CII National Award for Excellence in Energy Management-2022

Team Members

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1. Company Profile

ASHOK LEYLAND
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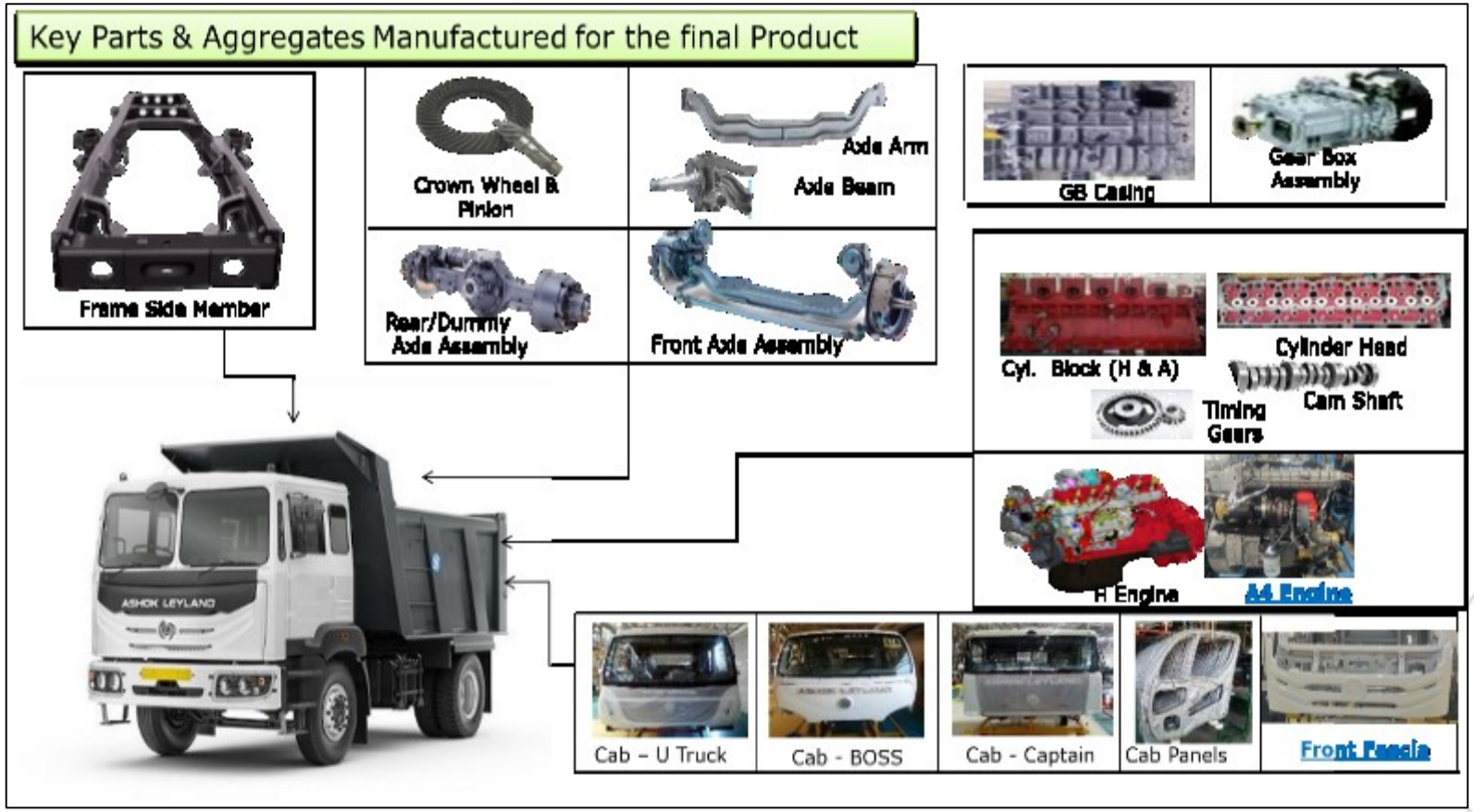
Ashok Leyland PNR Unit

Inauguration- Mar' 10

Young workforce Avg. Age ~24 years

Zero discharge Plant. **In-house ETP and STP plants**



In house Plantation facility of 57,000+ Trees

Rain water harvesting Pond (capacity : 8000 KL)

Certifications

- **Deming Prize (2016)**
- **IATF 16949**
- **ISO 45001,14001**

2. Energy Consumption Overview

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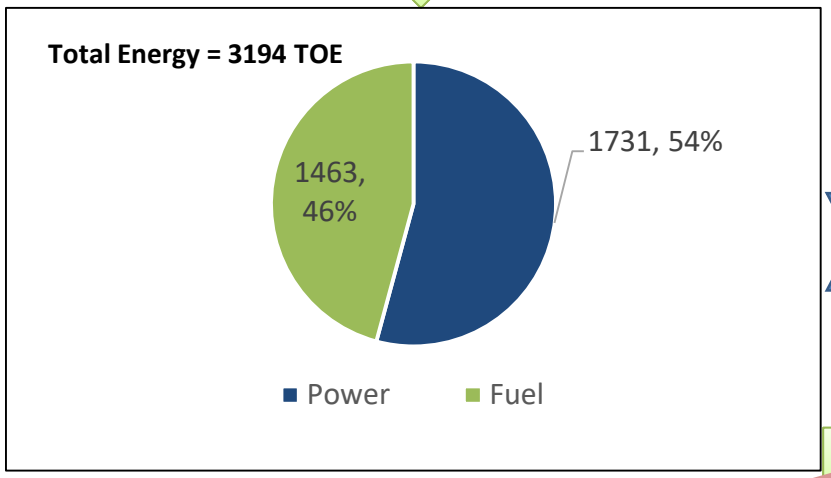
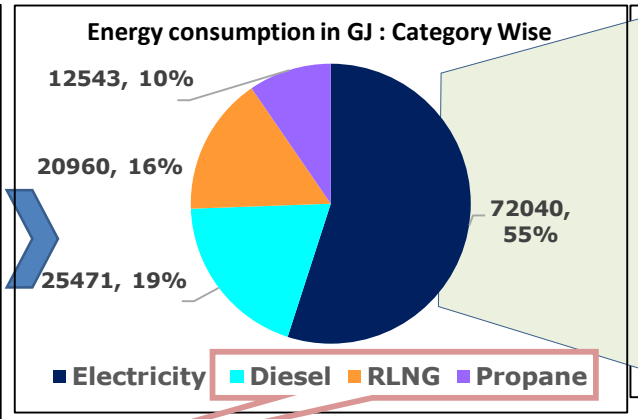
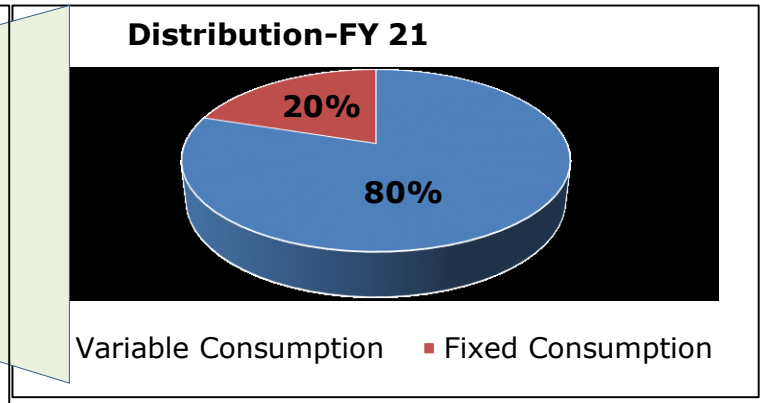
Distribution of Energy FY 21





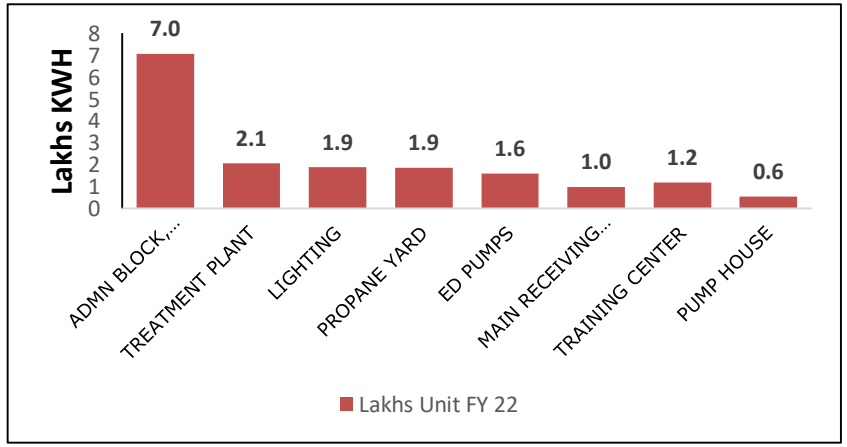


Variable Power Contributes 80% of Total power consumption

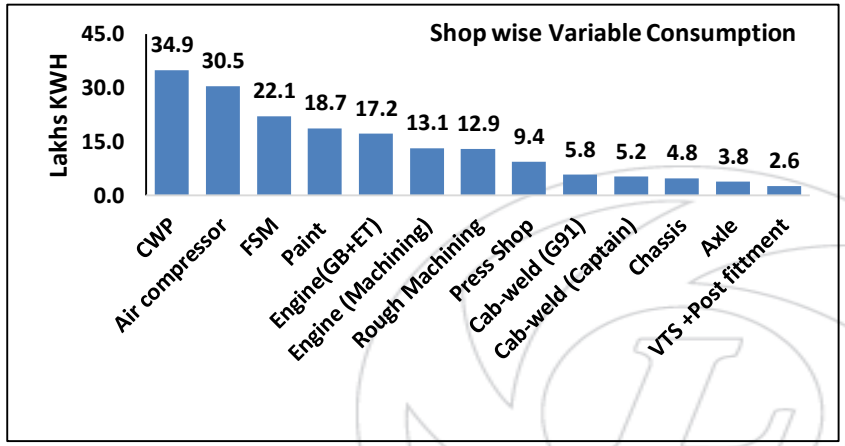
55% consumption is electricity

#	Fuel	Used in
1	Propane	Paint Shop
2	RLNG	FSM Shop
3	Diesel	Engine Testing, Vehicle Testing, MHE

Fixed Consumption



Variable Consumption



- *GJ: Giga Joules
- RLNG: Regassified Liquefied Natural Gas
- TOE; Ton of Oil Equivalent

