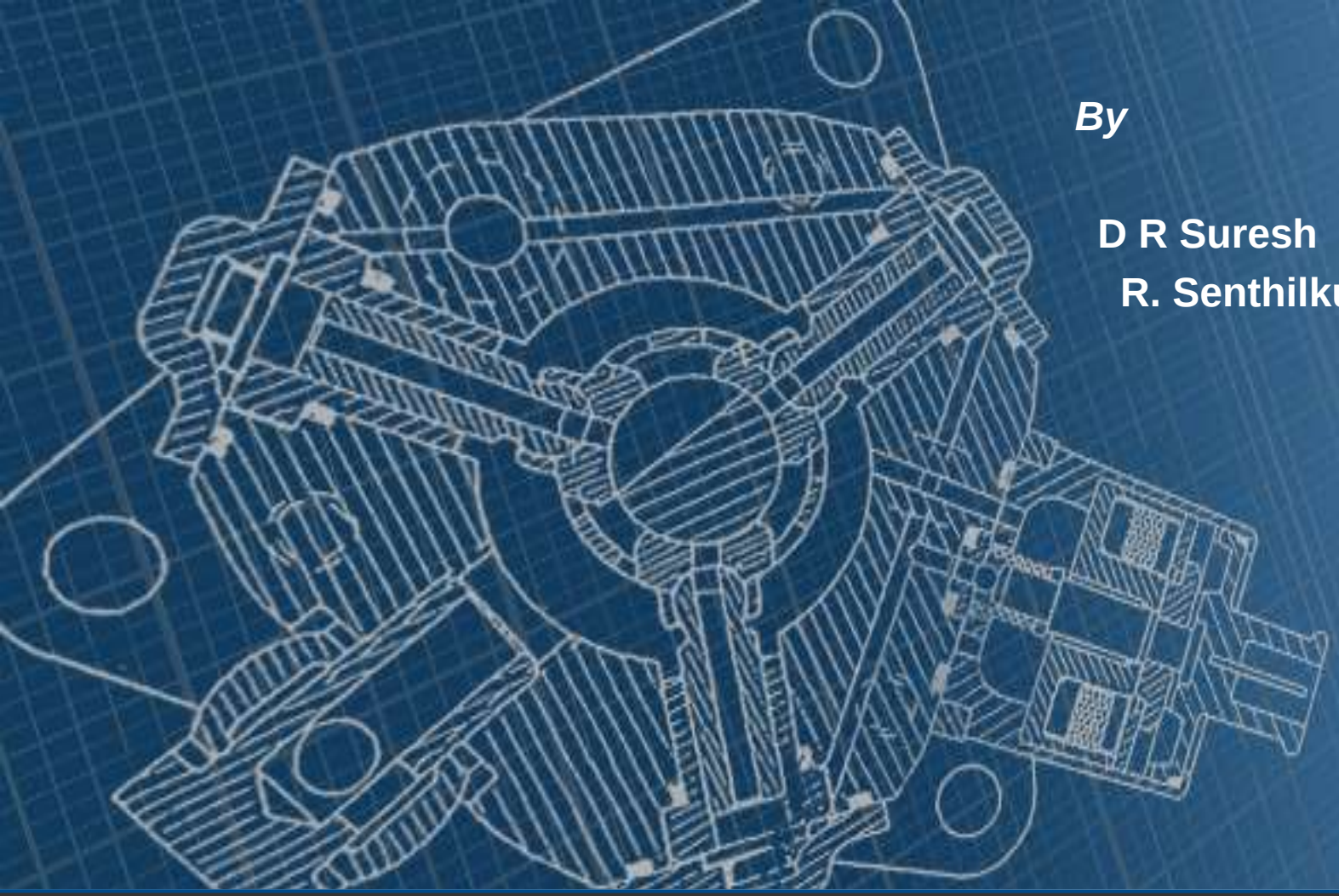


By

D R Suresh
R. Senthilkumaran

Green Co Forum , CII , Chennai

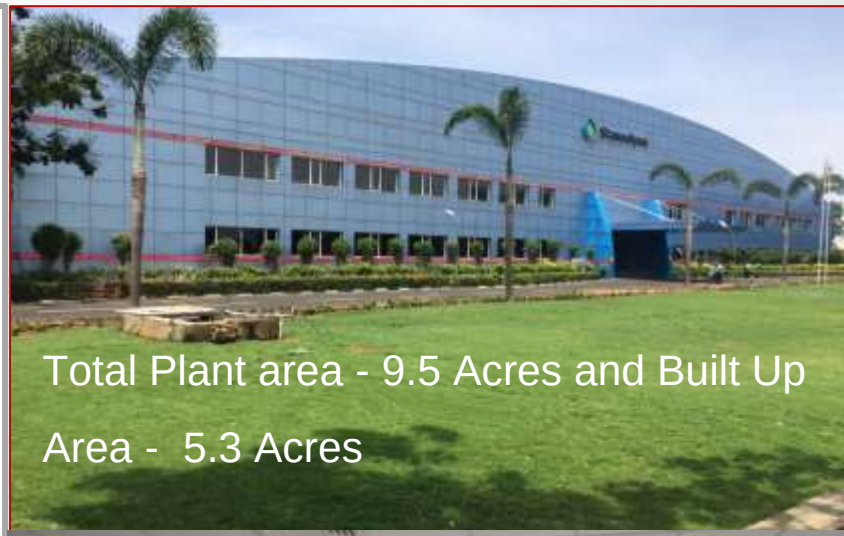
Stanadyne India Private Limited / Chennai

Feb 2nd 2018

Stanadyne

STANADYNE – INTRODUCTION

- ✓ **Stanadyne India Private Limited , a global fuel injection systems designer and manufacturer ,headquartered in Windsor, USA .Facility Located on Chennai -Tirupati highway -No.96, Aranvoyal Village, Thiruvallur Taluk & District-602 025**
- ✓ **Started Manufacturing in India since 2003.**
- ✓ **ISO/TS 16949 Certified , EMS Certificate ISO14001 : 2004 and OHSAS 18001; 2007 .**
- ✓ **BIQS Level III Certified.**
- ✓ **ISO 50001:2011 and Green Co Certificate in pipeline.**
- ✓ **Total No. of Employees : 440**
- ✓ **Annual Turnover : Rs.197 Crores.**
- ✓ **Manufacturing and Marketing of Fuel Injection Rotary pumps, Monobloc pumps & Injectors for Export and Domestic Markets.**



STANADYNE GLOBAL PRESENCE

FUEL PUMP PRODUCTS-FOOT PRINT

Stanadyne's Invention in 1952

Injectors

Monobloc Pumps

Fueling Innovation

EcoForce for <50HP Engines
Off High way Applications

GDI Pump

DB Rotary Pump

STANADYNE PROCESS FLOW

Stores

Soft Stage

- Barrel Machining
- Rotor Machining
- Sleeves from Suppliers
- Cam rings from Suppliers

