TATA MOTORS
Connecting Aspirations

CII- National Award for Excellence in Energy Management 2024

Tata Motors - Lucknow Plant

Gaurav Bansal	DGM (CPED-Utilities)
Nadeem Ahmed	Sr. Manager (Paint Shop-Maint.)
Dinesh Kumar	Executive (CPED-Mech Maint.)

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Tata Motors Limited- Commercial Vehicles: Introduction

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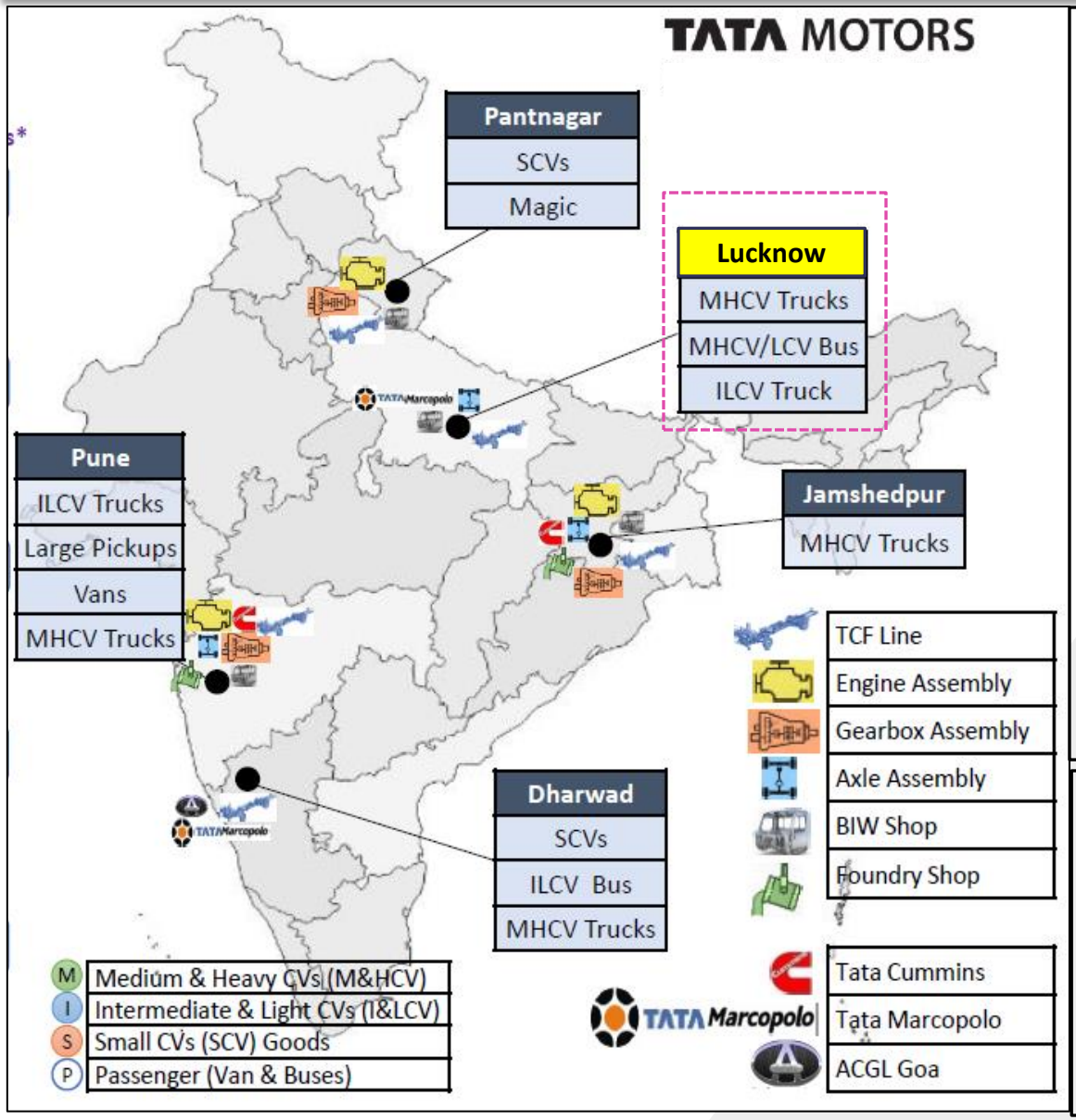


❖Tata Motors Limited is

- India's largest Automobile manufacturing company, with an extensive range of integrated, smart and e-mobility solutions in its portfolio
- Consolidated revenues of **Rs. 4.4 lakh crore's (52 Billion USD) in 2024**
- We are the **leader in Commercial Vehicles** in each segment

❖Tata Motors -**CVBU Lucknow** Fact File:

- Established in **1992** to meet the demand of Commercial Vehicles in Indian & overseas market and is strongly backed up by ERC and service setup to support the latest technology.
- Specialized in the designing and manufacturing of a range of modern buses – Low floor, Ultra Low floor, CNG & EV Buses and recently Hydrogen buses.
- Key Customers include **DTC , MSRTC, KSRTC,APSRTC, TSRTC JnNURM, UPSRTC and other STUs.**
- Nearly **5,500** employees
- Manufactures **340** vehicles per day (**102K** vehicles / year)

Product Portfolio:

HCV Trucks (Diesel, CNG)
25 T - 55 T

Buses (Diesel, CNG, EV)
4 T - 16 T

ILMCV Trucks (Diesel, CNG)
4 T - 19 T

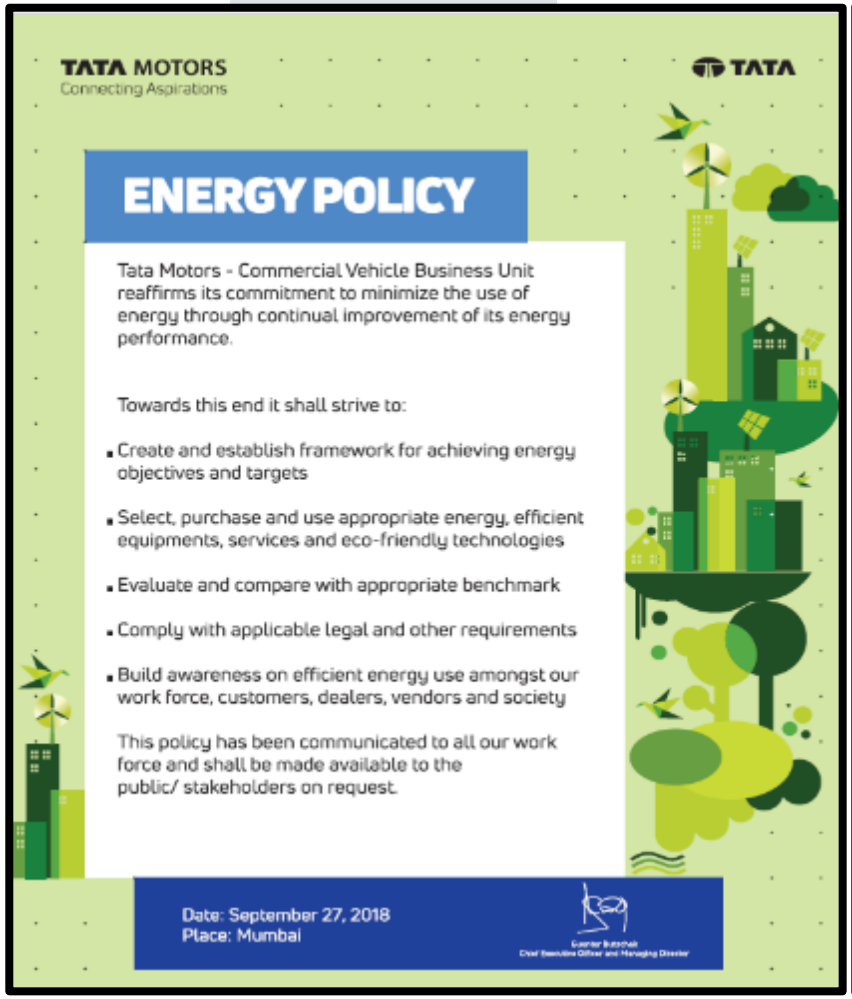
Hydrogen Fuel Cell Bus

163 VCs across 3 Product Lines Planned from Lucknow

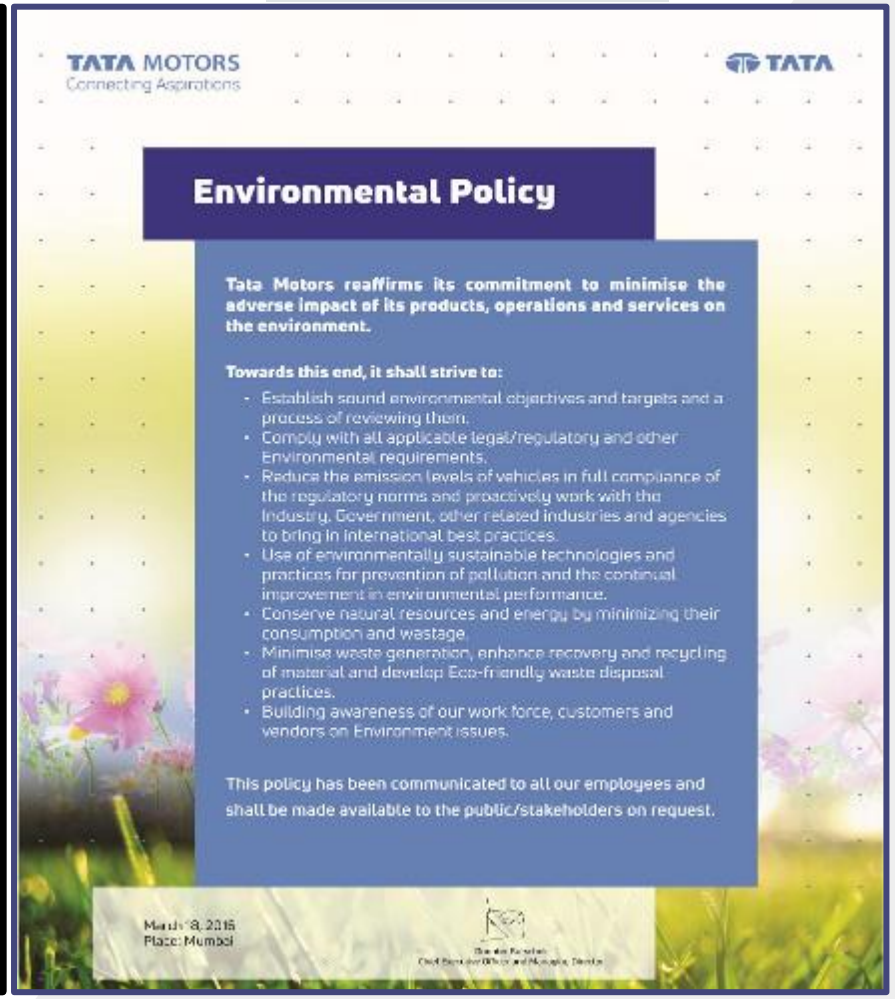
Tata Motors, Lucknow Plant provides complete Mobility solutions for Commercial Vehicles & Buses

Tata Motors Limited- Lucknow Plant

Energy Policy



Environment Policy



Energy Organization

Plant Head	Plant Co ordinator
Deepak Kumar	Parveen Kumar

Shop	Divisional Head	Divisional Co ordinator
Paint Shop	Sanjay Choudhury	Murugan
TCF	Anuj Kapoor	Nitansh Kamboj
BIW	Sanjay Choudhury	Debasish Paul
CPED	TS Head	Gaurav Bansal
EV Line	Siddhartha Hazra	Apurva Pandey
Axle	Anuj Kapoor	Bharat Rao
Planning	TS Head	Gaurav Rai Bansal
HR	Aditi Gupta	Anand Patil

Environment Governance

smart LIFESTYLE FOR ENVIRONMENT

Be wise — Reduce, Reuse, Recycle & Optimise.

Certifications:

IATF 16949 : 2016

ISO 14001 : 2015

ISO 45001 : 2018

ISO 50001:2018

CII Water Positive (Nov'22)

Tata Motors have committed to achieve UNDP's Sustainable Development Goals -Impacts SDG's 6,7,13,14,15

Tata Motors Limited- Lucknow Plant Layout

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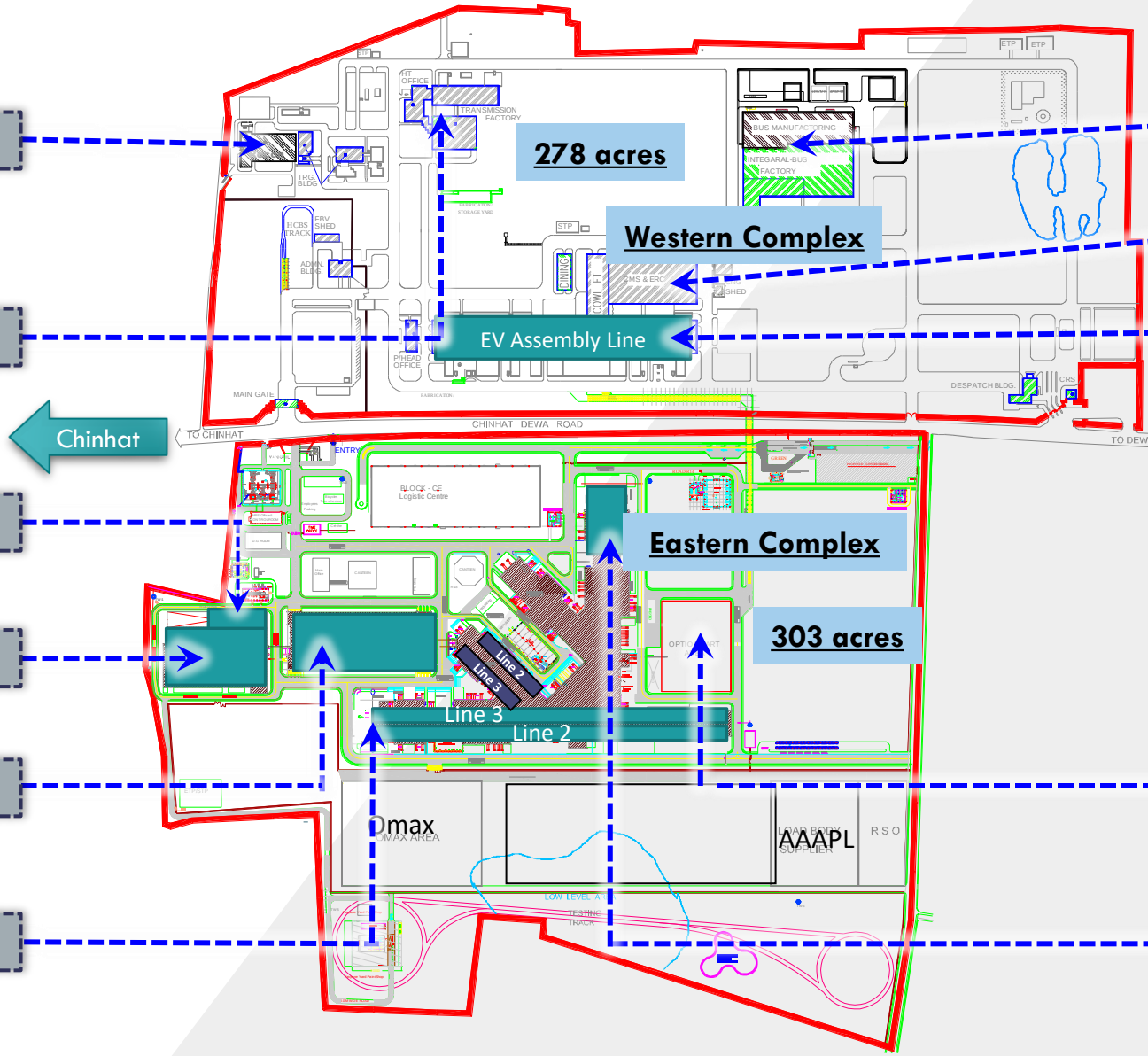
Total Plant Area – 581 acres



Prolife Shop

Axle Machine Shop

Front Axle Assembly

Weld Shop

Paint Shop

Assembly Lines 2 & 3

Chinhat

Dewa Road

TMBSL

ERC Facility

EV Assembly Line 1

Post Assembly Area

Rear Axle Assembly

Western Complex:

- **Buses (Diesel, CNG, EV) 4 T - 16 T**
- **Hydrogen Fuel Cell Bus**

Eastern Complex:

- **HCV Trucks (Diesel, CNG) 25 T - 55 T**
- **ILMCV Trucks (Diesel, CNG)**
- **4 T - 19 T**

