TATA MOTORS

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Connecting Aspirations

Bombay Chamber of Commerce and Industry

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Profile :

Dr. Matta. Srinu Babu
Dy. General Manager & Energy Auditor
Tata Motors Ltd
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97940 52525

Academic qualifications :

Ph.D. in Smart Grid Applications
M. Tech in Power Systems
B. Tech in Electrical & Electronics Engineering
MBA in Sales & Services
Six Sigma – Black Belt

Energy Auditor EA 5021, ISO 50001 Lead Auditor

Professional experience : 23+ years

Larsen & Toubro Ltd., Aditya Birla Group, Mahindra & Mahindra Ltd., General Motors and Tata Motors Ltd.

Energy Efficiency related recognitions :

National Energy Conservation Awards from BEE, India
CII Energy Excellence award from CII GBC
Best Energy Efficiency Award from UPNEDA, Govt. of UP

We are talking about ...

- An Overview of Tata Group & Tata Motors
- Energy Scenarios – Indian perspective
- Renewable Energy – Ways & Means
- ENCON – Residential, DC, N/W
- ENCON – Industry, Infrastructure & Building
- Energy Excellence @ Tata Motors
- E R A S E Approach
- Way Forward

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Brief introduction Tata Motors

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1945
Tata Motors
Established

82,797
Employee
Strength

12,74,072
Vehicles
Sold

>6,600
Sales & Service
Points

*Tata Motors Consolidated FY 18-19

Tata Motors Limited, a USD 45 billion organisation, is a leading automobile manufacturer with a portfolio that includes a wide range of cars, utility vehicles, trucks, buses and defence vehicles. Our marque can be found on and off-road in over 175 countries around the globe.

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Sources of Energy

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Sources of Non Renewable Energy:

- Coal
- Oil
- Natural Gas
- Nuclear

Sources of Renewable Energy:

- Sun
- Wind
- Hydro-electricity
- Geothermal
- Ocean currents
- Biomass

Energy shortage – Capacity Vs Deficit

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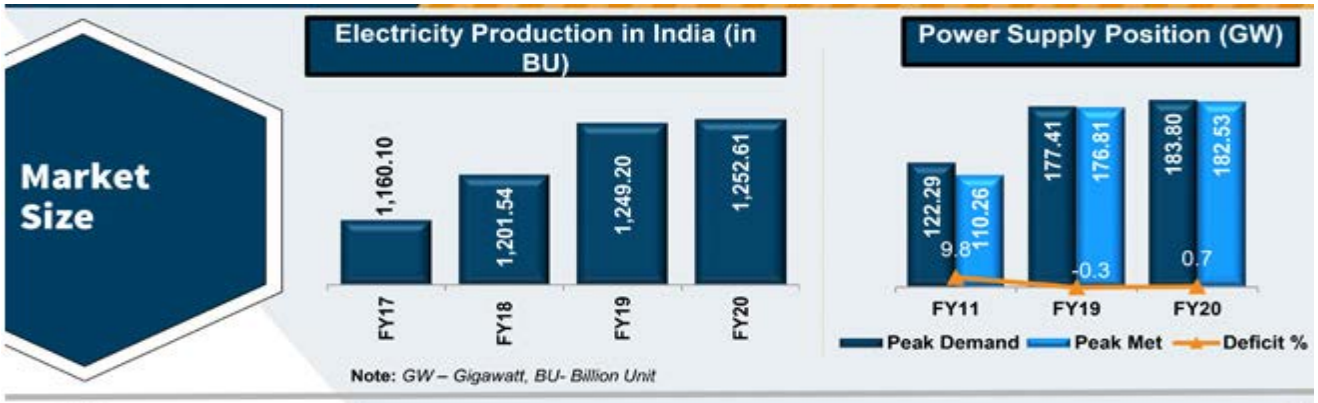

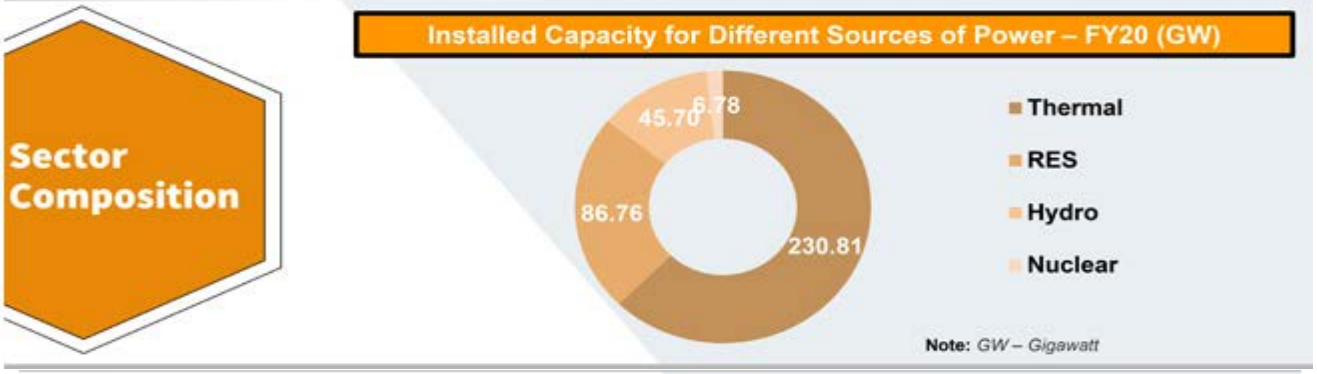

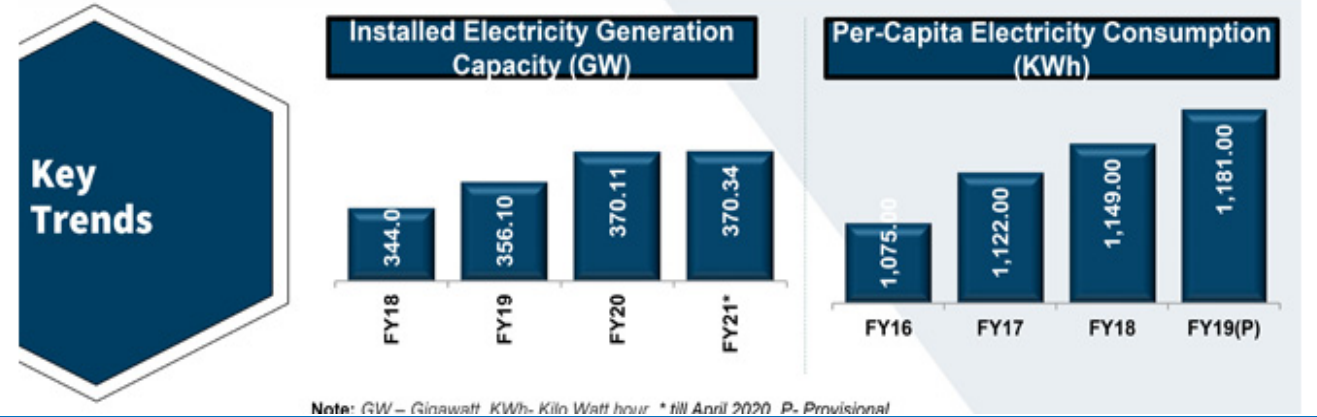

Many villages still need remain un-electrified. Quality power not available

Source of data

https://www.ibef.org/industry/power-sector-india/infographic

Energy Dilemma

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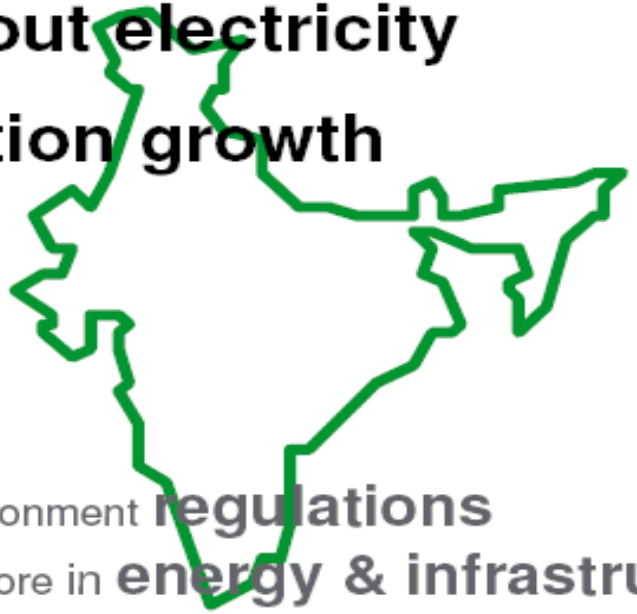
The Indian energy dilemma

Managing needs of a developing nation:

- x 4 consumption growth
- ÷ 10 people without electricity
- x 6 times generation growth
- ÷ 2 power cuts



Vs.

- Complying with environment regulations
- Investing INR 50M Crore in energy & infrastructure till 2030
- Controlling energy cost

Energy Deficit Solution

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The equation is simple:

Scarcity +
Cost +
environment.

&

Booming
development
of India.

Energy
Efficiency
is a must.

Energy Consumption

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Industry & buildings are also the first energy consumers!

31%	>2%	18%	21%	28%
Industry & Infrastructure	Data centres & networks	Buildings	Residential	Transportation

Energy Consumption

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One unit saved at home equals 3 units saved at the power plant!

1 unit saved at home = 3 units not generated at the power plant

Energy challenges & opportunities are everywhere:

Supply Side

More Efficient and cleaner Supply

Demand Supply Management
+
Metering & Analysis

Demand Side

More Efficient Use Conservation & Management

Cleaner supplies will take time to implement

↓

We must develop technologies and business models to increase renewable energies penetration

Current technologies allow us to target 30% savings

↓

We must focus on Energy Efficiency to solve our energy dilemma

Mid term approach

Short term action

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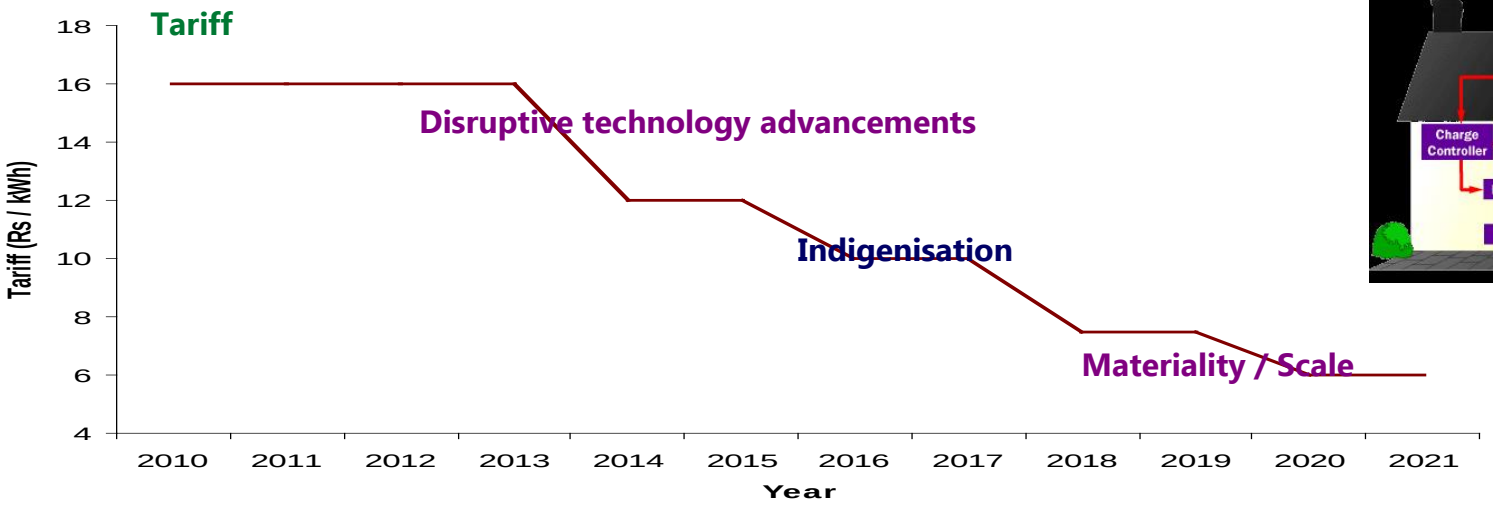

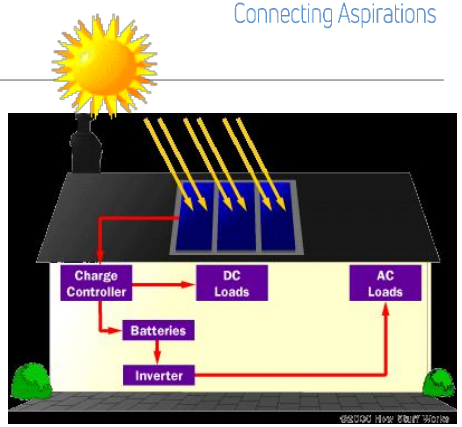

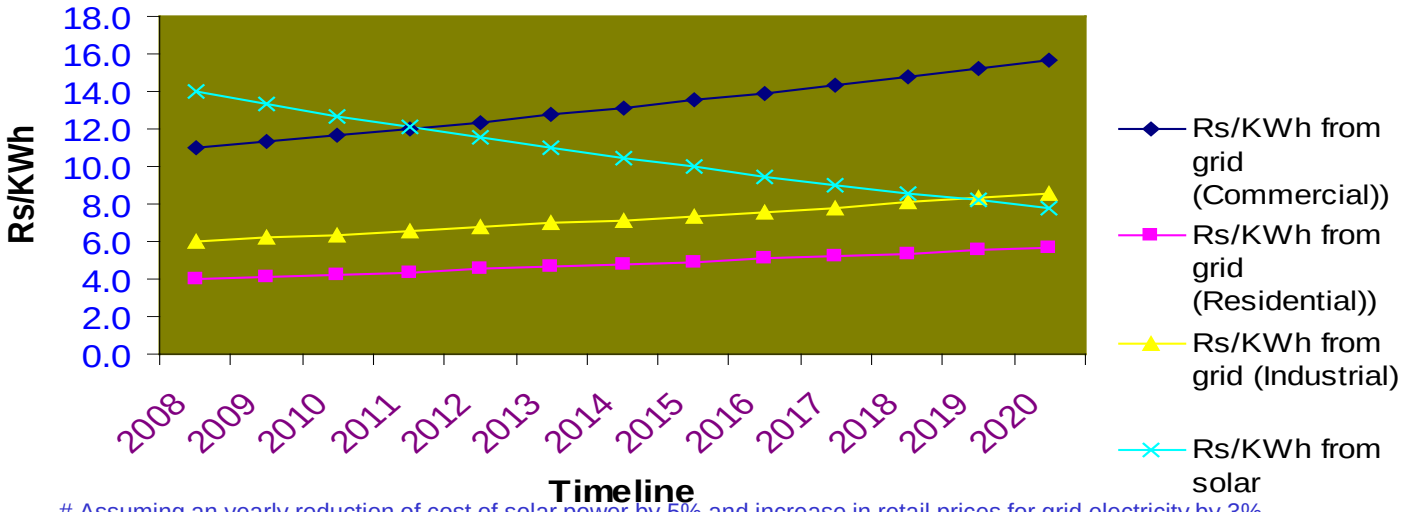

Grid parity for commercial consumption as well

Assuming an yearly reduction of cost of solar power by 5% and increase in retail prices for grid electricity by 3%