2. Specific Energy Consumption in last 3 Years

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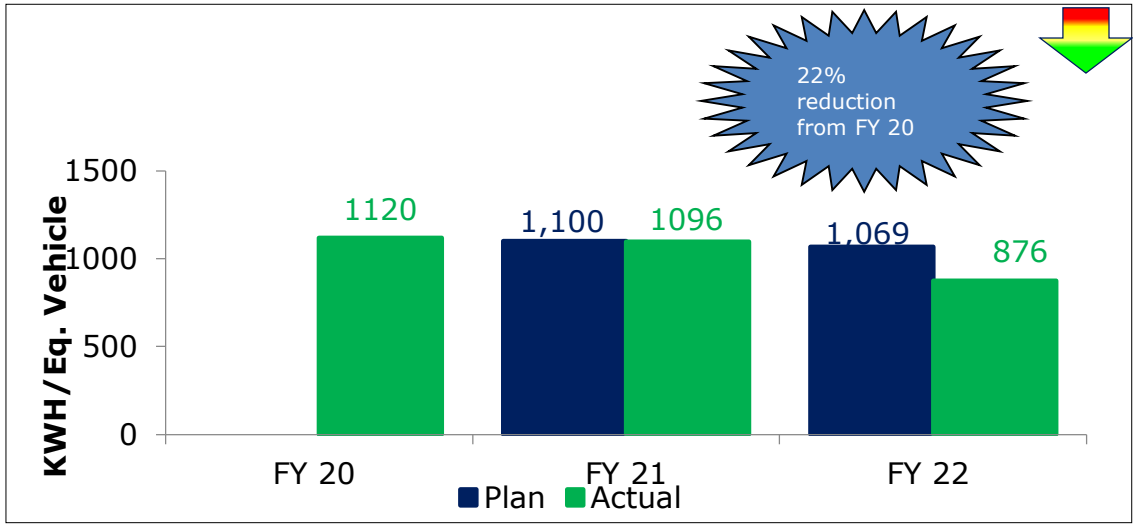
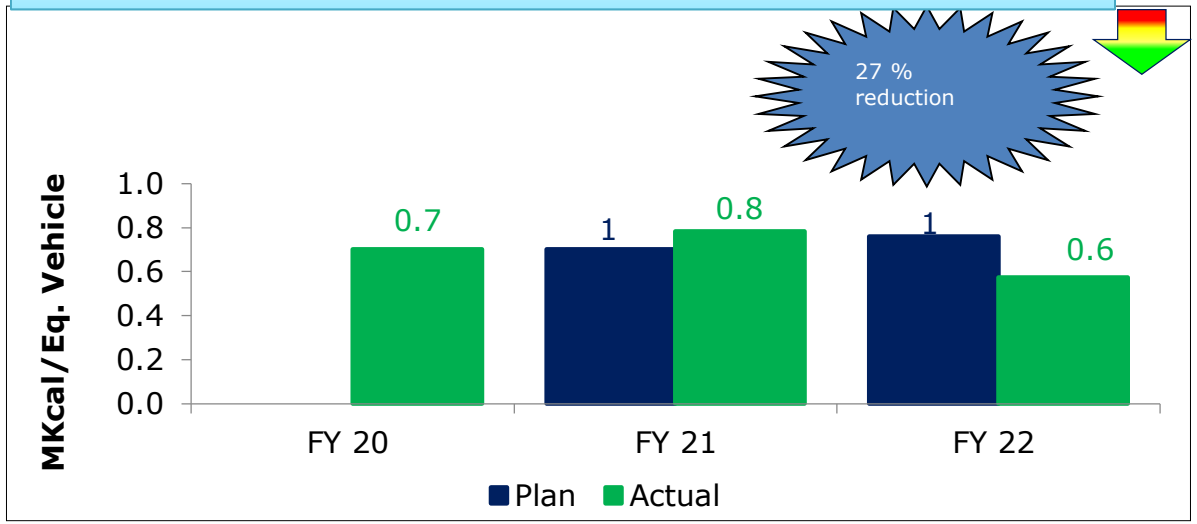
Specific Energy Consumption-Electrical



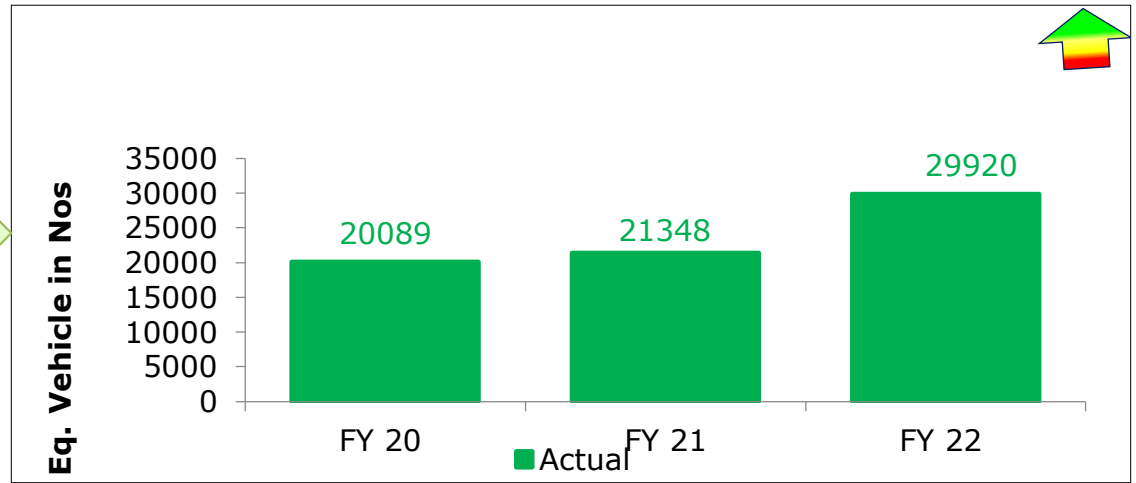
22% reduction in Power

Specific Energy Consumption-Thermal



27 % reduction in Fuel

Production Data



3.1 Information on Competitors, National & Global benchmark

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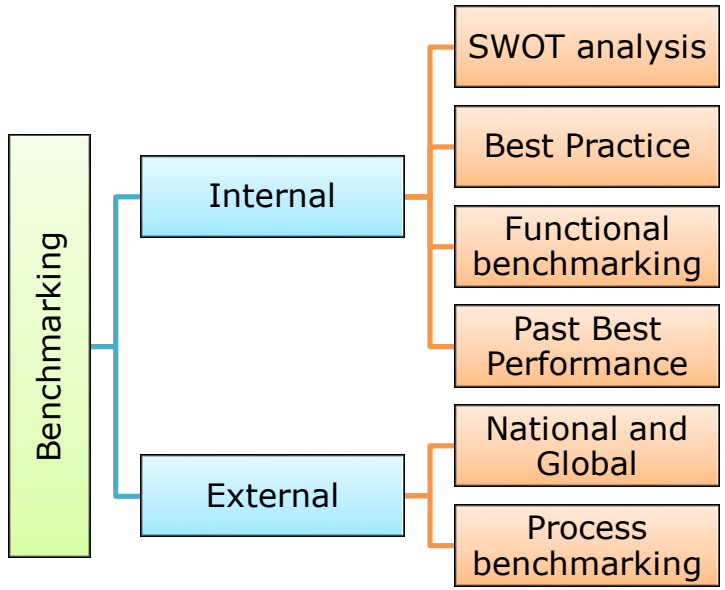
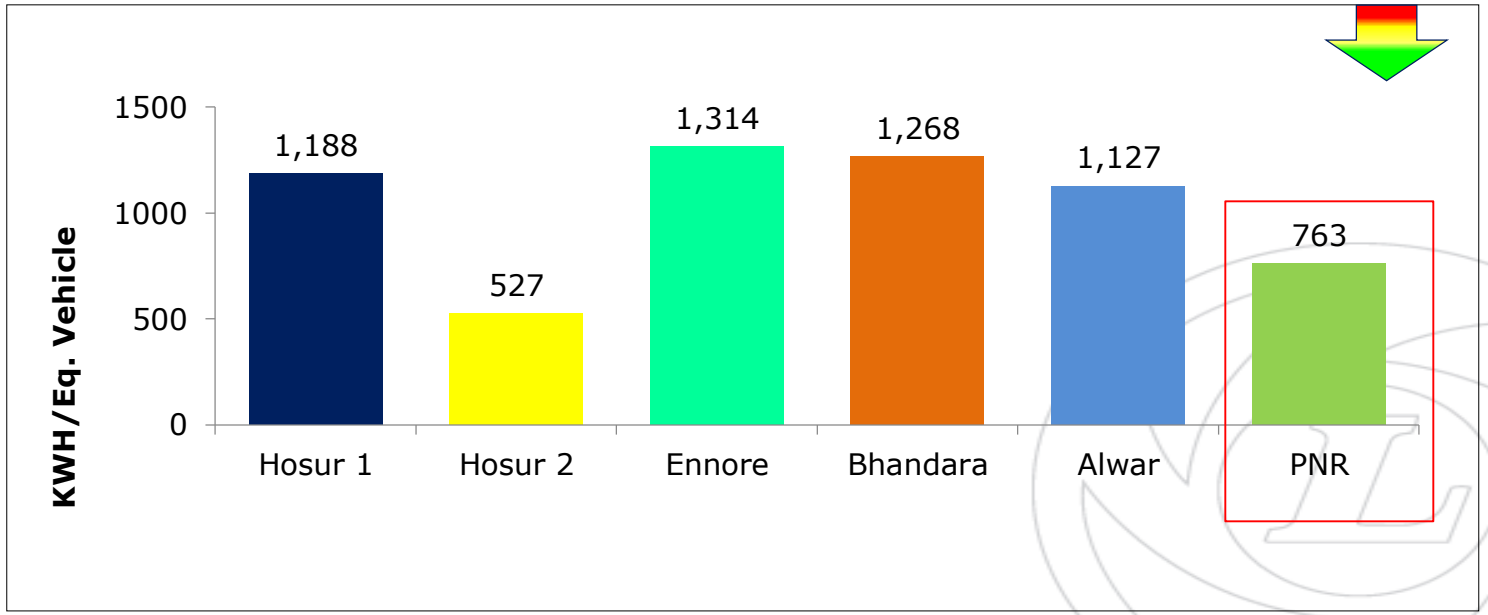


Internal benchmarking with other AL Units

- **PNR Stood Second among all Plants**
- **PNR achieved the best Performance in comparable Plant**



3.2 National Level benchmarking

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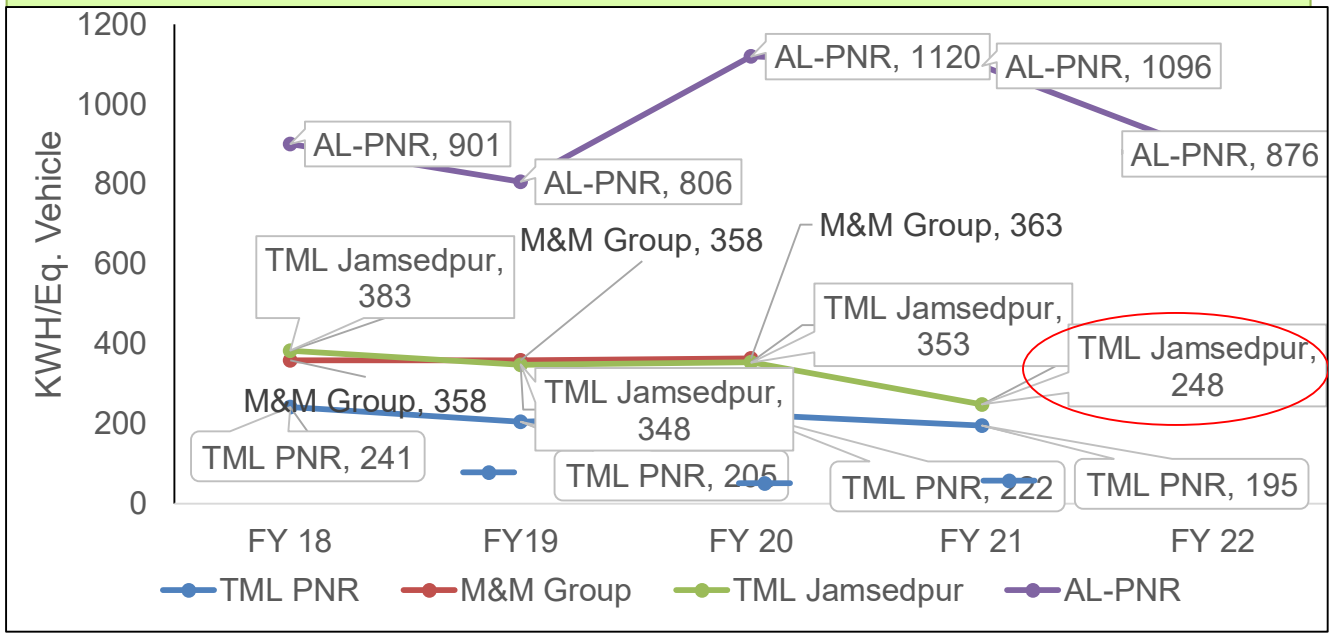
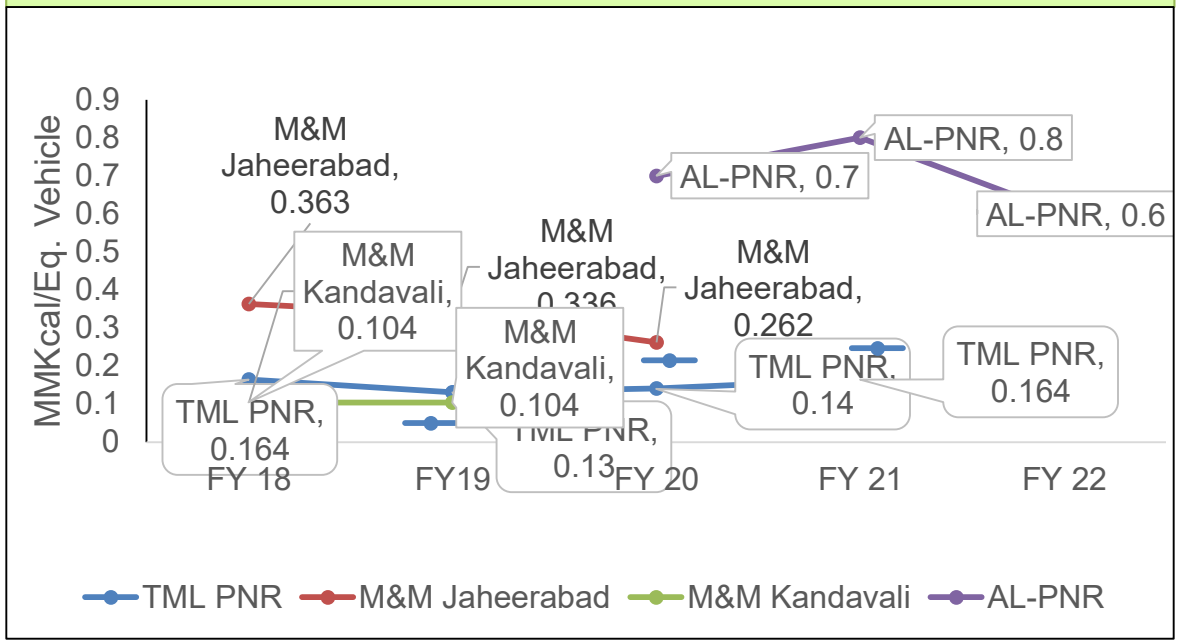
National Level Benchmarking: Power SEC