Tata Motors Limited- Lucknow- Key Manufacturing Processes

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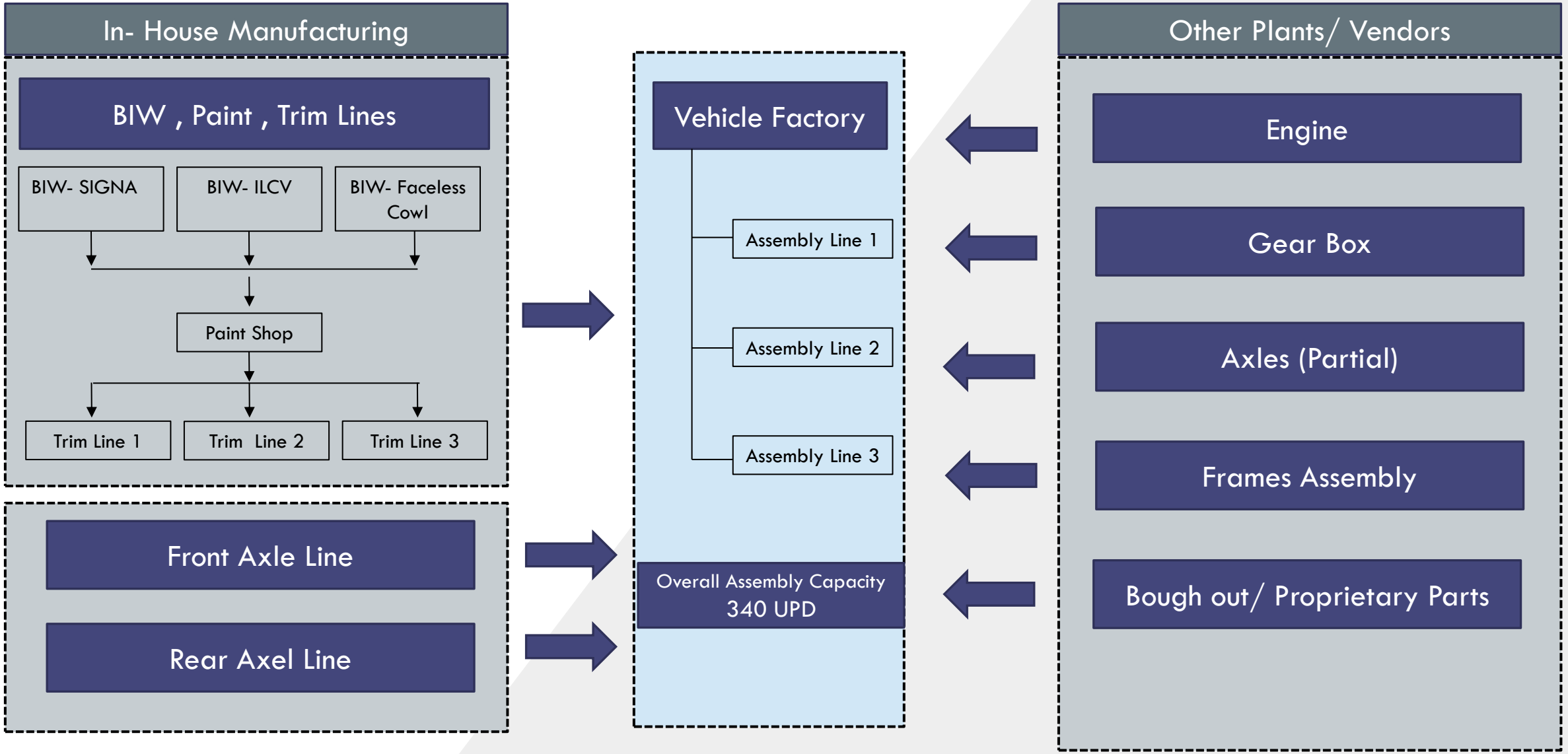

Assembly Lines are flexible to manufacture any model with minimum changes – ILCV, Buses , HCV.

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Energy-Overall and Specific Consumption

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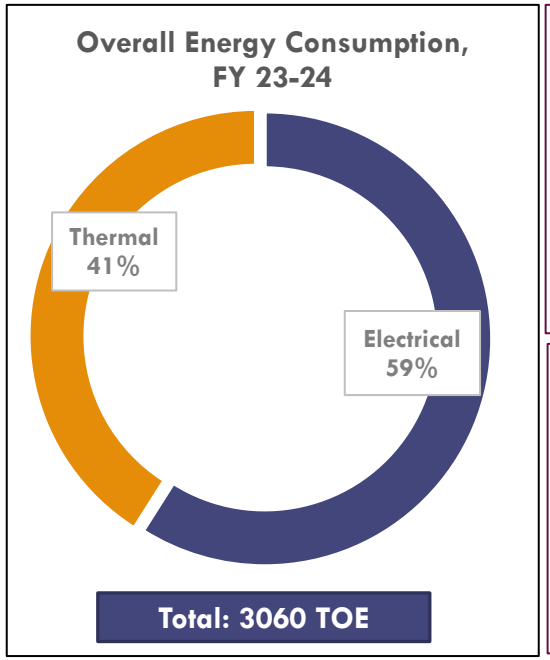

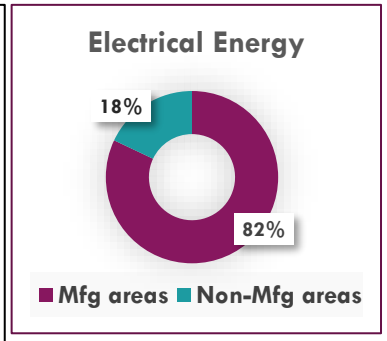

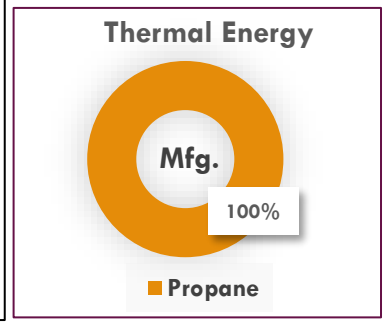

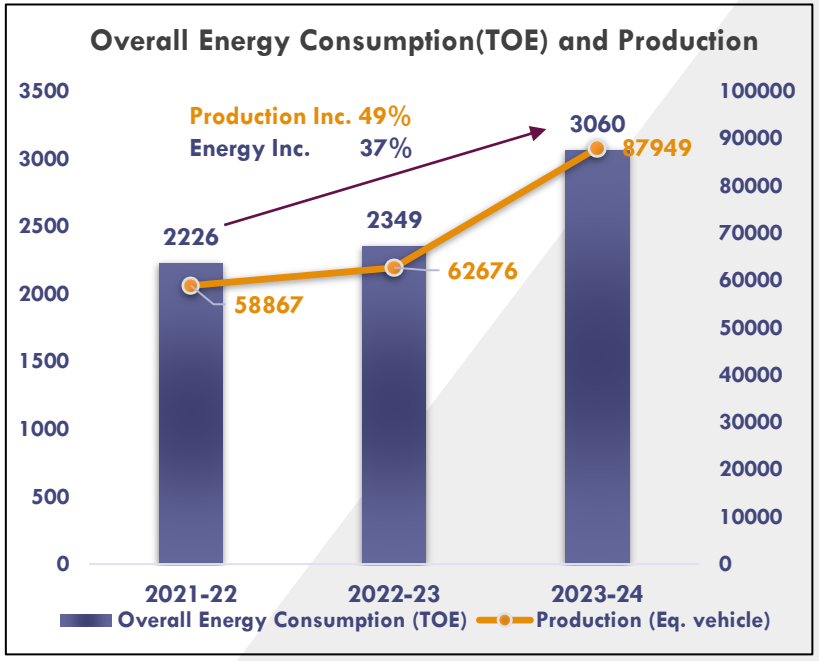

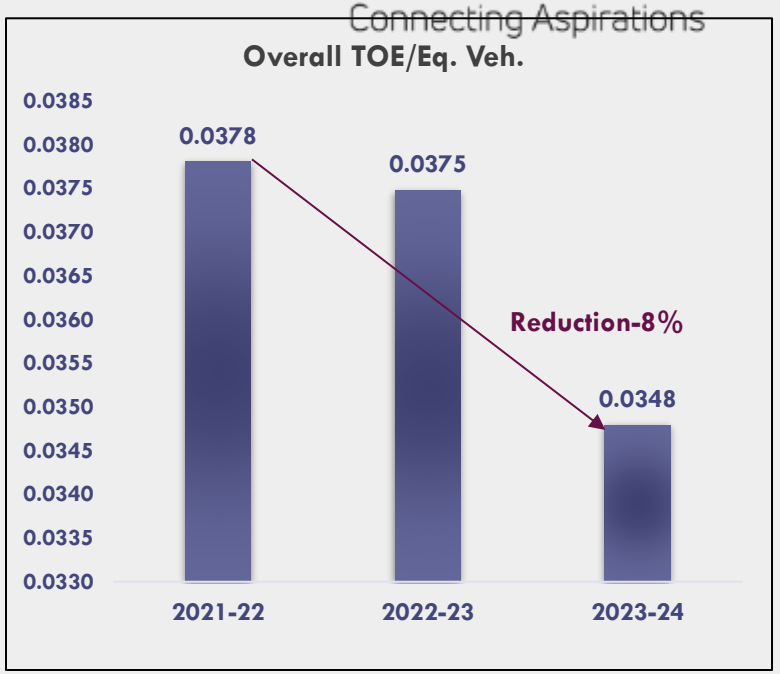

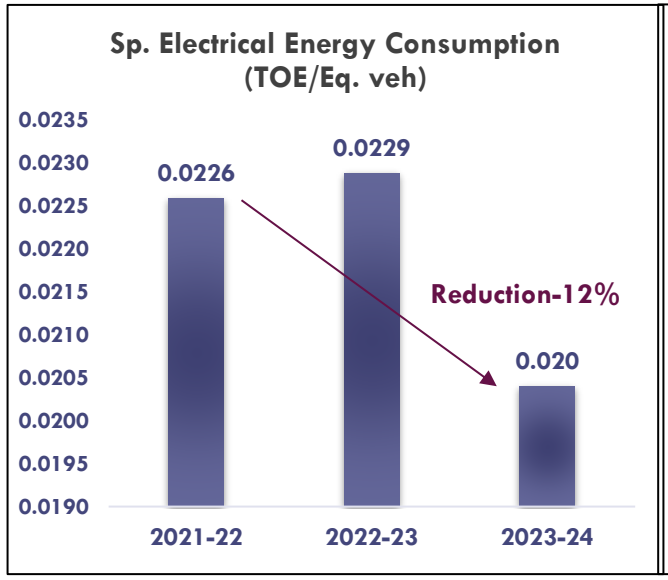

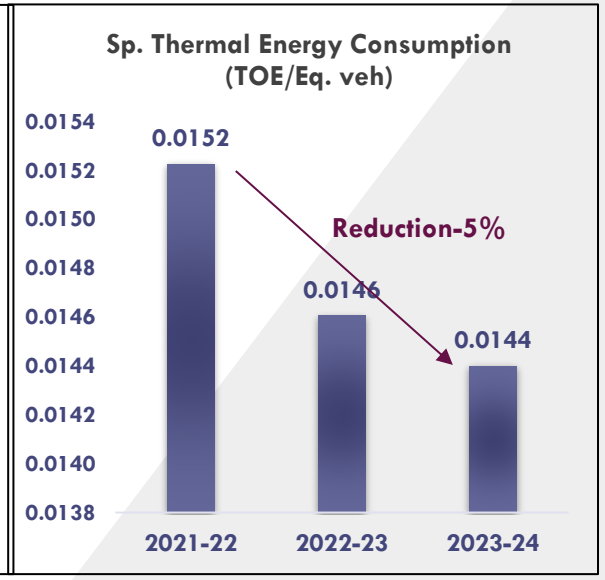

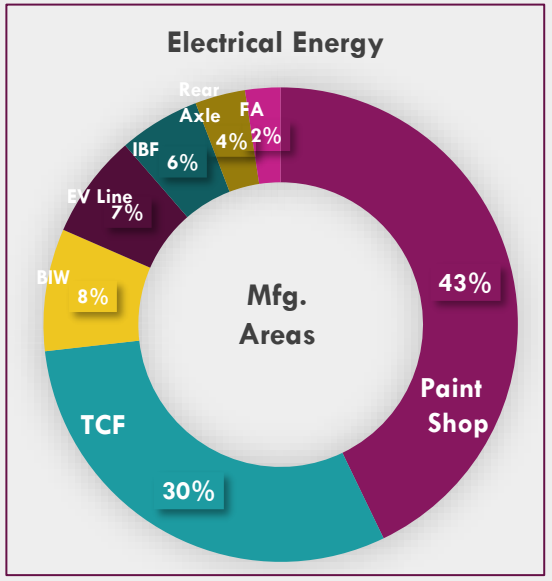

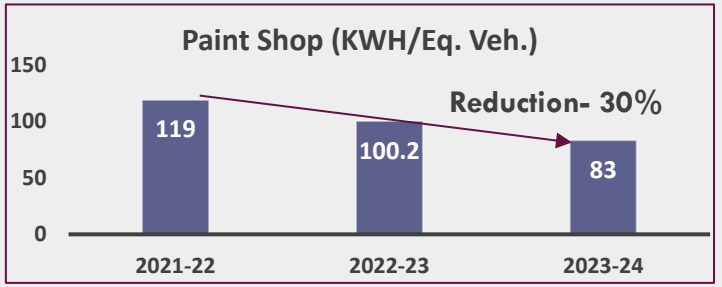

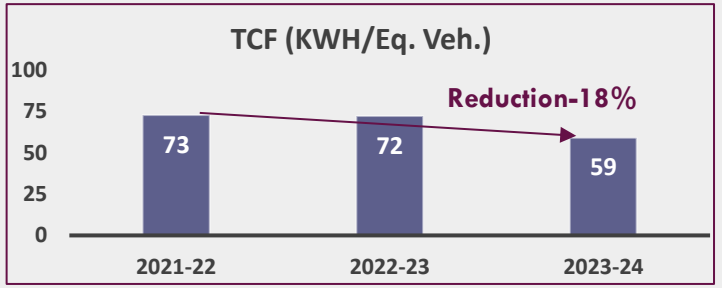

YOY Specific Energy Consumption reduced by 8% during last 3 years, even though Production No's increased by 49%