Heat Treatment

- SQF – Barrel
- Sleeve – Nitrex
- Rotor - Nitrex

Hard Stage

- Barrel Machining
- Sleeve Machining
- Rotor Machining
- Cam ring Machining

Hard Machining

- Hyd. Head Machining

- Match Grinding

Climate Control
Energy Sub Micron

Assembly & Calibration

Warrants High Fixed Energy-Prime target for En con project

Finished Goods

- Storage
- Dispatch

ENERGY MANAGEMENT SYSTEM

Monitoring → **Reporting** → **Review**

15 Zones Sub Digital Energy Meter monitoring purpose

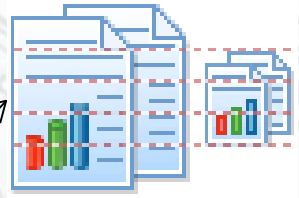
Every Day Energy Review practice

Monthly Enon. Review Reduce 200 Amps target

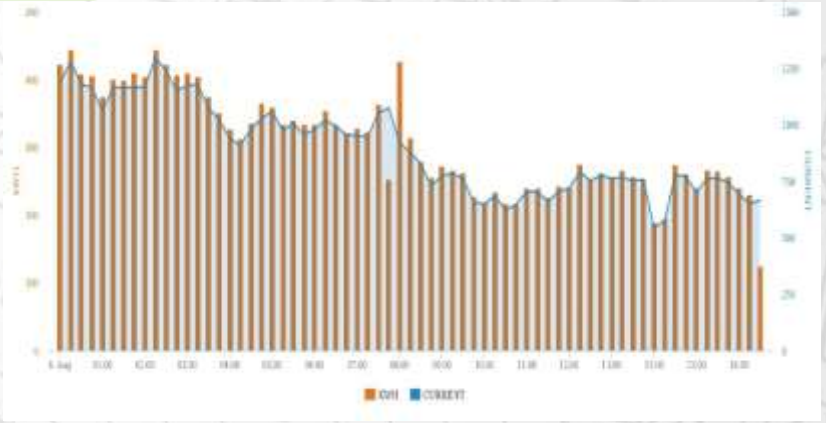
Weekly Review Implement Idea

PDCA

CI



Periodical Air leak Assessment program



Smart sense On line report

ENERGY MANAGEMENT STRUCTURE

Mr. K .Murugesan
Director- Operations
Steering Leader

R. Senthilkumaran
Energy –Senior Manager

Team Leaders: **Project Execution / Evaluation**

K.Murugan

Jagadeesh

Suresh

Paramasivam

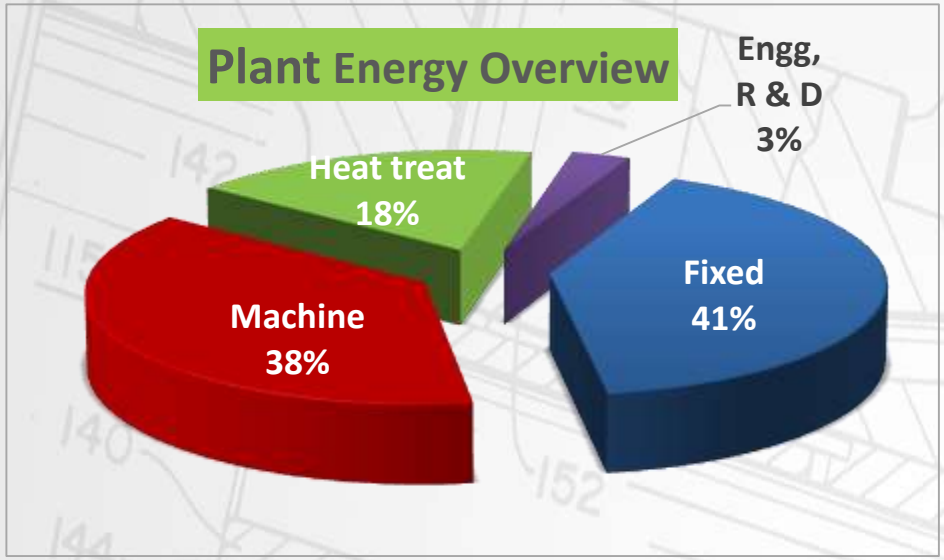
Raja

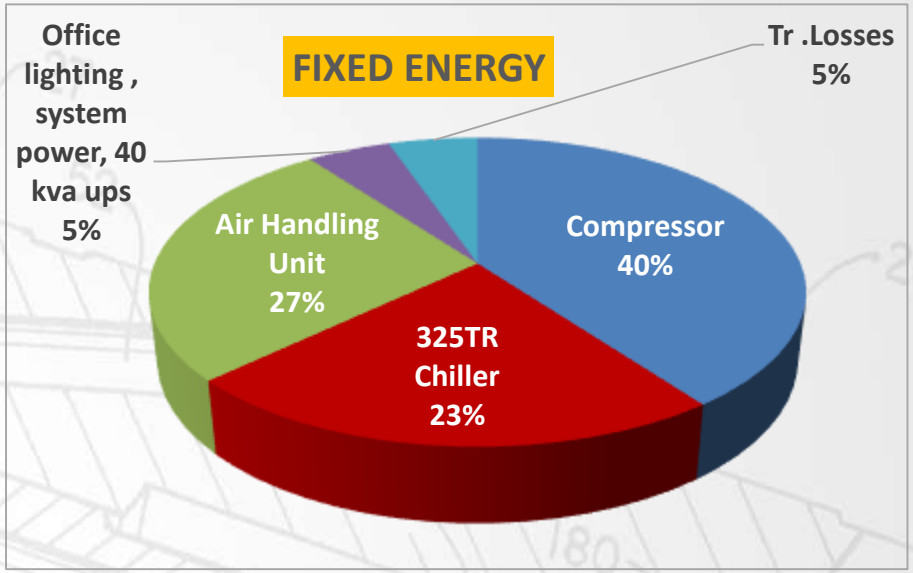
Mohan

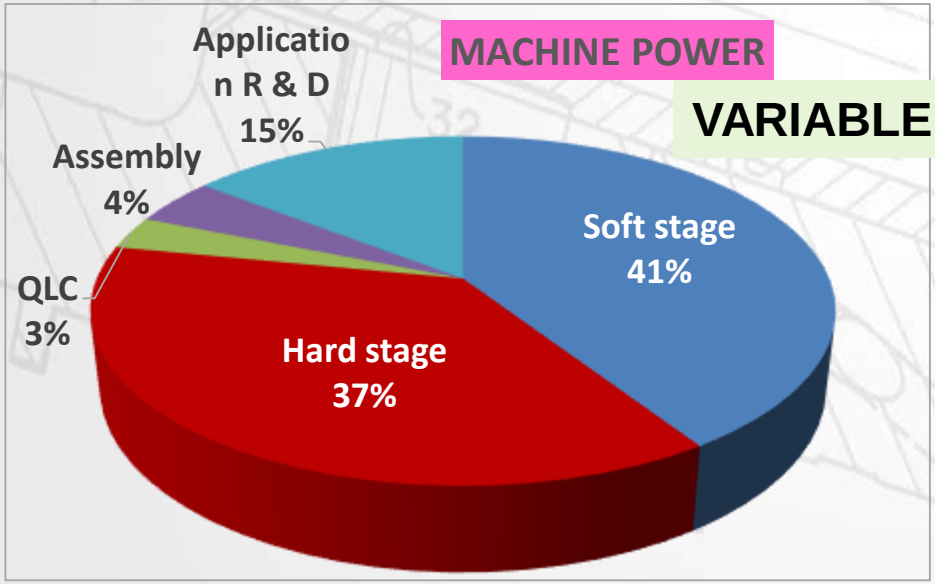
Dinesh

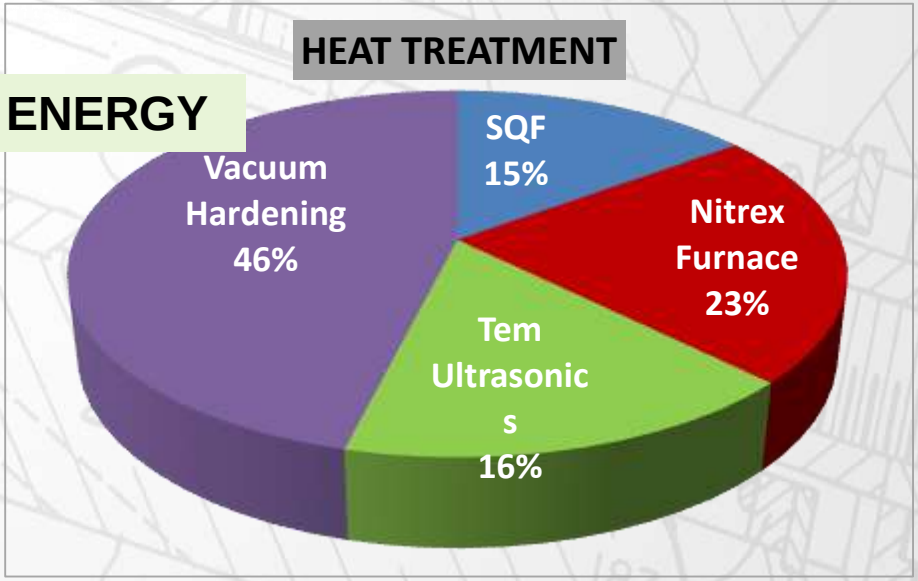
Gopi

POWER CONTRIBUTION ANALYSIS









Energy Consumption Scenario- Stanadyne

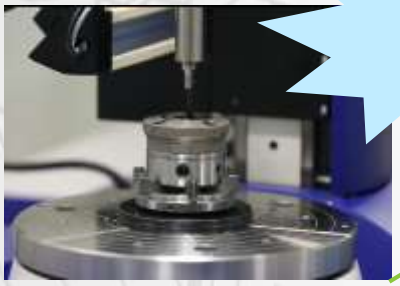