National Level Benchmarking: Fuel



Al Pantnagar benchmark itself with TATA Motors Jamshedpur.
however accurate benchmarking can not be done due to Production Volume, different Product and aggregates and different

Al Pantnagar has highest year on year reduction in thermal energy

3.3 Roadmap to achieve National level Benchmarking

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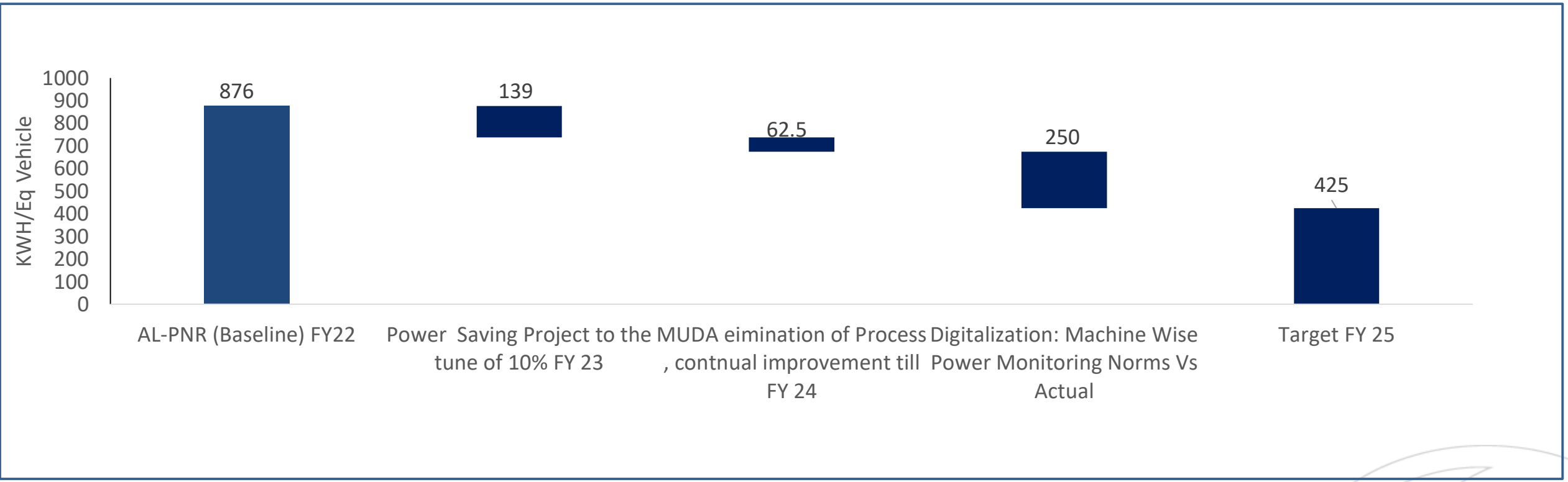
Road map to achieve Benchmarking



Al Pantnagar benchmarked its competitors and taken target of 71% reduction till FY 25

3.4 Major Encon Projects Planned in FY 23

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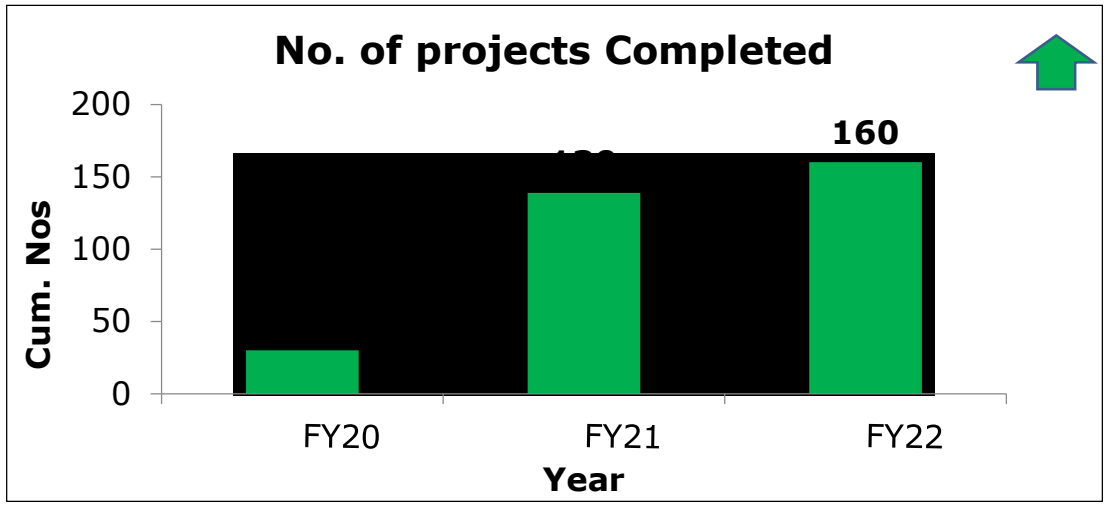
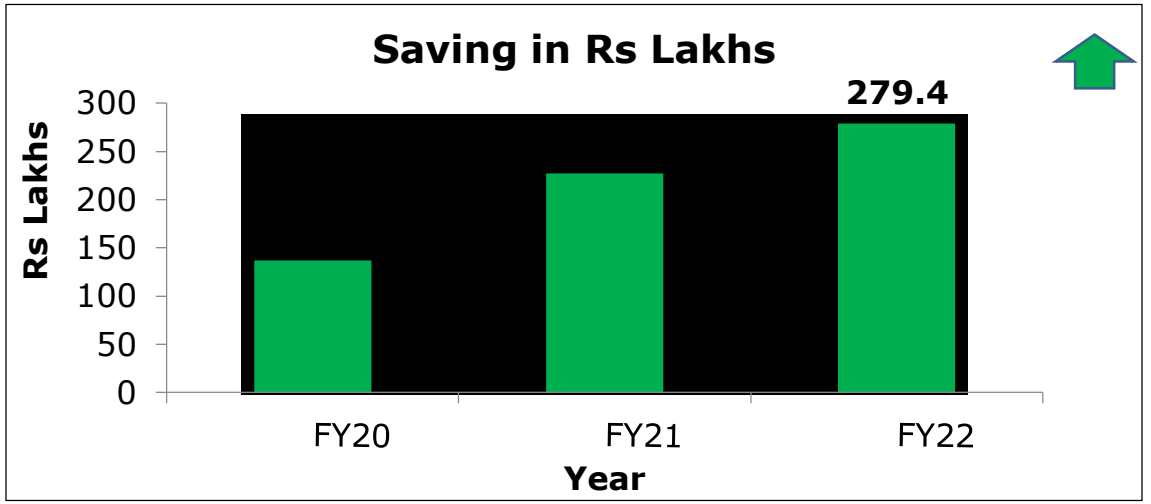
#	Project Tittle	Saving in Lakhs KWH	Saving in Rs. Lakhs	Investment in Rs. Lakhs
1	Electrical Energy Savings by optimizing the pump speed using VFD as per process and quality requirements (Paint Shop)	1.4	8.35	10.2
2	Optimized the running of 2 nos Air Blower of ETP by interlocking the speed with DO sensor	0.6	3.5	2.4
3	Replacement for existing Old screw compressors (0.19 KW/CFM) with energy Efficient new Compressors (0.16 KW/CFM)	4.5	27	90
4	Capacity improvement in Paint shop by increasing numbers of hangers in PTCED line	18	108	108
5	Modification in existing facility 40 /10 EOT Crane.	4.5	0.5	3
6	Power saving by batch size optimization in weld shop	7	1.16	0
7	132 KW motor (IE1 efficient) installed in 800T press application. Overhauling required of existing motor, so selection of IE3 efficient motor for replacement.	0.63	3.8	0
8	Restoration of anode cell efficiency at ED bath	0.8	4.75	0

Inference: Rs.160 Lakhs Potential Saving Project identified, saving potential in Tco2E is 3500

4. Energy Saving projects implemented in last three years





Summary

Year	No of Energy saving projects	Investments (INR Lakhs)	Electrical savings (Lakhs kWh)	Thermal savings (Million Kcal)	Savings (INR Lakhs)	Impact on SEC (Electrical, thermal)
FY 2019-20	30	3	23.62	-	137.2	Electrical
FY 2020-21	109	10	28.8	221	227	Electrical & Thermal
FY 2021-22	21	78.7	53	646	279.4	Electrical

5.1 Innovative Projects implemented

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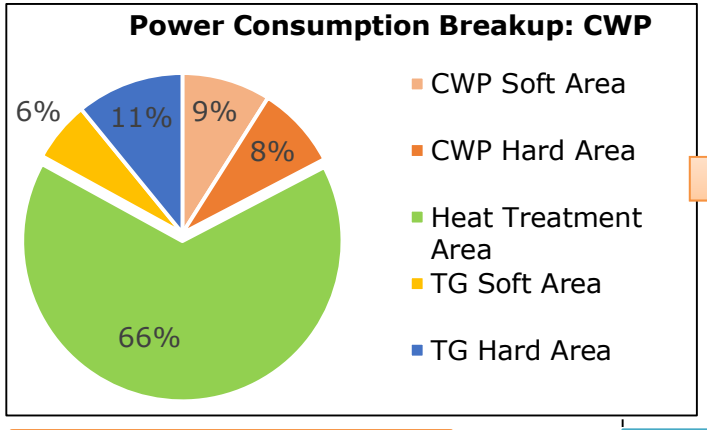
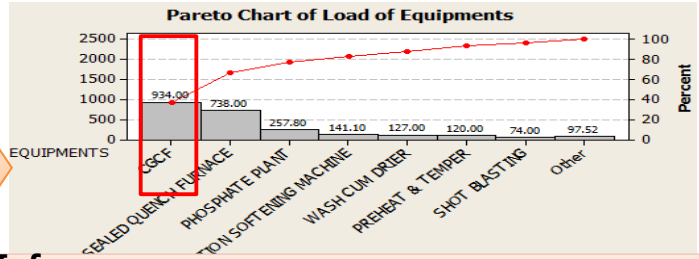
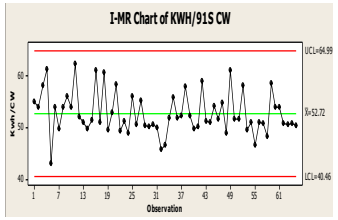
1. Problem: High power consumption in CWP Shop