Information on Competitors, National & Global Benchmark

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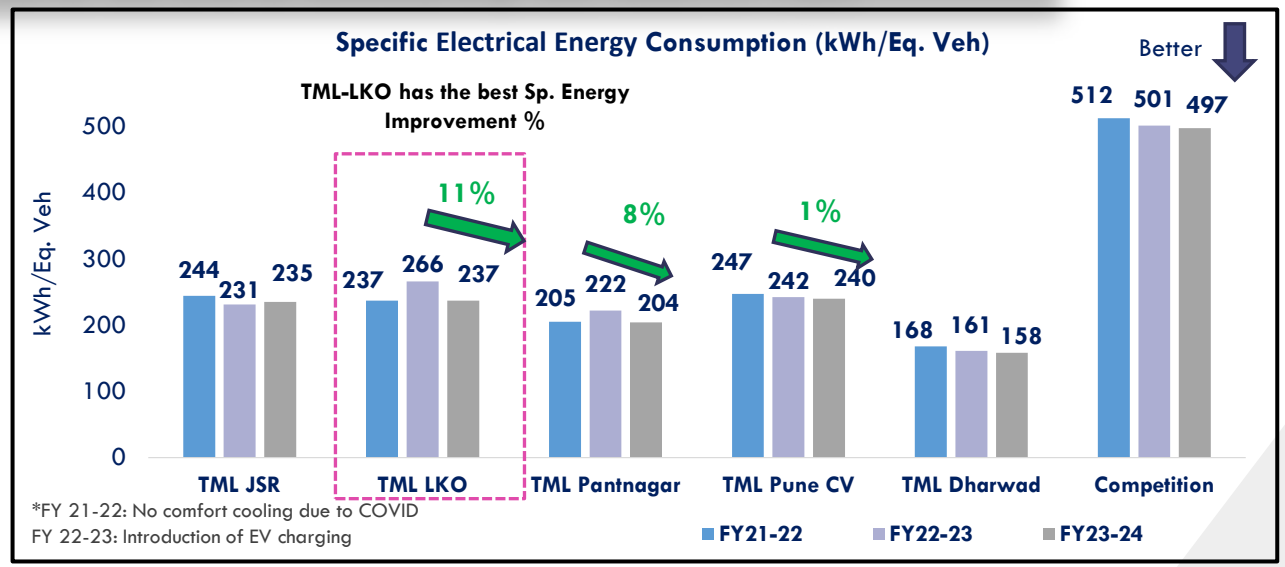
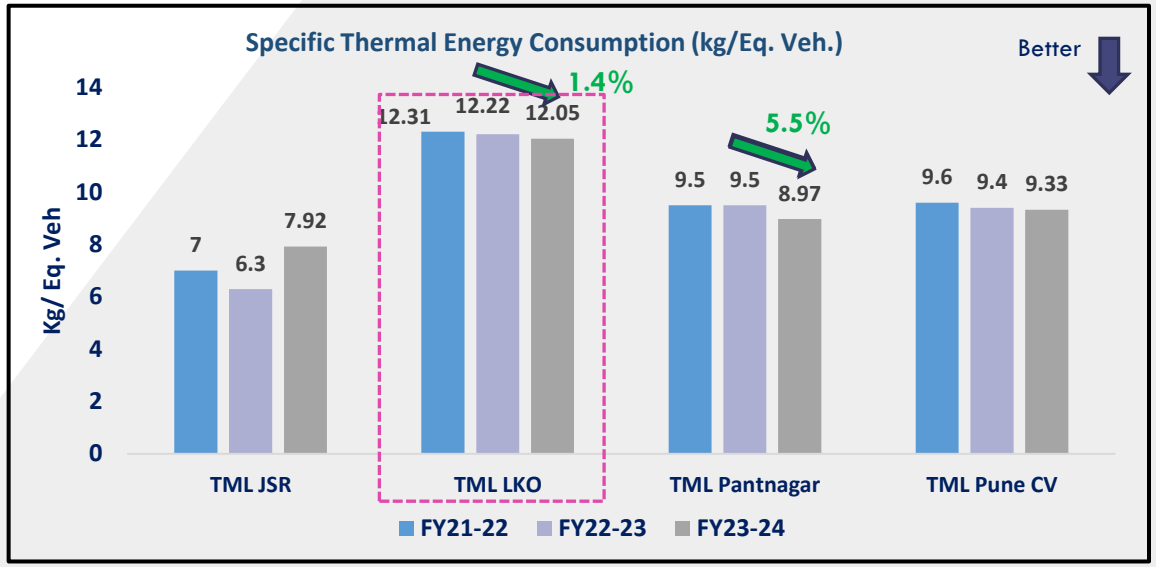
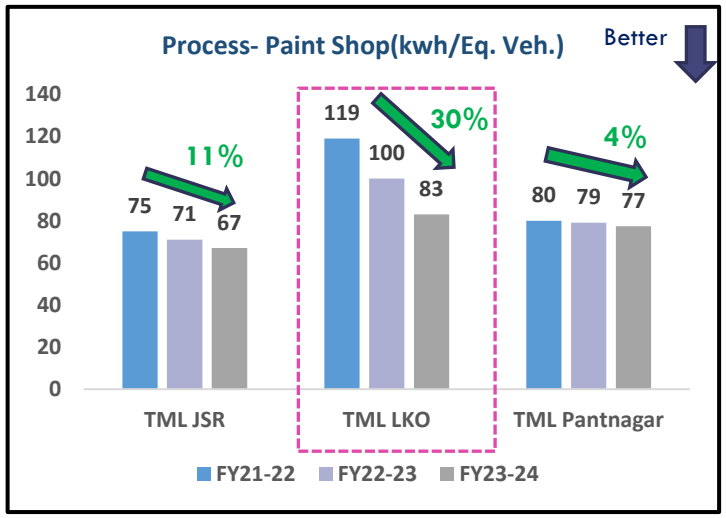
Internal and External Benchmarking: Tata Motors CV Plants



*FY 21-22: No comfort cooling due to COVID
FY 22-23: Introduction of EV charging





Internal Process Benchmarking for Paint Shop

All Tata Motors CV Plant's share data amongst each other for Internal Benchmarking & Learning & Sharing

Specific Electrical Energy:
TML-Lko has the Best Improvement wrt FY 2022-23

Specific Thermal Energy:
TML-Lko has the 2nd Best Improvement wrt FY 2022-23

Paint Shop Process Benchmarking:
TML-Lko has the Best Improvement wrt FY 2022-23

There are no Standard data available for National and Global benchmarks

Roadmap for Achieving Long Term Target of Energy Consumption

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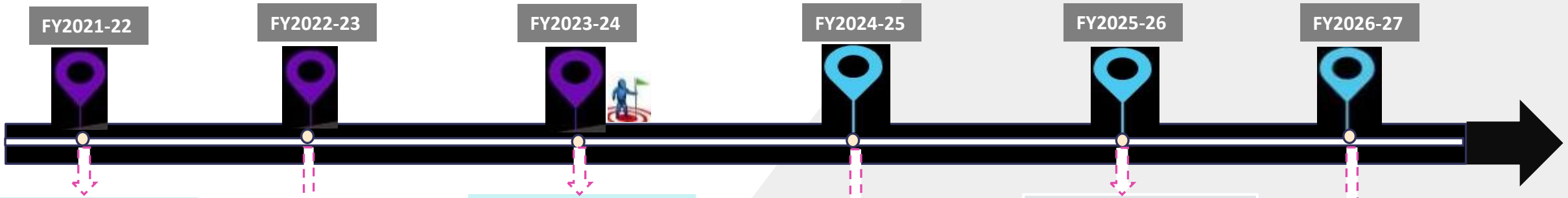
5 year Target plan:
Electrical: 17% reduction
Thermal: 24% reduction



FY2021-22

Electrical: 237 KWH / EU
Thermal: 12.31 kg/EU

- Implemented quick win EnCons and resource planning for others
- CII Energy Excellence Energy Award; PDCA process review
- Water heating system using existing PHEs in PMR
- Interlocking of load with conveyor line
- LT Line ring system

FY2022-23

Electrical: 266 KWH / EU
Thermal: 12.22 kg/EU

- Energy Audit, Review and Suggestion scheme
- Daily Work Management (DWM) Review for energy monitoring
- VFD Installation for equipment
- Alternate day PTED running
- Running hour optimization of FDVs, AC, etc.

FY2023-24

Electrical: 237 KWH / EU
Thermal: 12.05 kg/EU

- Phase wise replacement with LED lights
- VFDs for man coolers and timer logic for FDVs.
- Smart Utilities management system using Industry 4.0
- Reduction of ED circulation pump operating frequency
- Paint CED 250 implementation
- Ring system in compressed air line

FY2024-25

Electrical: 232 KWH / EU
Thermal: 11.4 kg/EU

- Sealer oven elimination in Paint shop process
- Reconditioning of low efficient chillers
- Control system for utility load optimization in shop floors
- Phase wise replacement with LED lights
- Digitalization- Development of system analytics through Industry 4.0

FY2025-26

Electrical: 225 KWH / EU
Thermal: 10.3 kg/EU

- Energy efficient IE4 motors for TCF shop
- Workshop on Encon and Energy Audits & Review
- Alternate fuel in paint shop to be used
- Waste heat recovery system for Paint shop
- Low bake sealant introduction
- Water heat Recovery system

FY2026-27

Electrical: 221 KWH / EU
Thermal: 9.3 kg/EU

- Hydroxy generator for top coat oven in Paint shop
- High efficiency chiller plants
- Migration to 8th generation CED paint
- EC fans for ASUs at Paint Shop
- Concentrated Solar Thermal (CST) system for Hot Water Generator in Paint Shop
- Elimination of fuel usage for Heating Bath in Paint Shop by using room temperature chemical/Solar Thermal /Waste Heat Recovery application

*FY 21-22: No comfort cooling due to COVID
FY 22-23: Introduction of EV charging

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Energy and Cost Reduction Projects FY 2024-25 (ERASE Methodology)

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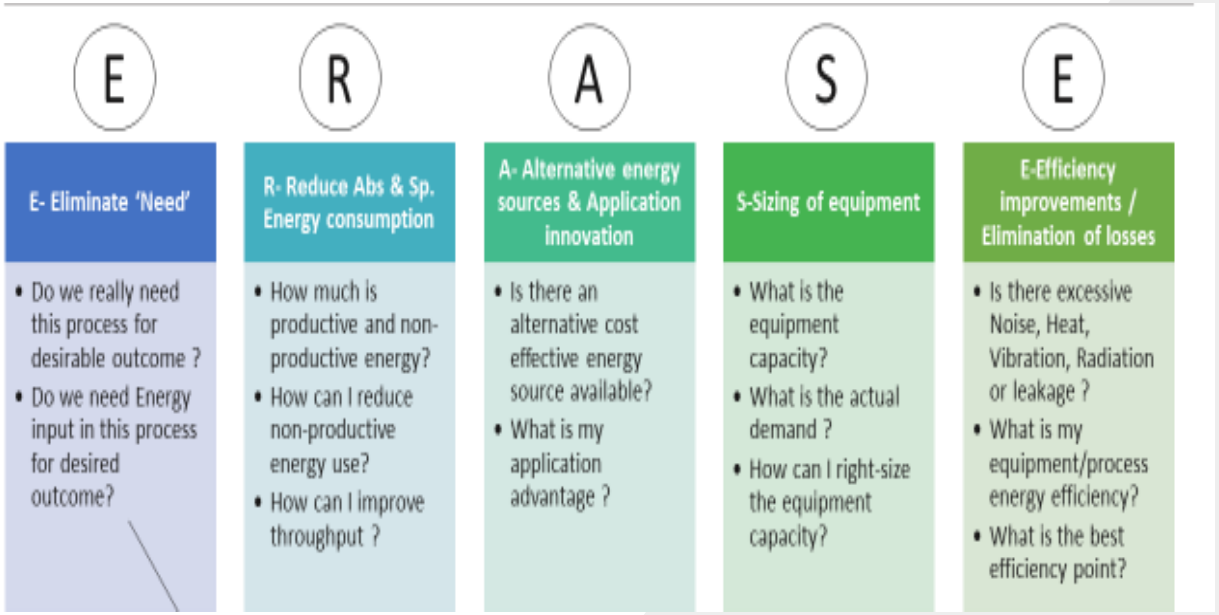
Year	Idea Description	Control Type (ERASE)	Annual Electrical Saving (Million kWh)	Annual Electrical Cost Saving (Rs million)	Annual Thermal Saving (kcal)	Annual Thermal Cost Saving (Rs million)	Total Annual Savings (Rs million)	Investment Made (Rs million)	ROI (Yrs)
2024-25	Wet on Wet Sealer implementation at LKO Paint Shop	E	0	0	756.96	4	4	2	0.5
2024-25	ED 250 Implementation	A	0.3	2.4	0	0	2.4	0	0
2024-25	Staggered Shop running to utilize the Solar Energy on Non working /day	Eff	0.1	0.8	0	0	0.8	1	1.2
2024-25	Solar Plant installation 1.5 MWp	A	2.8	4.2	0	0	4.2	0	0
2024-25	Reconditioning/ Replacement of low efficient chillers	Eff	0.3	2.4	0	0	2.4	0.5	0.2
2024-25	Phase Wise LED Light Replacement	A	0.25	2	0	0	2	0.5	0.2
2024-25	Power Purchase through Open Access	A	0	20	0	0	20	0	0



Total Expected Benefit:

3.75 Million kwh

39 kwh/Eq. Veh.

26,850 TCO2

0.28 TCO2/Eq. Veh.

Rs. 36 Million

Rs. 377/Eq. Veh

Rs. 4 Million

EnCons Summary (FY 2021-2024)

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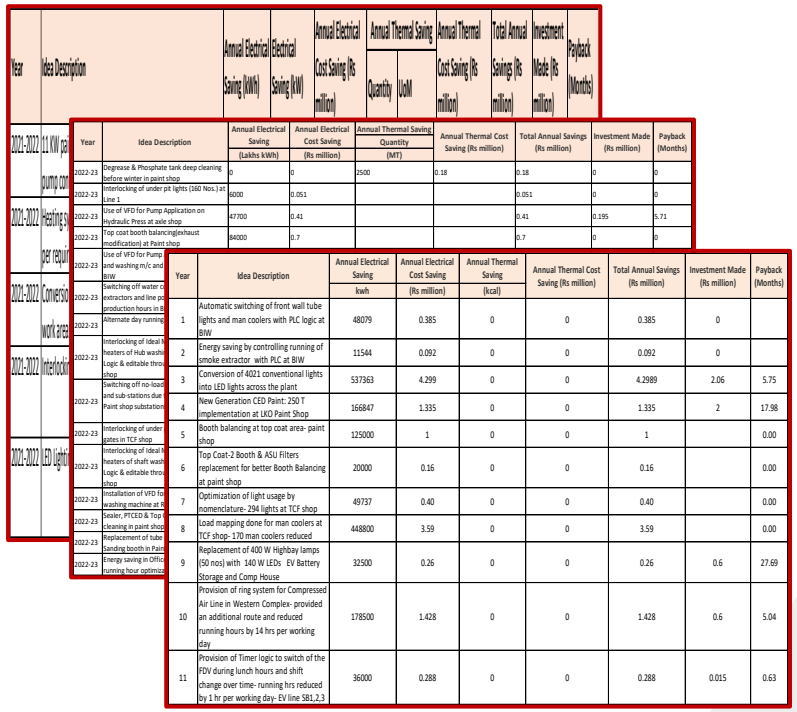
Year	Consumptions		Saving Through EnCons		Saving Through EnCons		Total Savings	Investments	ROI Period	Savings
	Electrical	Thermal	Electrical (Lacs KWH)	Thermal (in MT)	Electrical	Thermal	Rs in Cr.	Rs in Cr.	in Months	In kwh/Eq. Veh.
	(KWh in Lacs)	(in MT)	(KWh in Lacs)	(in MT)	Rs in Cr.	Rs in Cr.				
2021-22	139.6	488	4.96	63.4	0.423	0.32	0.743	0.23	3.2	8.4
2022-23	166.7	766	10.33	31.15	0.97	0.183	1.153	0.12	9.6	16.48
2023-24	208.6	1060	23.74	9.00	2.05	0.054	2.1027	0.47	4.4	26.99
Total	**514.9**	**2314**	**39.03**	**103.55**	**3.44**	**0.557**	**3.99**	**0.82**	**1.48**	**51.88**

EnCons List



Year	Idea Description	Annual Electrical Saving (kWh)	Annual Electrical Saving (kW)	Annual Electrical Cost Saving (Rs million)	Annual Thermal Saving Quantity	Annual Thermal Saving UoM	Annual Thermal Cost Saving (Rs million)	Total Annual Savings (Rs million)	Investment Made (Rs million)	Payback (Months)
2021-22	11 kW ga									
	pump con									
2021-22	Heating s									
	per requir									
2021-22	Conversio									
	work area									
2021-22	Interlockin									
2021-22	LED Lightin									

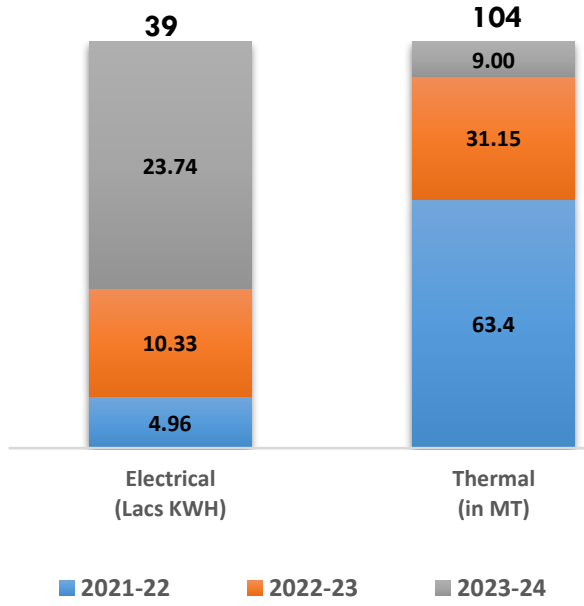
Year	Idea Description	Annual Electrical Saving (Lakhs kWh)	Annual Electrical Cost Saving (Rs million)	Annual Thermal Saving Quantity (MT)	Annual Thermal Cost Saving (Rs million)	Total Annual Savings (Rs million)	Investment Made (Rs million)	Payback (Months)
2022-23	Degrease & Phosphate tank deep cleaning before winter in paint shop	0	0	2500	0.18	0.18	0	0
2022-23	Interlocking of under pit lights (160 Nos.) at Line 1	6000	0.051			0.051	0	0
2022-23	Use of VFD for Pump Application on Hydraulic Press at axle shop	47700	0.41			0.41	0.195	5.71
2022-23	Top coat booth balancing(exhaust modification) at Paint shop	84000	0.7			0.7	0	0
2022-23	Use of VFD for Pump							
2022-23	and washing m/c and							
	BIW							
2022-23	Switching off water c							
	extractors and line pc							
	production hours in B							
2022-23	Alternate day running							
2022-23	Interlocking of Ideal H							
	heaters of Hub washi							
	Logic & editable throu							
	shop							
	Switching off no-load							
2022-23	and sub-stations due t							
	Paint shop substations							
2022-23	Interlocking of under							
	gates in TCF shop							
2022-23	Interlocking of Ideal H							
	heaters of shaft washi							
	Logic & editable throu							
	shop							
2022-23	Installation of VFD fo							
	washing machine at P							
2022-23	Sealer, PTCED & Top C							
	cleaning in paint shop							
2022-23	Replacement of tube							
	Sanding booth in Paint							
2022-23	Energy saving in Offic							
	running hour optimiz							

