4: Dynamic Load shedding To avoid Power plant black out.

## REQUIREMENT:

Shedding of load to the tune of 20 MW during exigency to avoid blackout.

## CONSTRAINT

No Power Management System installed for fast load shedding/throw-off in milliseconds

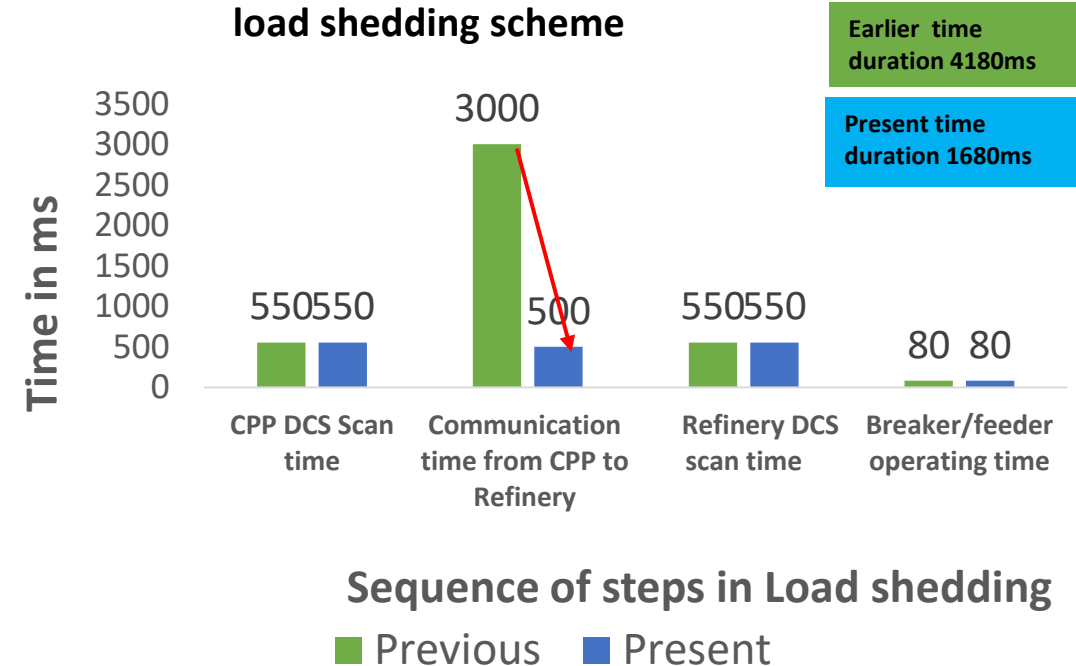
## IN HOUSE SOLUTION

1. All shaddable load Identified & grouped
2. Hardwire connectivity between Refinery and CGPP DCS to reduce the communication time from 4180ms To 1680ms