Source of data : MNRE

Wind Power

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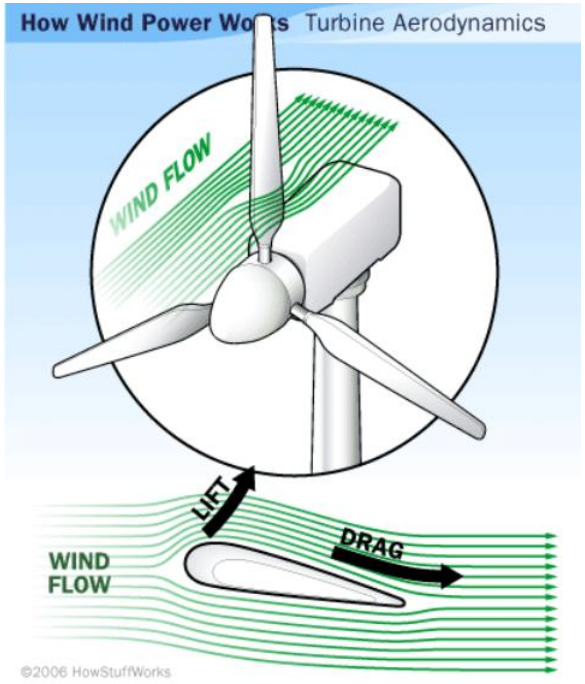

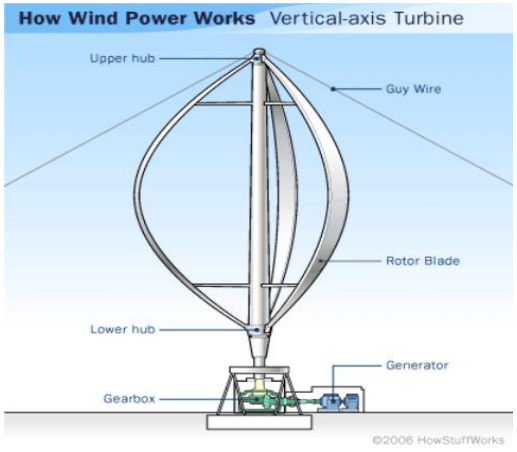

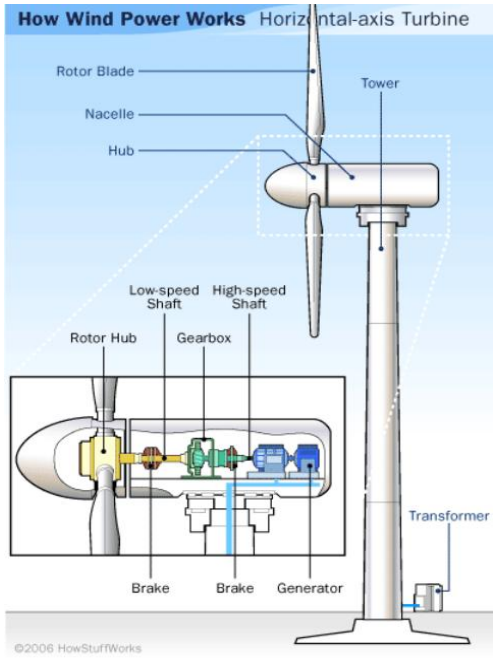

Solar Power

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- A report on the **Solar power** says that the **utilization of just 5% of existing solar energy would suffice the Global energy requirement**.

- Technology is readily available for **generation of Power, heating , cooking** etc. applications. For industries, an immediate thought of putting up solar power plant of rated capacity and solar concentrator for Canteen, Guest houses , offices, remotely located load centers would reduce the energy bill besides protecting the environment.

Bio Fuels

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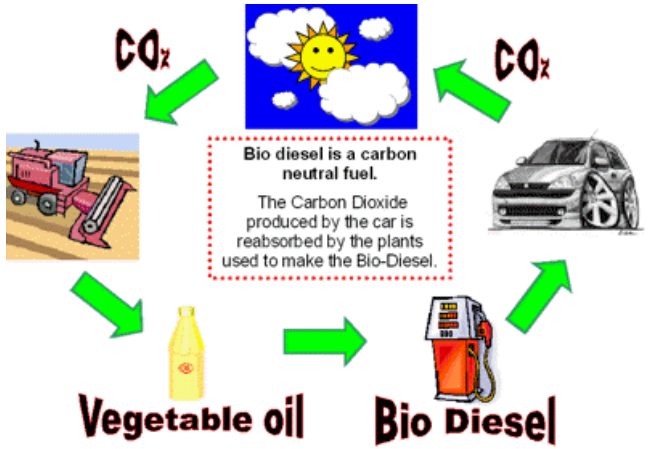
Bio-Gas

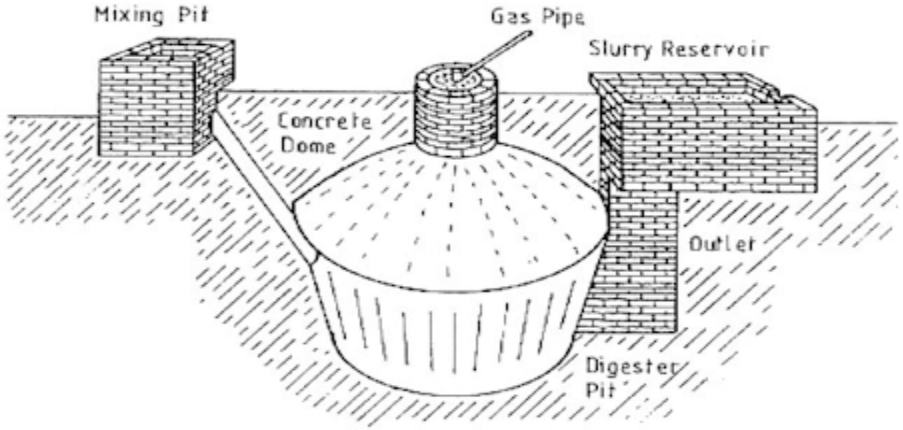
Waste's of animals, trees, rice husk etc. can be utilized for the generation of gases, which inturn utilized for heating, cooking applications.

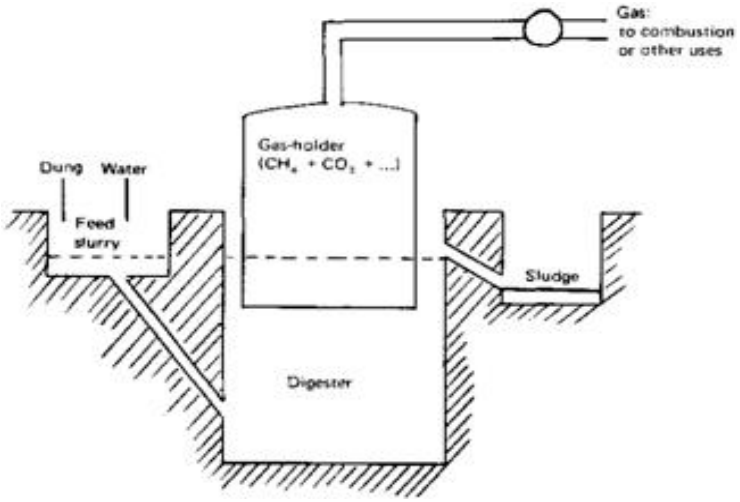
Bio-Diesel

As the cost of petroleum products touching the sky, an immediate thought on alternate fuels is the top most order of demand today. Proven technology for Bio-diesel from Jetropa & Pengenia etc. is readily available. With these in line, the demand on Petroleum product would come down by 25-35 %. In APCW premises , all unused area can be utilized for Jetropa & Pengenia cultivation inturn to sell in the market or for mines-vehicle like Dozer, Dumper, shovel etc. application.

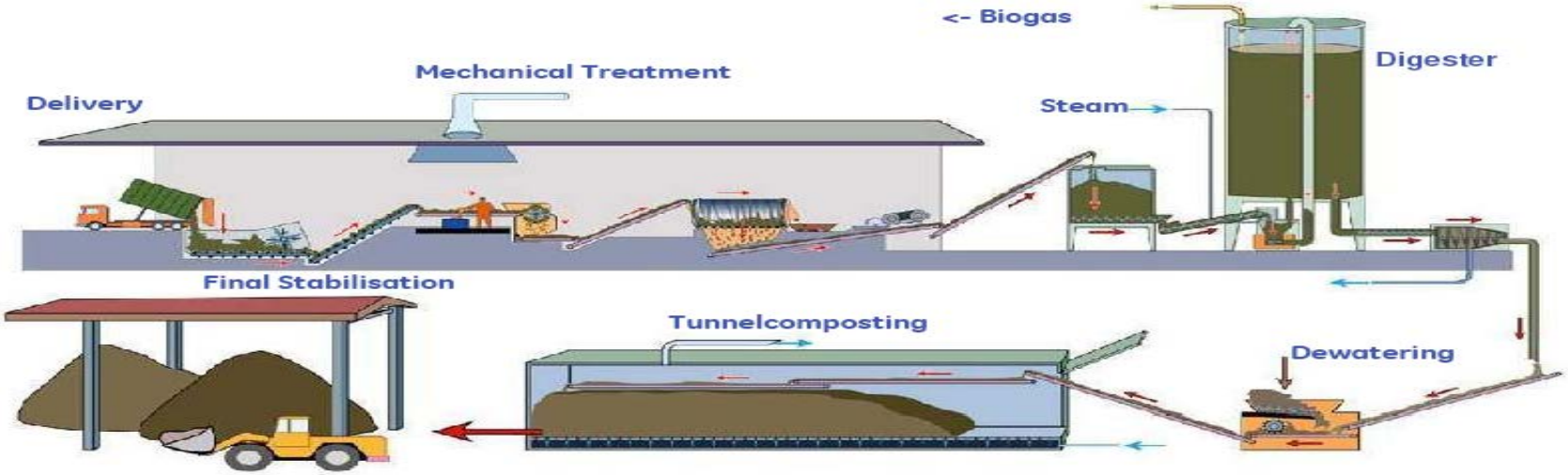


Simple schematic





Anaerobic digestion of Bio-waste



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Lighting System	
01.	One of the best energy-saving devices is the light switch. Turn off lights when not required.
02.	Many automatic devices can help in saving energy used in lighting. Consider employing infrared sensors, motion sensors, automatic timers, dimmers and solar cells wherever applicable, to switch on/off lighting circuits.
03.	As for as possible use task lighting, which focuses light where it's needed. A reading lamp, for example, lights only reading material rather than the whole room.
04.	Dirty tube lights and bulbs reflect less light and can absorb 50 percent of the light; dust your tube lights and lamps regularly.
05.	Fluorescent tube lights and CFLs convert electricity to visible light up to 5 times more efficiently than ordinary bulbs and thus save about 70% of electricity for the same lighting levels.
06.	Ninety percent of the energy consumed by an ordinary bulb (incandescent lamp) is given off as heat rather than visible light.
08.	Replace your electricity-guzzling ordinary bulbs (incandescent lamps) with more efficient types. Compact fluorescent lamps (CFLs) use up to 75 percent less electricity than incandescent lamps.
09.	A 15-watt compact fluorescent bulb produces the same amount of light as a 60-watt incandescent bulb.

Source of data : https://beeindia.gov.in/

Room Air Conditioners	
01.	Use ceiling or table fan as first line of defence against summer heat. Ceiling fans, for instance, cost about 30 paise an hour to operate - much less than air conditioners (Rs.10.00 per hour).
02.	You can reduce air-conditioning energy use by as much as 40 percent by shading your home's windows and walls. Plant trees and shrubs to keep the day's hottest sun off your house.
03.	One will use 3 to 5 percent less energy for each degree air conditioner is set above22˚C (71.5˚F), so set the thermostat of room air conditioner at 25˚C (77˚F) to provide the most comfort at the least cost.
04.	Using ceiling or room fans allows you to set the thermostat higher because the air movement will cool the room.
05.	A good air conditioner will cool and dehumidify a room in about 30 minutes, so use a timer and leave the unit off for some time.
06.	Keep doors to air-conditioned rooms closed as often as possible.
07.	Clean the air-conditioner filter every month. A dirty air filter reduces airflow and may damage the unit. Clean filters enable the unit to cool down quickly and use less energy.
08.	If room air conditioner is older and needs repair, it's likely to be very inefficient. It may work out cheaper on life cycle costing to buy a new energy-efficient air conditioner.