Year	Idea Description	Annual Electrical Saving kwh	Annual Electrical Cost Saving (Rs million)	Annual Thermal Saving (kcal)	Annual Thermal Cost Saving (Rs million)	Total Annual Savings (Rs million)	Investment Made (Rs million)	Payback (Months)
1	Automatic switching of front wall tube lights and man coolers with PLC logic at BIW	48079	0.385	0	0	0.385	0	
2	Energy saving by controlling running of smoke extractor with PLC at BIW	11544	0.092	0	0	0.092	0	
3	Conversion of 4021 conventional lights into LED lights across the plant	537363	4.299	0	0	4.2989	2.06	5.75
4	New Generation CED Paint: 250 T implementation at LKO Paint Shop	166847	1.335	0	0	1.335	2	17.98
5	Booth balancing at top coat area- paint	125000	1	0	0	1		0.00
6	Top Coat-2 Booth & ASU Filters replacement for better Booth Balancing at paint shop	20000	0.16	0	0	0.16		0.00
7	Optimization of light usage by nomenclature- 294 lights at TCF shop	49737	0.40	0	0	0.40		0.00
8	Load mapping done for man coolers at TCF shop- 170 man coolers reduced	448800	3.59	0	0	3.59		0.00
9	Replacement of 400 W Highbay lamps (50 nos) with 140 W LEDs EV Battery Storage and Comp House	32500	0.26	0	0	0.26	0.6	27.69
10	Provision of ring system for Compressed Air Line in Western Complex- provided an additional route and reduced running hours by 14 hrs per working day	178500	1.428	0	0	1.428	0.6	5.04
11	Provision of Timer logic to switch of the FDV during lunch hours and shift change over time- running hrs reduced by 1 hr per working day- EV line SB1,2,3	36000	0.288	0	0	0.288	0.015	0.63

Major ENCON Projects

1	Control System (Timer Logics/ Occupancy Sensor/ Light Sensor etc.) for switching of man coolers and lights across the Plants
2	Reduction of ED Circulation pump operating frequency from 45Hz to 35Hz
3	Shut off valves for individual lines of Compressed Air Supply across shops and for main incoming Air Supply at BIW Shop
4	Timer based Air Supply and interlock for Front Wall Manipulator at BIW shop.
5	Provision of Ring System for Compressed Air Line in Western Complex.
6	New generation CED paint used in Paint Shop
7	Remote Shut down Valves for Compressed Air Supply for TCF Shop
8	Inverter Welding guns are being used in place of Thyristor based Welding machines

YoY Saving



Total Cumulative Energy Saving in last 3 years is Rs. 4.0 Cr.

EnCons Projects-Compressed Air Pipe Line Ring System

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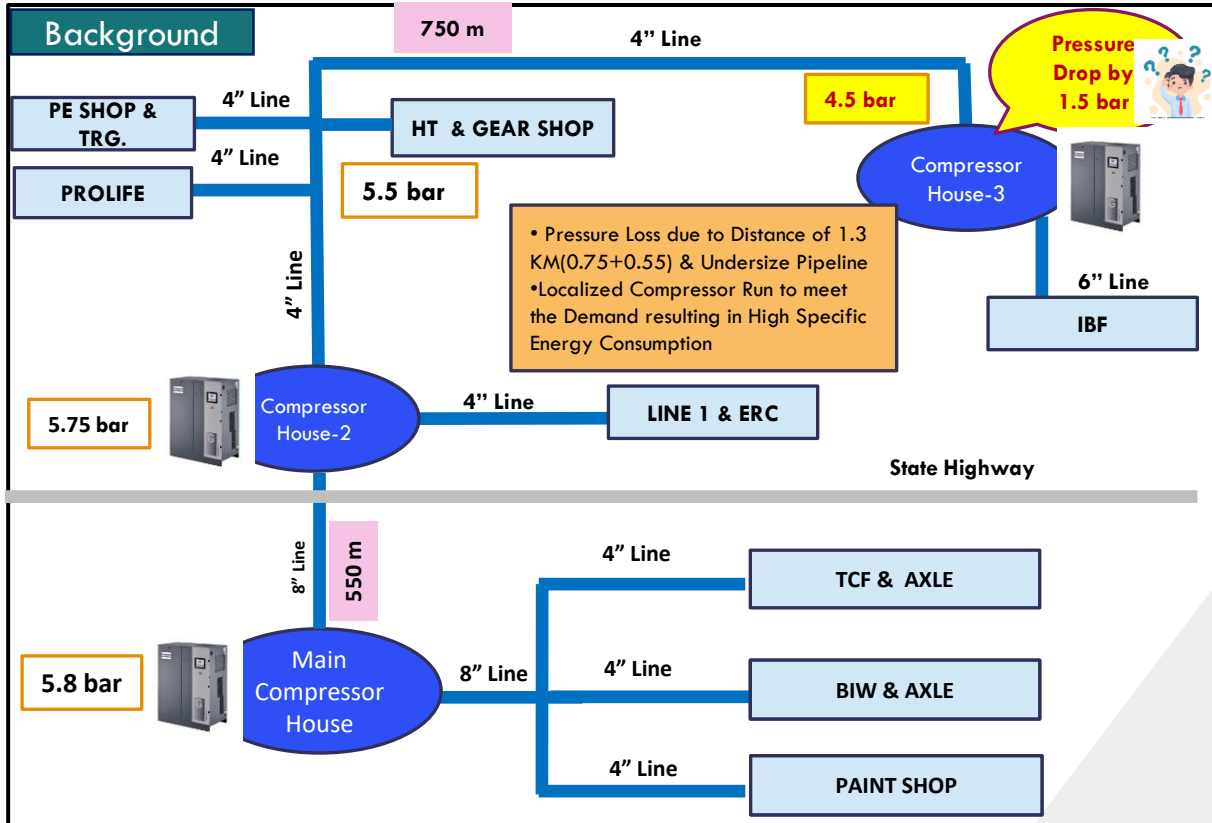
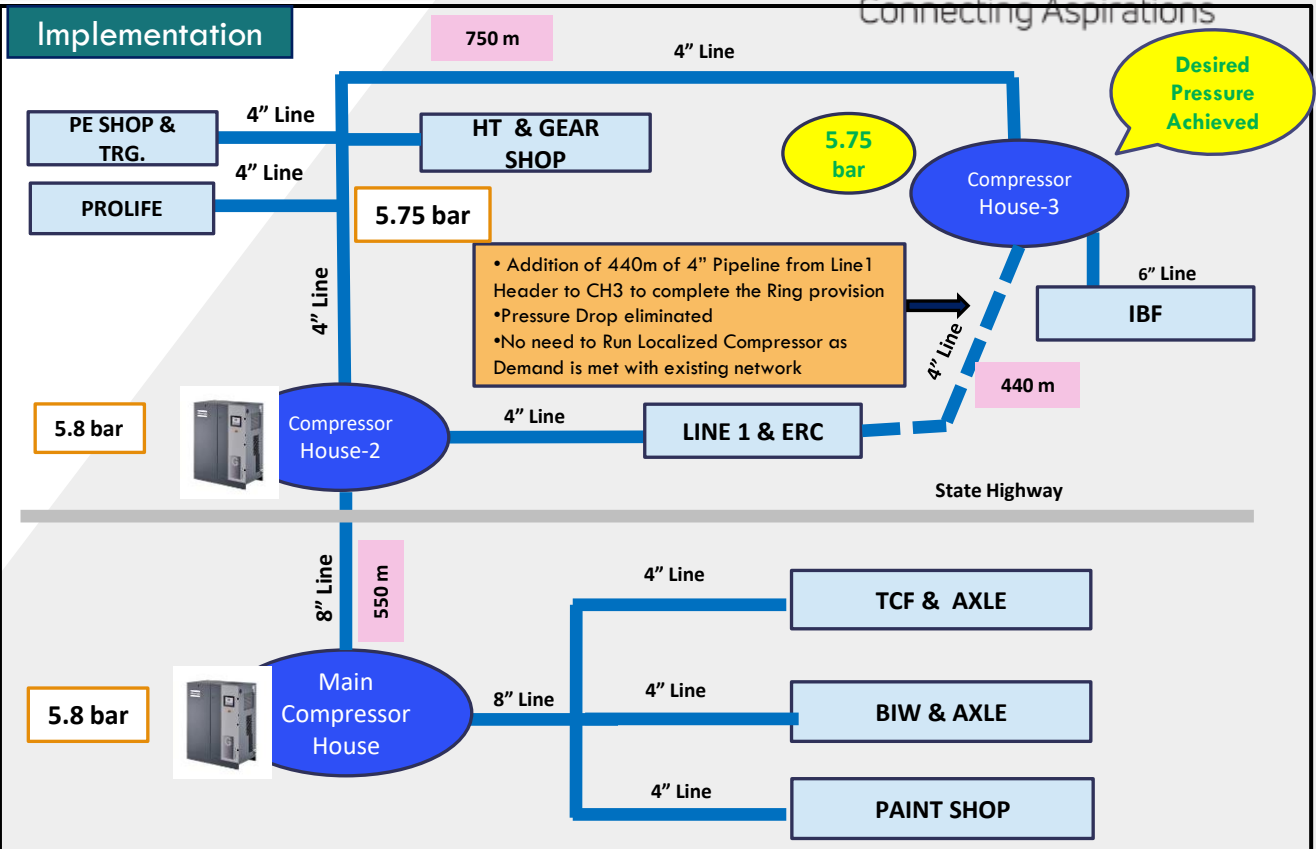
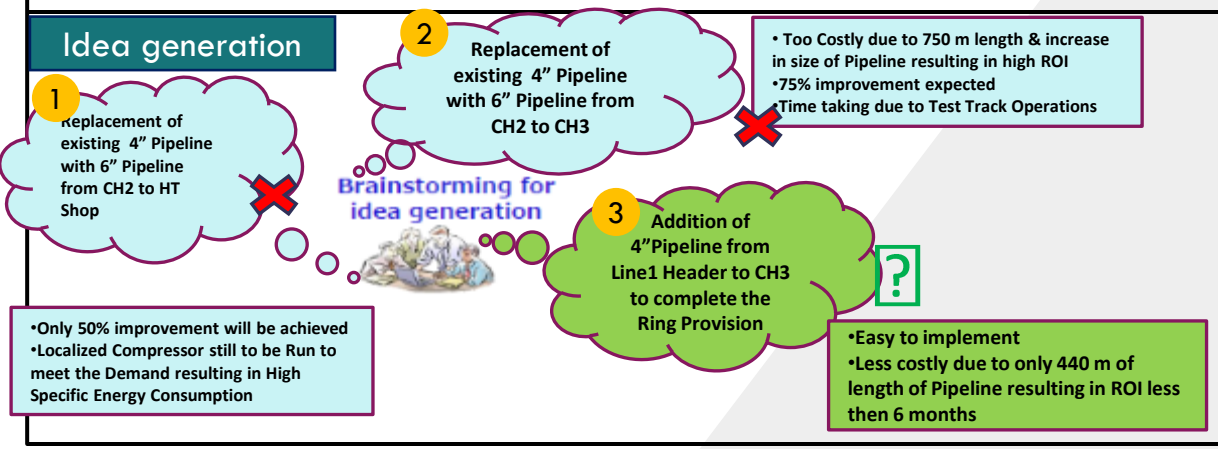
Background



Implementation



Idea generation



Benefits

0.72 Million kwh	516 TCO2	Rs. 5.76 Million	Rs. 0.85 Million

EnCons Projects-Double Loading of FES Cowl

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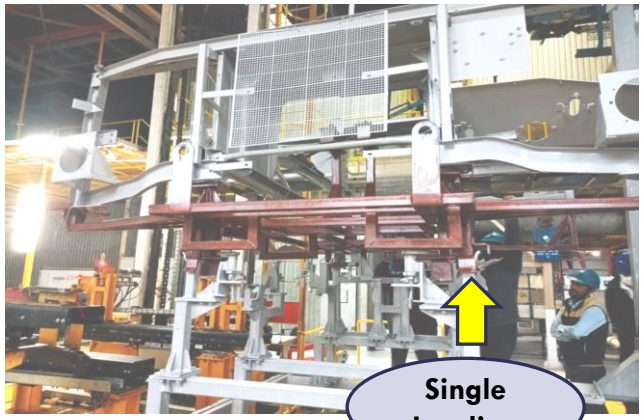
Background

During Loading of LPO-Model-Face-less Cowl at PT Loading Lift, CG (Center of Gravity) shifted to one side Causing Cowl to topple.



Root Cause

Toppling of Face less Cowl in PT ED Loading

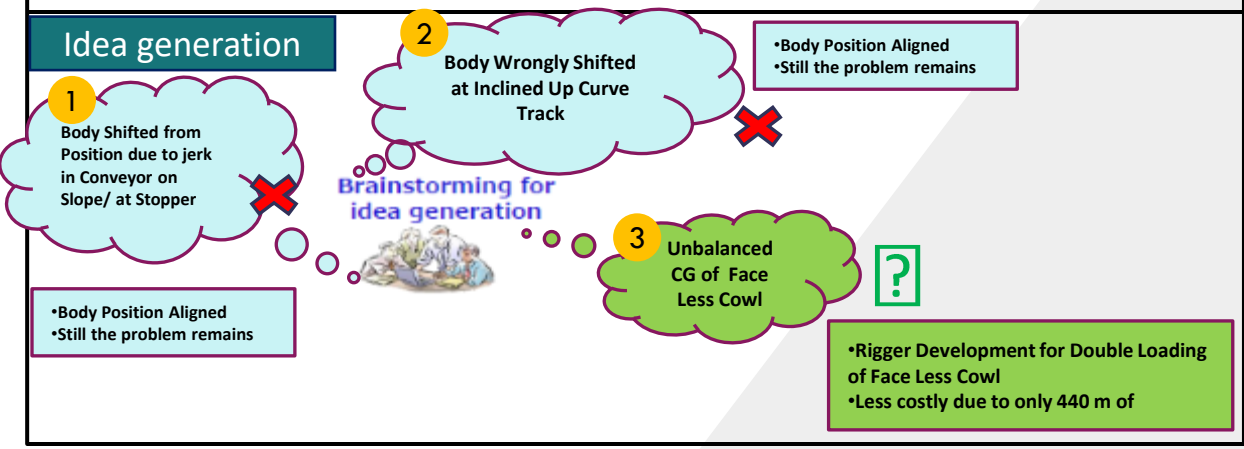
↓

Un-balanced Face less cowl

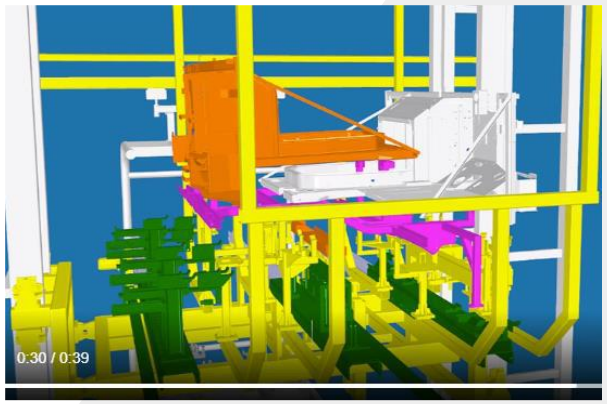
↓

CG (Center of Gravity) shifted to one side

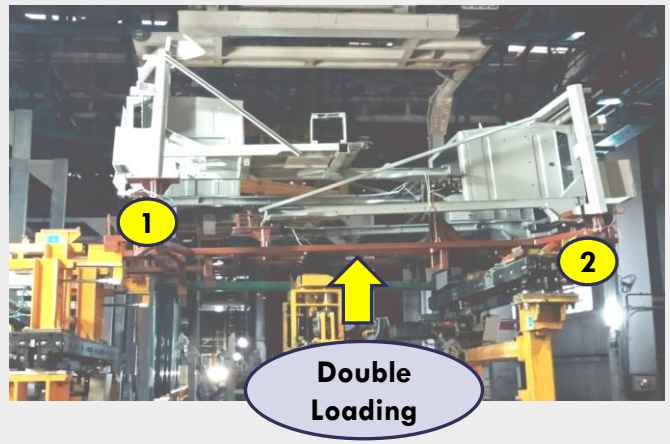
Idea generation

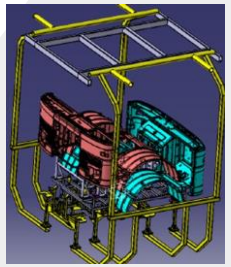


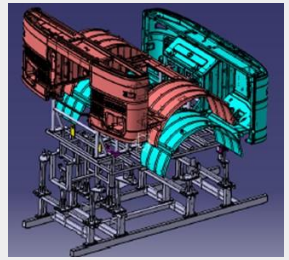
Implementation

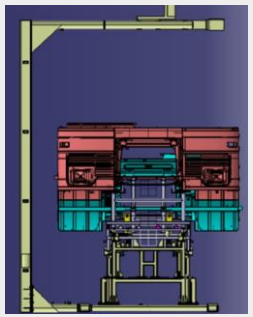


Rigger development for Double Loading









Trail on WBS, Skid & Hanger

Double Loading of Face Less Cowl body with "Development of Rigger" resulting in balanced CG & elimination of toppling issues.