Precise Climate Control

Controlled Climate of *C %RH

Sub micron M/cing

Precise Sub- micron Measurement

Sub Micron Accuracy



Sub micron Product

Dirt Free Assy & Testing

Hard Stage

Fuel Injection Pump

Assembly

ENERGY CONSERVATION METHODLOGY

ENERGY MANAGEMENT

UTILITY EQUIPMENTS ENERGY EFFCIENCY OPTIMIZATION

Energy Saving Thro Data Analysis

Road Mapping

GROUP CAPTIVE WIND ENERGY RE DISTRIBUTION

Power Forecasting And Scheduling Power cost Planning

PROCESS INNOVATION & IMPROVEMENT

Process study and Rearrange

ENERGY REDUCTION TOWARDS POSITIVE STEPS

PLANT RESOURCE	
Connected Load	3830 Kw
Connected Demand	1500 kva
Captive Power Generation	2000 kva
Average Energy consumption per day	16195 Kwh
Compressor	960 Cfm
Boiler	2 Ton & 4 Ton
Water Consumption /Day	80 KL

ENERGY REDUCTION

Team Members + Plan + Key Measure + Review + Implement

Energy Burden 2011-2012 - Stanadyne

Demand Restriction of 30% in Normal Hrs

Un scheduled Power Cut

Precise M/C- Precise Tooling damage due to Frequent Power Cut

Demand Restriction of 90% in Peak Hrs

DG run 24X7 to Support M/C from Power Cuts

Forced to manage Prod by IEX/TPP support in Normal/Peak Hrs

Fuel Cost Fluctuation

Energy Saving Initiatives From 2012-2017

K w h r

C o s t