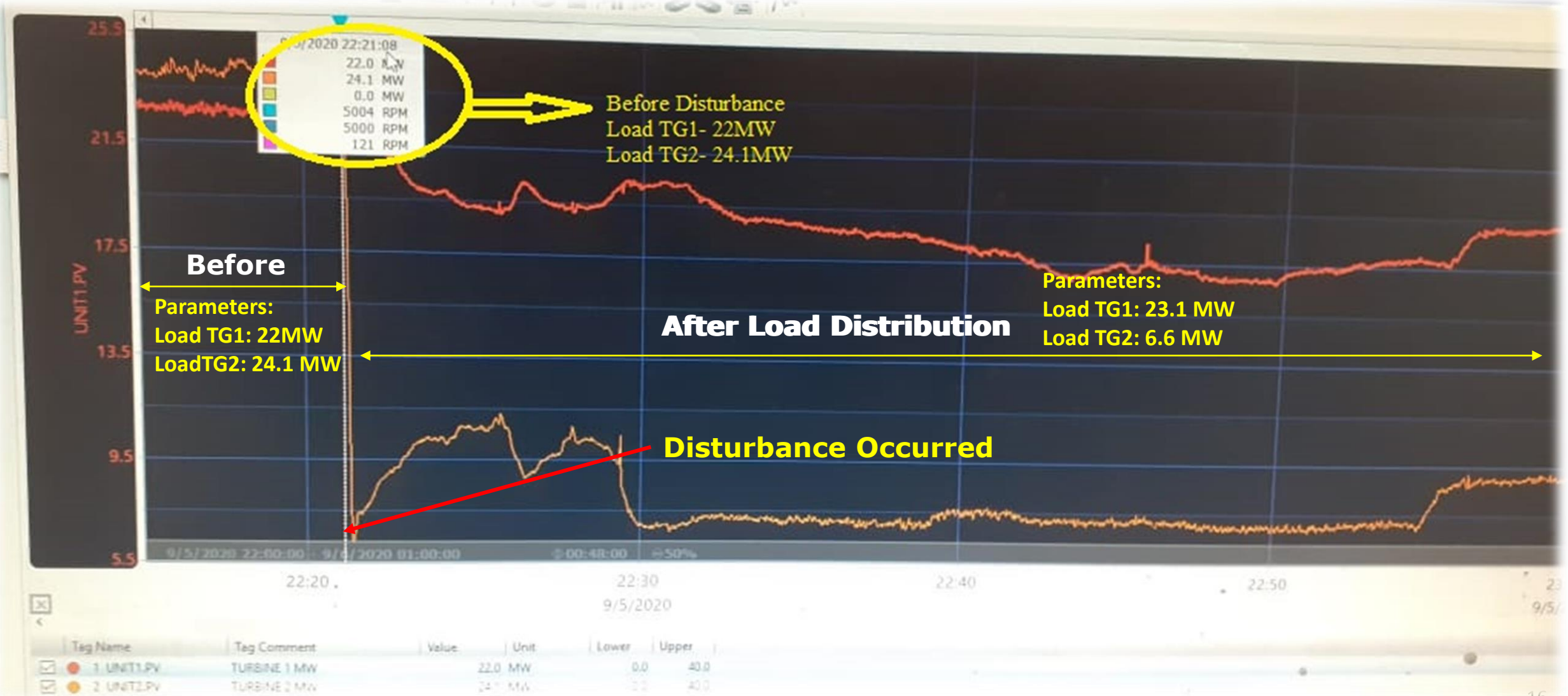
## Outcomes/Gain:

1. Post implementation, **couple of blackout occasions avoided** (on 10<sup>th</sup> March 20 & 5<sup>th</sup> Sep20).
2. **~ 890 GJ energy saved per tripping.** (at Plant startup LDO, HFO cons. & Grid import power) (Rs.14.9 Lacs/tripping)

Time comparison between previous and present load shedding scheme



## Load shedding Scenarios



## Problem / Concept Description

1. High rejects leads to unsafe working condition .
2. High coal rejects from the coal Mills ,1.6% coal rejects.
3. High Unburnt and carbon loss in the boiler. Hence lower boiler efficiency 85% max.

## Approach

Comprehensive study and improvement was carried out by team to find out the suitable technology / Technology provider to improve the mill performance and reduce the challenges.

## Result / Implementation Status

1. Improve Reliability of milling system.
2. Improve life of grinding element and other internals.
3. Improve Coal Finess.
4. Decrease Coal Rejects. Recorded 0.5% from 1.6%.
5. Boiler Efficiency achieved 86.9% in last Financial Year.

\* [Achieved coal saving of 7000 TonPA.](#)