Benefits

S.No.	Parameters	Savings	Cost Saved/ Body (In Rs.)	Monthly Production	Total Monthly Saving (In Rs.)
1	Quality Cost	Rework Eliminated	150	375	56,250
2	Productivity Cost	a. Man hours saving b. Breakdown Elimination- Reduction of Operating Hours	20	375	7,500
3	Power Cost Propane Cost	Reduction in running hours resulted in a. Reduction in Power Consumption b. Reduction in Fuel Consumption	100	375	37,500
		Total Monthly Cost Savings (In Rs)		1,01,250	

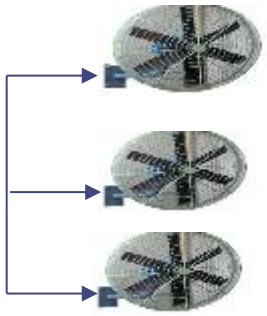
Electrical- 0.04 Million kwh **Propane- 2.2 MT**

EnCons Projects

TATA MOTORS

HVLS fan installation

Before: Multiple man cooler



After: Single HVLS Fan

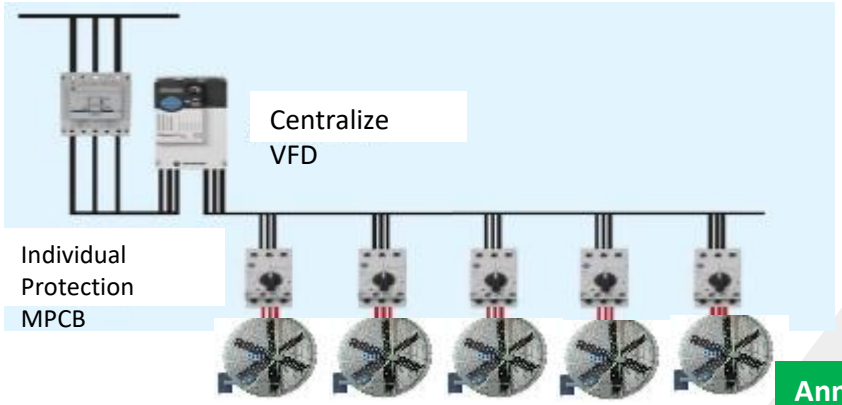
Alternative technology

Use of single HVLS fan instead of multiple man cooler at post body area

- Now one 2.5 KW HVLS fan being operate instead of of 08 Nos X 2.2 KW man cooler

Annual Saving -- 0.43 Lacs KWH

VFD Integration in Man coolers



Efficiency Improvement

Before: **DOL Starter**
Operating freq. =50 HZ

After: **VFD integration**
Operating freq. =40 HZ

Annual Saving -- 0.46 Lacs KWH

A provision made for controlling the operation of group of man cooler through single VFD so that fan RPM as well as operation can be control as per operation need.

- At present 60 no's of man cooler being control through 05 no's of VFD of equivalent rating in TCF Shop. Horizontal deployment in progress for reaming areas

Use of Inverter Welding machine in place of Thyristor base M/c

Before: Thyristor based Welding machine

Lighter weight
Lower energy

Less welding spatters
Higher PF (0.95)
No blow holes

After: Inverter Welding machine

Quantity: 96 nos.

Use of MFDC Spot Welding Guns in place of IT Guns

Before: IT spot Guns

Lower energy
Lower weld time

No inductive losses
Higher PF (0.95)

After: MFDC Spot Gun

Quantity: 101 nos.

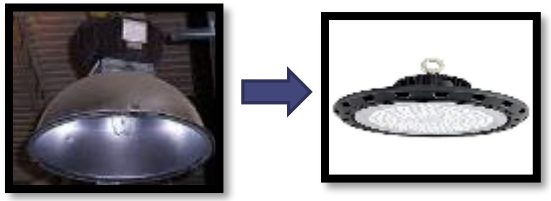
Annual Saving -- 1.5 lacs KWH

EnCons Projects

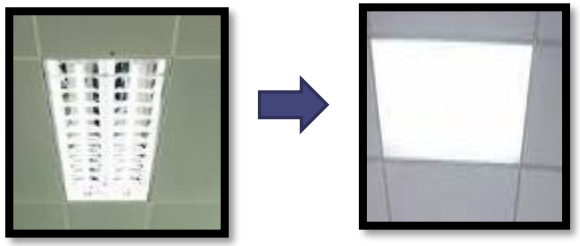
TATA MOTORS
Connecting Aspirations

LED Light replacement

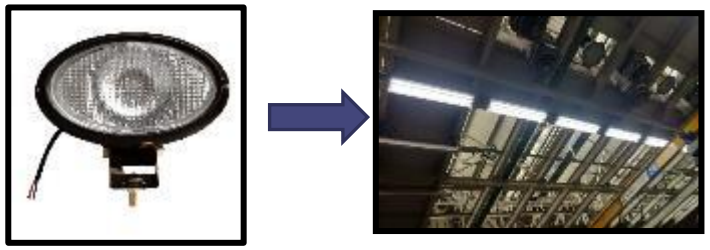
Alternative technology



Replacement of HPMV/MH lamp by LED lights



Conversion of Shops and office lightning to LEDs



Conversion of task shop lighting to LEDs

Total light replaced – 4071 Nos
Annual Saving -- 5.7 Lakhs KWH

Compressed air and Energy Audits

Administrative control

Use of local compressor during partial working day

Periodic leakage audit for compress air network

Surprise energy audits to sensitize the personal about wastage of energy

Annual Saving -- 0.6 Lakhs KWH

Energy Efficient Motors

Operational Efficiency

Use of energy efficient motors of higher capacity

Total = 16 no's (7.5 KW - 90 KW range)

In Paint Shop application and Air Compressor

Use of 5 star ACs

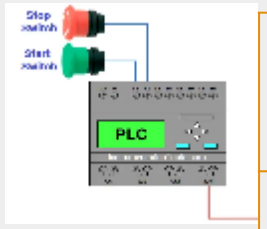
Use of 5 Star ACs in the area need 24 X 7 operation

Total 25 no's X 1.5 ton AC installed

Annual Saving -- 0.6 Lakhs KWH

PLC and Timer Logic

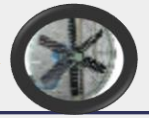
Operational Efficiency



FDV

Man Cooler

Shop Lights



Smoke Extractor

Before: Manual Control

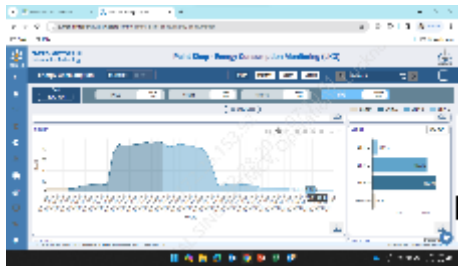
After: Provision made through PLC timer logic for automatic controlling of start stop operations of shop utilities during break hours and shift changeover time in working days

Annual Saving -- 0.95 Lakhs KWH

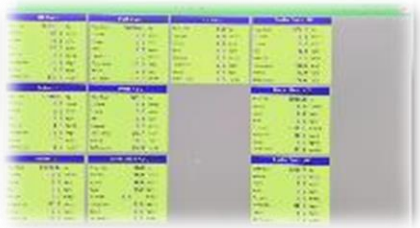
EnCons Projects

TATA MOTORS
Connecting Aspirations

Digitalization- Equipment wise online monitoring



Fuel meters and energy meters dashboard- Paint Shop



Alternative technology

Real Time Monitoring & Remote Access
- Live View Data & Graph
- Analysis and administrative control
- 75 kwh/day savings

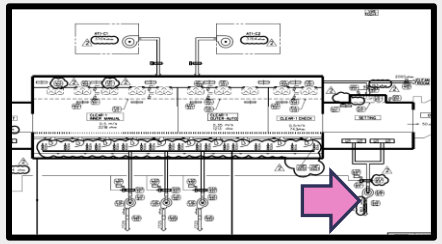
Annual Saving -- 0.22 Lakhs KWH

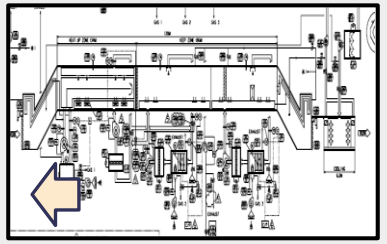
Sustenance- Maintenance Activities

Operational Efficiency

Booth Balancing at top Coat Paint Shop
- **150 kwh/day savings**

In a closed zone system, maintaining booth balance is important as flow of cool air will increase the fuel consumption while reverse will increase chiller load and disturbs booth work environment.





Annual Saving -- 0.54 Lakhs KWH

Sustenance- Maintenance Activities

Identifying and arresting hot Air Leakage in paint shop, (Ex. ED oven TAR (Combustion Chamber)

Before: Hot Air Leakage Temp 247 °C

After : Zero Hot Air Leakage Temp. 36°C

Annual fuel Saving -- 3 MT/year

Sustenance- Maintenance Activities

Chocked Mesh /Jaali Removal Activity of Top Coat -2 Booth Exhaust Chimney

Cleaned Exhaust Top Coat Area and Chimney with in-house HK team. And reduced 20 Hz frequency as earlier.

12500 kwh saving per month

Annual Saving -- 1.4 Lakhs KWH

Horizontal Deployment of Major Ideas-Across Shops

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Connecting Aspirations

S.No	Idea Description	Paint Shop	TCF	Office Areas	Rest Areas	Status of Implementation as on 2024
1	Switching off no-load transformers in MRS and sub-stations.				✓	✓
2	Installation of LT Ring system for transformers of Paint shop-A, Paint shop- B & Paint Shop-C substations to eliminate iron losses of transformers.	✓			✓	✓
3	LED Lights in TCF R1/R2, DRR4 areas	✓	✓		✓	✓
4	Use of portable compressor for fixed air demand wherever feasible.	✓	✓	✓	✓	✓
5	Individual shut-off valves for Front wall, sub-structure and Mainframer lines in BIW.				✓	✓
6	No water extraction on Non-working day results zero energy consumption of Pump house.	✓	✓	✓	✓	✓
7	Installation of LT Ring system for transformers of BIW Shop substation to eliminate iron losses of transformers.				✓	✓
8	Hourly energy report analysis and deriving corrective actions.	✓	✓	✓	✓	✓
9	Compressed air system optimization	✓	✓		✓	✓
10	Installation of Shut off valves for isolate the pneumatic supply of particular area based on requirement.	✓	✓	✓	✓	✓
11	Bare minimum lighting in shops through low wattage Emergency Lighting system after working hours.	✓	✓	✓	✓	✓
12	Operation of R2 area in co-ordination with Line operation		✓		✓	✓

Various other initiatives creating major impact on energy consumption:

- Stringent Daily Monitoring of consumption shop wise
- Industry 4.0- Energy Dashboard with Power BI
- Digital transformation- Energy Dashboard with equipment wise monitoring in Paint Shop.
- Currently, horizontally deploying to all the shops.
- Trainings and awareness sessions on energy management for all employees.
- Activities during Energy Conservation Month Celebration.

TATA MOTORS
Connecting Aspirations

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Slides

Innovative Project-1 : Implementation Of New Generation CED Paint (250 T) In Cab & Cowl Body

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Project:

With close consultation with paint manufacturer, a new generation CED paint "KNP 250 T" has been implemented in electro deposition process for Cab & Cowl painting in Lucknow Plant. Earlier CED Paint "KNP LB40" was being used in electro deposition process .

Paint Shop Process Flow

Pre - Treatment → Electro Deposition → Baking Oven → CED Inspection → Sealant line -1 / Sealant line -2 → Underbody → Sealer Oven → Moist Sanding → Painting in Top Coat Line → Baking Oven → Inspection & Polishing → Touch Up → Wax Application → **Dispatch**

Old Paint KNP LB40 → New Paint KNP 250 T

ED Tank 300 KL

ED Circulation

ED Circulation system - 190 KW

During Off Days Circulation time:
Before: 24 Hrs in a Day
After: 10 Hrs in a Day

Circulation time reduced

Issues with Existing Technology

1. LB 40 Series is the initial and most basic CED series. Having issues with very narrow operating window of Paint Temperature & requires continuous circulation 24x7 irrespective of production.
2. Low box section coverage requires a high CED Voltage to enable throw power of primer.
3. Most of the competitors move away from LB 40T to LB 200 / LB 250T due to high operating cost & high effort in process control

Step Followed for Implementation of new Generation CED paint :

1. Initial Sample testing conducted at 3 Locations – TML CV Lko, TML PV Pune & ERC Pune and independent third party as per TML standard IS 7265 /726511.
2. After OK qualification from Lab, simulation exercise conducted on line in real time conditions.
3. More than 34 short term & long term test conducted to ensure quality & durability of coating processes.
4. Initial Lot Line trials, followed with mass production initially started at TML PV Pune.
5. After successful results, same has been implemented at TML LKO in phased manner.

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Benefits :

CED Paint Old Vs New Comparison					
S.N	**KNP LB40 (Old)**	**KNP 250 T (New)**	**Benefits with new CED paint**	**Annual Saving (In KWH)**	**Benefit Category**
1	CED bath need continuous circulation in working day as well as non working day	CED bath need intermittent circulation during non working Days. • Total 8-10 Hrs. circulation required • 1 hrs. circulation / 6 Hrs. time duration	14 Hrs of circulation pump running Hrs. reduced in each Non Working Days	162000	Energy Saving
2	Need to maintain temp range 25 - 30 Deg.	Need to maintain temp range 25 - 35 Deg.	Chiller load reduced due to increase in temp tolerance by 05 Deg.	4847	Energy Saving
3	Throw Power 22 cms	Throw Power 26 cms	Throw Power increased by 04 cms		Quality
4	Roughness Index - 0.5	Roughness Index - 0.2	Roughness Index improved by - 0.3		Quality
5	Desired coating strength is achieved at 20 micron DFT (Dry Film Thickness)	Desired coating strength is achieved at 16 micron DFT (Dry Film Thickness)	Required coating thickness reduced by 4 micron, in result paint consumption decreased by 8%		Cost Saving

Annual savings :

1.68 Lakhs KWH

121 ton CO2

Rs 22 Lakhs

Innovative Project-2 : Energy saving through efficiency improvement (JPH) of PTED line

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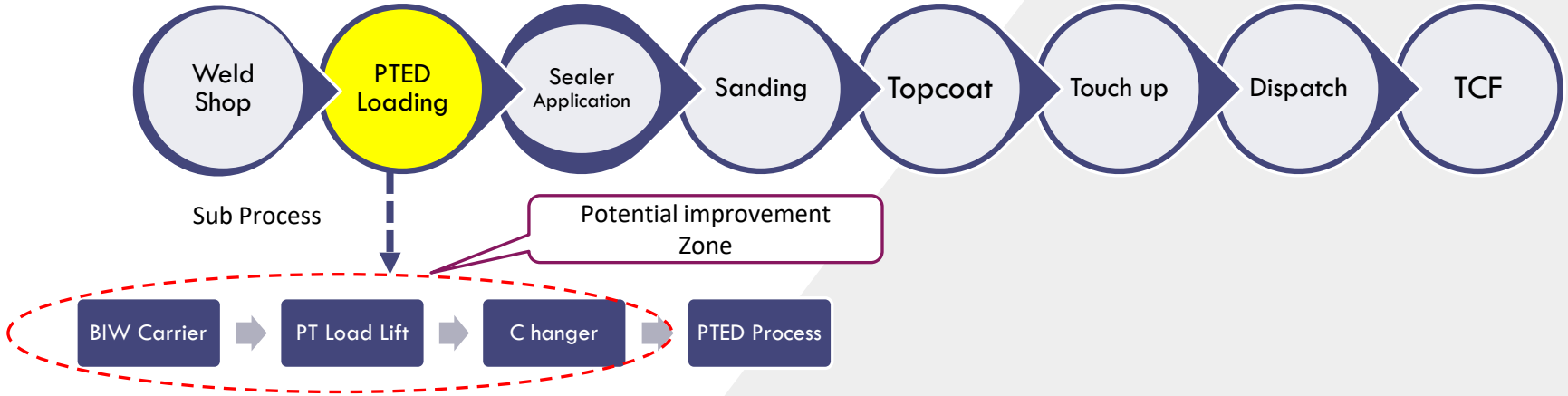
Project:
Energy Saving by increasing the hourly production from 14 job to 20 job through efficiency improvement of PTED line.