Inference:
1) 66% of Total Power Consumption is of Heat Treatment area.
2) 37% of Total Power Consumption is contributed by CGCF (Continuous Gas Carburizing Furnace)

2. Observation-Model wise Comparison



Power consumption of model 91S (53 KWH/CW) is ~2 Times of 60S (27 Kwh/CW)

Baseline- 53 KWH/Crown Wheel
Target-40.5 KWH/Crown Wheel

Factors that differentiates 91S from 60S

Result	Cycle Time	Quality	Loading per Tray
Power Consumption	91S :90 min 60S: 60 min	High Case depth Low Case depth	4.5 nos 6 nos

3.Analysis

More Cycle time is required in 91S to attain Required higher case depth as compared to 60S Crown wheel

Reduce Power Consumption

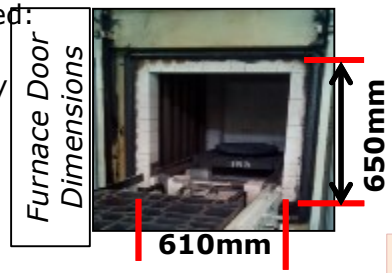
Option 1:Optimize Quantity per tray

Option 2: Cycle time reduction by optimization of all KPIV & KPOV

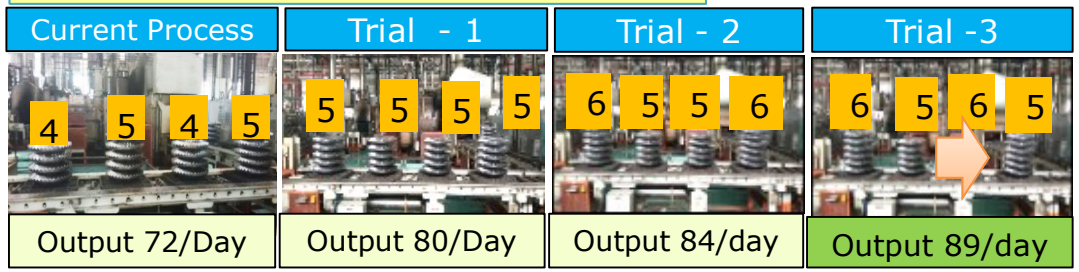
Option 1-Optimize Qty./Tray

Constraints where Risk is involved:

- Furnace height
- Pusher load bearing capacity
- Motor load bearing capacity
- Height of loaded crowns will cater atmosphere control



Optimization Trials for Part Qty. /tray



Cpk > 1.67. With loading pattern (Trial-3), Output/Day got increased from 72 to 89 & KWH/CW reduced from 55 to 44 but the target not achieved.

Option 2-Reduce cycle time

Parameter Optimization to Reduce Cycle Time

Regression Analysis
KPOV: Case Depth
KPIV: Carb Temp,Push Cycle time,CP Carb,Cp Diff,Hard Temp

Regression Analysis: Response Cas versus Temp CArb, Cycle Push t, ..

The regression equation is
Response Case = - 11.3 + 0.0124 Temp CArb + 0.00448 Cycle Push time
+ 0.0530 CP Carb + 0.0524 Cp Diff + 0.00133 Hard Temp

Predictor	Coef	SE Coef	T	P
Constant	-11.2572	0.9948	-11.32	0.000
Temp CArb	0.0123506	0.0008542	14.46	0.000
Cycle Push time	0.0044764	0.0008088	5.53	0.001
CP Carb	0.05303	0.09550	0.56	0.596
Cp Diff	0.05236	0.08088	0.65	0.538
Hard Temp	0.0013348	0.0004444	3.00	0.020

Inference: Carburizing temperature, Push Cycle time, and Hardening temperature are found significant for Case depth

4.Action

Parameters thru DOE

	Before	After
Carb Temp	930degC	940degC
Push Cycle Time	90min	80min
Hard Temp	840degC	850degC

5.Check

Power Consumption Reduced from 53 Kwh/CWP to 40 kwh/CWP

6.Standarization

5.2.1 Innovative Projects implemented

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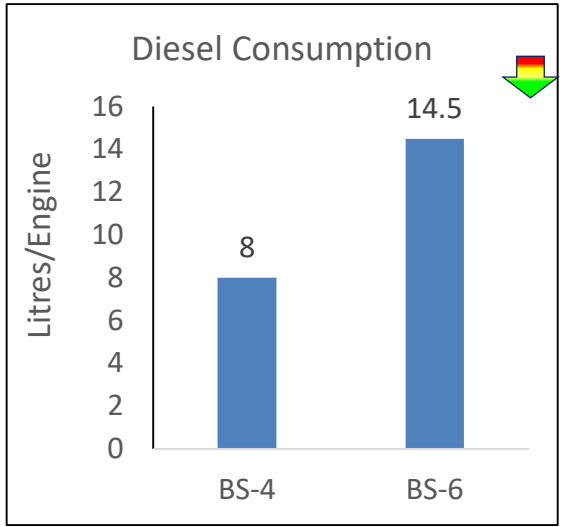
Problem:



Consumption of diesel per engine got increased drastically due to strict emission norms of BS6

Observation

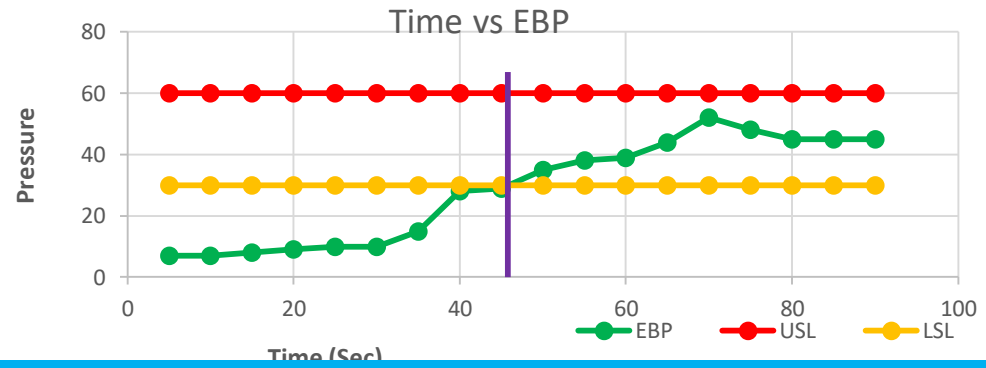
Cycle step	Time (Sec)	Fuel consumption (ltrs) D=C/0.832
Idle & Leak Test	90	0.09
Running in @2000 RPM	240	3.13
Idle before EGR Learning	30	0.07
EGR Learning	30	0.00
Idle	15	0.04
Fly-up	30	0.07
CAC & EBP	90	1.00
Performance 1	90	1.00
Performance 2	90	0.77
Performance 3	90	0.53
Idle	30	0.07
End cycle & Leak & Noise Check	190	0.06
Additional Running @1600 RPM	600	5.11
Total Time (Secs)	1615	11.9

High Diesel consumption in Engine Testing in H6 -2V mode;
Total testing time :1615 sec
Diesel consumption 14.5 litres

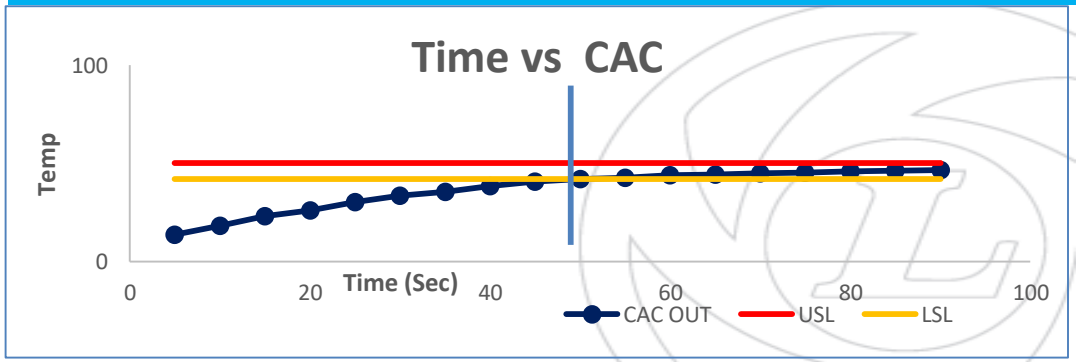
Analysis & Action

- With the help of DOE methodology, trials were conducted on process steps for optimization of CAC & EBP* cycle & Performance 1 cycle
- Performance 3 cycle is eliminated after validating the data of 5000 engines

EBP variation w.r.t Time at Performance 1



CAC Variation w.r.t Time at Performance 1



5.2.2 Innovative Projects implemented

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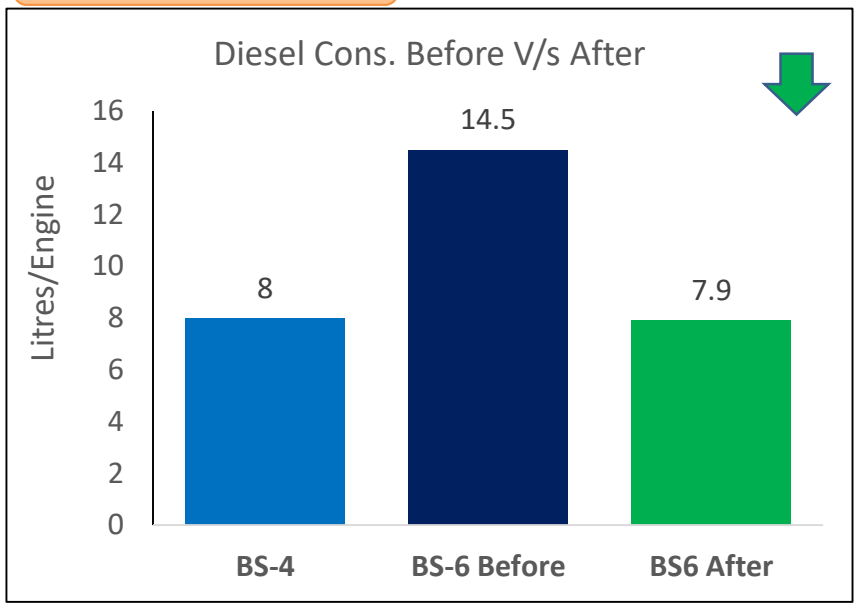
Before V/s After Cycle time

Cycle step	Before Time (Sec)	After Time (Sec)	Fuel consumption (ltrs) D=C/0.832
Idle & Leak Test	90	90	0.09
Running in @2000 RPM	240	240	3.13
Idle before EGR Learning	30	30	0.07
EGR Learning	30	30	0.00
Idle	15	15	0.04
Fly-up	30	30	0.07
~~CAC & EBP~~	~~90~~	~~0~~	~~1.00~~
Performance 1	90	90	1.00
Performance 2	90	90	0.77
~~Performance 3~~	~~90~~	~~0~~	~~0.53~~
Idle	30	30	0.07
End cycle & Leak & Noise Check	190	190	0.06
~~Additional Running @1600 RPM~~	~~600~~	~~0~~	~~5.11~~
Total Time (Secs)	1615	835	7.9

- **Additional running in cycle is eliminated** after increasing the Direct pass rate of engine from 65% to 95% in BS6 engine
- **Diesel consumption had reduced to 7.9 litres per engine** from 14.5 litres per engine

Benefits



Benefit :