Source of data : https://beeindia.gov.in/

Refrigerators	
01.	Make sure that refrigerator is kept away from all sources of heat, including direct sunlight, radiators and appliances such as the oven, and cooking range. When it's dark, place a lit flashlight inside the refrigerator and close the door. If light around the door is seen, the seals need to be replaced.
02.	Refrigerator motors and compressors generate heat, so allow enough space for continuous airflow around refrigerator. If the heat can't escape, the refrigerator's cooling system will work harder and use more energy.
03.	A full refrigerator is a fine thing, but be sure to allow adequate air circulation inside.
04.	Think about what you need before opening refrigerator door. You'll reduce the amount of time the door remains open.
05.	Allow hot and warm foods to cool and cover them well before putting them in refrigerator. Refrigerator will use less energy and condensation will reduced.
06.	Make sure that refrigerator's rubber door seals are clean and tight. They should hold a slip of paper snugly. If paper slips out easily, replace the door seals.
07.	When dust builds up on refrigerator's condenser coils, the motor works harder and uses more electricity. Clean the coils regularly to make sure that air can circulate freely.
08.	For manual defrost refrigerator, accumulation of ice reduces the cooling power by acting as unwanted insulation. Defrost freezer compartment regularly for a manual defrost refrigerator.

Source of data : https://beeindia.gov.in/

Water Heater	
01.	To help reduce heat loss, always insulate hot water pipes, especially where they run through unheated areas. Never insulate plastic pipes.
02.	By reducing the temperature setting of water heater from 60 degrees to 50 degrees C, one could save over 18 percent of the energy used at the higher setting.
Microwave Ovens &Electric Kettles	
01.	Microwaves save energy by reducing cooking times. In fact, one can save up to 50 percent on your cooking energy costs by using a microwave oven instead of a regular oven, especially for small quantities of food.
02.	Remember, microwaves cook food from the outside edge toward the centre of the dish, so if you're cooking more than one item, place larger and thicker items on the outside.
03.	Use an electric kettle to heat water. It's more energy efficient than using an electric cook top element.
04.	When buying a new electric kettle, choose one that has an automatic shut-off button and a heat-resistant handle.
05.	It takes more energy to heat a dirty kettle. Regularly clean your electric kettle by combining boiling water and vinegar to remove mineral deposits.
06.	Don't overfill the kettle for just one drink. Heat only the amount of water you need.

Source of data : https://beeindia.gov.in/

Computers	
01.	Turn off your home office equipment when not in use. A computer that runs 24 hours a day, for instance, uses - more power than an energy-efficient refrigerator.
02.	If your computer must be left on, turn off the monitor; this device alone uses more than half the system's energy.
03.	Setting computers, monitors, and copiers to use sleep-mode when not in use helps cut energy costs by approximately 40%.
04.	Battery chargers, such as those for laptops, cell phones and digital cameras, draw power whenever they are plugged in and are very inefficient. Pull the plug and save.
05	Screen savers save computer screens, not energy. Start-ups and shutdowns do not use any extra energy, nor are they hard on your computer components. In fact, shutting computers down when you are finished using them actually reduces system wear - and saves energy

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THERMAL UTILITIES

Boilers

- Preheat combustion air with waste heat
  (22 ^{0}C reduction in flue gas temperature increases boiler efficiency by 1%).
- Use variable speed drives on large boiler combustion air fans with variable flows.
- Burn wastes if permitted.
- Insulate exposed heated oil tanks.
- Clean burners, nozzles, strainers, etc.
- Inspect oil heaters for proper oil temperature.

Steam System

- Fix steam leaks and condensate leaks
  (A 3 mm diameter hole on a pipe line carrying 7 kg/cm^{2} steam would waste 33 kilo litres of fuel oil per year).
- Accumulate work orders for repair of steam leaks that can't be fixed during the heating season due to system shutdown requirements. Tag each such leak with a durable tag with a good description.
- Use back pressure steam turbines to produce lower steam pressures.
- Use more-efficient steam desuperheating methods.

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Industries

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Furnaces

- Check against infiltration of air: Use doors or air curtains.
- Monitor O_2 /CO_2/CO and control excess air to the optimum level.
- Improve burner design, combustion control and instrumentation.
- Ensure that the furnace combustion chamber is under slight positive pressure.
- Use ceramic fibres in the case of batch operations.
- Match the load to the furnace capacity.
- Retrofit with heat recovery device.
- Investigate cycle times and reduce.
- Provide temperature controllers.
- Ensure that flame does not touch the stock.

Insulation

- Repair damaged insulation
  (A bare steam pipe of 150 mm diameter and 100 m length, carrying saturated steam at 8 kg/cm^2 would waste 25,000 litres furnace oil in a year.)
- Insulate any hot or cold metal or insulation.
- Replace wet insulation.
- Use an infrared gun to check for cold wall areas during cold weather or hot wall areas during hot weather.
- Ensure that all insulated surfaces are cladded with aluminum
- Insulate all flanges, valves and couplings

Source of data : https://beeindia.gov.in/

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Waste heat recovery

- Recover heat from flue gas, engine cooling water, engine exhaust, low pressure waste steam, drying oven exhaust, boiler blowdown, etc.
- Recover heat from incinerator off-gas.
- Use waste heat for fuel oil heating, boiler feedwater heating, outside air heating, etc.
- Use chiller waste heat to preheat hot water.
- Use heat pumps.

ELECTRICAL UTILITIES

Electricity Distribution System

- Optimise the tariff structure with utility supplier
- Schedule your operations to maintain a high load factor
- Shift loads to off-peak times if possible.
- Minimise maximum demand by tripping loads through a demand controller
- Stagger start-up times for equipment with large starting currents to minimize load peaking.

Source of data : https://beeindia.gov.in/

Industries

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Motors

- Properly size to the load for optimum efficiency.
  (High efficiency motors offer of 4 - 5% higher efficiency than standard motors)
- Use energy-efficient motors where economical.
- Use synchronous motors to improve power factor.
- Check alignment.
- Provide proper ventilation
  (For every 10 ^{o}C increase in motor operating temperature over recommended peak, the motor life is estimated to be halved)

Drives

- Use variable-speed drives for large variable loads.
- Use high-efficiency gear sets.
- Use precision alignment.
- Check belt tension regularly.
- Eliminate variable-pitch pulleys.
- Use flat belts as alternatives to v-belts.
- Use synthetic lubricants for large gearboxes.

Source of data : https://beeindia.gov.in/

Industries

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Fans

- Use smooth, well-rounded air inlet cones for fan air intakes.
- Avoid poor flow distribution at the fan inlet.
- Minimize fan inlet and outlet obstructions.
- Clean screens, filters, and fan blades regularly.
- Use aerofoil-shaped fan blades.
- Minimize fan speed.
- Use low-slip or flat belts.

Blowers

- Use smooth, well-rounded air inlet ducts or cones for air intakes.
- Minimize blower inlet and outlet obstructions.
- Clean screens and filters regularly.
- Minimize blower speed.
- Use low-slip or no-slip belts.

Pumps

- Operate pumping near best efficiency point.
- Modify pumping to minimize throttling.
- Adapt to wide load variation with variable speed drives or sequenced control of smaller units.
- Stop running both pumps -- add an auto-start for an on-line spare or add a booster pump in the problem area.

Source of data : https://beeindia.gov.in/

Industries

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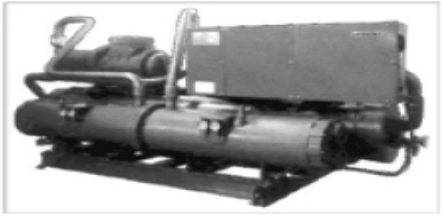
Compressors

- Consider variable speed drive for variable load on positive displacement compressors.
- Use a synthetic lubricant if the compressor manufacturer permits it.
- Be sure lubricating oil temperature is not too high (oil degradation and lowered viscosity) and not too low (condensation contamination).
- Change the oil filter regularly.
- Periodically inspect compressor intercoolers for proper functioning.

Compressed air

- Install a control system to coordinate multiple air compressors.
- Study part-load characteristics and cycling costs to determine the most-efficient mode for operating multiple air compressors.
- Avoid over sizing -- match the connected load.
- Load up modulation-controlled air compressors. (They use almost as much power at partial load as at full load.)
- Turn off the back-up air compressor until it is needed.

Chillers



- Increase the chilled water temperature set point if possible.
- Use the lowest temperature condenser water available that the chiller can handle.
  (Reducing condensing temperature by 5.5 ^{0}C, results in a 20 - 25% decrease in compressor power consumption)
- Increase the evaporator temperature
  (5.5^{0}C increase in evaporator temperature reduces compressor power consumption by 20 - 25%)
- Clean heat exchangers when fouled.

Source of data : https://beeindia.gov.in/

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HVAC (Heating / Ventilation / Air Conditioning)

- Tune up the HVAC control system.
- Consider installing a building automation system (BAS) or energy management system (EMS) or restoring an out-of-service one.
- Balance the system to minimize flows and reduce blower/fan/pump power requirements.
- Eliminate or reduce reheat whenever possible.
- Use appropriate HVAC thermostat setback.
- Use morning pre-cooling in summer and pre-heating in winter (i.e. -- before electrical peak hours).

Refrigeration

- Use water-cooled condensers rather than air-cooled condensers.
- Challenge the need for refrigeration, particularly for old batch processes.
- Avoid oversizing -- match the connected load.
- Consider gas-powered refrigeration equipment to minimize electrical demand charges.
- Use "free cooling" to allow chiller shutdown in cold weather.
- Use refrigerated water loads in series if possible.
- Convert firewater or other tanks to thermal storage.

Source of data : https://beeindia.gov.in/

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Cooling towers

- Control cooling tower fans based on leaving water temperatures.
- Control to the optimum water temperature as determined from cooling tower and chiller performance data.
- Use two-speed or variable-speed drives for cooling tower fan control if the fans are few. Stage the cooling tower fans with on-off control if there are many.
- Turn off unnecessary cooling tower fans when loads are reduced.
- Cover hot water basins (to minimize algae growth that contributes to fouling).
- Balance flow to cooling tower hot water basins.
- Periodically clean plugged cooling tower water distribution nozzles.

Lighting

- Reduce excessive illumination levels to standard levels using switching, delamping, etc. (Know the electrical effects before doing delamping.)
- Aggressively control lighting with clock timers, delay timers, photocells, and/or occupancy sensors.
- Install efficient alternatives to incandescent lighting, mercury vapor lighting, etc. Efficacy (lumens/watt) of various technologies range from best to worst approximately as follows: low pressure sodium, high pressure sodium, metal halide, fluorescent, mercury vapor, incandescent.
- Select ballasts and lamps carefully with high power factor and long-term efficiency in mind.
- Upgrade obsolete fluorescent systems to Compact fluorescents and electronic ballasts
- Consider daylighting, skylights, etc.
- Consider painting the walls a lighter color and using less lighting fixtures or lower wattages.
- Use task lighting and reduce background illumination.

Source of data : https://beeindia.gov.in/

Industries

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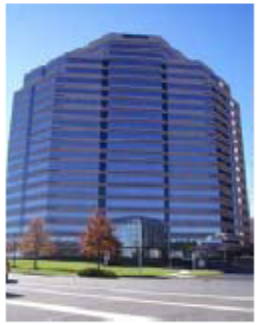
DG sets

- Optimise loading
- Use waste heat to generate steam/hot water /power an absorption chiller or preheat process or utility feeds.
- Use jacket and head cooling water for process needs
- Clean air filters regularly
- Insulate exhaust pipes to reduce DG set room temperatures
- Use cheaper heavy fuel oil for capacities more than 1MW

Buildings

- Seal exterior cracks/openings/gaps with caulk, gasketing, weatherstripping, etc.
- Consider new thermal doors, thermal windows, roofing insulation, etc.
- Install windbreaks near exterior doors.
- Replace single-pane glass with insulating glass.
- Consider covering some window and skylight areas with insulated wall panels inside the building.



- If visibility is not required but light is required, consider replacing exterior windows with insulated glass block.
- Consider tinted glass, reflective glass, coatings, awnings, overhangs, draperies, blinds, and shades for sunlit exterior windows.
- Use landscaping to advantage.
- Add vestibules or revolving doors to primary exterior personnel doors.

Source of data : https://beeindia.gov.in/

Industries

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Water & Wastewater

- Recycle water, particularly for uses with less-critical quality requirements.
- Recycle water, especially if sewer costs are based on water consumption.
- Balance closed systems to minimize flows and reduce pump power requirements.
- Eliminate once-through cooling with water.
- Use the least expensive type of water that will satisfy the requirement.
- Fix water leaks.
- Test for underground water leaks. (It's easy to do over a holiday shutdown.)
- Check water overflow pipes for proper operating level.
- Automate blowdown to minimize it.
- Provide proper tools for wash down -- especially self-closing nozzles.
- Install efficient irrigation.
- Reduce flows at water sampling stations.
- Eliminate continuous overflow at water tanks.
- Promptly repair leaking toilets and faucets.
- Use water restrictors on faucets, showers, etc.
- Use self-closing type faucets in restrooms.
- Use the lowest possible hot water temperature.

Source of data : https://beeindia.gov.in/

We are talking about ...

- An Overview of Tata Group & Tata Motors
- Energy Scenarios – Indian perspective
- Renewable Energy – Ways & Means
- ENCON – Residential, DC, N/W
- ENCON – Industry, Infrastructure & Building
- **Energy Excellence @ Tata Motors**
- E R A S E Approach
- Way Forward

Energy Management System

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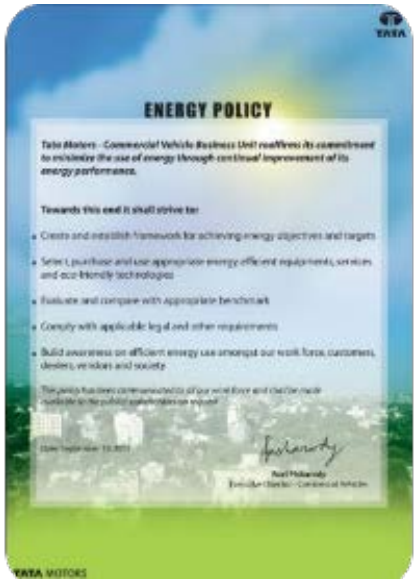
We have Energy Management Cell in our Plant, Which initiates & Manages all sorts of Energy Conservation measures across the Plant.