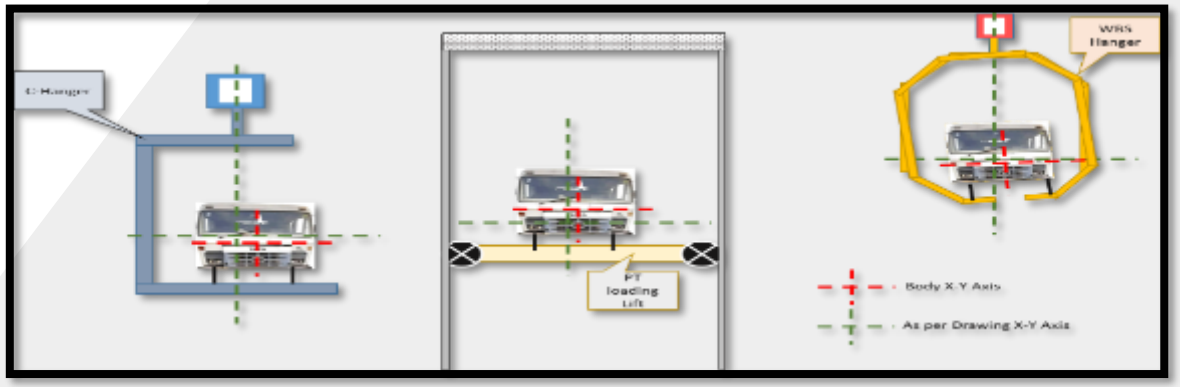
Trigger: Increase in demand per shift.

Process Flow Diagram



Sr.Nos	Problem Details
1	Body seating issue on C-hanger which taking more time for seating adjustment with manual interventions
2	Lift not transfering Body acuurately on C-hanger
3	Body trasfering from WBS hanger to Lift Forks in 7mm-X & 9mm-Y offset positions

Job hangers & Lift



- Misalignment observed at different handling Equipment
- In **X axis** total misalignment found **45mm**
- In **Y axis** total misalignment found **26 mm**

Due to above lot of manual intervention was required for job adjustment

Action Plan for minimizing the misalignment of Job handling equipment's

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Sr.Nos	Validated Causes	Possible Solutions
1	Body seating issue on C-hanger which taking more time for seating adjustment	Install Guide way at PT Loading Station for C-Hanger
2		Install Autoadjusting Clamping unit of C-Hanger
3		C-hangers Resting Pegs alignment as per drawing dimesnsions.
4	Lift not transfering Body acuurately on C-hanger	install Cup type new resting on Lift's Fork
5	Body trasfering from WBS hanger to Lift Forks in 7mm-X & 9mm-Y offset positions	WBS Hanger clamping units 4 nos
6		WBS Hanger Resting Pegs Alignment as per drawing dimensions.

Conclusion: After taking above 6 actions total misalignment reduced under 10mm.

After:

Guide plate installation for C hanger

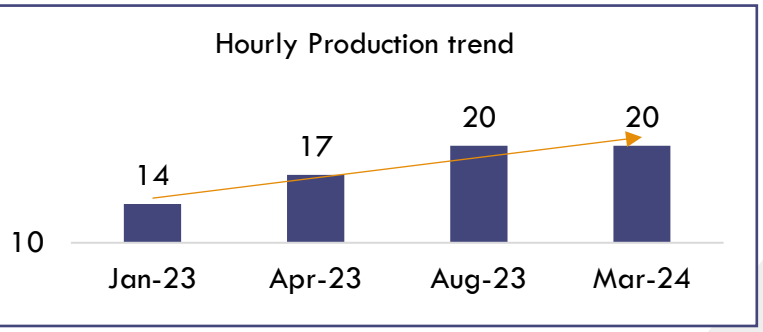
Auto adjusting lock for C hanger

C hanger resting pegs as per drawing dimensions

New cup type resting provided in Lifts

WBS hanger clamping in four arms

WBS hanger pegs alignment as per drawing dimensions



Manual intervention minimized, resulting in increase in hourly production

Annual savings :

Propane 9 MT

4.8 Lakhs KWH

370 ton CO2

Rs 43.5 Lakhs

Innovative Project-3 : To increase the production of BIW from 65-85 per shift

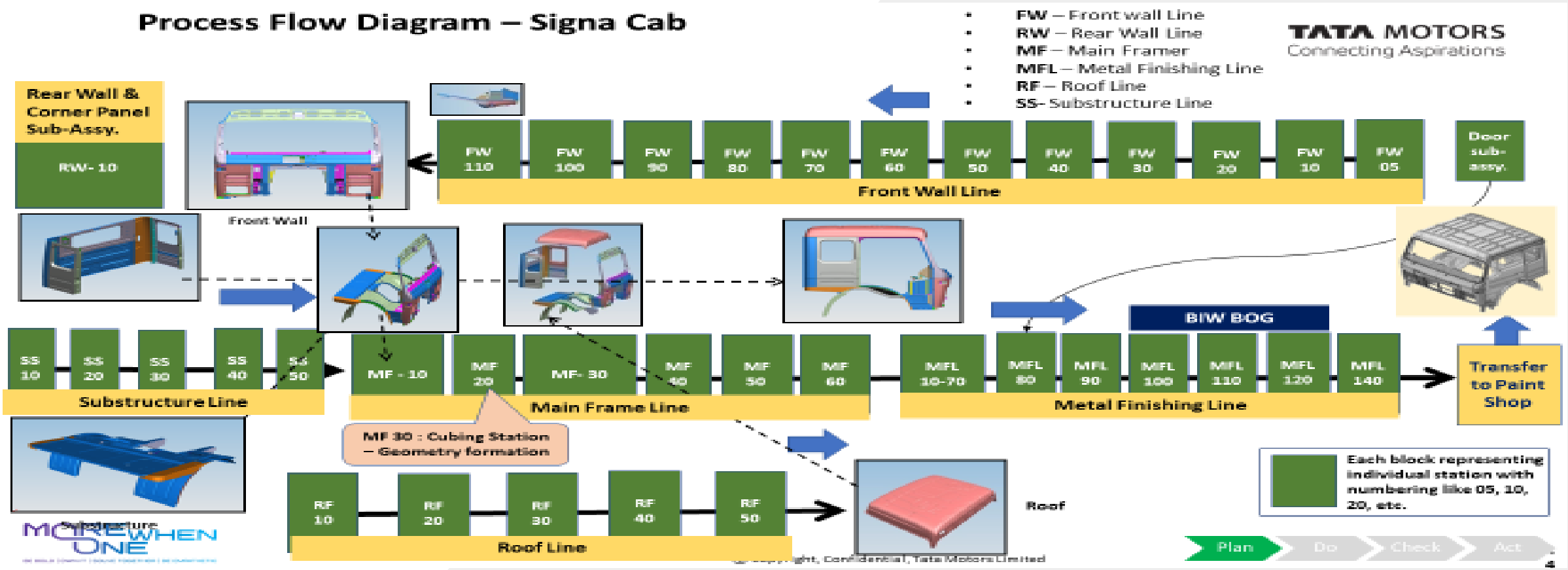
BIW SHOP
TATA MOTORS LUCKNOW
MISSION 85
SIGNA CABIN PRODUCTION RAMP UP TO 85/SHIFT

Project: **Design and line modifications done in BIW line to accommodate more production in the same time and using same energy**

Present Condition:

- Two production lines in weld shop i.e.., Signa Cab & ILCV Cab.
- 57%(65 nos) of the shop volume was 1516 Signa Cab & 43%(50nos) was ILCV Cab.
- As per business requirement, New 1516 cowl model was to be produced.
- Being from 1516 family, New 1516 cowl can be produced on 1516 signa line with minimum investment.
- Daily requirement for New 1516 Cowl was 20 nos.

Total Time (min)	Administrative Breaks (min)	Net Available Time (min)	Customer Demand (nos)	Takt Time (min)	Remarks
(A)	(B)	(A-B)			
510	70	440	65	6.1	1516 Signa Cab
510	70	440	85	4.7	1516 Signa Cab & 1516 Cowl

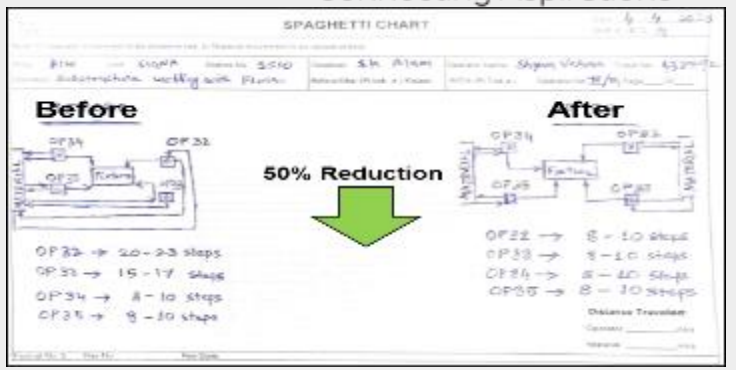


Innovative Project-3 : To increase the production of BIW from 65-85 per shift

TATA MOTORS
Connecting Aspirations

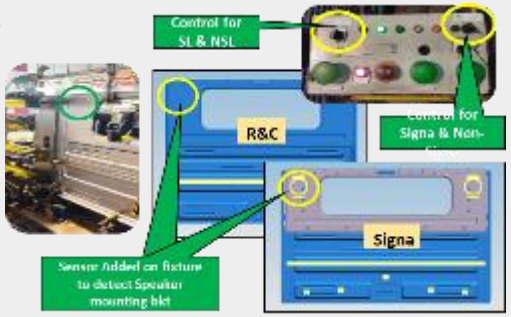
Measures taken:

- Ladder Logic modification on Front wall, Substructure and main framer Auto clamping done-
  a. Inversion system transfer PLC program modification for cycle time reduction)
  b. RPM increased from 400 RPM to 600 RPM as well as slow speed program modification
  c. Remote pendant provided for safety
- Logical modification done in Transporters.
- Modification done Robotic programs on Main framer and substructure robotic stations.
- Each station processes was improved using Standard Work Combination Chart & Spaghetti Chart to optimize Non value adding Activities.
- MF 50 gate operation PLC program modification (gate operation start when shuttle down at forward side cycle time saving 22 seconds



Before:

After:



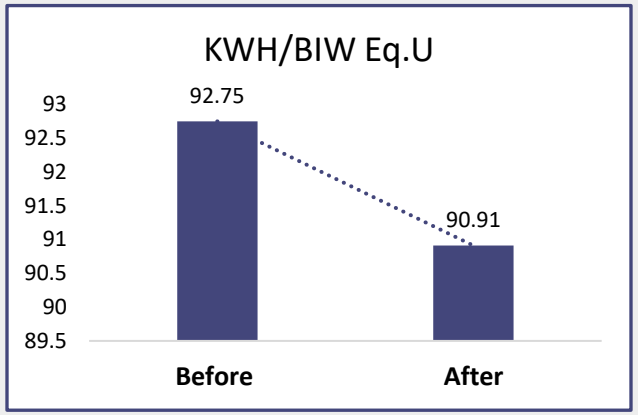
Result: 1st june23 achieved production target of 85 cabs per shift

Impact:

Average BIW Kwh/Eq. Veh- **Before: 92.75 BIW Kwh/shop Eq. Veh**. at **65 cab per shift**

Average BIW Kwh/Eq. Veh- **After: 90.91 BIW Kwh/shop Eq. Veh**. at **85 cab per shift**

Total Kwh/Eq. Veh. saved=1.84 kwh/Eq. Veh.*85(no. of cabs)= 156.4 Kwh Per shift



Way Forward:

To move towards **110 Cabs per shift** and increase energy efficiency

Annual savings :

46,920 KWH

33.6 ton CO2

Rs 3.75 lacs

TATA MOTORS
Connecting Aspirations

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Slides

TML– Net Zero Commitment

TATA MOTORS
Connecting Aspirations

DRIVING NET ZERO

Targets taken up by Tata Group

- ✓ **[2030]:** [25%] reduction in absolute CO_2e emissions from [2020] baseline (Scope 1+2) from 2020 baseline, excluding Tata Steel India. Tata Steel India to reduce emissions intensity by 30% from 2020 baseline.
- ✓ **[2045]:** Net Zero emissions across the Group for Scope 1 and 2 all companies (and Scope 3 for JLR, TML, TCS TCPL)

Targets taken up by TML - Lucknow

- ✓ **[2026]: RE 100.**
- ✓ **[2035]: Net Zero Emissions across the Plant for Scope 1 and 2**

PIONEERING CIRCULAR ECONOMIES

THE TATA GROUP WILL BE A GLOBAL MODEL FOR BEST PRACTICE CIRCULARITY

- ✓ **[2023]**: Launch Group model for Circular Economy
- ✓ **[2025]**: More than double the content of renewable or recycled resources in products by 2025 (from 2020). The Group will set revenue-based KPIs from 2025 onwards
- ✓ **[2030]**: Replenish fresh water used across Group operations in India and zero waste to landfill across Group companies
- ✓ **[2040]**: Tata Group will replenish more fresh water than it consumes.

- ✓ **[2023]: Water Positivity certification**
- ✓ **[2024]: Zero Waste to Land Fill certification**

PRESERVING NATURE AND BIODIVERSITY

THE TATA GROUP WILL STRIVE TO HAVE A POSITIVE IMPACT ON NATURE

- ✓ **[2024]:** Action plan for net positive impact will be implemented across Tata Group companies
- ✓ **[2025]:** Invest in 10 NBS projects in India, which deliver biodiversity and community co-benefits.
- ✓ **[2030]:** Tata is an NBS leader and has supported development of a thriving NBS market in India.