1. Saving in Tco2E : 217/annum

2. Diesel saving : 79200 ltr./annum

2. Recurring Saving in Rs. Lakhs: 71.3 lakhs/annum

5.3 Innovative Projects implemented

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Problem: High DG running resulting in high diesel consumption and increase in power cost

Source of Power

EB Power

33 KV (HT)

DG -6X1500 KVA

Transformers — 2X5MVA

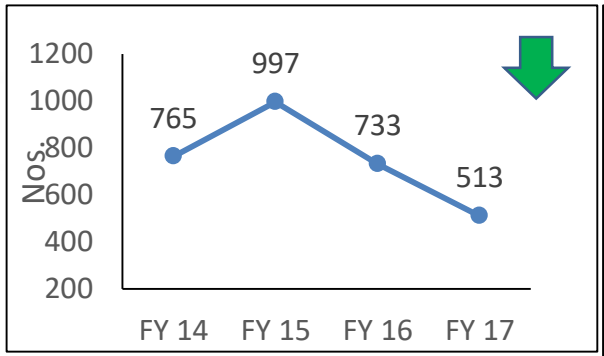
MRS

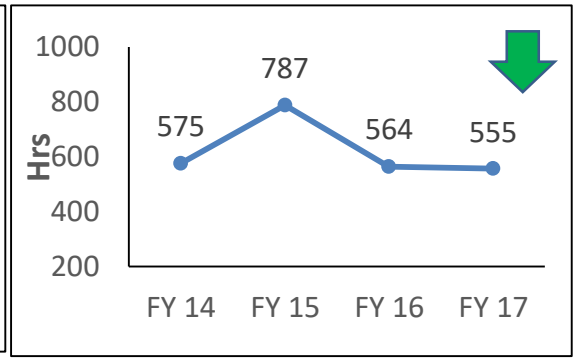
11KV

11KV to 415 V — Substation — Machines

415 V

Power interruption





Observation

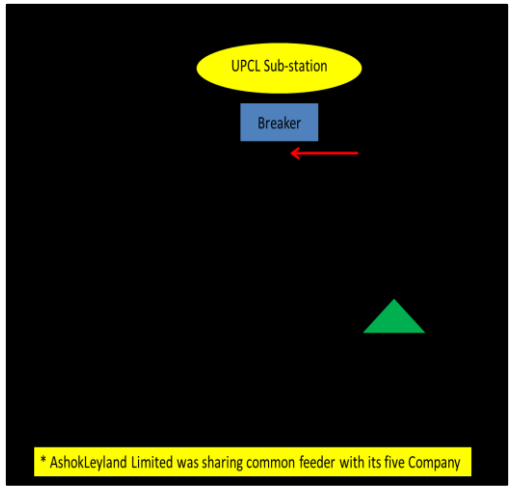
Power interruption leads to wastage of energy due to warm up of machine/ovens

Challenge faced

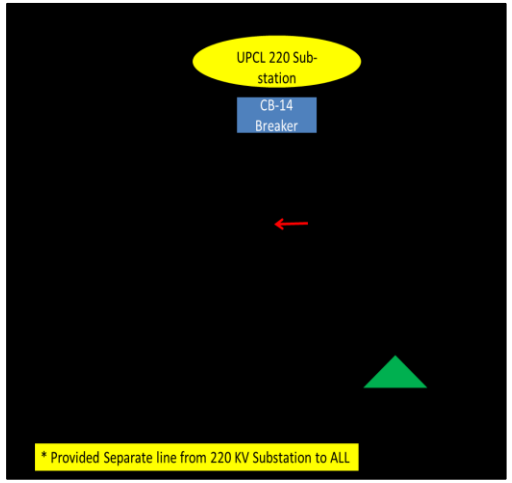
- High Power interruption
- High Electronic card failure
- Layout finalization
- Layout approval from UPCL board
- Overhead line crossing in High way

Action

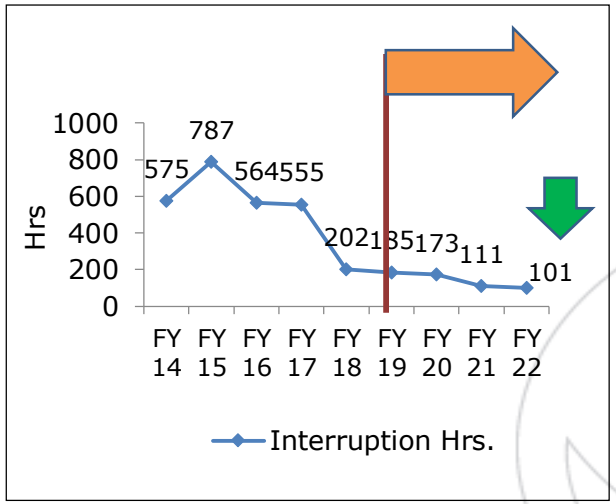
Before: Mixed Feeder



After: Independent Feeder



Effect



Benefit :

1. Saving of **674 Tc02E/Annum**
2. Saving of diesel by 1.7 lakhs ltr/Annum
3. Saving of **Rs 1 cr/Annum**

6a. Utilisation of Renewable Energy sources

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Renewable Energy

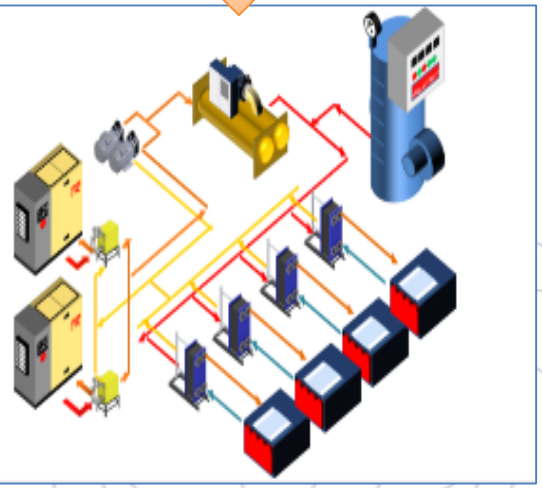
Yea	Technology (Electrical)	Type of Energy	Onsite/Offsite	Installed Capacity (MW)	Generation (million kWh)	% of overall electrical energy
FY 2019-20	**Solar PV**	**Electrical**	**Onsite**	3	3.3	13%
FY 2020-21	**Solar PV**	**Electrical**	**Onsite**	3	3.1	13.4%
FY 2021-22	**Solar PV**	**Electrical**	**Onsite**	3	3.2	14%

Roof Top Solar Power Plant

Renewable Energy

Year	Technology (thermal)	Type of Energy	Installed Capacity (million kCal)	Usage (million kCal)	% of overall thermal energy
FY 2019-20	Compressor exhaust heat recovery and utilization in washing machine	Thermal	300	76	0.5%
FY 2020-21		Thermal		238	1.4%
FY 2021-22		Thermal		255	1.5%

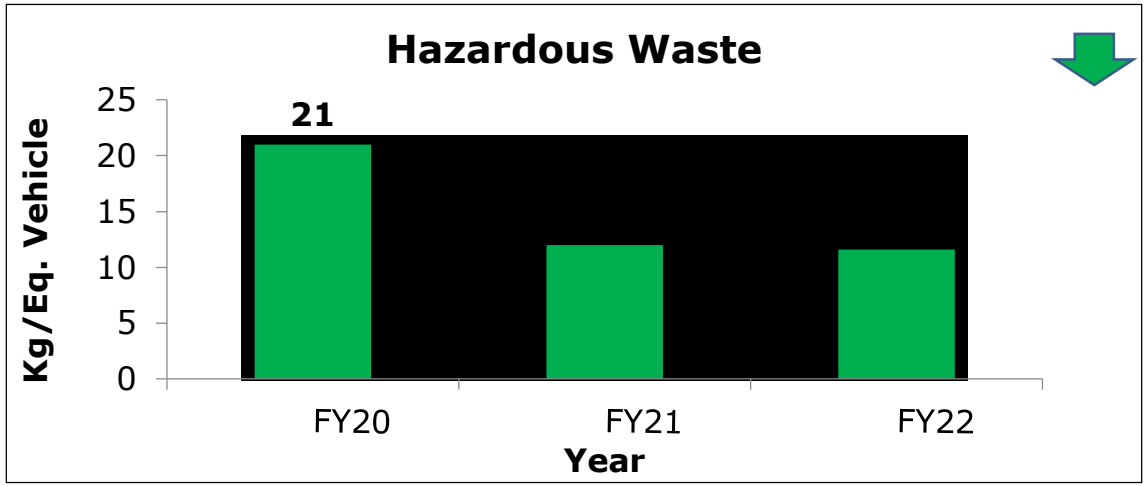
Exhaust heat utilization ckt



7. Waste utilization and management

Sr. No.	Description	FY 20	FY 21	FY 22
1	Phosphate Sludge	34.25	10.92	29.3
2	Paint Sludge	80.411	35.00	69.7
3	Discarded Containers	100.86	51.95	50.1
4	ETP Sludge	78.91	68.00	90.4
5	Filter & Filter Material	49.67	11.90	18.5
6	Used Oil	0.00	0.00	0.61
7	Waste Coolant	67.955	18.34	53.2
8	Waste Residues Containing Oil/Cotton waste	36.66	12.98	18.6

Result



47% reduction in Waste

7.1 Hazardous waste reduction

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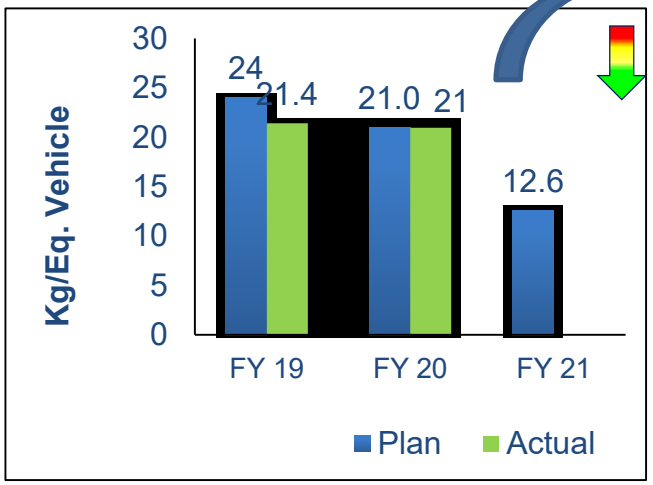
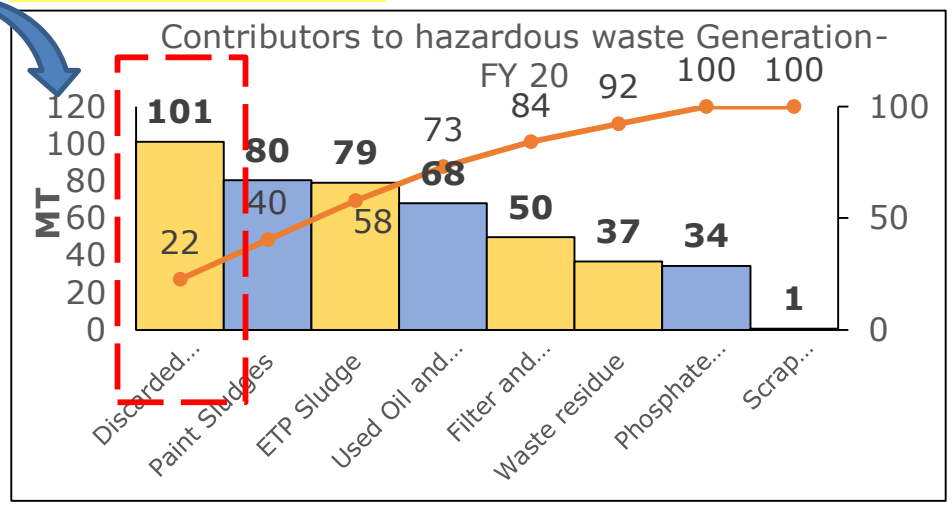
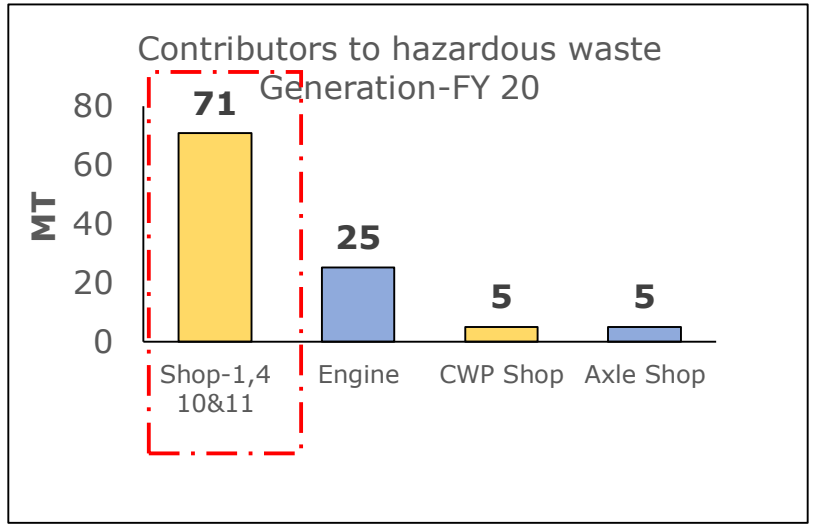
Problem