Energy Policy



ISO 50001 Certificate

2013

2016

2019

Team Structure – ISO 50001

Mr. Pramod Choudhary
Plant Head Lucknow

MR -Lko Works
Dr. S.B. Matta

DH – Mr. S. B. Matta
Plant services

DH – Mr. V. Agrawal
Paint shop

DH – Mr. S. N. Verma
TCF

DH – Mr. U. Tauheed
BIW

DH – Mr. R. K. Singh
IBF

 # DH – Divisional Head

DH – Mr. R. K. Singh
Axle Shop

DH –Mr. G. V. Joshi
Planning

DH – Mr. A Chharia
Materials & ADD

DH – Mr. Ankush Gour
HR

DH – Mr. R. K. Singh
CV- CX

ENERGY MANAGEMENT SYSTEM – An Overview

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- TOP MANAGEMENT COMMITMENT
- STAFF COMMITMENT
- ENERGY AUDIT
- ACTION PLAN
- MONITORING & TARGET SETTING
- REVIEW & DEVELOP PROFILE
- LONG PAY BACK PROJECTS

EnCon Implementation Methodology

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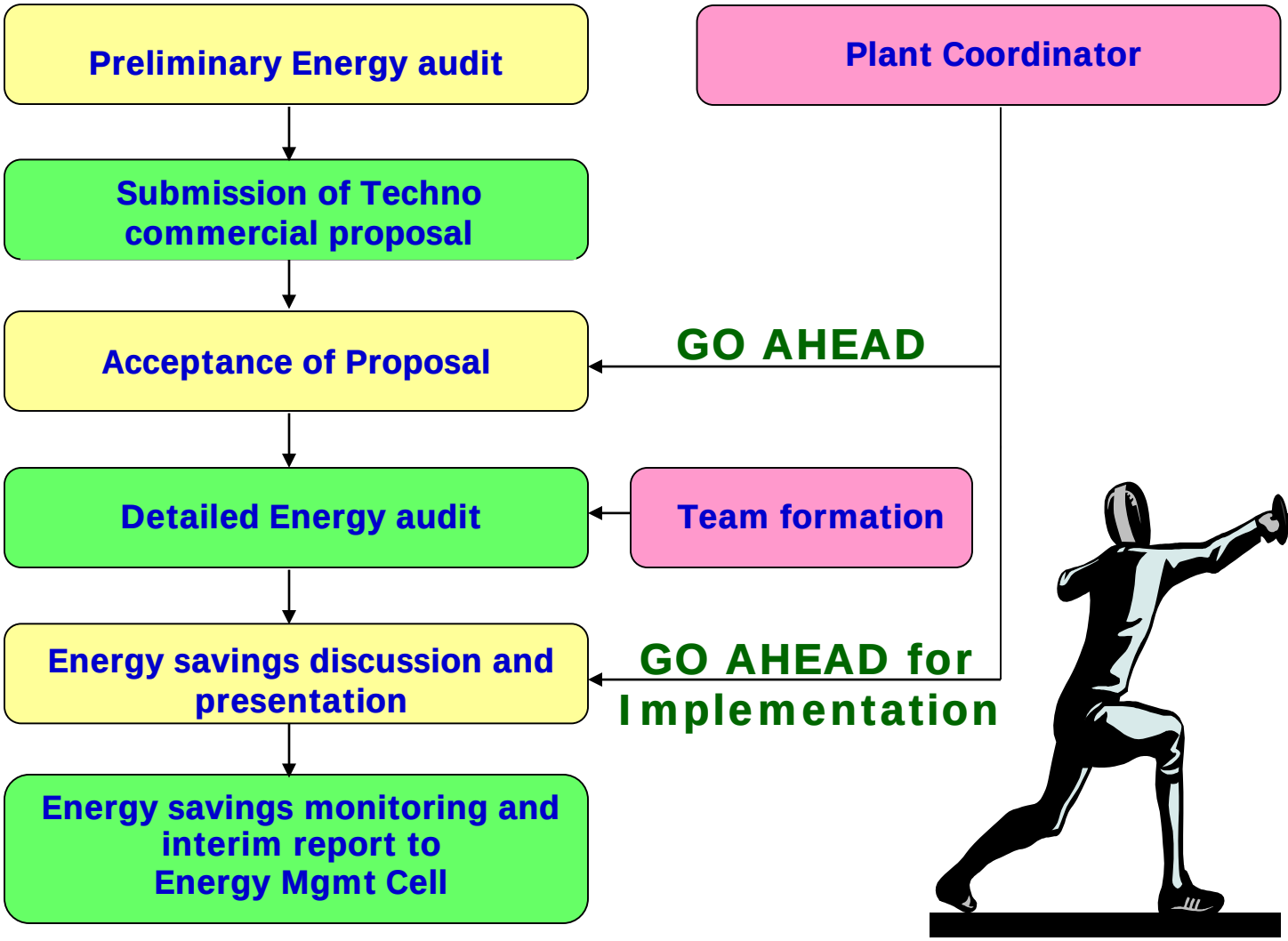

TATA MOTORS
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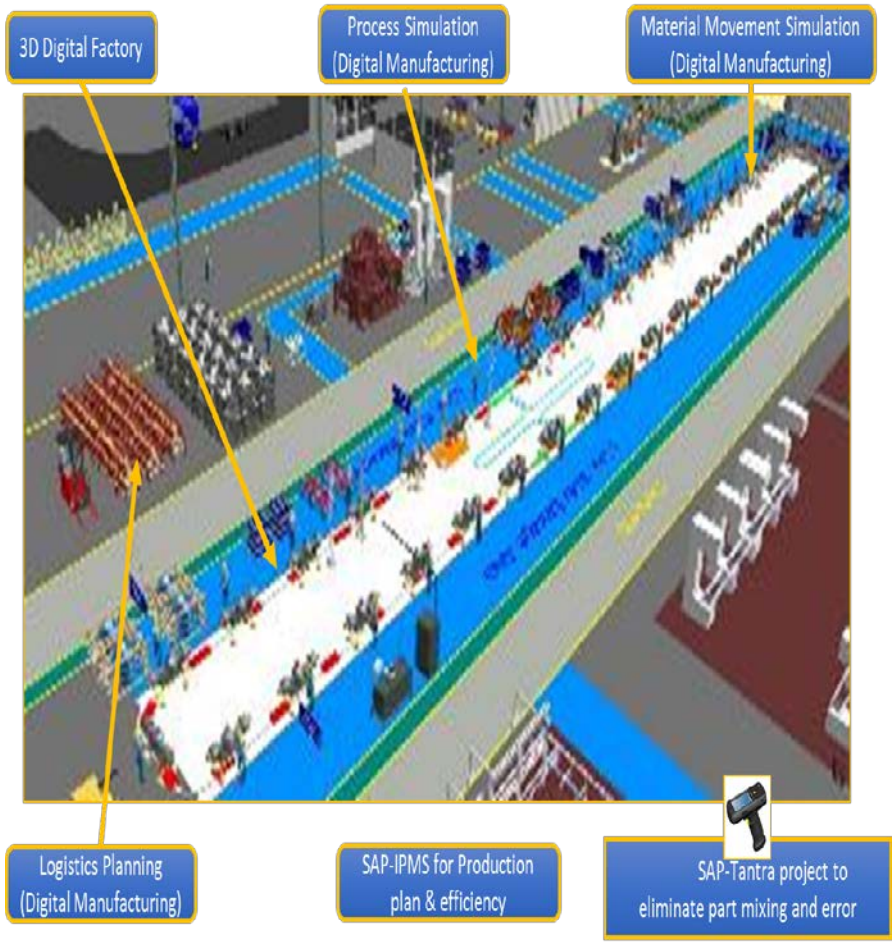
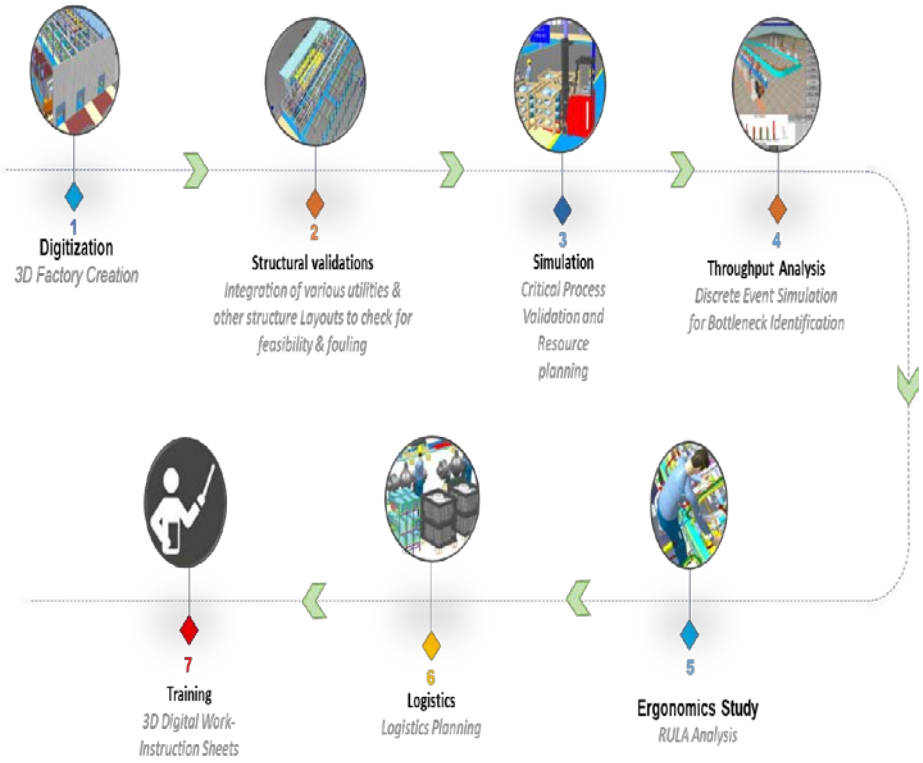
Innovation ::Digital Transformation : Project Planning & Operation

3D layout of Manufacturing Line



Process flow for Digital transformation



Innovation ::Digital Transformation : Project Planning & Operation

TATA MOTORS
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Technology Landscape – before and after implementation

	Traditional Method	Digital Method	Transformation Impact
 Layout	2D drawings using Auto Cad	3D digital Factory	Factory Set-up time reduced
 Simulation	No Virtual Simulation, Expensive Physicals only for very critical processes	Virtual Simulation of Critical Processes helped to identified Potential issues	Short Project Lead time. Saving on rework cost and time
 Collaboration	No single platform for discussions and decision making among various stake-holder	Virtual Factory encouraged different agencies to work in more collaborate manner	Issue identified and resolved before physical installation/construction.
 Training	Traditional training methods such as classroom teaching using PPTs and OJT	3D Digital Work-Instruction videos along with Quality and Safety awareness	Better Visualization of the process enables operator to learn fast
 Maintenance	Preventive Maintenance ,Breakdown Maintenance based on schedule	Maintenance based on Real time data	Down-time of machines reduced thus improving OEE
	Collection of information from individual machines and preparing reports	Connected Machines, IPMS, Mobile App, online quality parameter monitoring	Better tracking and control quality and M/c parameters. Faster information exchange.

Innovation ::Digital Transformation : Project Planning & Operation

TATA MOTORS
Connecting Aspirations

Quantitative Benefits and Awarded in CII Digital Transformation Meet

Project Time

~25% Reduction, through
- Better Project Management

With Use of Simulations, Avoided Rework

Cost

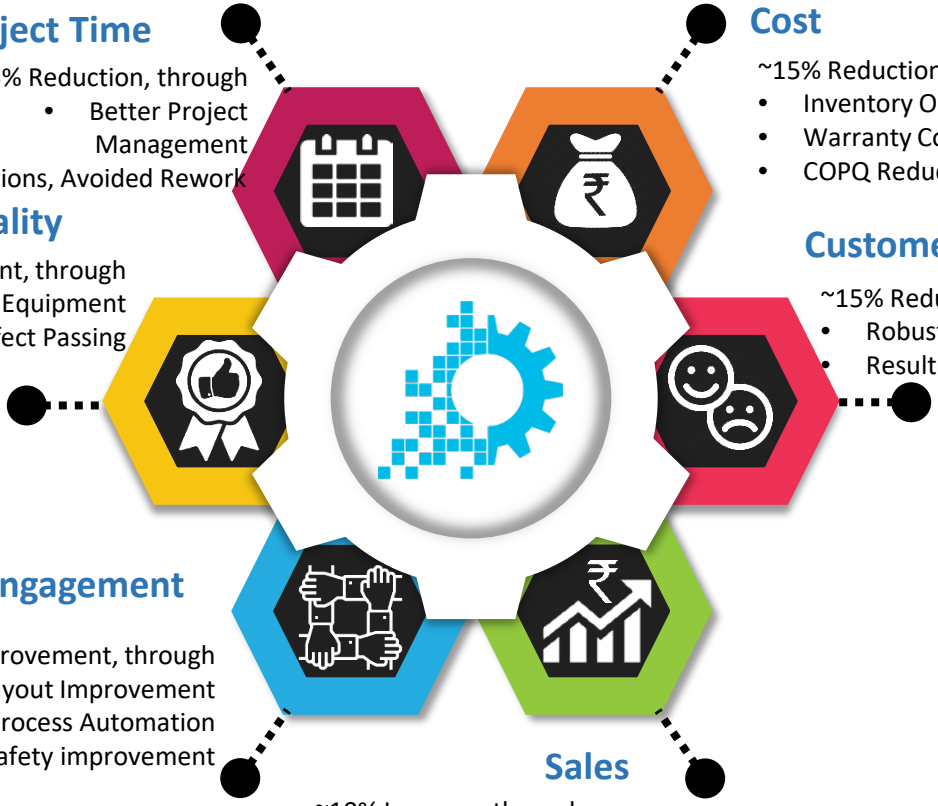
~15% Reduction, through
- Inventory Optimization
- Warranty Cost reduction
- COPQ Reduction

Quality

~25% Improvement, through
- Connected Equipment
- Avoiding Defect Passing

Customer Complaint

~15% Reduction, through
- Robust Process Design
- Resulting Reliability of Product