- ✓ **[2023]: Action plan for Net Positive Impact / Nature Based solution**
- ✓ **[2028]: Tata is an NBS leader and has supported development of a thriving NBS market in India**

TML- Lucknow-RE 100 Journey

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RE Highlights

Total 6 MWp Solar Plant Installation

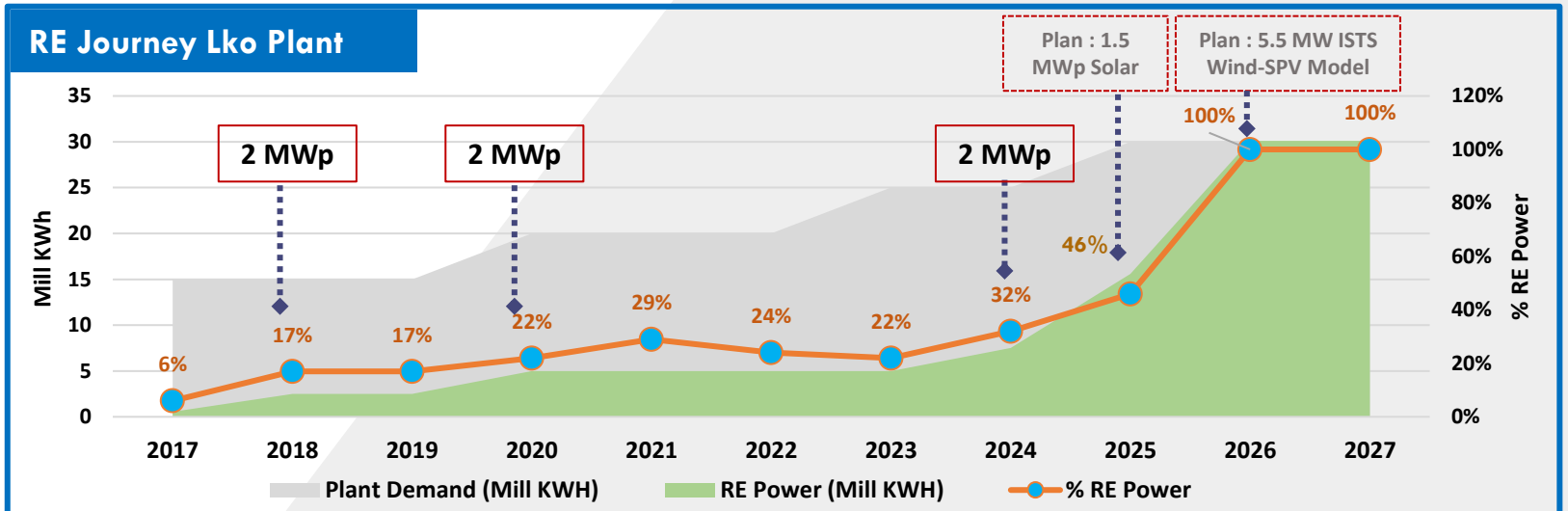
Phase-1 (2017~18) : 2 MWp
Phase-2 (2019~20) : 2 MWp
Phase-3 (2023~24) : 2 MWp

Carbon Foot Prints : 5370 Tons of CO2/ Year

Business Model : OPEX

TML  BECIS

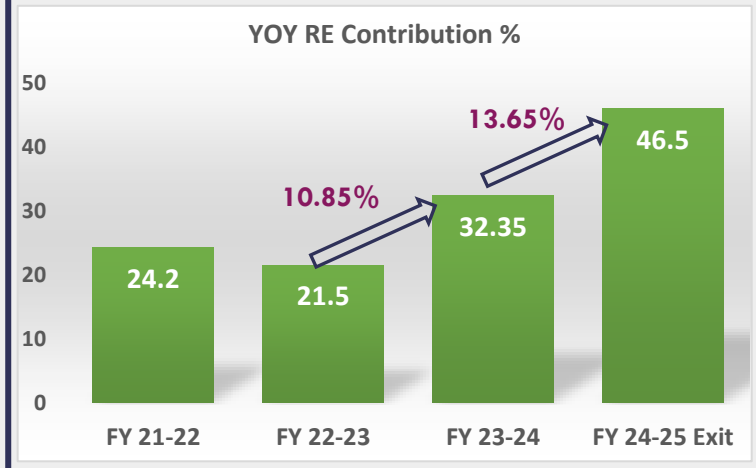
RE Journey Lko Plant



Solar Plant Layout and Details

Technology Source	Year	Installed Capacity (in MW)	Generation (in Million kWh)	Share %
SOLAR	**2021-22**	4.13	4.16	**24.20**
SOLAR	**2022-23**	4.13	4.86	**21.50**
SOLAR	**2023-24**	6.13	5.05	**32.35**
SOLAR	**2024-25**	6.13	7.50	**46.5**

RE Contribution and Solar Plant Photos

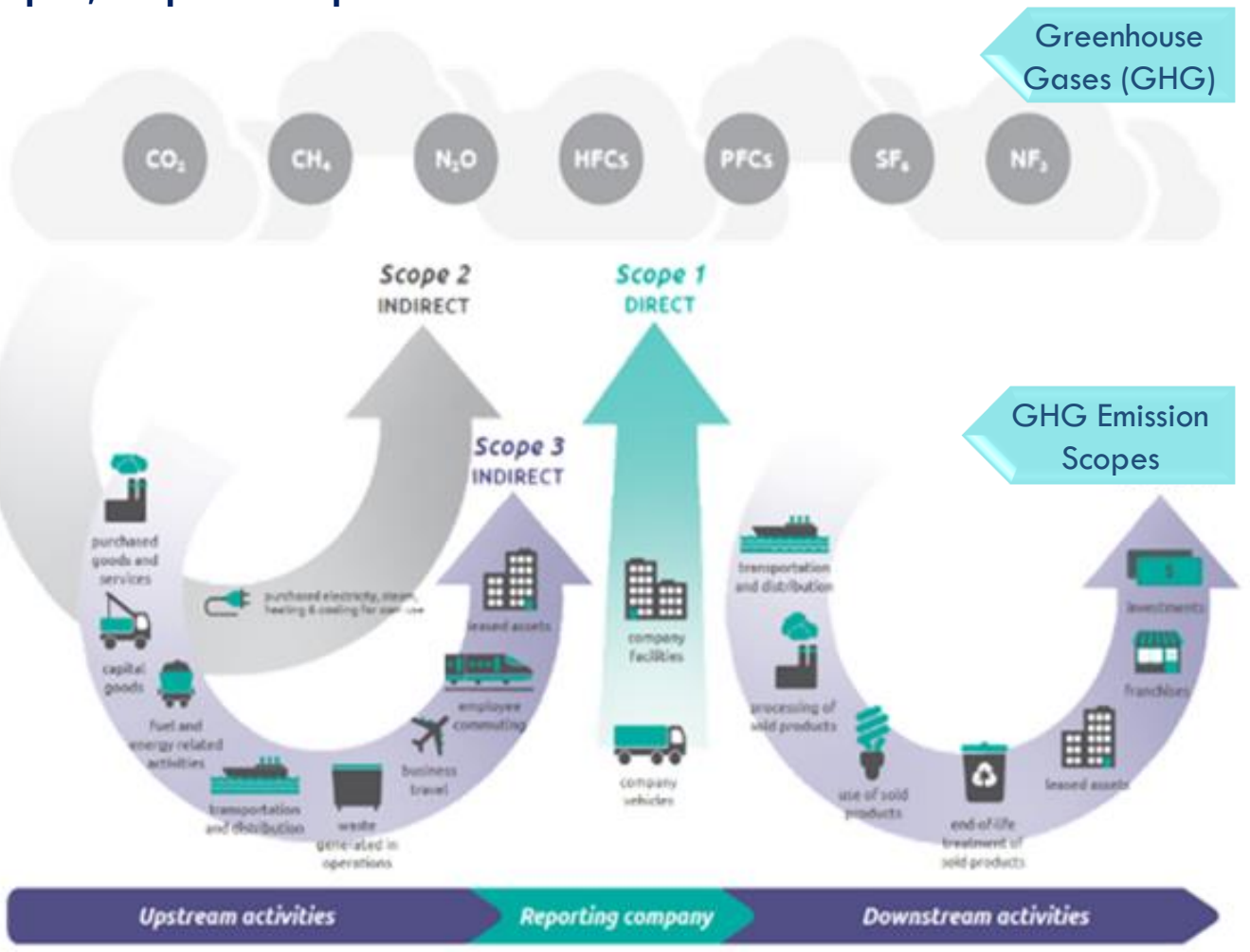


RE Contribution Increased by 11% in FY 23-24 with the Increase in Solar Plant Installation and Green Power Purchase through Open Access

GHG Inventorization-Scope1 and Scope2

TATA MOTORS
Connecting Aspirations

GHG Protocol-Categorizes the Direct and Indirect Emissions into 3 Parts: Scope1, Scope2 & Scope3



Sources of Scope-1 & Scope-2 Emissions at Lucknow

- DG Set (Diesel)
- Company Owned Vehicles (Diesel)
- Company Owned Vehicles (Petrol)
- Canteen (LPG)
- Engine Testing in ERC (Diesel)
- Process Heat Generation in Paint Shop (Propane)

→ Scope-1 Emission

- Grid Electricity (Total Plant excl. Marcopolo)

→ Scope-2 Emission

→ Total GHG Emission

GHG Inventorization Tata Motors-Lucknow Plant include Scope1 & Scope2 Emissions

GHG Inventorization-Scope1 and Scope2

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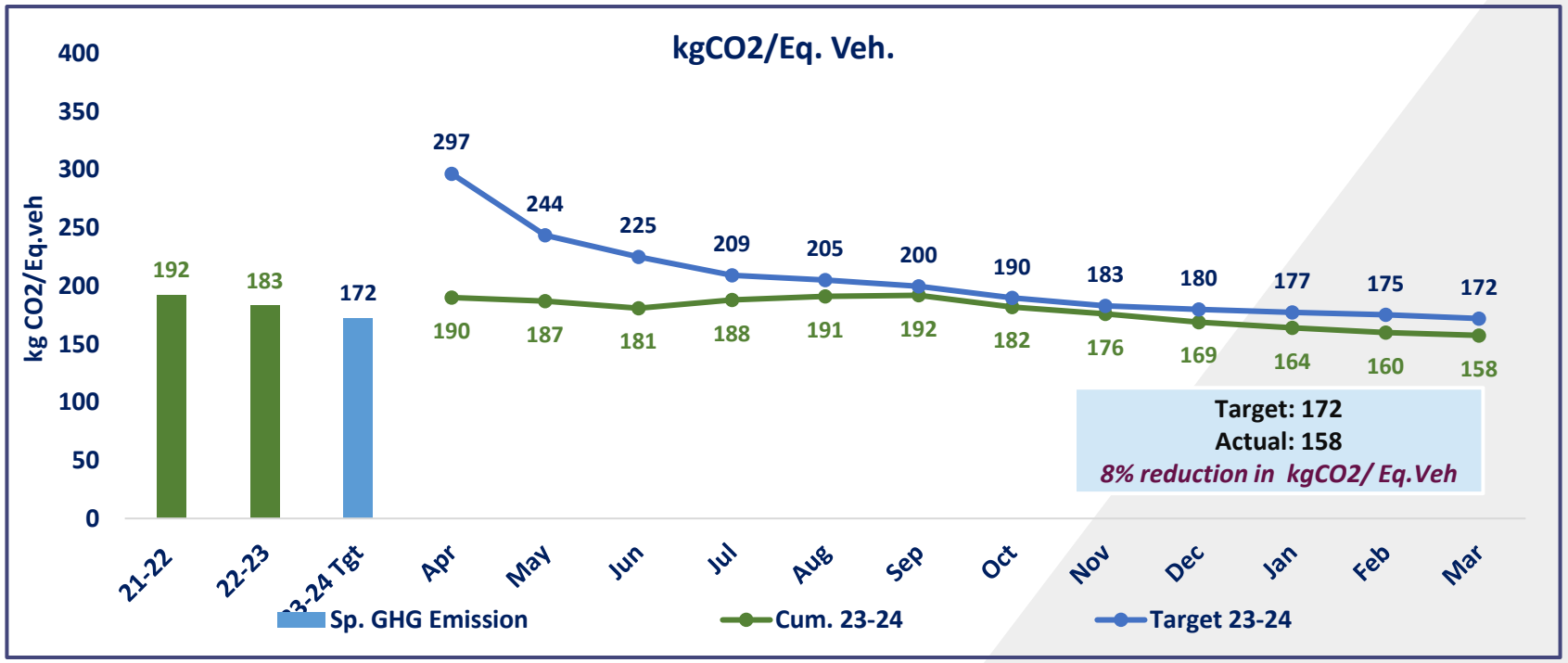
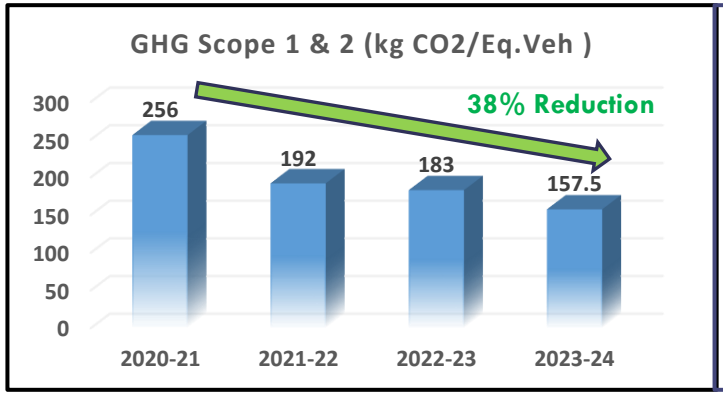
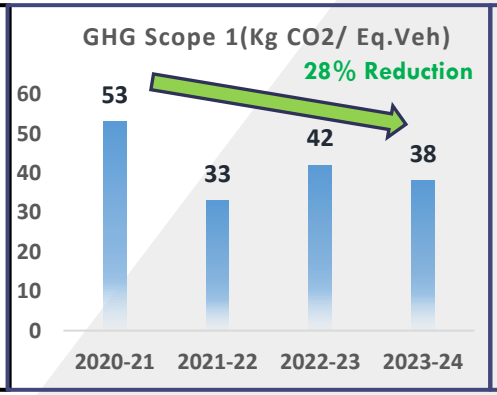
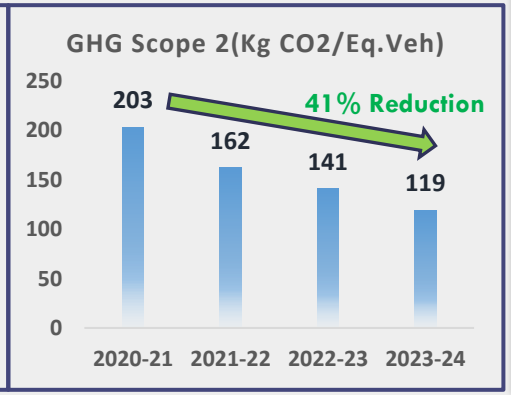
GHG Emission Trend FY23-24 (kg CO2/Eq. Veh)



Major Actions taken	Savings (kg CO2/Eq Veh)	Status
Reduction of Power distribution loss. - Roll out Kaizen, **Completed Kaizens. Improving power factor.**	**5**	SDCA
Interlocking Task lights, Pit lights & Mancoolers with Assembly line conveyor.- **Completed**	**6.0**	SDCA
Compressed Air requirement during Non Production day (NPD)-Use of portable compressor.**–Continuous**	**3.3**	SDCA
Replacement of less efficient Inverter with high efficient Inverter to enhance contribution Solar power- **Completed**	**6.0**	SDCA
High compressed air leakage in shops-Weekly audit and arresting leakage audit. Setting target of 5% leakage target.-**Continuous**	**1.6**	SDCA
Heating system in PMR at Paint Shop	**3**	SDCA



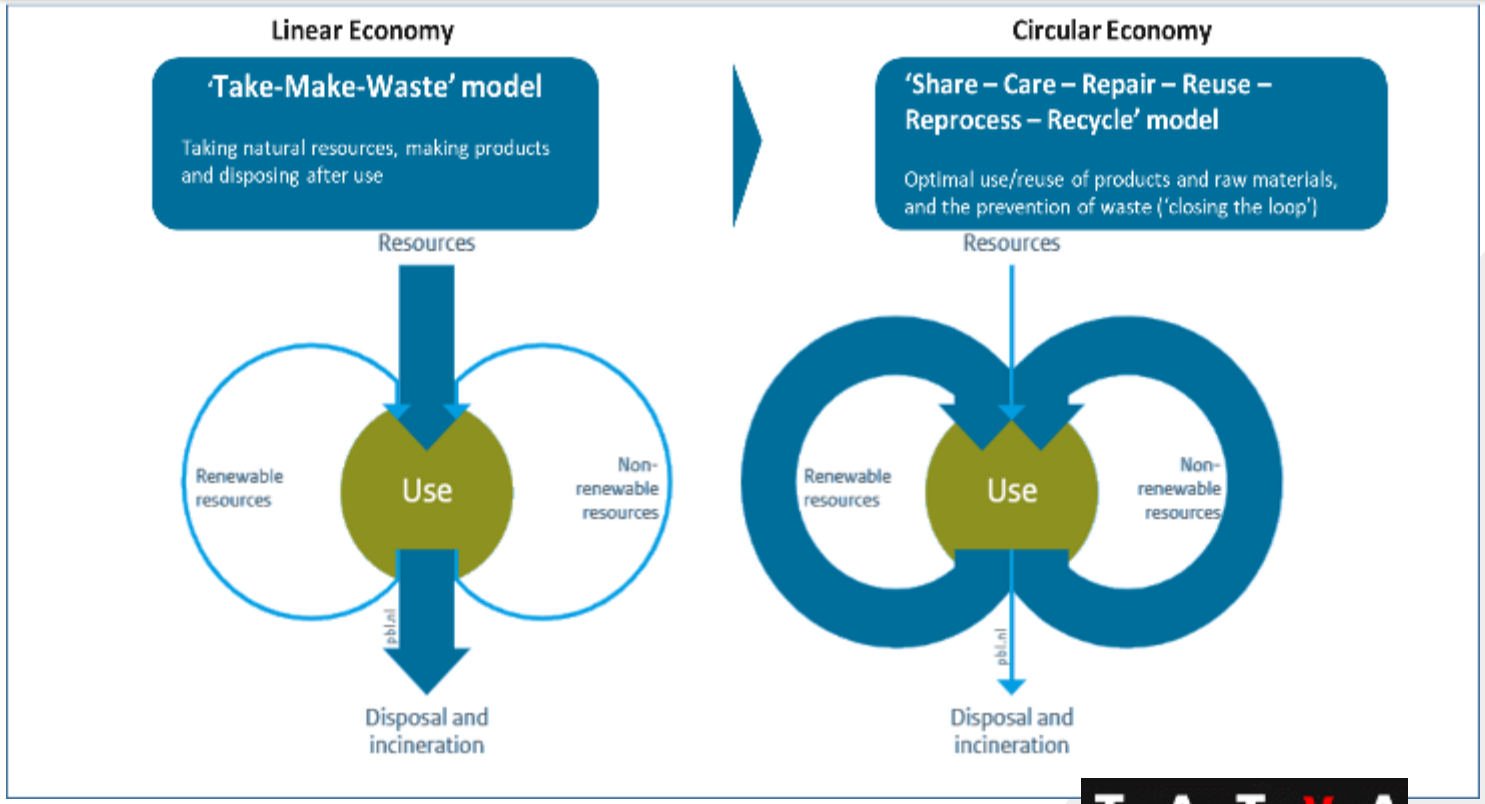




38% Reduction (256 to 157.5 kgCO2/Eq. Veh.) in GHG over the last 4 years

20.23 Lacs kgCO2 Savings

Circular Economy (T A T V A)



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1 **Eliminate waste through Design**

Designing our products to minimize use of virgin material, reduce waste and upcycle

2 **Circulate products and materials**

If we redesigned products so they could be reused or disassembled at the end of life, we could keep those products and their materials at their highest value at all times

3 **Thinking in Systems**

Many actors working together to create effective flows of materials and information, connections between people, places and ideas.