ENCON PROJECT INITIATIVES-LAST 3 YEARS

Low Hanging Fruit

High Hanging Fruit

Zero Investment Projects: 35 No's	With Investment Projects: 33 No's
TOTAL ENERGY REDUCTION – 0.315 Million Kwh	TOTAL ENERGY REDUCTION – 0.930 Million Kwh
TOTAL ENERGY COST REDUCTION - 3.037 Million	TOTAL ENERGY COST REDUCTION - 10.06 Million

ENERGY CONSERVATION SUMMARY

Stanadyne

TOTAL ENCON PROJECT WITH COST AND ENERGY SAVING 2014-17

Year	No of Zero Investment project	No of Investment Project	Annual Electrical Saving, Million kWh	Annual Electrical Cost Saving, Rs Million	Annual Thermal Saving, Million kcal	Annual Thermal Saving Rs	Innovation Electrical Saving in Kwh	Innovation Electrical Cost Saving Rs Million	Renewable Energy Cost Saving	Total Annual Savings, Million Rs	Investment Rs million
2014-15	13	8	0.34	[illegible]	[illegible]	[illegible].75	0.06	0.60	1.22	5.39	1.33
2015-16	16	[illegible]	[illegible].18	[illegible]	752.31	1.02	0.25	0.23	0.01	4.44	1.54
2016-17	6	13	0.51	4.41	124.72	0.71	0.04	0.35	4.80	10.27	2.95
Total	35	33	1.21	9.41	952.83	2.01	0.35	1.17	6.03	20.10	5.82

3 YEARS ENERGY SUMMARY
ENERGY REDUCTION 1.56 Million Kwh
ENERGY COST SAVING Rs 20.10 Million

En con Project 1 -Climate Control Energy Optimization

Goal :

Climate Control Room- Energy Optimization

Process Req:

Match grinding cell, Assembly cell, Calibration Cell and Standards room needs

Humidity 50+-5% RH + Temp 20+-2*C ⇔ 24X7 days

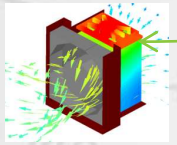
Problem Statement :

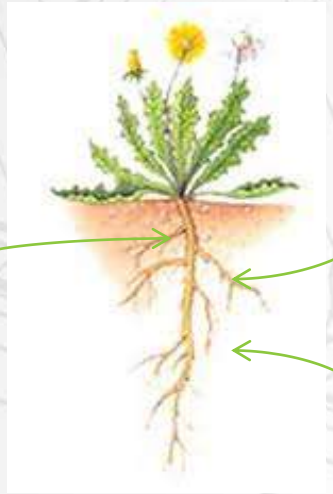
Energy consumption is high to maintain RH& Temperature

En con Project 1 -Climate Control Energy Optimization

Root cause :

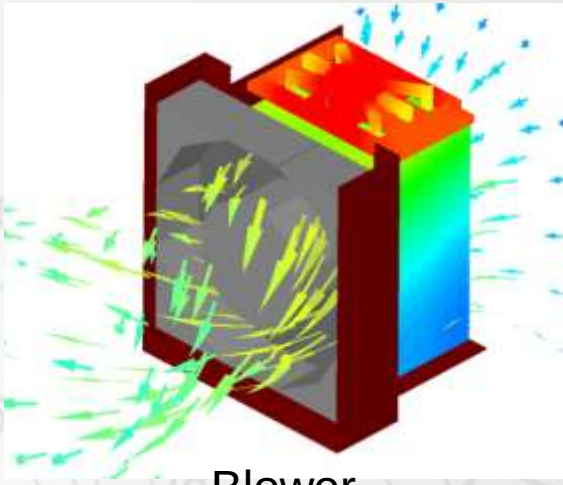
Blower run 24X7





Heater Bank-142kw

9.20Lacs units/Annum is consumption



Blower

Idea Generation – why why analysis:

Maintain Temp	Maintain RH
Blower is necessary ?	Heater Bank Necessary?
Heater Bank is necessary ?	Need working Cont.?
Need to run 24x7?	Any Alternative ?
Any alternate?	

Heater Bank

En con Project 1 -Climate Control Energy Optimization

Brain stroming:

- Bry Air Control Method
- Hot Water Generation
- De-Humidifers
- Climate controller-AHU interfacing

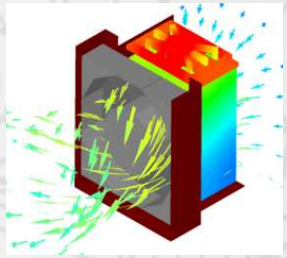
1/10 of energy consumption

Action:

Dehumidifier installed in all cells ,that can remove moisture and maintain RH.

Installation of Temp Sensor in mid of Cell that can provide feed back to blower so that the blower can only run whenever the temperature in the cells touches 26 º C

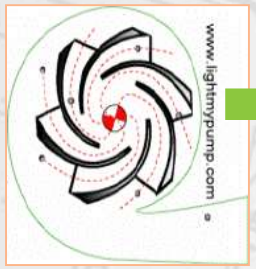
Dehumidifier**s**



Temp. Controller Feed back To Blower

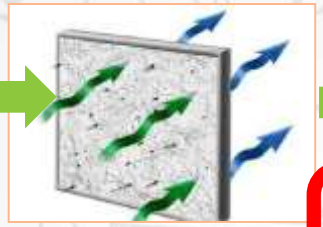
Precise Temp Controller Interfaced to HVAC Blower Motor