Employee Engagement

~10% Improvement, through
- Layout Improvement
- Process Automation
- Ergonomics & Safety improvement

Sales

~10% Increase, through
- Levelled Production
- Improvement in Customer Experience

Teamwork, Employee involvement & Monitoring

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Connecting Aspirations

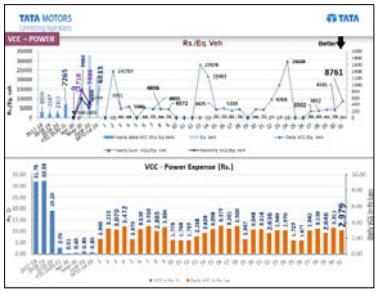
Monthly Energy Consumption Report

ENERGY CONSUMPTION 2019-20

Figures in KWH

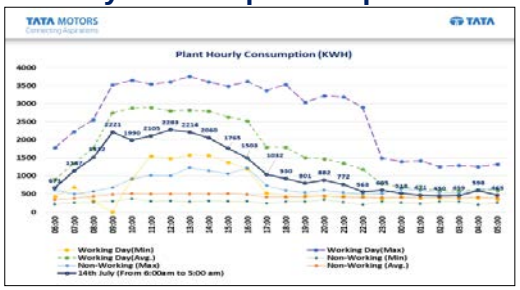
FACTORY	Dec-19	Jan-20	Feb-20	Mar-20
EASTERN COMPLEX				
BIW				
BIW Cab	30103	29885	42825	7097
BIW Cowl	17657	16650	20104	7438
FDV	0	0	0	0
COMP	13691	12555	15960	4155
BIW Office / others	3459	2845	3824	599
Distribution Losses	5737	5686	8235	3398
Total	**70648**	**67620**	**90949**	**22688**
PAINT SHOP				
PTED	276243	270240	58056	125761
Paint	199896	182651	252332	55852
COMP	69201	71042	191305	32740
Paint others	33456	34243	71892	16336
Distribution Losses	52586	55324	32462	45001
Total	**631382**	**613501**	**606048**	**275690**
TCF				
Assly	84210	101803	92831	23993
Trim Assly	12468	17988	15117	4219
FDV	0	0	0	0
Compressor	38154	41387	42232	13080
TCF office / others	19581	18255	15958	13560
Distribution Losses	14262	16490	17609	10428
Total	**168676**	**195923**	**183747**	**65281**
Rear Axle and Line-4,5	17252	16260	4125	1830
Logistics Centre	14904	25247	20629	9615
RSO	**5597**	**9370**	**8390**	**8445**

Daily Consumption Report

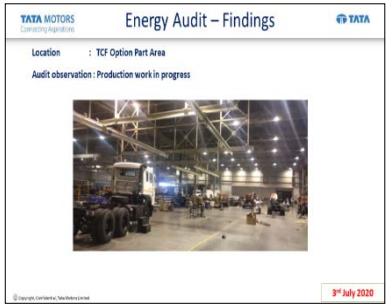


Daily Shopwise Report

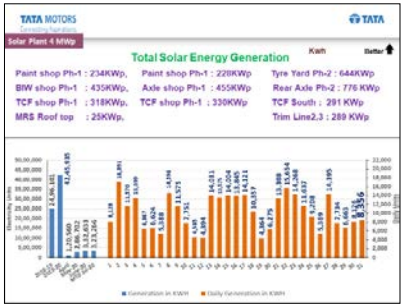
Hourly Consumption Report-Plant



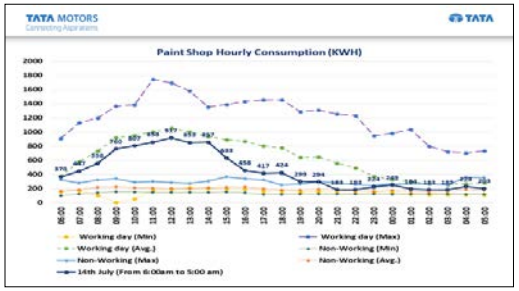
Daily Energy Audit Report



Daily Solar Generation Report



Hourly Consumption Report-Shop



Awareness level

2017-18

Reporting of energy consumption of the plant and individual shops on **fortnightly** and **monthly** basis

2018-19

H1: Reporting of entire **plant's** energy consumption on **daily** basis

Daily Energy Audit Report (DEAR) circulated across the plant to minimize energy wastage.

H2: Reporting of entire plant's and **shop-wise** energy consumption on **daily** basis.

2019-20

H1: Reporting of shop-wise energy consumption started on **hourly** basis.

H1: Reporting of **working day's and non-working day's consumption** separately for identification of areas/processes of energy wastage.

H2: Automatic recording and reporting of energy consumption through SCADA for eliminating manual errors and minimizing the time required for report preparation

EnCon Projects

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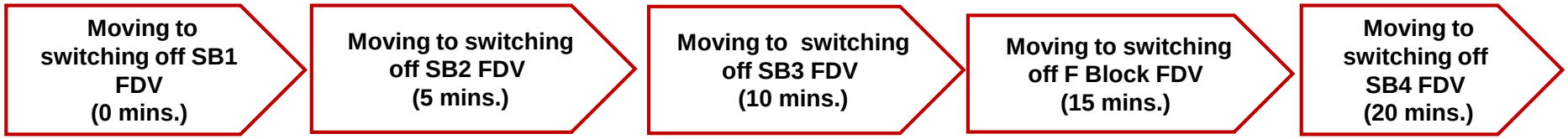
Connecting Aspirations

GSM Based Smart Control of Shop Floor Ventilation System

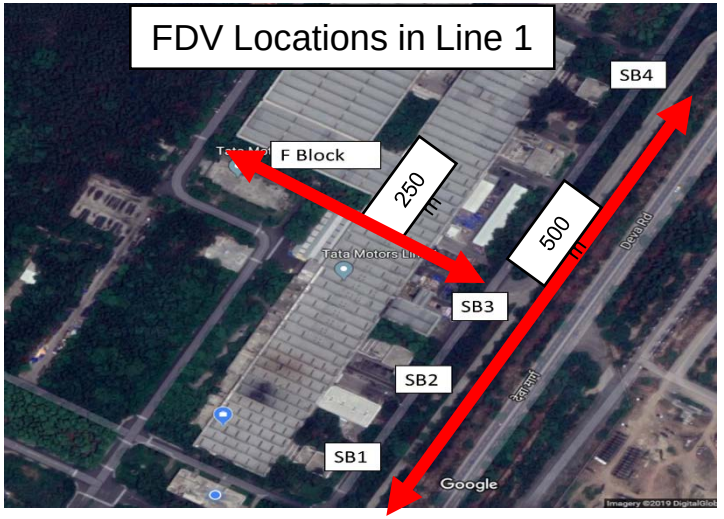
Present process :



Concerns in present method :

- One operator has to travel around 1 Km. for manually switching off all FDVs in western complex due to control panel given at that particular location and hence there is electrical energy wastage of 5,137 KWH/month due to travel time of around 20 mins.

Blower & Control panel



EnCon Projects

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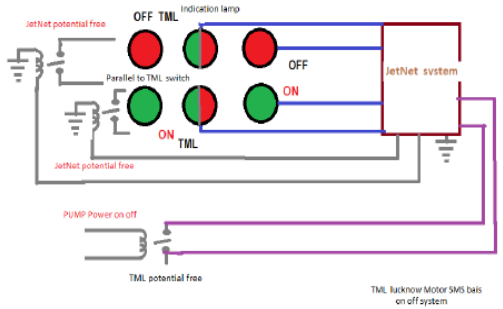
Connecting Aspirations

GSM Based Smart Control of Shop Floor Ventilation System

LCA Solution :

- Remote switching off FDVs by integrating off operation of FDV with GSM modem from one location. Also message will be delivered to user that which FDV has been switched off (wireless switching off operation is done through GSM modem to avoid cable cost and laying of cable line)



Control panel- Remote Switching off SB1 FDV → **Remote switching off SB2 FDV (Instantly)** → **Remote switching off SB3 FDV (Instantly)** → **Remote switching off F Block FDV (Instantly)** → **Remote switching off SB4 FDV (Instantly)**

Benefits & Horizontal Scope :

1.Energy saving :- Energy saving of 41,096 KWH/annum by providing remote switching off FDVs

2. Cost Saving :- Recurring cost saving of Rs. 3.28 lakhs/annum

3. Environment:- Reduction in carbon footprint (reduction of 33.7 tonne of CO2/annum by energy saving)

4. SMS escalation to user for information of FDV switch off.

5.No laying out of wire is required as it is wireless communication with help of GSM modem

6. Horizontal deployment of GSM based control for other process machines of assembly line 1,2 and 3

Solution Cost:-
Rs. 3.28 Lacs. for all 5 FDVs

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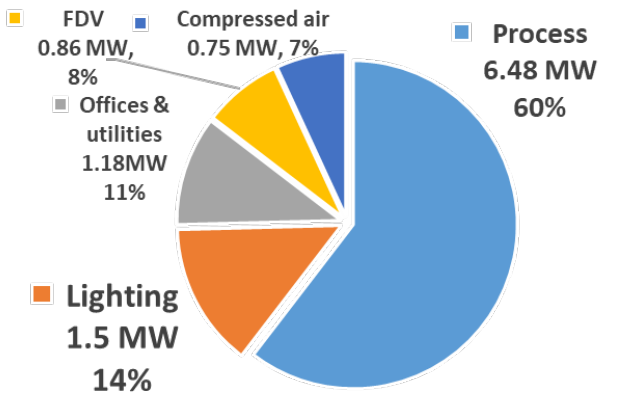
Connecting Aspirations

Innovative Projects: LED Migration Project

Load application wise contribution



Evolution of Lighting

Why LED for lighting

LED, the best lighting option today

- Energy efficient, higher Lumens per Watts
- No Mercury-Environmental friendly
- No IR & UV emissions
- Reduced heat generation

LEDification Project

No expenses in LED- migration

- OPEX model Lights, Installation, Testing & Commissioning of LED lights
- 5 yrs extended warranty

Scope & Savings

Phase wise LEDification project

- Entire plant in phases
- Better control schemes
- Reduction in consumption by 50% (Minimum)

Optimal design & execution

WCQ- Lighting Standard compliance

- Designed lighting wrt WCQ Lighting standard
- Modifications - New wiring / removal as per conditions
- Execution of the project without disturbing the production
- Compliance to Safety standards

EnCon Projects

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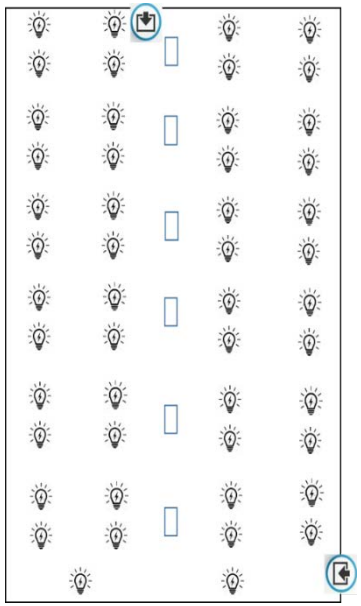
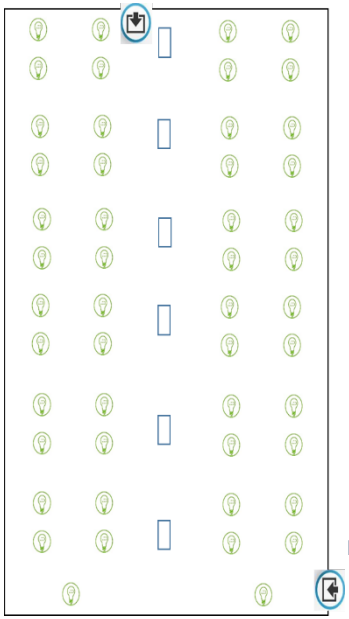
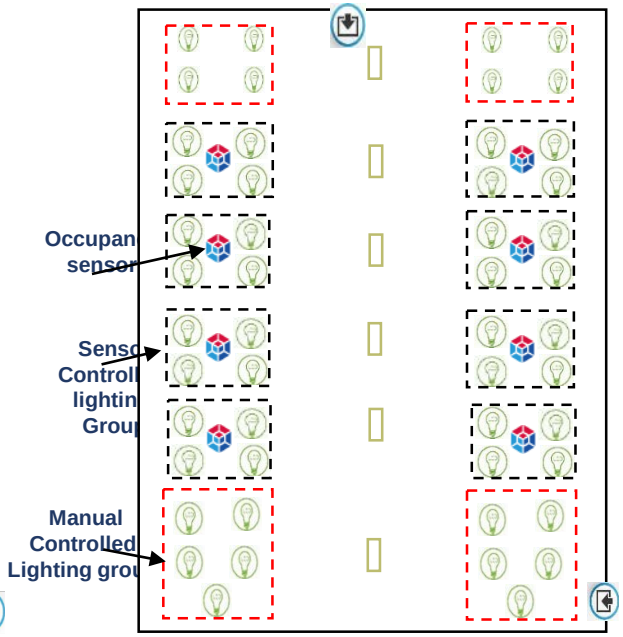
Conventional Lighting system