4 **Use of Renewables**

Work towards using energy from renewable sources to manufacture our products, running our processes and in logisitics

T A T V A

ENERGY

- **Emissions**
  Direct, Indirect, Spares
- **Energy Efficiency**
- **Use of Renewables**

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MATERIALS

- **Material Circularity**
  - *Circular Inflow*
  - *Circular Outflow*
    - *Recovery Potential*
    - *Actual Recovery*
- **Water**
  Fresh Water, Net Water Ratio
- **Waste**

LIFETIME

- **Increase in Life**
  Product, Equipment
- **Circular Spares**
- **Recovery at End of Life**

UTILIZATION

- **Utilization**
  Products, Plants

Carbon Footprint - Scope 3- Circular Economy (T A T V A)

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Levels for Circularity and Roadmap

Levels of circularity	0	1	2	3	4	5
	No circularity	Low circularity	Moderate circularity	High circularity	Full circularity	Net positivity in system
	Past	Today	2025	2030	2035	2040
	Classic make-use-waste mentality	Silo optimization and sales focus	Product improvement and better coordination	Aligned incentives and life-cycle optimization	Full circular value chain in as-a-service models	Ecosystem optimization
Energy	Carbon-intensive fuels	Renewable energy in component production and assembly	Alternative drivetrains; low-carbon production	Carbon-neutral use phase; low-carbon materials	Carbon-neutral production and materials	Full energy grid integration of vehicles
Materials	Linear value chain	Production scrap looping	Recycled content increased	High-quality recycling loops	Full "at level" recycling and transparency	Upcycling of waste
Lifetime	Sales-driven model	Repair networks and used car markets	Increased reman in aftermarket	Modular design for upgradability and reman	Purpose-built vehicles	Second-life applications
Use	Private ownership	Private ownership and leasing	On-demand services (cities); subscriptions	Fleets dominate: vehicles and mobility on demand	Mobility on demand in breathing fleets	Optimized mobility system

Prolife Process

Extending the life of commercial vehicles

Aimed at commercial vehicles, Tata Prolife works towards :
Extending the life of vehicles and aggregates through systematic overhaul, leading to optimum performance.

Targets for Circularity

Pathway	KPI No.	KPI	UOM	FY24-25 Targets	FY23-24	FY24-25 (YTD July'24)
Energy	KPI E01	GHG Emissions from Operations	kgCO2e/eqveh)	136	157.49	148.3
	KPI E02	% RE	%	46%	32.35	47.27
	KPI E03	Energy Intensity	GJ/Eq vehicle	1.48	1.48	1.63
Utilization	KPI U01	Utilization of Production Capacity (Chassis Line)	%	38%	37.32	37.85
	KPI U02	OLE of output line (of the same Chassis Line)	%	65%	69.41	59.02
Lifetime	KPI L01	Increase in life of plant equipment	%	120%	121.8	127.13
	KPI L02	Circular Spares used	%	70%	78.48	52
	KPI L03	Recovery type for EOL Rejections	%	100%	100	100
Materials	KPI M01	Zero Waste to Landfill	%	100%	99.18	100
	KPI M02	Material Circularity- IDM	%	2%	0	0
	KPI M03	Net Water Ratio	ratio	2.8	2.5	2.83

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Slides

Green Supply Chain Management

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Green Supply Chain Policies

Environmental Policy

Climate Change Policy

Green Supply Chain Policy

Road Map For Polythene Elimination in SCM

- Compilation of Single use plastic Packaging Disposal data
- Mapping the Procurement data of the plastic Packaging for interplant transfers & SPD

Formation of the Plant wise CFT April

- Parts involved in the Plastic film Packaging
- Packaging Critical Requirement mapping

- B/O Part Family wise Mapping of Packaging Condition
- Part Family Wise Packaging for interplant / SPD

Plant Wise Data Analysis & Plastic Elimination Plan

- Mapping of the Major Suppliers Involved
- Parts in finished vehicle Protected with Plastic Films
- Idea Generation workshop for Plastic elimination

- Part Family wise Alternate Solution mapping for B/O, SPD, interplant transfer

Alternate Packaging development & Implementation

- Elimination of the plastics film in low hanging Parts
- Ensuring the Use of 50 Micron thk plastics for unavoidable parts
- Adopting the benchmark best practices

- Elimination of the Plastics packaging in the B/O Parts, Interplant transfers & in SPD.

Elimination of the plastic Packaging

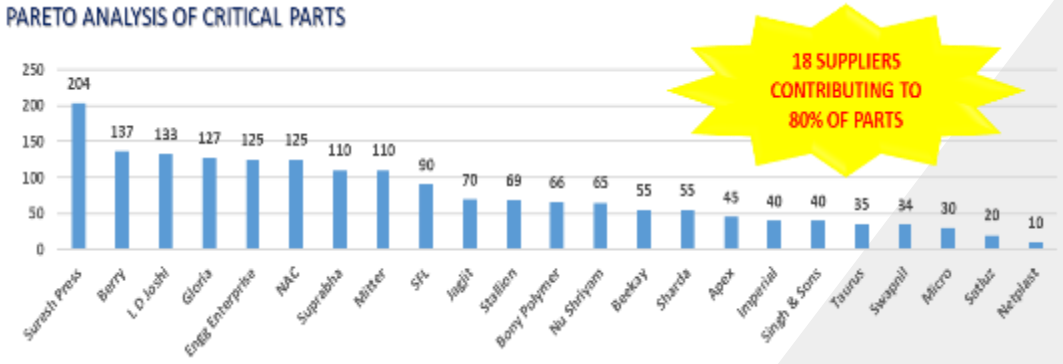
- Purchase & Logistics team Intervention
- Introduction of the Recyclable / Returnable packaging
- Ensure compliance of the statuary requirement wherever unavoidable

- Reduction in the Plastic Disposal waste

Plastics Film free Packaging

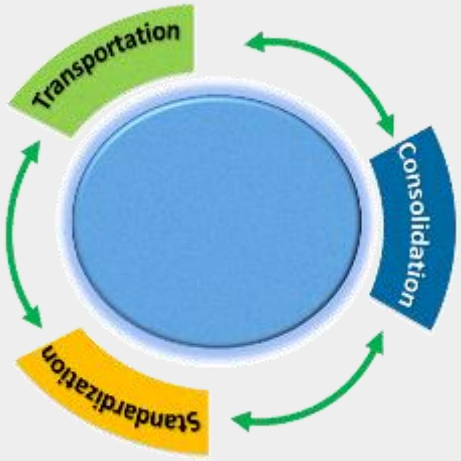
- Recycling of the 50 mic thk plastic films
- Packaging standard for part family
- Sustenance thru dock audit
- Refurbishing check and standards for the Returnable / recyclable packaging

PARETO ANALYSIS OF VEHICLE CRITICAL PARTS CONTRIBUTING TO POLYTHENE PACKAGING



Contribution of packaging include maximum part of plastic, wood and carton. By elimination or reuse of these material can save lot of energy. We had segregated the supplier in on basis of contribution of Parts

Expansion Plan of Green Supply Chain through Transportation, Consolidation and Standardisation (TCS) Initiative



TCS is a cost reduction initiative to improve operational efficiency from below levers:

Transportation [T] - Optimisation of inbound transportation cost
Consolidation [C] – Consolidation of suppliers/part combinations
Standardisation [S] – Standardisation of parts/process

Initiative under Transportation aims to
- Optimize logistic cost
- Encourage supplier to establish set-up near TML locations, thereby saving logistic fuel consumption
- Reduction in packaging scrap through returnable packaging

Initiative under Consolidation aims to
- Build Strategic Supplier Base through consolidation of suppliers
- Reduce operational costs and improve efficiency & productivity through consolidation of parts such as higher assembly procurement & MASOP elimination

Initiative under Standardization aims to
- Reduce complexity and achieve modularity for quick response to the market
- Part Commonization across models (No VAVE) to enhance productivity
- Standardization of best process across plants

Logistics Suppliers identified for Elimination of Packaging Materials

Green Supply Chain Management

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Projects Implemented in Supply Chain for Eliminating Polythene, Wooden & Cartons Packaging

1. Project	Evaluation by	Benefits
Part Description : HEADLAMP & BLINKR MTG ASSY Vendor : LUMAX INDUSTRIES LTD, PUNE	Shadow board packaging accommodating more items in single box	2.36T of Annual Polythene waste generation eliminated

Before

After

2. Project	After	Benefits
Primary Packing – carton package Secondary - paper / thermocol	Primary Packing – better PP box Secondary Packing – shadow board	3.5 T of Annual Polythene waste generation eliminated

Before

After

3. Project	After	Benefits
Corrugated box packaging replaced with FLC boxes	Primary Packing – better PP box Secondary Packing – shadow board	Wooden carton eliminated

Before

After

4. Project	Evaluation	Benefits
Primary Packing - 1/ Polypack Secondary - Trolley Polythene weight :62 g	Primary Packing – better PP box Secondary Packing – shadow board	3.1 T of Annual Polythene waste generation eliminated

Before

After

5. Project	Evaluation	Benefits
Primary Packing - 1/ Polybag Secondary - Corrugated Box	Packing – PP box, Inside- shadow board packing	Annual Saving of 50 lacs

Before

After

6. Project	After	Benefits
Corrugated box packaging replaced with returnable trolleys for alternators.	Primary Packing – Returnable trolleys	Corrugated box eliminated

Before

After

Approx. 50 T of Polythene and 60 T of Carton and Wood eliminated resulting in reduction of 242 Ton CO2
Saving: 4.5 kgCO2/Eq. Veh. For FY 23-24

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Waste Utilization & Management

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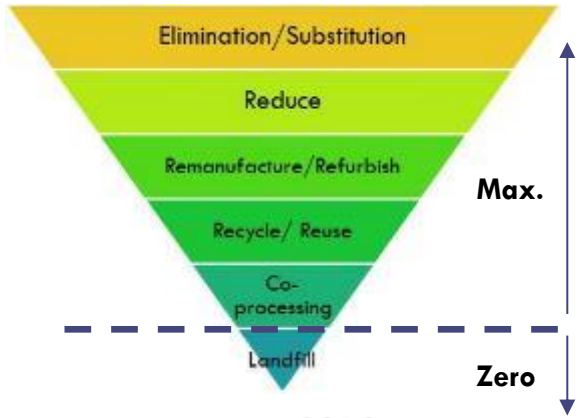
ZWtL Approach



Level of ZWtL Certification	Standard Waste Diversion Rate From Landfill	Actual
Achieved ZWtL	**≥ 99.7%**	**100% Yr 2024 , ZWtL Certification Planned**
Approaching ZWtL	≥ 97.5% to < 99.7%	Yr 2023
Aspiring ZWtL	≥ 95% to < 97.5%	Yr 2022

ZWtL Approach

Waste & Disposal Pathway		
S.No.	**Type of Waste**	**Disposal Method**
1	Waste Residues (Cotton)	Co-Processing
2	Paint Sludge	Co-Processing
3	ETP Sludge	Co-Processing
4	Waste Residues (Cotton Hand Gloves)	Co-Processing
5	Waste Residues Cont. Oil	Co-Processing
6	Phosphate Sludge	Co-Processing
7	Waste Residues (Sealant)	Co-Processing
8	Waste Thinner	Co-Processing
9	Waste Oil Mix with Coolant	Authorised Recycler
10	Used Engine Oil	Authorised Recycler
11	Skimmed Oil & Grease	Recovery
12	MS Drum & Plastic Cans	Authorised Recycler
13	Lead Acid Battery	Authorised Recycler

LKO will go to ZWtL certification as per CII guideline by Yr 2024 end.

Waste Utilization & Management- Diversion Rate to ZWtL

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Segregated Food Waste-Canteen

Automatic Organic Waste Bio Composter (AOWC)
Machine Capacity:- 500 Kg/Day Food Waste

- Feed the AOWC with Segregated Organic Waste + Thermo Bact Composting Enhancer
- AOWC Operation- 24 hours

- Soil enricher is ready
- Kept in Curing Pits (15-20 days) to convert into Rich Compost.

100% Food Waste is now Converted to Rich Compost through Automatic Organic Waste Bio Composter

Paint Sludge

Other Hazardous Waste

Collection at Hazardous Waste Storage Yard

Transportation for Co-processing

Co-processing at Cement Industry

All the Hazardous Waste is already being diverted to Co-Processing

Sustainability-Circular Economy-Water Positive Plant

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Steps Taken to Achieve Positive Net Water Ratio

1. **Elimination of Direct Water Supply to different areas**
   Local Storage tanks provided at each shop floor's to eliminate the need of continuous Direct Supply through Pump House
2. **Intermediate Running of Pump House**
   Implemented intermediate running of Pump House for filling the Localized tanks
3. **Underground Water Pipeline replacement**
   Phase-wise replacement of Underground Pipeline to above Ground to eliminate the losses due to leakages
4. **STP-Utlra filtered Water for Gardening**
   After the installation of Tertiary Treatment Plan, UF Water is used for Gardening purpose & fresh water is saved
5. **Online monitoring of Water Extraction through Bore well as well as Ground Table-Identification of Actionable Points**
6. **Shopwise Water consumption monitoring through DWM**

1 & 2

Localized Storage Tanks

3

Phase-wise replacement of "Underground Pipeline by Above-ground Pipeline"

4

STP- UF Water through Tertiary plant

Eastern Complex-STP

Western Complex-STP

5

Online Data Monitoring for Ground Water Extraction

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Awards & Achievements

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CII-National Award for Excellence in Energy Management

2023-Energy Efficient Unit Award

2021-Excellent Energy Efficient Unit Award

2020-Energy Efficient Unit Award

2019-Energy Efficient Unit Award

2018-Energy Efficient Unit Award

2016-Excellent Energy Efficient Unit Award

2015-Excellent Energy Efficient Unit Award

2014- Energy Efficient Unit Award

2012- Energy Efficient Unit Award

BEE-National Energy Conservation Award

2023- '3rd Prize' in Automobile Manufacturing Category

2020- '2nd Prize' in Automobile Manufacturing Category

2017- '2nd Prize' in Automobile Manufacturing Category

CII-Digital Transformation Meet

2021-'2nd Prize' in CII Digital Transformation Meet

2020 -'1st Prize' in CII Digital Transformation Meet

2018- '2nd Prize' in CII Digital Transformation Meet

Uttar Pradesh State Energy Conservation Award

2021-'1st Runner-Up Prize'-State Energy Conservation Award

2020-'1st Runner-Up Prize'-State Energy Conservation Award

2018-'1st Prize'-State Energy Conservation Award

2017-'1st Runner-Up Prize'-State Energy Conservation Award

2016-'1st Prize'-State Energy Conservation Award

Certifications

- ISO 50001:2018
- ISO 45001:2018
- ISO 14001:2015
- IATF 16949:2016

- CII-Water Positive Plant-2022
- CII-Environmental Best Practices Award

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Thank you

Q&A

TML, Lucknow Plant

MOREWHEN ONE