## Key Benefits:

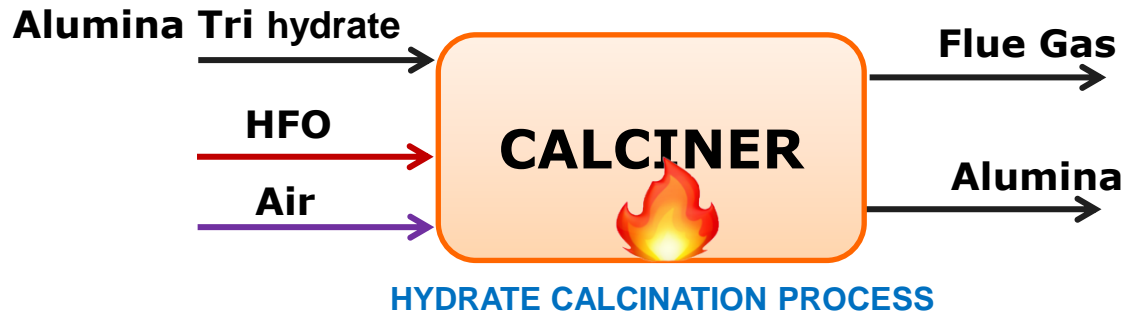
**Increased sustainability**

**Increased Efficiency**

**Waste Reduction**

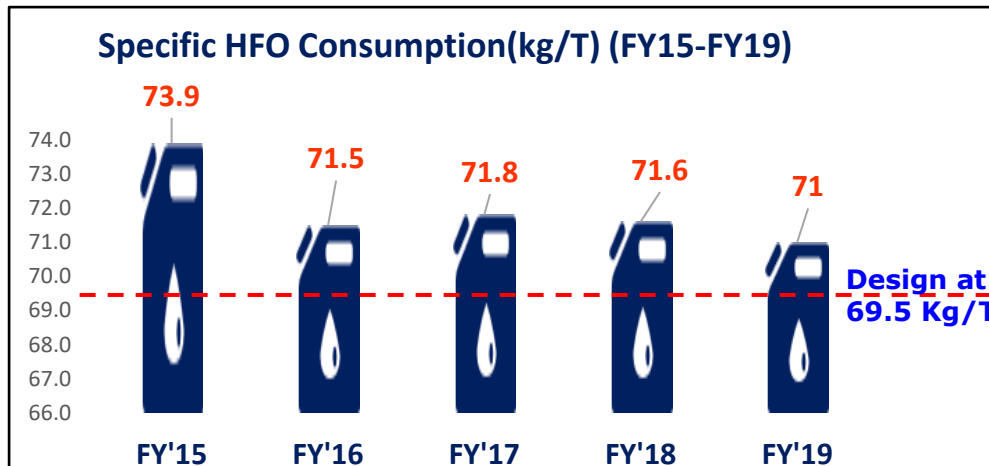
**APC Reduction**





## Before:

- Specific Oil Consumption higher than the design Value



## After:

Worked on Four Aspects:

- Process Parameter Optimization
  - Reduced Hydrate Feed rate Fluctuation through fine tuning in the controller
  - Optimization of Stack O<sub>2</sub> % at 7% (Earlier-10%): Audited and Attended Air Leakages
- Insulation Audit: (Thermal Scanning/Visual inspection).- 170 m<sup>2</sup> area corrected.
- Logic control modified for Burner Nozzels
- Reduced Unplanned Stoppages

## Outcomes:

**A. Hydrate Feed Process Variations:** St. deviation reduced by 30%

	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19
135		4	1	1					
140		1	1	1					
145			1	0					
150		1	0	1				1	1
155		5	4	1			5	2	11
160	4	5	4	1	2	4	11	10	9
165	10	8	0	10	7	18	6	5	
170	5	5	1	1	8	5	3	5	
175	1	1	3	5	9	1	3	4	
180			10	6	4	0			

**B. Unplanned Stoppages: Reduced by ~50%**

Major Work :

1. **Frequent Breakdown of FBC control valve. (once in a 3 Months):** -

Additional sleeve provided with packing housing



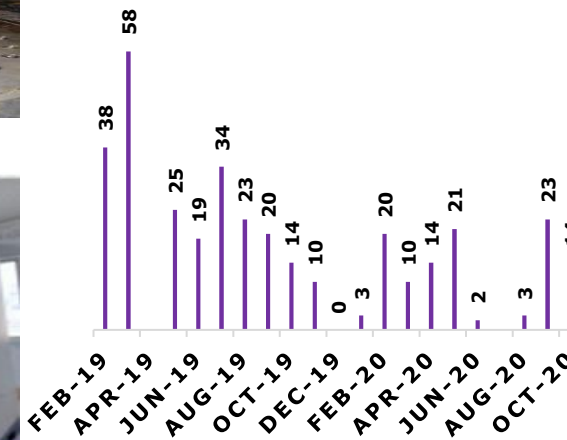
2. **Frequent ID Fan Tripping (Total Stoppage-19.5 hrs)**