HVAC Circuit System Climate Control – Stanadyne

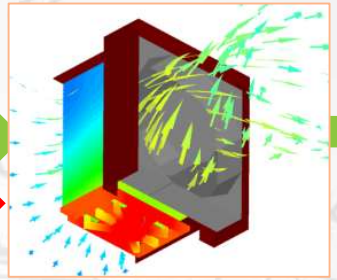


VAM Chiller pump

HVAC Coil @ 12°C

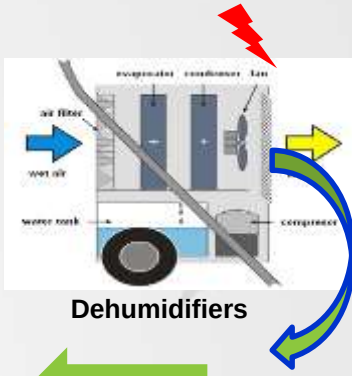


10 Micron Filter



Air Blower

0.3 Micron HEPA Filter



Dehumidifiers

Temp Feed back

Requirement : RH 45- 55% , Temp 25 ± 2° C

Refrigerant Cool type

Compressor high efficient rotary

Power of 830 w/unit, Total Connected load 12.45 KW

Humidity 45+–5 %

30Lit of Water/Unit is collected

Quality Unaffected

1/10 of energy consumption

En con Project 1 -Climate Control Energy Optimization-Result

Benefit due to Best Practice:

Annual Energy Savings = 12.20 Lacs Units

Add-on Benefit:

1. Switch off -380 KVA DG set -Reduce the Total connected load -Annual Fuel Cost saving 14.61 Lakhs

2. Switch off-228 KW (Other Accessories) during Plant shut Down and Festival Holidays-Annual Energy Cost saving 27 Lakhs

3. Switch OFF-Boiler and ID Fan During plant shut down -Annual Fuel cost reduction 9.57 Lakhs.

4. Preventive Maintenance Planning became easier.

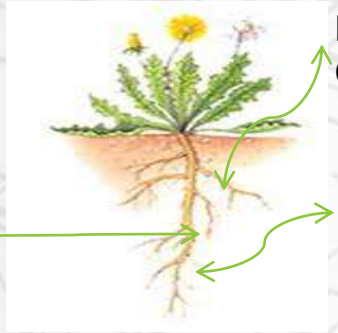
11.65 Million cost saving

En con Project 2 –Compressor Energy Optimization

Goal :

Optimization Of Air Compressor and Energy Reduction

Root Cause Analysis :



Brain stroming:

Intelligent Flow Control system to install at main header for Constant Pressure delivery

Microprocessor sense rate of change of demand and according to directly increase/ decrease down stream flow pressure

Result :

Annual Energy saving 0.94 Lac units

Intangible Benefit:

Switch OFF-22 KW Compr or Spare's purchase 15 % ,PM Exe n can be done periodically

8.93 Lacs cost saving

Investment:

4.5 lacs cost Rs

En con Project 3 – Shop Floor Light Energy Reduction

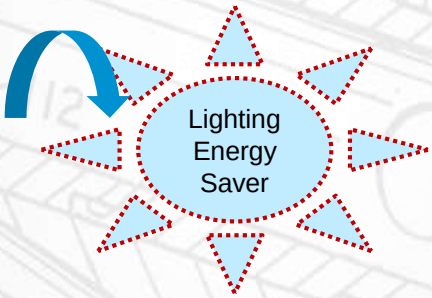
Goal :

Lighting Energy Reduction-Shop Floor

Root Cause Analysis :

Shop Floor Illumination@ 24X7 days ⇔ Lighting @ 24 hrs & Failures + Energy Consump. ↑

Idea Generation ;



Benefit :

Power saving of 20% in the lighting load .Life of lamps increases substantially resulting in reduced inventory and maintenance cost. **Energy save in resistive load by maintaining the real regulated voltage. Energy saved by avoiding unnecessary high voltage. Under / Over Voltage Protection with graded time delay & Effect of load Power Factor on Output Voltage is Nil**

Result:

Annual Energy saving of **0.27 Lacs units**

Intangible Benefit:

Spare cost reduction @ 10%

Reduction of MTBF Lighting power factor maintaining 0.85 Constant Output voltage

En con Project 4 – Own Generator Fuel Reduction

Goal :

Own Generator-Fuel Consumption

Root Cause Analysis :

Dg run@ 24X7 days ⟷ Support Prod@ 24X7 + Prevent Tool Break/ Rejection + Avoid Mc Reset time

Idea Generation ;

1000 kva UPS

Benefit :

Power Backup During unscheduled Power Cut.