Analysis



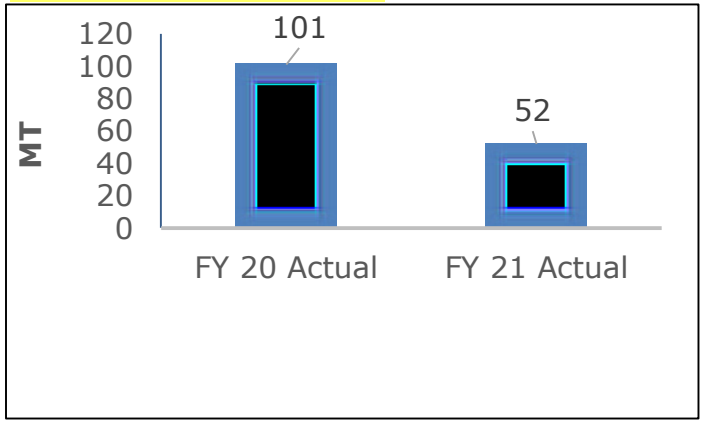


Actions

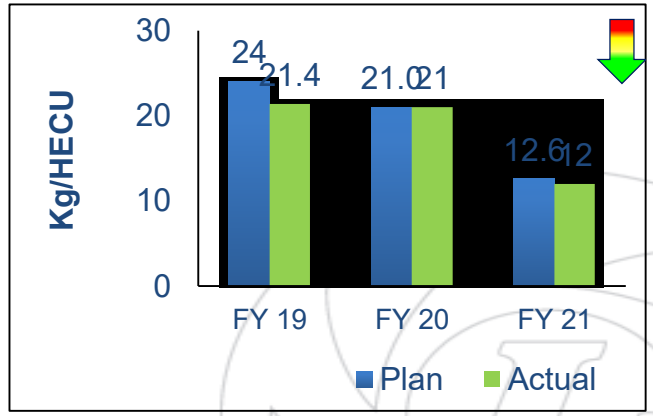
Before

After

Result



Effect



Inference – 49 MT discarded containers (Barrels) reduce thru implementation of "Bulk oil supply"

8. GHG Inventorisation

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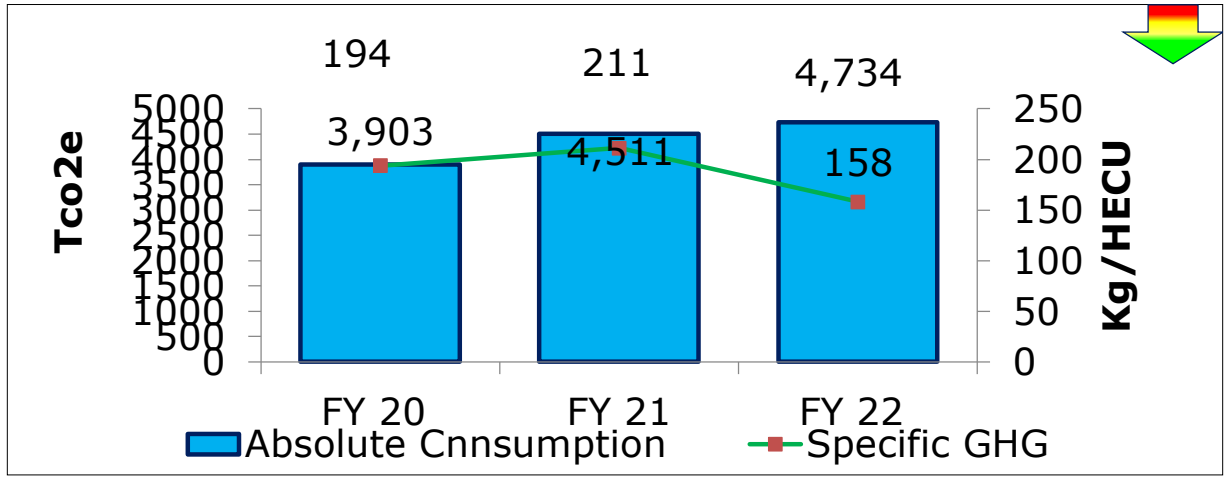
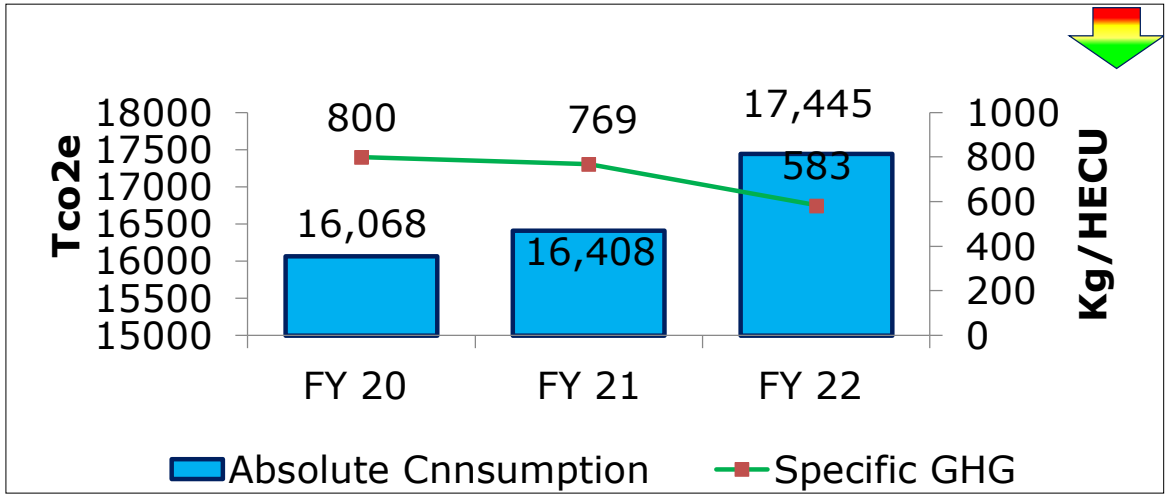
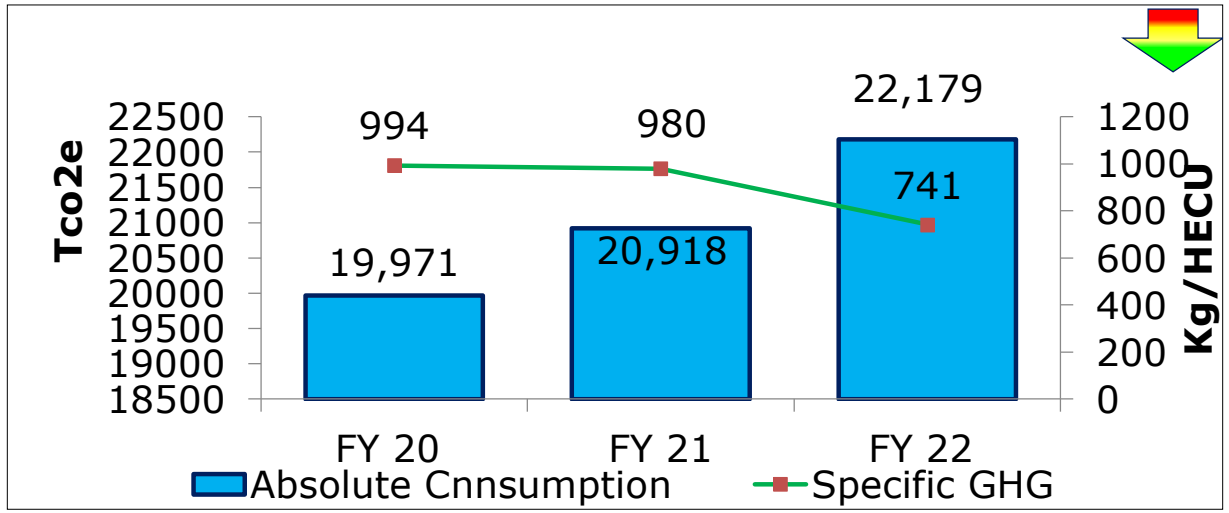
Emission Scope-1



Emission Scope-2



Total Emission (Scope-1 + Scope-2



25% reduction in GHG

Public disclosure on GHG is done through Annual Sustainability report

8.1 Net Zero Emission Target Short Term and Long Term

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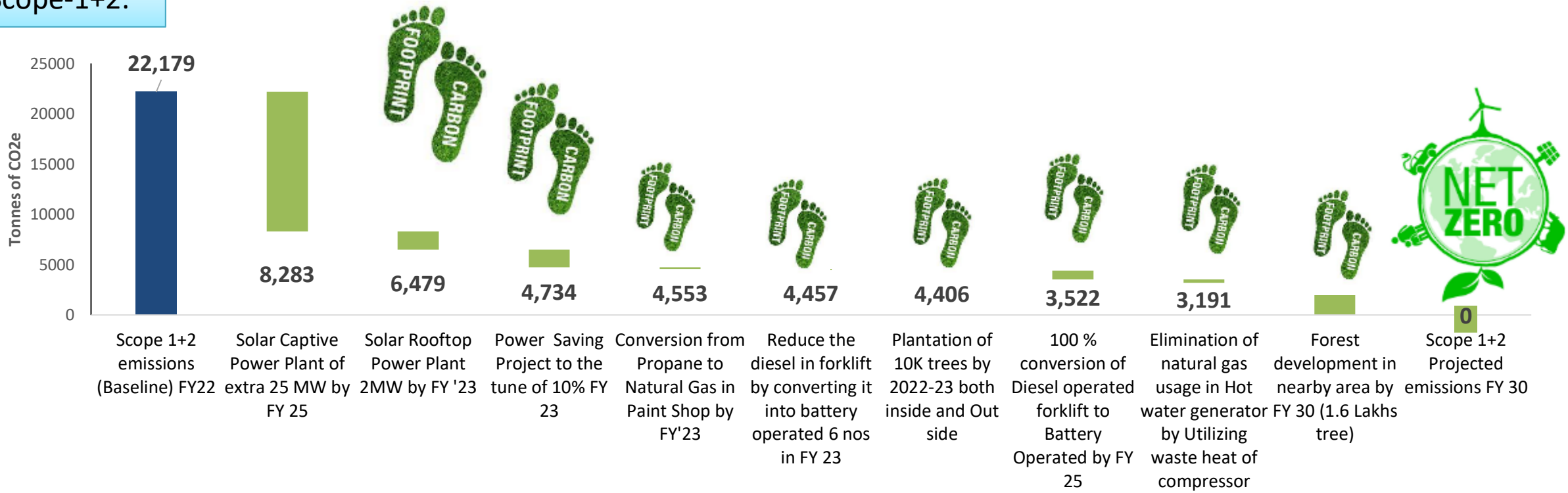
Scope-1+2:



Major Projects Planned

Renewable Energy

- Implementation of Solar Power Plant will reduce Tc02e by 22500

Power Saving Project

- Energy Conservation Project will reduce 4734 Tc02E

Adopting Clean Gas

- Conversion from Propane to RLNG, will reduce 4553 Tco2e
- Conversion from Diesel to battery operated forklift

Carbon Sequester

- Development of forest by Planting 2 lakhs tree

8.2 Efforts to carbon capture and reduction in GHG

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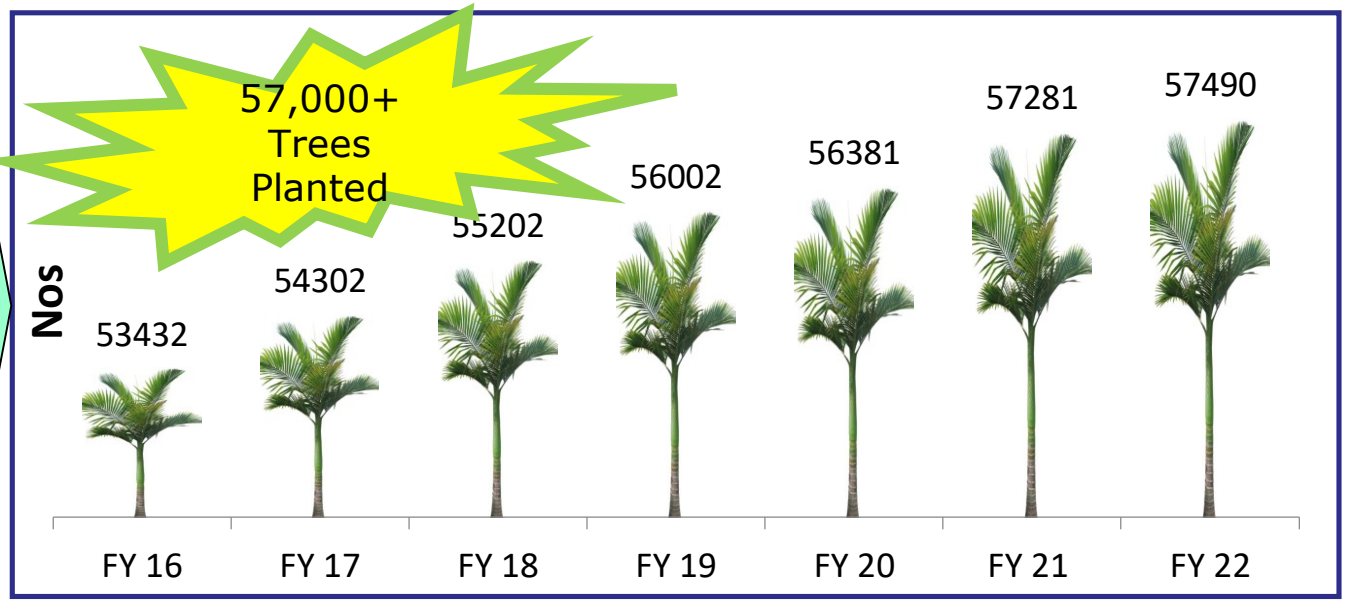
Tree Plantation Drive @ PNR

Results of Tree Plantation **Inside the Plant**



Miyawaki Forest

Beyond the boundaries…

2842 Tco2E Carbon Sequested through Tree Plantation

8.3 Efforts to reduction in GHG : Transition towards Clean Fuel

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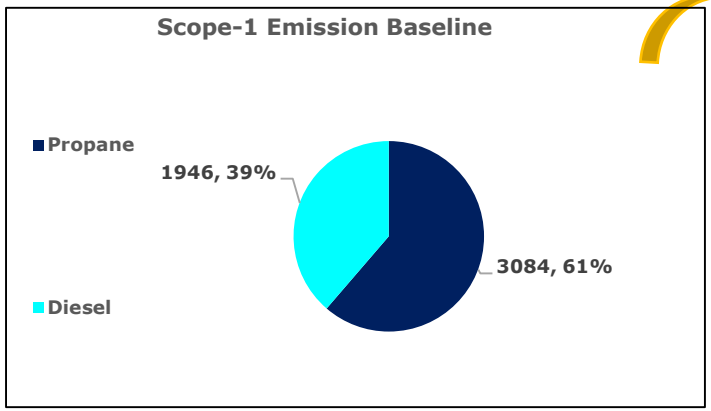
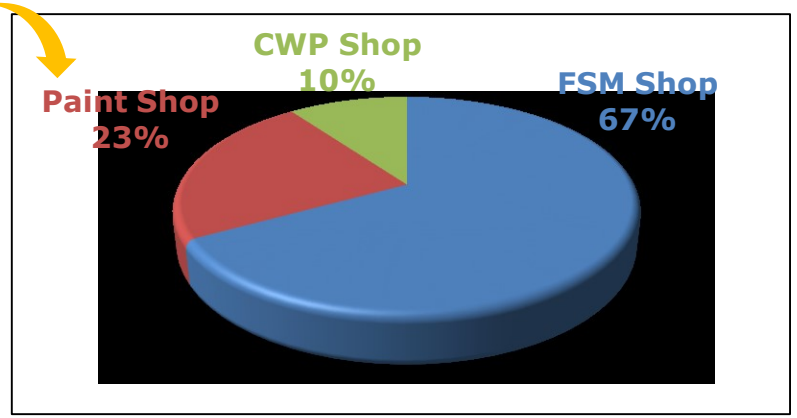
Problem: High Scope-1 Emission



Propane is a major contributor in emission

Distribution of Propane



- FSM is a major contributor of propane

Options: Explored

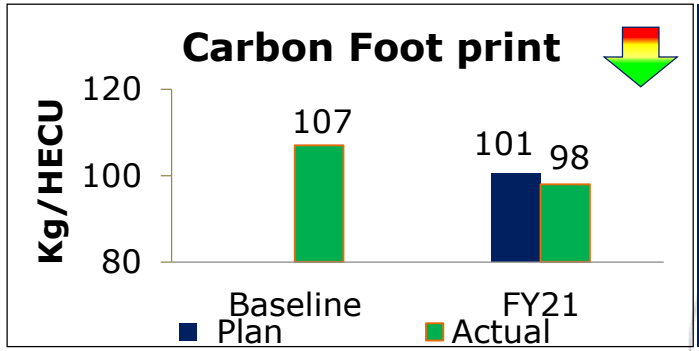
1. Reduce the propane consumption ✗
2. Usage of electric heating in place of propane heating ✗
3. Usage of alternate Fuel having low emission factor ✓

Option-1: Not Feasible ,Propane consumption is as per Std.
Option- 2: are not feasible due to high Tco2E with equivalent heat

Action

- Propane replaced by Natural Gas

Result



Benefit :
1.Saving in Tco2E : 498/annum

2. Recurring Saving in Rs. Lakhs: 60 lakhs/annum

8.4 Efforts to reduction in GHG : Green Energy

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Problem: No Renewable energy source

Installed capacity of Solar
Pan India: 36 GW
Ashok Leyland: 82 MW.
AL Pantnagar: 0 MW

Source data: Ministry of new and renewable energy

Challenge faced

- High Scope-2 carbon emission
- Air Pollution
- Single Source for Power

Observation

S.no	Strategies	Emissions	Cost	Dependency on UPCL	Availability	Selection Priority
1	Utilization of Natural energy-**Solar**	✓	✓	✓	✓	High
2	Utilization of Natural energy-**Wind**	✓	✓	✓	X	Not feasible in region due to low wind speed
3	Souce of Power Suplply through IEX		✓	✓		Medium
4	In-House Captive Power generation			✓	✓	Low

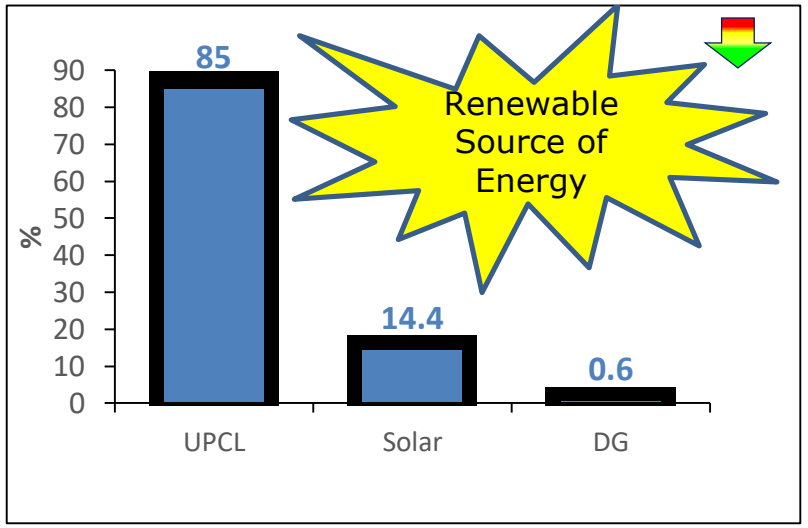
25 Years PPA signed off with M/S Hinduja Renewals

Action

Shops	Solar Plant Capacity (KW)	No. of Panels (330 Wp Each)	No. of Inverter (70kW Each)
Engine- Shop 8	1201.2	3640	17
Cab Weld- Shop 6	706.2	2140	10
Press Shop- Shop 12	363	1100	5
Chassis- Shop 1	732.6	2220	11

- **3 MW Solar Panels installed on the roof top of 4 shops of ALP.**
- Connectivity is ensured across the entire plant so that the power generated by these 4 shops can be used entire plant.

Result



Benefit :

1.Saving in Tco2E : 2730/annum
2. Generated Units: 32 lakhs unit ./annum
3. Recurring Saving in Rs. Lakhs: 32 lakhs/annum

9. Green Supply Chain Management

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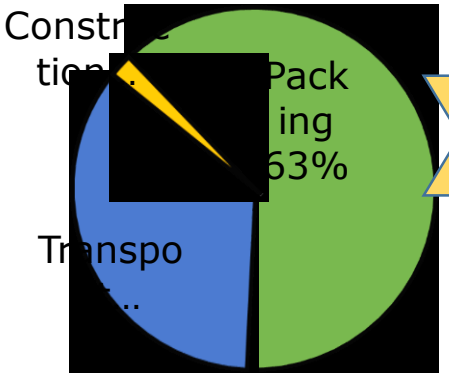
Capability building on Environment Aspect and Impact:
1. Service Provider
2.Contractors
3. Suppliers

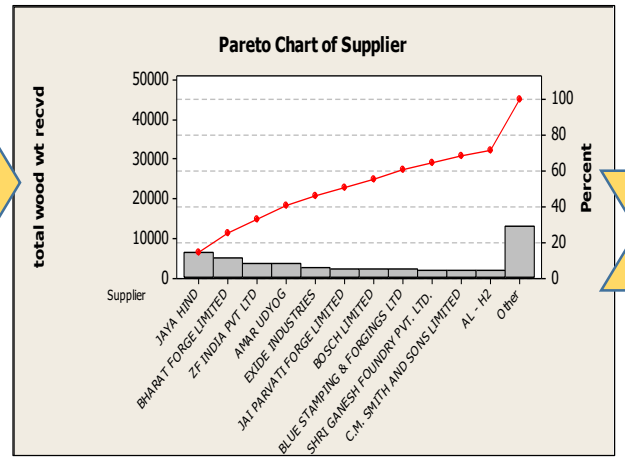
Emphasizing on Carbon foot Print reduction in Value chain