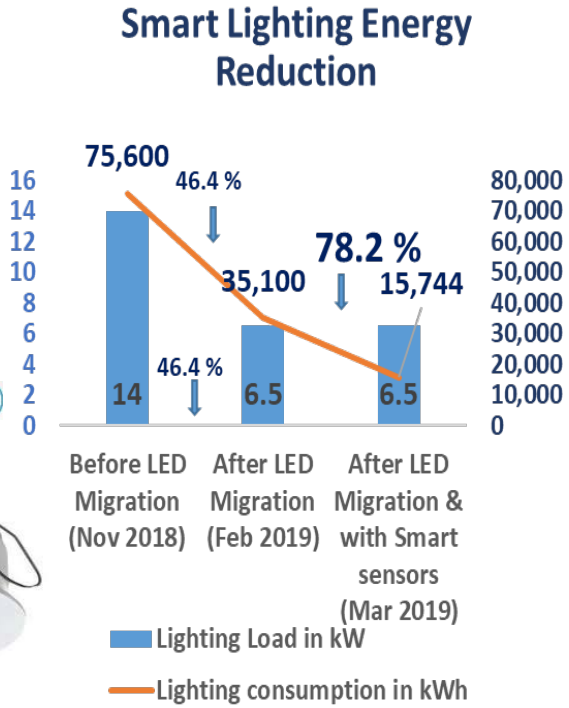
After LED Migration



After Sensor installation



Occupancy Sensor



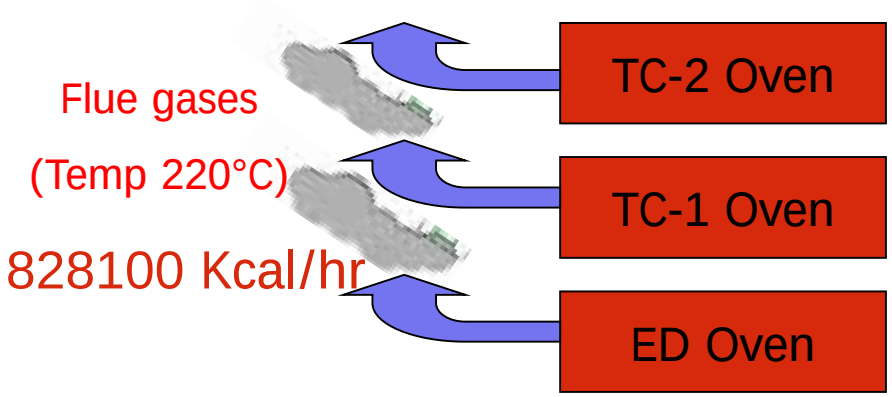
Power Consumption : 14 KW
Lux level : 125~200
Energy Cons.-Monthly: 6,300 KWH / 50,400 INR-Annually : 75,600 KWH / 6,04,800 INR

: 6.5 KW (Red 46.4%)
: 250~450 (Inc 250%)
: 2,925 KWH / 23,400 INR (Red 46.4%)
: 35,100 KWH / 2,80,800 INR

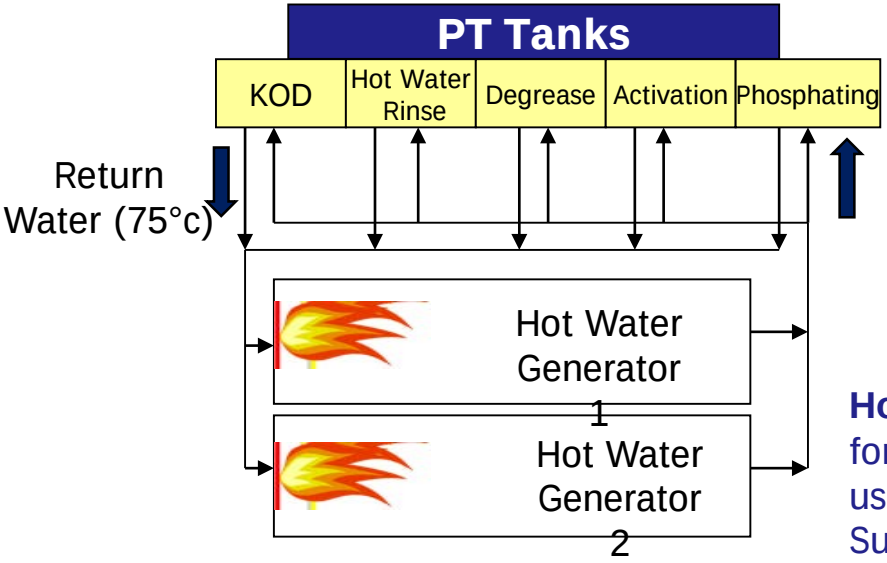
: 6.5 KW (Red 46.4%)
: 250~450 (Inc 250%)
: 1,312 KWH / 10,400 INR (Red 78.2%)
: 15,744 KWH / 1,25,952 INR

EnCon Projects

At TML Lucknow plant , we have Paint shop for painting face cowl of the vehicles. It contains 3 Nos. of Propane fired Ovens (ED , TC 1 & 2). Internal temperature is maintained at 160-180 °C and its hot flue gases were exhausted through preheater to atmosphere. But still Flue gas was having a substantial heat energy which can be utilized for useful work.



OVEN at paint shop



Hot Water (85°c)

Waste Heat Recovery System

Hot Water Generator(HWG) generates hot water of 85°C for Pre treatment (PT) process on white of Cowl. HWG use Propane gas as a fuel for burner application.
Supply Hot water 85 °C goes to PT process and returns at 75 °C .

EnCon Projects

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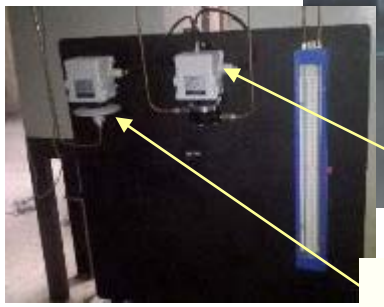
Installation of Heat Exchanger With diverter valve Assy- E.D. Oven

Shell & Tube Heat Exchanger

Stainless Steel Ducting



Flue Gas Back Pressure Switch

DP Water Switch

Motorized Actuated Diverter valve

Pressure Indicator

Resistance temperature detectors

Flow Meter

Hot Water O/P

Cold water I/P

Allen Bradley PLC panel Control Logic L71

EnCon Projects

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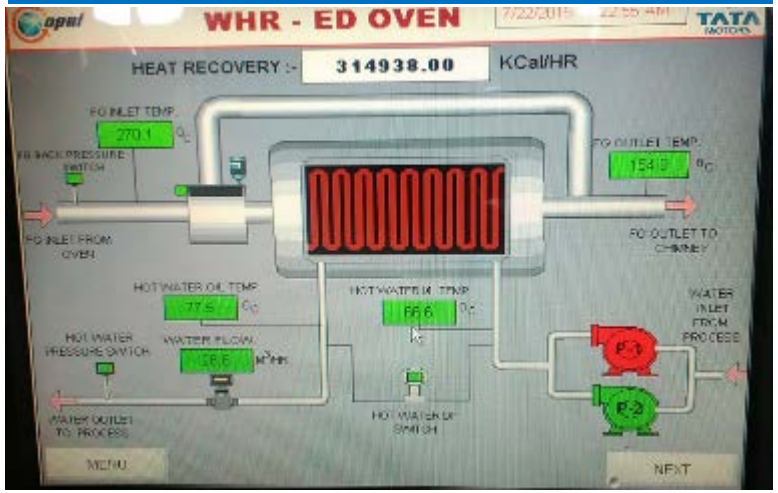
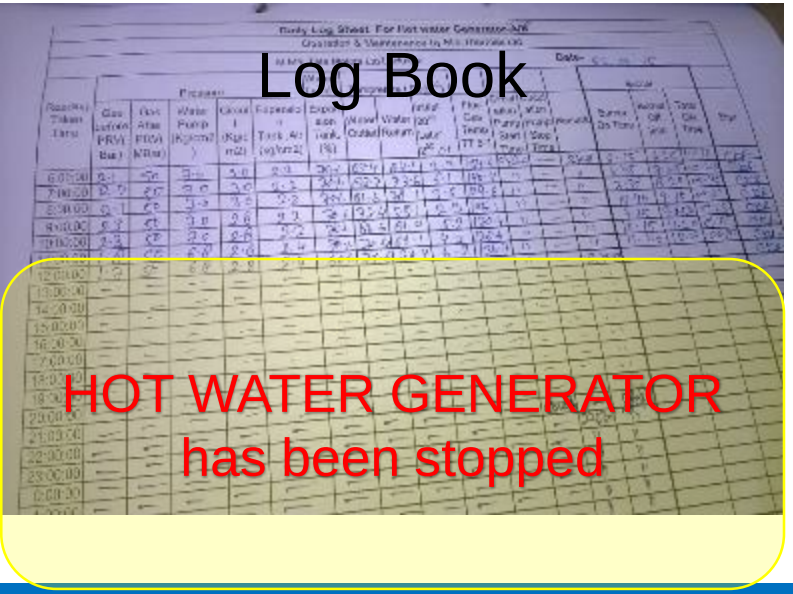
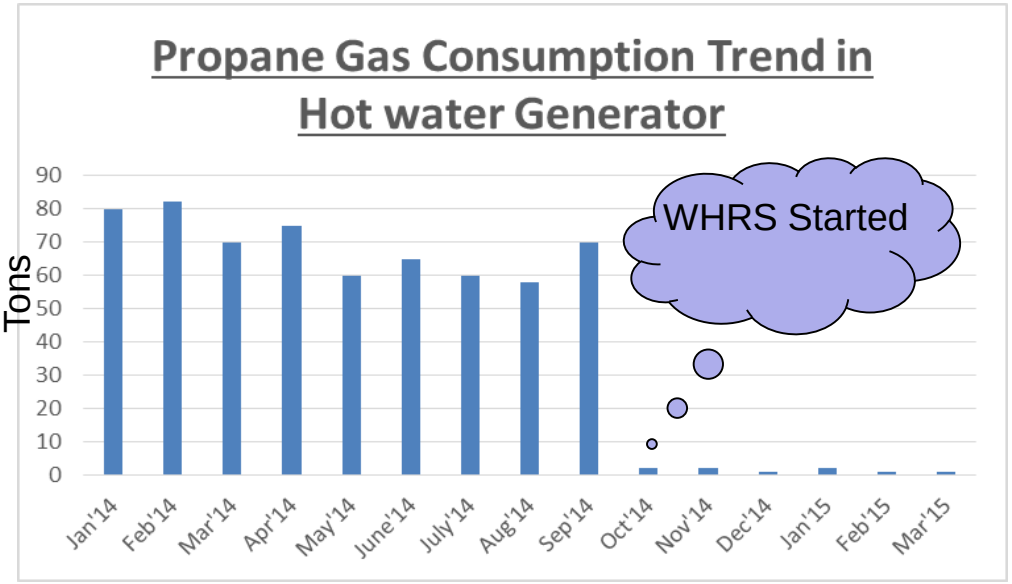
HMI screen to operate the WHRS safely



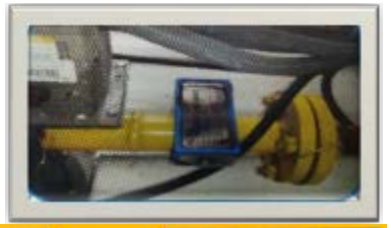




Annual saving – 268 Tons of Propane Gas
Rs. 15.54 Millions
Pay back- Less than 1 Year
Annual carbon abatement- 429 Tons of CO_2

EnCon Projects

Before: At TML Paint shop , we have propane based Ovens and hot water generator equipment. There we consume average of 1500 tons of propane gas every year. During ISO 50001 implementation, we started calculating Ovens efficiency , which triggered us to work on increasing its efficiency.



After: We studied and explored the opportunity in this regard. We have seen Flux maxiox from CII & learned that by using this we can increase the efficiency of paint shop Ovens & hot water generator equipment's. So, We implemented this technology which increased the efficiency of equipment substantially.

Benefits

1. Reduction in energy consumption by 5-6 % by enhancing thermal efficiency of equipments.
2. Zero Maintenance cost
3. Leads to a cleaner environment
4. Eliminates use of fuel additives

Energy Saving = 17 Tons of Propane Gas/ year
Rs 9.8 Lakhs
30.6 Tons of CO_2e

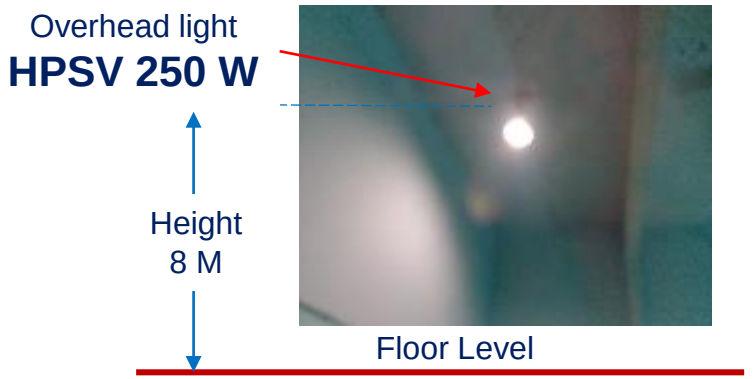
Principle of working:
Conversion of para-hydrogen to higher energized ortho-hydrogen through magnetic stimulation i.e. the application of the proper magnetic field to change the state of hydrogen molecules which enhances the energy of atom & general fuel activity. Hydrocarbon fuel molecules treated with the magnetic energy of the Flux Maxiox tend to de-cluster. creating smaller Particles more radially penetrated by oxygen thus leading to complete combustion. They become more normalized distanced from each other having bigger surface available for bonding with oxygen. In the combustion chamber increased reactivity of oxygen is achieved resulting in better oxidation of the primary hydrogen elements, further oxidation of the carbon element, the secondary fuel element.

EnCon Projects

Before : In continuation drive of Lighting optimization in offices & shops, we encountered an opportunity in PE shop. There lighting fittings were roof ceiling suspended which was covering entire height of the shop. However required effective height of the lighting was half of the shop height of 8 Mtr. It was not only energy wastage also inaccessible for maintenance. The wiring of the lights was such that the lights in unnecessary areas could not be segregated and switched OFF. This led to energy wastage and difficulty in maintenance as well.