Provided additional fan on top of the panel

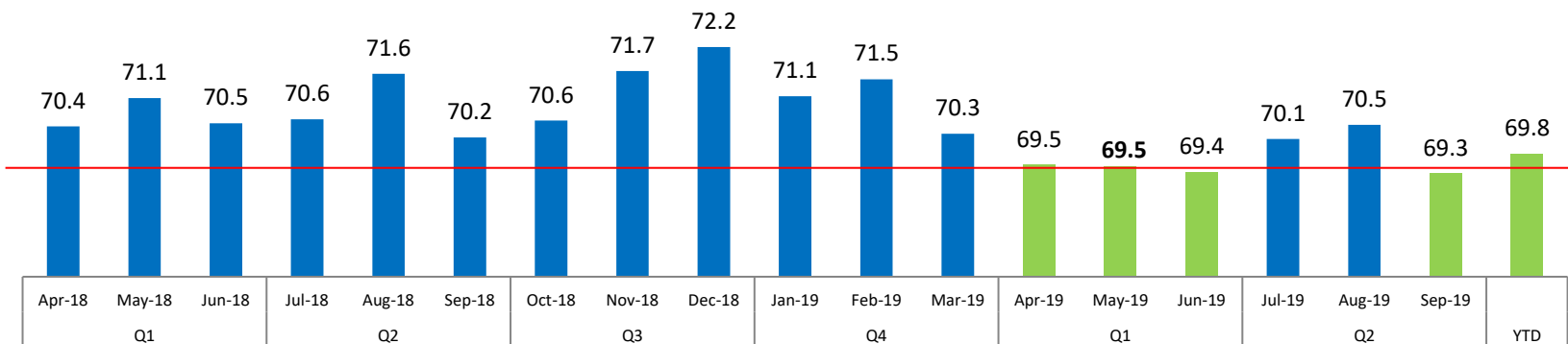


-Modification of logic so as to operate only two fans at any point of time with a differential pressure trip delay

Unplanned stoppages (HOURS)



HFO Specific Consumption (kg/T) ( FY19- FY20)



**Decrease in HFO specific consumption- 1.2%**



**Capacity  
5MW AC/7MWp  
DC**



**Average Power generation  
since inspection  
1.037 MW**



**Installation –Feb 2020**

- Evacuation Voltage: 33 KV
- Project Mode: BOOM (Build, own, operate & maintain)

- Solar Generation 2.25% of total power generation
- Power cost in Rs./Kwh (SOLAR/CGPP): 3.13/3.41
- Saving of 0.28Rs/kWh
- Annualized benefit without RPO Rs. 9.06 Lakhs
- Annualized benefit with RPO: Rs. 87.15 Lakhs

## Information on GHG Inventorisation and public disclosure:

17/03/2021 Wednesday 3:14:34 PM

### Environmental Information

M/s. Utkal Alumina International Ltd., Durgamuda.

(i) Name of the industry/plant with contact details (as per the Consent to Establish/Operate)	M/s Utkal Alumina International Ltd. (Alumina Refinery), Durgamuda, Bhubaneswar-751015, Dist. Bhubaneswar, Odisha.
(ii) Details of the spatial consent to operate & fulfillment with zoning	CTO No.002/2011 (EIA/NOI) - COE BURE, (SPAD) MPD- 31.04.2011 SPO No.002/2011 (SPO/NOI) - COE BURE, (SPAD) MPD- 31.04.2011
(iii) Status of operational status	Operational