Awareness and Knowledge sharing through Cross learning during Vendor Meet

Awareness on Environmental issue

Efforts towards Wood free Packaging





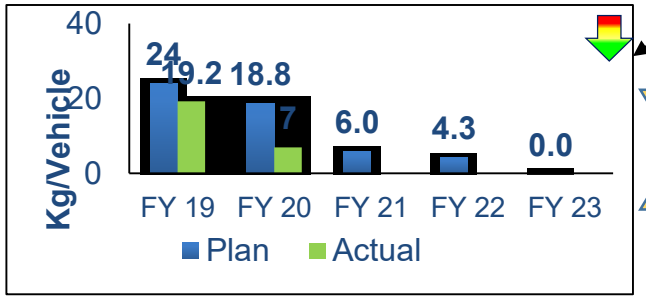
Our 90% of Supplier base is located in 225Km radius

Parts Supplied by Suppliers

S.N.	Vendor Name	Part Name
1	BHARAT FORGE LIMITED (10%)	Axle Beam / Axle Arm
2	EXIDE INDUSTRIES (6%)	EXIDE
3	JAYA HIND (9%)	Gear Housing
4	ZF INDIA PVT LTD (6%)	V link rod
5	AMAR UDYOG (8%)	Intake Manifold

Implementation

S.N.	Supplier Name	Part description	Improved packing (Sample)
1	Bharat Forge	Axle Arm	
2	New Allenberry	Gears	
3	Exide Industries	Battery	



Plan to achieve zero wood usage by FY23

10.1 Teamwork, Employee Involvement & Monitoring

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Energy Management Structure

Head-PNR
(Plant Champion- Budget Allocation)

Review Freq: Monthly

Head – Utility & Central Purchase
(BEE Certified Energy Auditor)

Review Freq: Fortnightly

Energy Manager
Role: Energy Budget , EC project feasibility checking , support in implementation, Awareness

Review Freq: Daily and Weekly

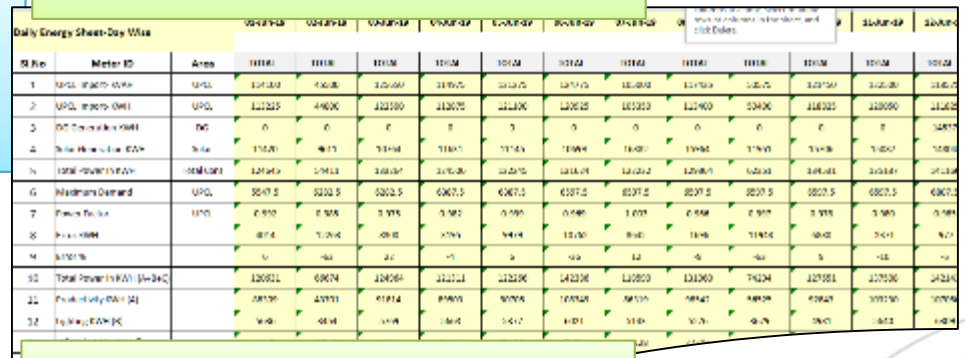
- CFT Engine Shop
- CFT FSM Shop
- CFT Utility
- CFT CWP Shop
- CFT Weld Shop
- CFT Chassis Shop
- CFT Axle Shop
- CFT Paint Shop

**CFT: Cross Functional Team are Energy Champion*

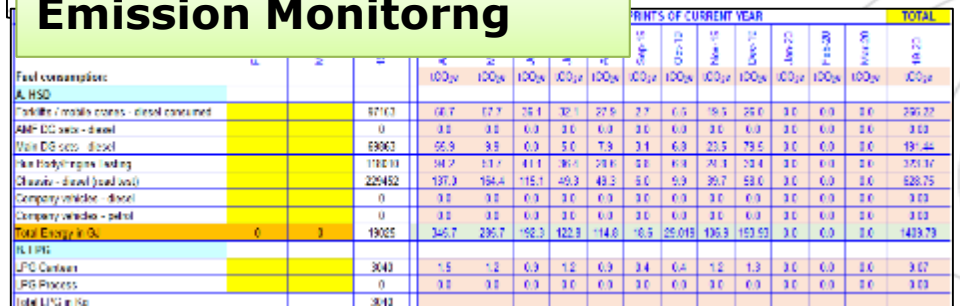
4 Step Methodology for Encon

Step 1	Step 2	Step 3	Step 4
Daily Area wise Energy Consumption Monitoring	Area wise Energy Mapping for each shops	Prioritize the area as per Energy Consumption	Gap Analysis, Brainstorming ,idea evaluation and implementation

Daily Energy Report



Emission Monitorng



10.2 Energy Efficiency awareness and Training program

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ENCON Pledge on National Energy Conservation Day

Poster Competition among associates

External Training

#	Name	Training Program Conducted	No. of Days	Agency
1	Niraj Jarmal	Advance Energy Efficiency Program	2	CII
2	Mahesh Chandra Pandey	Advance Energy Efficiency Program	2	CII
3	Neeraj Bhatt	Advance Energy Efficiency Program	2	CII
4	Deepak Dhilod	Air Compressor	1	IR

Process Strengthening through External Audit

- Energy audit by M/s Siemens
- Energy audit by PCRA
- Preliminary Energy Audi by M/s CII

Out of 78 findings 63 recommendation were implemented

Internal Training were periodically Imparted by Energy managers

10.3 Budgetary Process

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Beginning of every year, based on projected production volume, expected expenditure on power (considering variable + Fixed element of power cost & tariff impact) is sent to corporate.

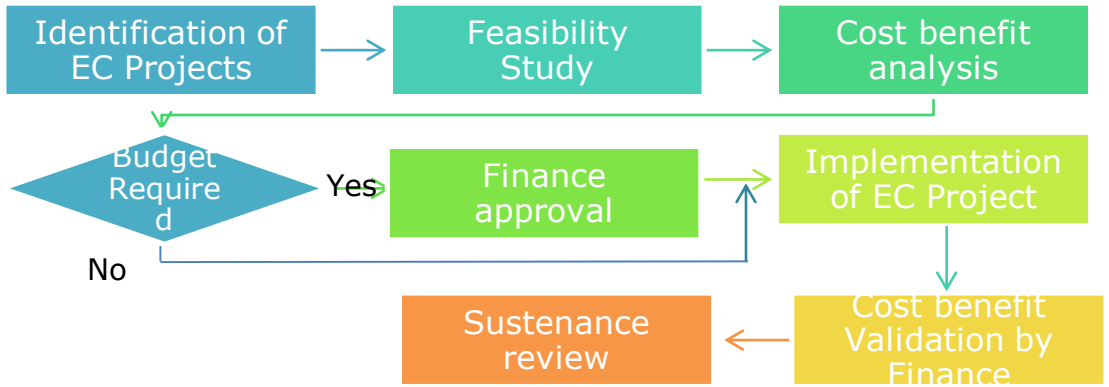
On receipt of sanctions, plant level targets are set and this overall target is further broken down to Gemba level/Shop Level.

	ASHOK LEYLAND LTD	
0	PRODUCTION - PTS VEHICLES	
0	PRODUCTION - PTS ENGINES	
1	EQ PRODUCTION	21659
2	FIXED UNITS REQD PER DAY	26000
3	FIXED UNITS REQD PER ANNUM (2*365)	9490000
4	VARIABLE UNITS REQD PER ECU	926
5	VARIABLE UNITS REQD FOR THE YEAR	20056234
6	TOTAL UNITS REQUIRED (3+5)	29546234
7	POWER CUT ASSUMED %	14
8	UPCL POWER UNITS (6 * 86%)	25409761
9	GEN SET UNITS (6 * 14%)	4136473
8A	WIND MILL UNITS	0
8B	UPCL UNITS	25409761
A	UPCL COST	
10	MAXIMUM DEMAND KVA (MD)	8000
11	MD RS. PER KVA + ET 5%	240
12	UPCL RATE RS./UNIT + ET 5% (3.50+5%)	3.68
12A	PEAKHOUR CONSUMPTION 4 LAKH UNITS PER MTH	0
12B	UPCL RATE FOR THE ABOVE (.7+5%)	0.74
13	MAXIMUM DEMAND IN RS. LAKHS (10*11)	230.40
14	CONSUMPTION COST RS. LAKHS (8*12)	933.81
14A	PEAKHOUR COST RS LAKHS (12A*12B)	0
14B	WIND MILL COST CREDIT (8A*.37)	0
14C	Electricity duty (8B*.25)	63.52
15	TOTAL UPCL COST RS LAKHS (13+14+14A+14B)	1227.73
B	SELF GEN COST	
16	UNITS GENERATED PER LTR OF DIESEL	3.50
17	DIESEL LTRS REQUIRED (9/16)	1181849
18	DIESEL COST PER LITRE RS.	36.43
19	DIESEL COST RS. LAKHS (17*18)	430.55
20	LUB OIL RS 0.25 LAKHS PER MONTH	3.00
20A	SELF GENERATION TAX (9*.1)	4.14
21	TOTAL DIESEL COST (19+20+20A)	437.69
22	TOTAL POWER COST RS. LAKHS (15+21)	1665.42
23	POWER COST PER ECU (22/8)	7689
24	POWER COST PER ECU YTD	
25	UNITS PER ECU (6/1)	1364

ENCON Budget is allocated in two heads:
1.CAPEX
2. REVEX

0.2% of turnover of total, Encon budget is allocated in FY 22

Encon Project Implementation Methodology



Project Suggestion given by Associates

Sl. No	Project Type	Gemba Unit	Idea Description	Category	Leader	Stage	Actual Saving with Finance Vetting
107	K54	P112	Productivity & Process Improvement in Press Line by conversion of 3 stage operation into 4 stage operation (T &GSE)	Power	HariPratap	IL5	
471	SGA	P104	Production optimization at Soenen M/c	Power	Prashant	IL5	3.08
483	SGA	P104	Power cost reduction thru temp optimization at washing m/c	Power	Chetan Negi	IL5	0.898
479	SGA	P104	Introduction of low bake powder	Power	Pradeep	IL5	
117		Utility	Solar plant 0.39 MW in Press Shop	Power	Rameshwar Dayal	IL5	
558	K54	P108	Cam Lobe Finish improved from Rz 1.5 to Rz 0.4 at cam lobe lapping machine.	Power	DevRaj	IL5	
339	SGA	P111	Cooling tower Commonization for bumper Assy.	Power	Bipin Singh	IL5	
476	SGA	P104	To optimize the running of blowers motor in STP	Power	Harpal	IL5	3.7
549	Utility	Utility	Fixed consumption reduction in Sewage Treatment Plant	Power	Pankaj	IL5	

100% involvement : Best Suggestion is awarded with RISE-I award

12. Learning from CII Energy Award or any other award program

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- Innovative Projects implemented
- External Benchmarking data of similar industries
- Best Practices of various industries
- New Product Knowledge through energy suppliers
- Different Problem Solving technique
- Approach of industries towards climate change

Major Accolades External

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Certificate of Award

This is to certify that
Ashok Leyland Limited
has participated and awarded as 1st Runner Up,
under Best Energy Efficient Organisation
Category in the
5th Edition of CII National Energy Efficiency Circle
Competition held on 16-18 June 2021.

Mr Shreekant Somany
Chairman,
CII – Centre of Excellence for
Competitiveness for SMEs

Dr Sudhir Kapoor
Chief Jury,
CII National Energy Efficiency
Circle Competition

Mr Pikender Pal Singh
Executive Director
Confederation of Indian Industry

Date: 18-06-2021

CII
Confederation of Indian Industry

5th Edition of CII National
Energy Efficiency Circle
Competition

Certificate No. EC21/804

CII National Energy award

CII Green Manufacturing Award

CII Go Green award

DL Shah Water Award

Major Accolades External

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CII EHS Best Energy and Carbon Foot Print

SILVER AWARD

Special Category Awards on EHS

CII EHS Excellence award

Money Is Yours But Resources Belong to The Nature & Society

Thank you !

Contact detail:

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Sandeep.Saini@ashokleyland.com

Major Accolades External

ASHOK LEYLAND
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National Energy award by The President of India

SEEM energy Award-2018

SEEM energy Award-2019