Drawbacks:

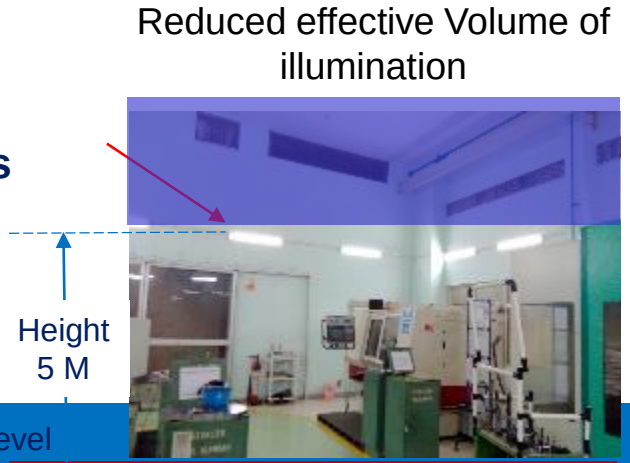
- ❖High energy consumption
- ❖Illumination at border line of requirement.
- ❖Difficulty in maintenance due to greater mounting height of lights
- ❖Lights could not be switched OFF when not required



After : Energy Management cell co-ordinated with PE shop team and conducted a brainstorming session for improving the shop's lighting system. As an outcome of the session, it was decided to replace the existing lights with energy-efficient LED tubelights. Also, reduced effective height of the lights to 5 M which was easily accessible zone wise for maintenance and resulted in energy saving.

Benefits:

- ❖Energy saving
- ❖Increase in illumination
- ❖Easy maintenance of lights due to lower height
- ❖Enhanced life of lights
- ❖Localized need-based zone-wise lighting control



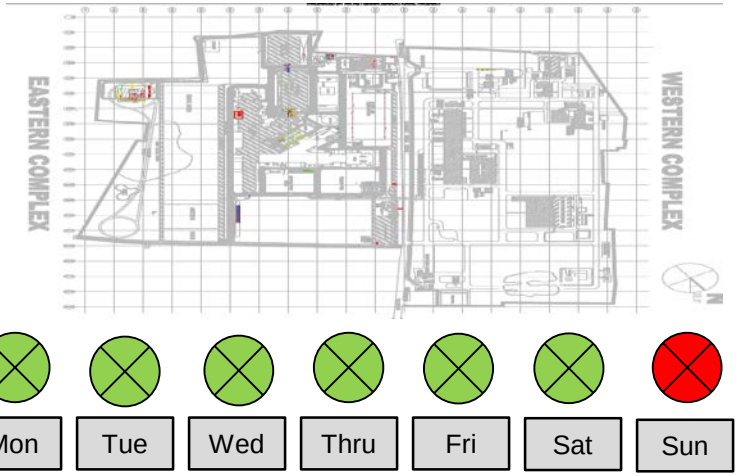
Energy Saving : 27000 KWH / year
Cost saving : Rs. 2.13 Lakh / year
Carbon Abatement : 22 tCO_2e

EnCon Projects

Before : Lucknow works was working on 6 days per week. The assembly lines were running at under capacity due to market recession. It has resulted in increasing trend of SEC due to higher Fixed load contribution especially in assembly shops.

- ❖ Shop floor loads
- ❖ Office loads
- ❖ Comfort Load
- ❖ Canteen services
- ❖ Transportation services
- ❖ Crèche services
- ❖ Training center

- ❖Data center load
- ❖Other utilities
- ❖Non working day fixed load

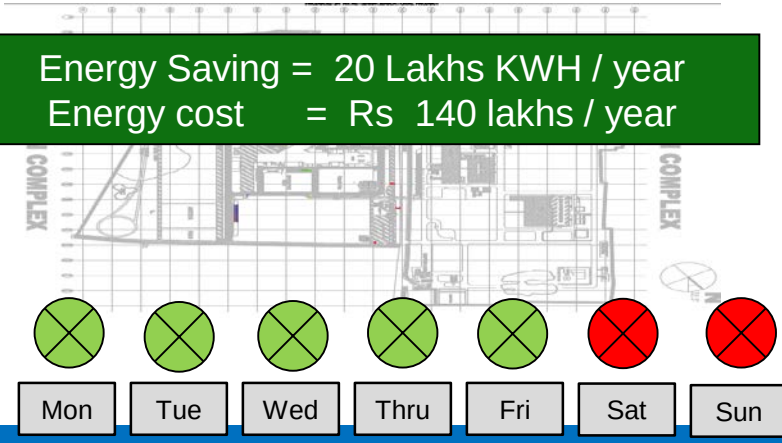


After : Energy Management cell co-ordinated with Manufacturing, Supply chain, HR & Admin, Union and other concerned agencies to operate the plant in **5 days per week** based instead of 6 days per week, keeping the same working hours per week. This has resulted in reducing fixed load energy consumption substantially. Besides this, significant energy reduction in canteen, conservancy, transportation, comfort loads in offices & shops etc been achieved.

- ❖ Shop floor loads
- ❖ Office loads
- ❖ Comfort Load
- ❖ Canteen services
- ❖ Transportation services
- ❖ Crèche services
- ❖ Training center

- ❖Data center load
- ❖Other utilities
- ❖Non working day fixed load

Energy Saving = 20 Lakhs KWH / year
Energy cost = Rs 140 lakhs / year



EnCon Projects

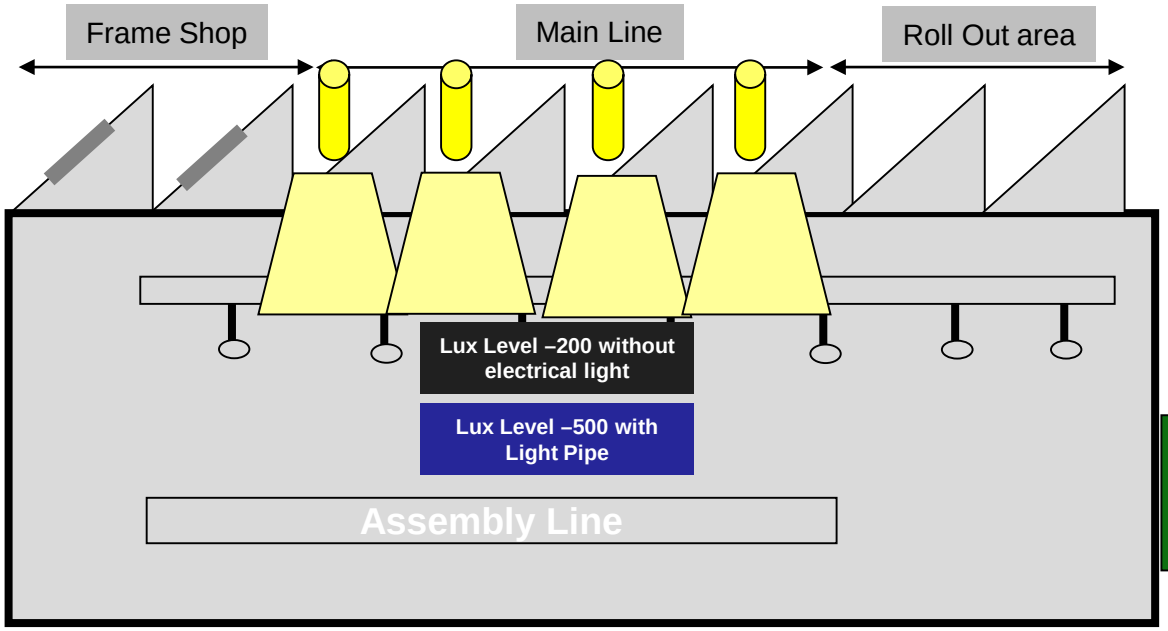
TATA MOTORS
Connecting Aspirations

Before:-

We had conventional lighting in our Line -1, we studied the lux level and found that when the lights were off during day time the lux level drop to 200 Lumen which was far below the required lux level of 400 Lumen, so the operators used to keep the lights on in day time also.

After:-

We have Installed light pipes in our main line and also provided transparent sheets in roof at logistics area so that we can increase the lux level to 500 Lumen without switching the lights on during day time, since we used light pipes hence there was no increase in shop floor temperature also.



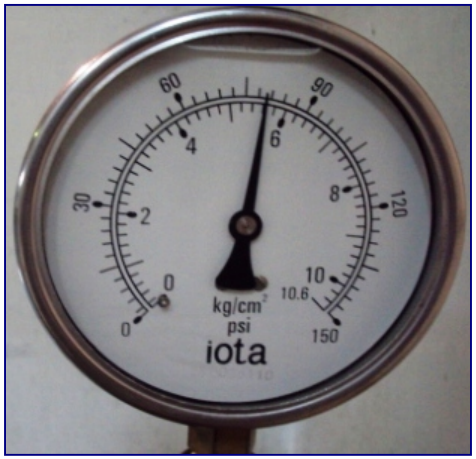
Cost Saving : Rs. 6 Lakh / annum
Electrical Saving : 85000 KWH
Carbon Abatement : 69.7 tCo2

Optimizing the Compressor Pressure

In Phase 1 : The compressed air pr. of 6.2 bar was under usage earlier. The Line pressure of the Compressed air reduced to 5.9 bar with no effect on the pressure delivered at the end user.

In Phase 2 : After detailed study and agreement from end user, further reduced the pressure setting optimally at 5.7 bar.

Before Condition | **Phase 1** | **Compressor House** | **Phase 2**



6.2 bar | **5.9 bar** | **5.7 bar**

Total Investment : **0 Lakh**

Total Savings : **0.92 Lakh/annum**

Payback :**Immediate**

EnCon Projects

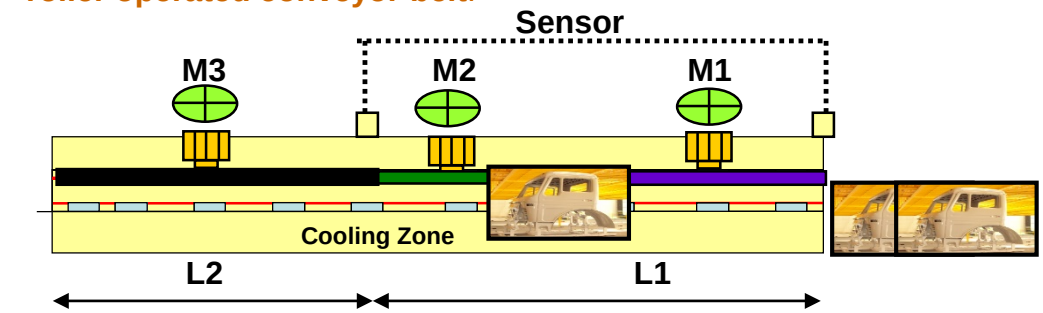
TATA MOTORS
Connecting Aspirations

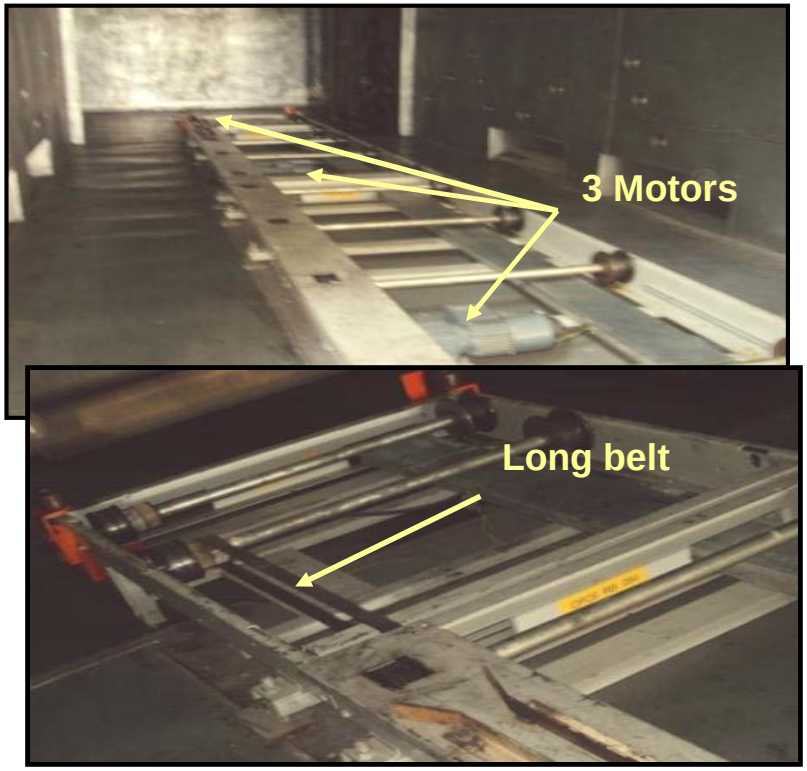
Optimisation of Cooling Zone- Roller Belt operation in Paint Shop

In Paint shop, after Top Coat & Sealer Oven ,cowl passes through the cooling Zone on roller bed conveyor for cooling the cowl body by forced draft blower.

Before:

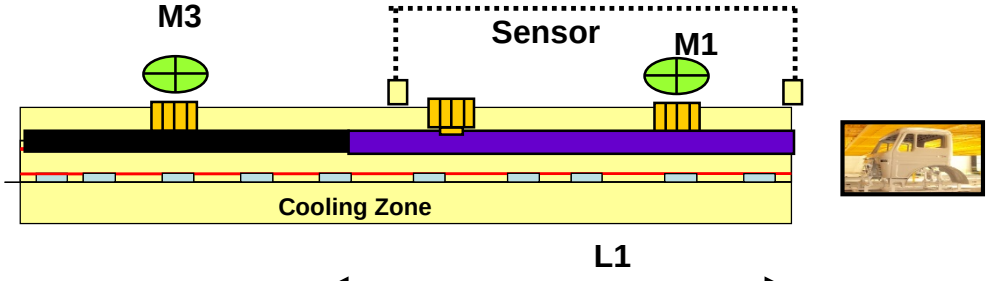
Roller bed conveyor operates with three motor which connected with roller operated conveyor belt.