(iv) Production Details

Sl. No.	Products manufactured (Smelting, Reducing, Finishing)	Details of Hazardous Chemicals used with quantity and storage	Type of HW generated with category as per HW/MSRHS	Quantity of HW Generated (G), Stored (S) & Disposed (D)			Mode of treatment and disposal (Pre-processing, On-processing, recycling, landfilling/vermicomposting/other etc.)
				G	S	D	
1	(a) Calciner (3, 50 MW) (b) Thermal Power (307 Mw MW)	(a) Used in plant (b) (c) Rotary hearth (d) (e) (f) (g) (h) (i) (j) (k) (l) (m) (n) (o) (p) (q) (r) (s) (t) (u) (v) (w) (x) (y) (z)	(a) (b) (c) (d) (e) (f) (g) (h) (i) (j) (k) (l) (m) (n) (o) (p) (q) (r) (s) (t) (u) (v) (w) (x) (y) (z)	20,000	4,000	20,000	To Authorize Recycle, Disposed to TDF and Common Hazardous Waste Treatment Storage Disposal (CHWTSD), Odisha.

17/03/2021 Wednesday 3:15:27 PM

(v) Air Emission:

Sl. No.	Source of Air Pollution (Ex. Boiler/ID units/Process with capacity in (t)/kg. type of pollutants)	Air Pollution Control Devices with stack height	Parameters monitored w.r.t. Air Pollution (PM, CO, SO <sub>2</sub> , NO <sub>x</sub> etc.)	
			Measured data	Limits/Standard prescribed by SPCB/CPCB
1	Boiler-1, Coal	ESP, Stack height:150 m	PM: 46.05 SO <sub>2</sub> : 590.8 NO <sub>x</sub> : 173.14	PM: 50, SO <sub>2</sub> : 600, NO <sub>x</sub> : 500
2	Boiler-2, Coal	ESP, Stack height:150 m	PM: 0 SO <sub>2</sub> : 0 NO <sub>x</sub> : 0	PM: 50, SO <sub>2</sub> : 600, NO <sub>x</sub> : 500
3	Boiler-3, Coal	ESP, Stack height:150 m	PM: 43.45 SO <sub>2</sub> : 163.43 NO <sub>x</sub> : 194.33	PM: 50, SO <sub>2</sub> : 600, NO <sub>x</sub> : 500
4	Calciner-1, HFO	ESP, Stack height:150 m	PM: 22.53	PM: 50
5	Calciner-2, HFO	ESP, Stack height:150 m	PM: 20.64	PM: 50

\*OCMS connectivity details: Date of installation: Boiler-1 on 23.11.2013; Boiler-3 on 18.09.2013; Calciner-1 on 15.10.2013; Calciner-2 on 28.05.2014; and operational status: In operation. OCMS are connected to SPCB/CPCB servers.

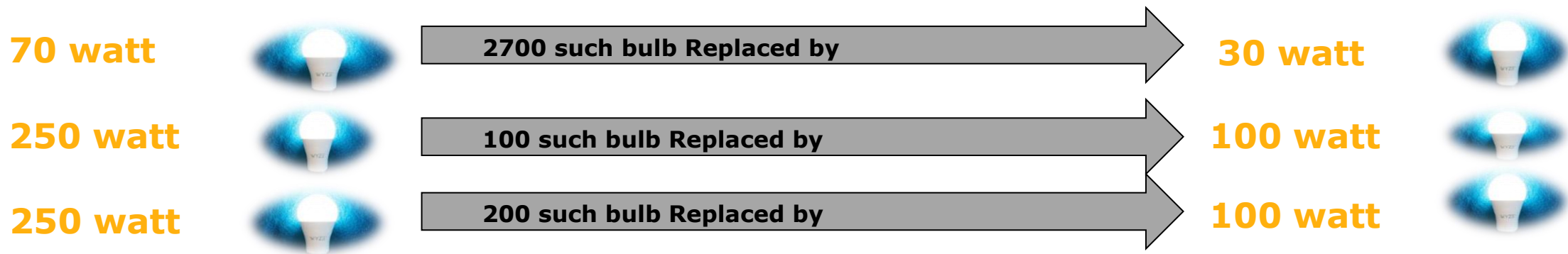
(vi) Effluent discharge: Not Applicable as plant operates on Zero Liquid Discharge (ZLD) philosophy

Sl. No.	Source of Effluent Discharge with Quantity (w/ process waste water, domestic effluent etc.)	Treatment method (ETP with capacity or any other method)	Mode of disposal of treatment effluent (Drain/)	Effluent discharge Monitoring (pH, COD, BOD, TSS, etc.)	
				Inlet	Outlet
Zero Liquid Discharge					

\*OCMS connectivity details (Date of installation and operational status): IP Camera and flow meter has been installed on and connected to SPCB/CPCB servers.