After :

Process improvement-Removed one motor after evaluate the prime mover capacity to operate the roller bed conveyor



Total Investment : **0 Lakh**

Total Savings : **1,085 KWH/annum**

Payback : **5 Months**

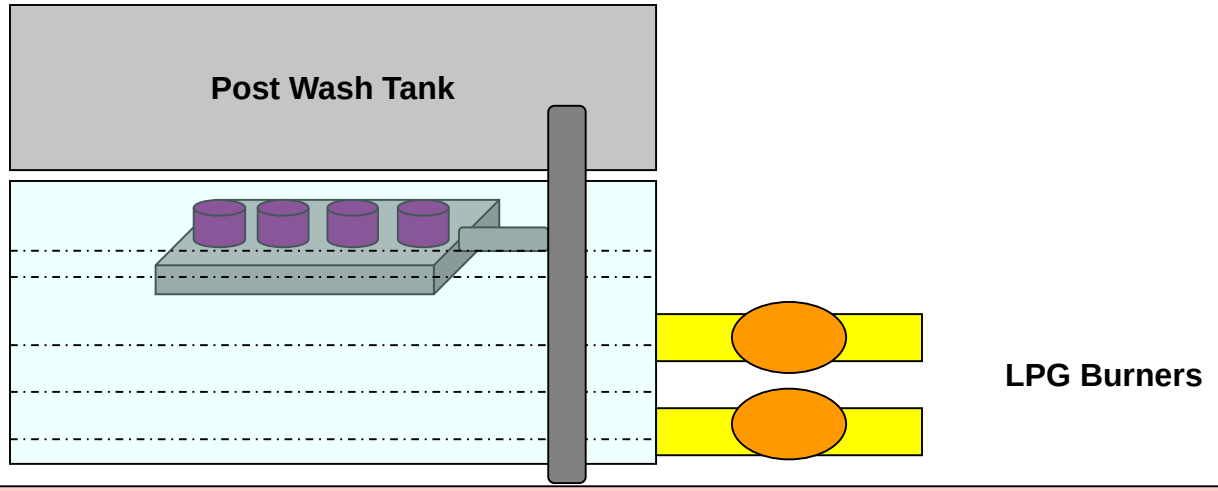
Conservation of electricity through utilization of temperature from heated waste gases to heat water in post wash chamber

MACHINE : **200 Kg/Hr CCHF**

Before :

Post Wash operation:-

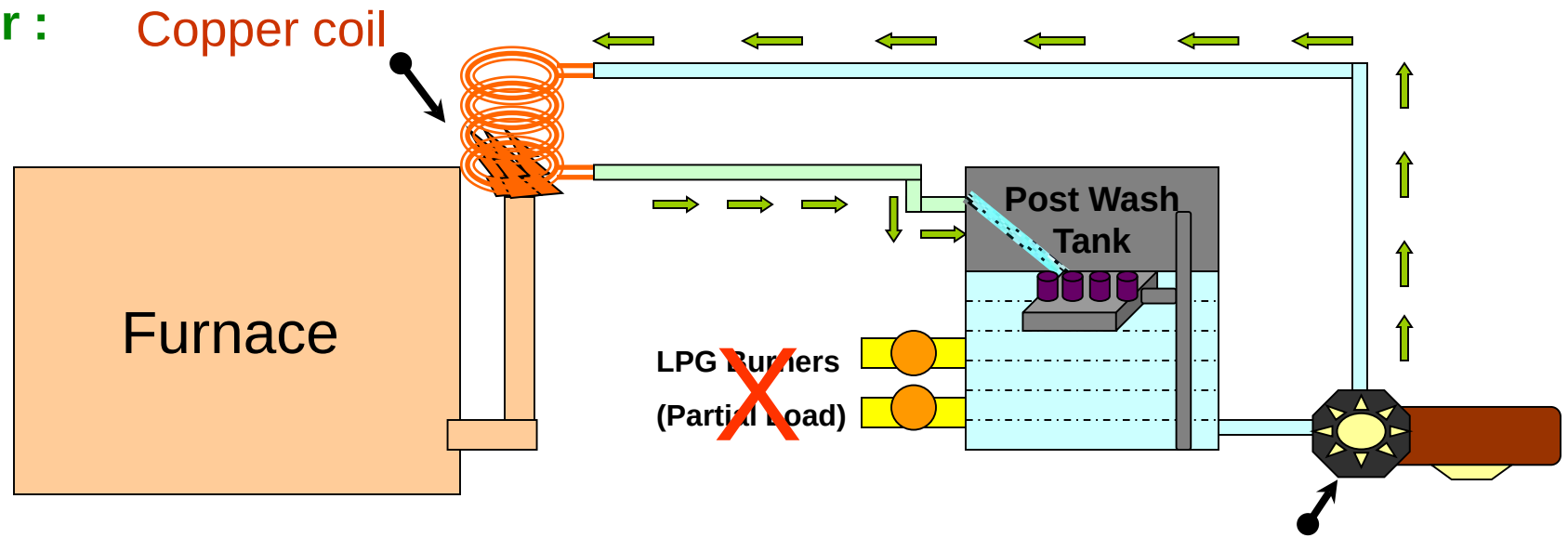
After the quenching process the metaquench42 oil layers needs to be cleaned from the components. To remove this oil layer we perform the post wash operation in which the components are dipped and wash with the spray of warm water which is maintained at the temperature of 60°C.



Method used to raise the water temperature:-

LPG burner were used to raise the temperature of water to 60°C.

After :



Method used to raise the water temperature:-

Now a modification is made in the system in which the heat of the flue gases are extracted and used to raise the temperature of water used for post wash.

The temperature of flue gases when burnt is 275°C and with the help of heat exchanger we recovered the heat. And this extracted heat is used to raise the water temperature of post wash to the required level.

Benefits :

Total Carbon emission reductions per annum : 45 T CO_2

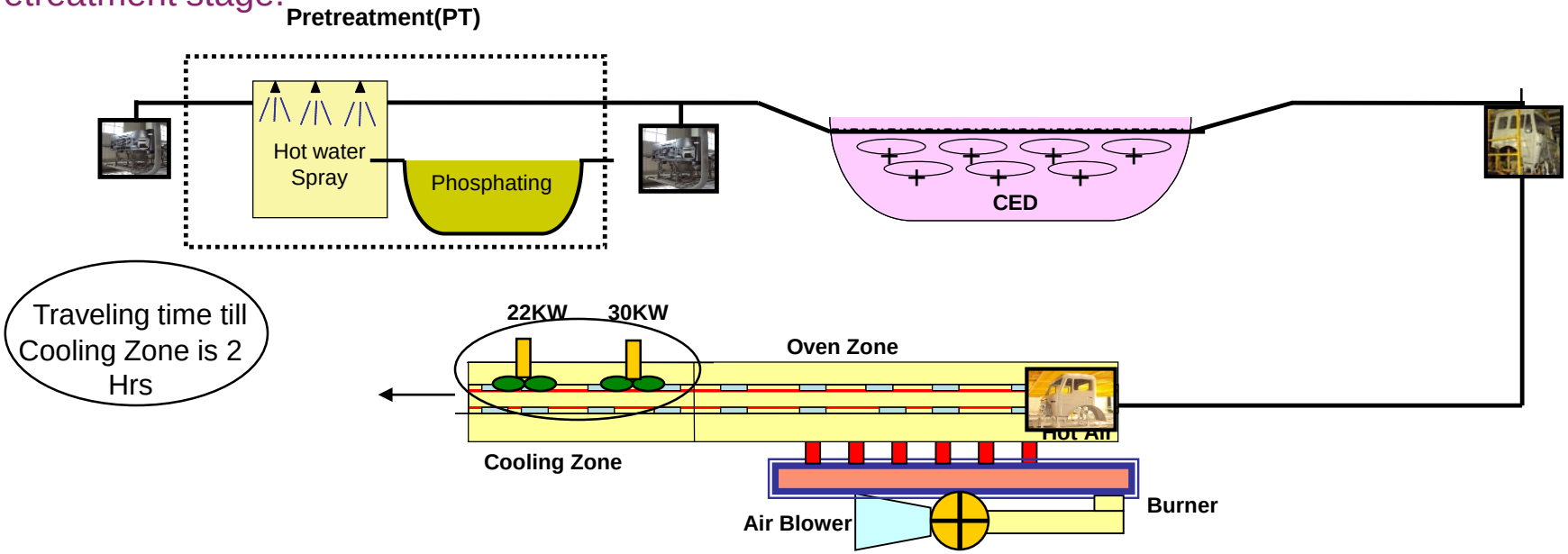
Optimisation of Cooling Zone – Fans operation at Paint Shop

Paint shop gets the Cowl from BIW Shop (Weld shop) for painting. In Paint shop, it passes first from Pretreatment stage, where oil, grease, dust & dirt is removed by hot water spray. Next, the Cowl body passes from Phosphate Station to make it ready for primer coat in ED (Electro- Deposition).

A layer of primer is applies over the surface of cowl by CED process and reaches to the oven for baking & drying at defined temperature i.e. 150°C. This oven is horizontally connected with cooling zone, where cowls gets cooled by two axial flow fans i.e.. 22KW & 30 KW.

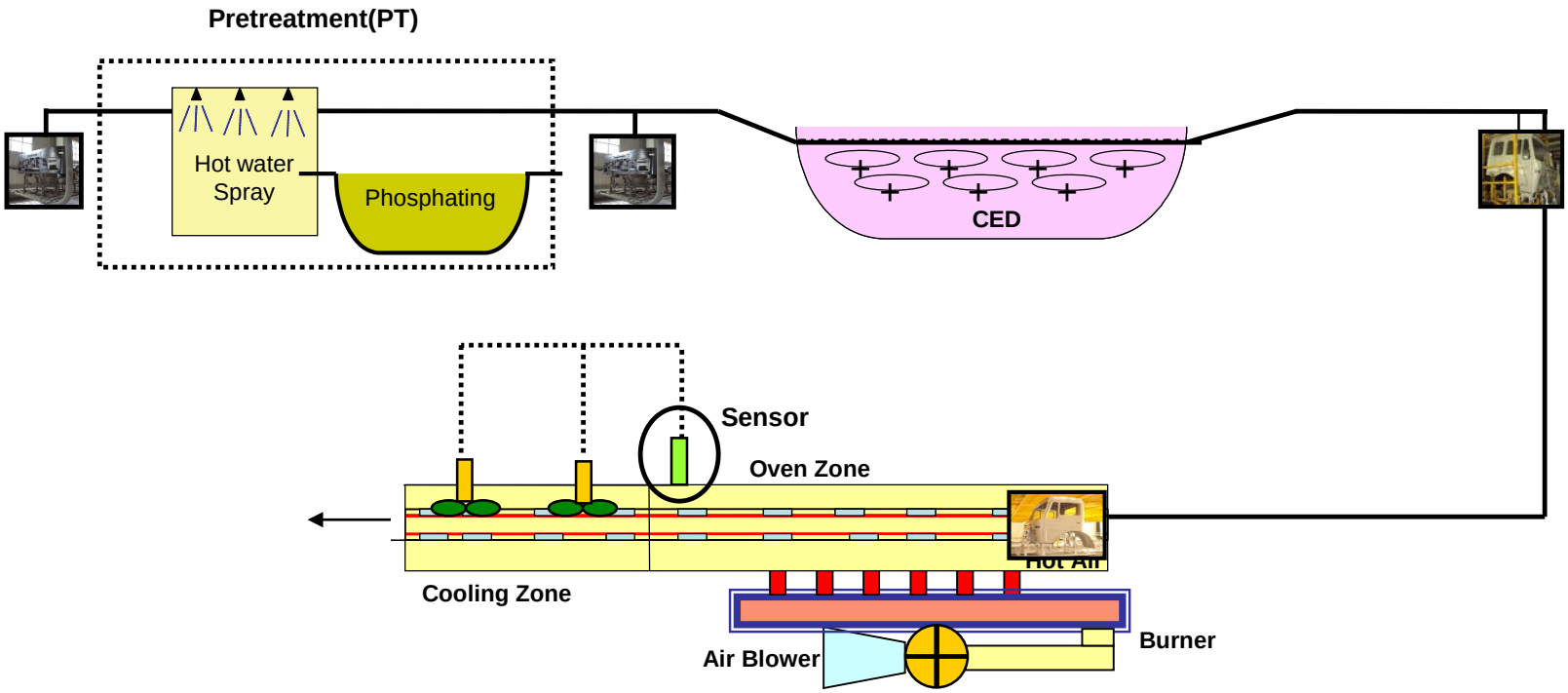
Before:

The Cooling Zone - Axial flow fans are interlocked with the Pretreatment Stage conveyor as shown below. The Cooling fans automatically comes into operation as soon as the conveyor starts. It is found always in running mode once the line gets started. Cowl takes almost 2 hrs time to reach the oven from Pretreatment stage.



After :

A Position sensor has been provided at the starting end of cooling zone, which senses the entry of cowl into oven subsequently it gives the start signal to the axial flow fan to run.



Benefits :

Total Carbon emission reductions per annum : 112 T CO_2

We are talking about ...

- An Overview of Tata Group & Tata Motors
- Energy Scenarios – Indian perspective
- Renewable Energy – Ways & Means
- ENCON – Residential, DC, N/W
- ENCON – Industry, Infrastructure & Building
- Energy Excellence @ Tata Motors
- **E R A S E Approach**
- Way Forward

E-R-A-S-E Principle

E- Eliminate ‘Need’

Key questions:

1) Do we really need this process for desirable outcome ?
2) Do we need Energy input in this process for desired outcome?

Solution : **Process Innovation**

E-R-A-S-E Principle

R- Reduce Energy consumption/ Sp. Energy consumption

Key questions:

1) How much is productive and non-productive energy?
2) How can I reduce non-productive energy use?
3) How can I improve throughput ?

Solution : **Measurement & Analyses**
Operational Control/ Operational efficiency

E-R-A-S-E Principle

A- Alternative energy sources & Application innovation

Key questions:

1) Is there an alternative cost effective and efficient energy source available?
2) What is my application advantage ?

Solution : Energy efficient technologies, Alternative fuels, Heat recovery, Renewable Energy

E-R-A-S-E Principle

S-Sizing of equipment

Key questions:

1) What is the equipment capacity?
2) What is the actual demand throughout the process? And why ?
3) How can I right-size the equipment capacity?

Solution : Right sizing of equipment / process demand

E-R-A-S-E Principle

E-Efficiency improvements / Elimination of losses

Key questions:

1) Is there excessive Noise, Heat, Vibration, Radiation or leakage ?
2) What is my equipment/process energy efficiency?
3) How can I improve it further?
4) What is the best efficiency point?

Solution : Energy efficient technologies and optimum loading for best efficiency, Loss elimination

Our Me :ation is

"Systematic, **nprovements,**

Knowledge **Team Work"**

are th nit an

"Exc ***nit "***

Thank You ! ! !