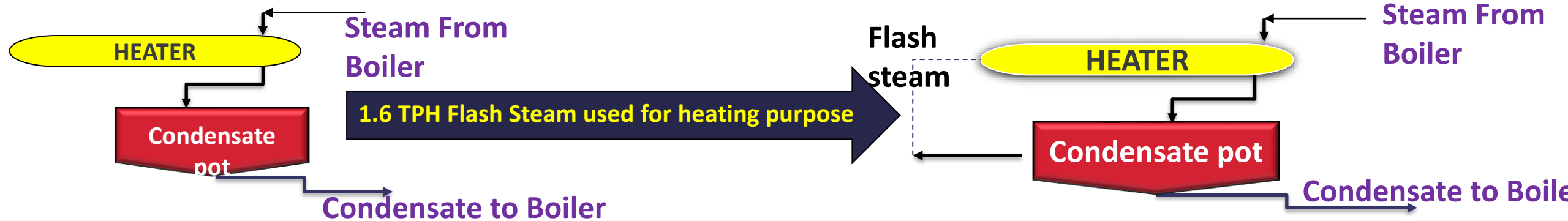
# Utkal expansion project considerations

- Total 490 no's of motors in expansion project of IE3 efficiency class.
- All the Transformers are level 2 energy efficiency class where the losses at 50% is 5050 Watt and at 100% it is 15000 Watt. Whereas in existing the losses at 50% and 100% is 5400 Watt and 17000 Watt respectively.
- All the lighting fixtures are LED type.



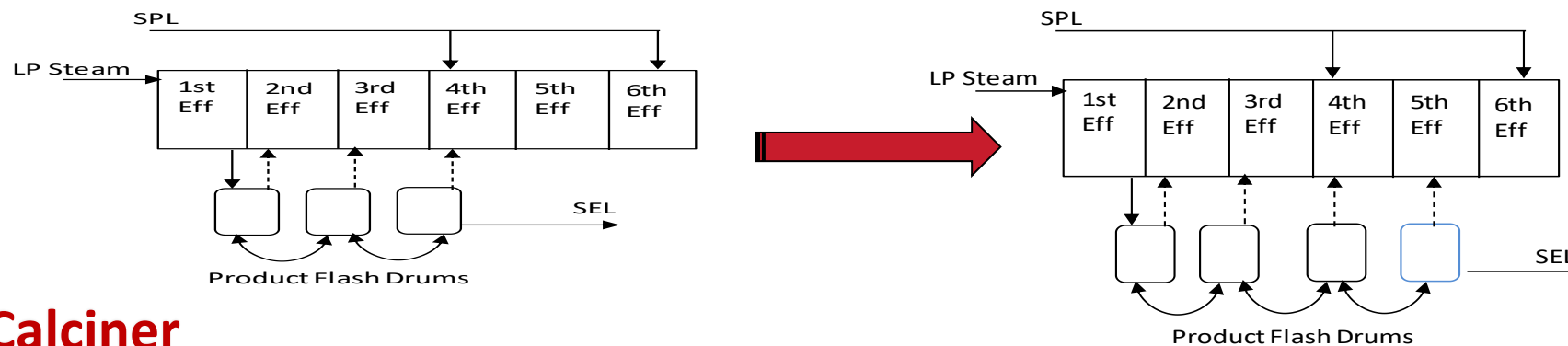
## A. Pre-Desilication

- In expansion train, condensate from both trains is flashed which results in Increasing heater performance



## B. Evaporation

- New evaporator with additional Product Drum will reduce ~2% steam consumption



➤ Steam economy increased by 2%

## C. Calciner

- New upcoming Calciner from M/s FLSmidth with improved Fuel efficiency.
- Claims 7% reduction on HFO specific Consumption than Existing Technology.

*Thank You.....*