24x7 DG run been Eliminated/Power cost Reduced

Fuel Consumption been reduced drastically

Result:

Annual Fuel Cost saving 204.42 Lacs

Monthly Fuel Saving – 70 * 24* 30 = 50400

Liters * 12 Month = **6.04 Lacs Lts**

Benefit:

After commissioning switch OFF the Generator , now we are Utilizing During power cut Hours

Fuel Reduction by 50%

Investment:

Rs 95.15 lacs

Thermal Energy Saving project 5 – Stanadyne

Goal :

Fuel (Bio Mass Briquette)- Reduction

Process Req:

Match grinding cell, Assembly cell, Calibration Cell and Standards room

Humidity 50+-5% RH + Temp 20+-2*C ⟺ Boiler Runs @ 24X7 days

Problem Statement :

Bio Mass consumption is high to maintain Climate Control Condition

Bio Mass

Implementation Status – Stanadyne

Before

Ext Duct Eliminated

Combustion takes place inside the boiler

After

Heat losses are reduced

Space saved. Motor cap Downgraded

After Implementation-Result

- By modifying external furnace in to built-in furnace, the overall efficiency is increased by η 37%

- The motor is used to suck the excess steam from the boiler to the economizer.

- After modification to inbuilt furnace the motor capacity is also reduced from 20 HP to 12.5 HP moto

- Stack temperature was reduced from 120°c to 70 °c.

- Considerable reduction in emission level spotted.

Benefit

Tangible Benefits:

1.Fuel Annual saving 29,72,000 @ 27%

2. Power Cost Annual saving 2,50,000

3. Material cost reduction 240,000

4. On time Investment Cost 10,80,000

5. Pay Back period Month 4.2

In tangible Benefits:

Operator working comfortable

Reduce Heat losses (Now working Normal Temp.).

Tube Cleaning Hours reduced (Man Hours reduction)

VAM Chiller Condensate water recovery

Goal : 100% Recovery of Heat in Flash steam & Condensate water from VAM Machine

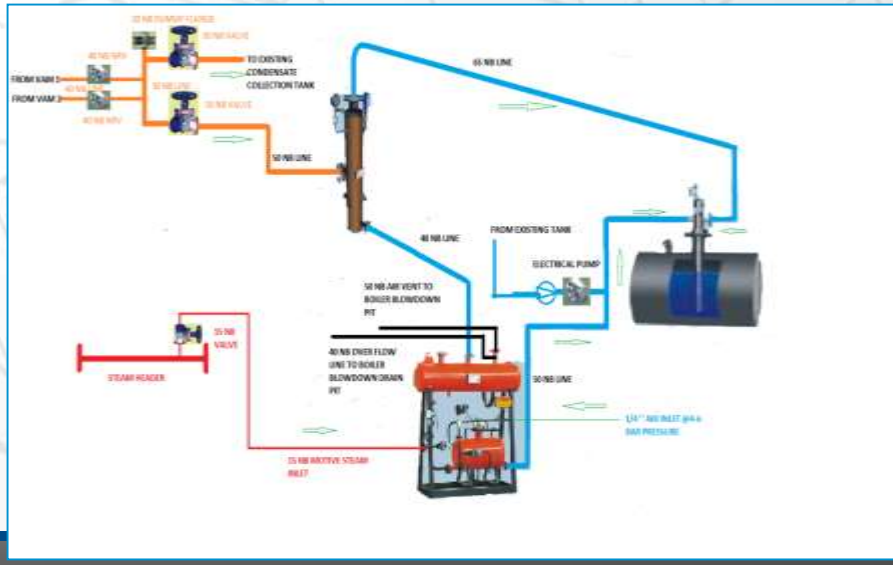
Problem Statement : Condensate water stored in ground tank and pumped to Feed tank with High Delta T difference.

Action : Installation of closed loop condensate recovery system nearer to Boiler . Now condensate water pumping through float sensor and steam Flash pumping through de-aerator automatically.

Benefit : Condensate water is pure form of water , There is no hardness and TDS It have less conductivity.

Feed water Temp Increased from 65 degree to 98 Degree

Daily manual blow down not required , TDS maintained at min level 750.2.2 KW Motor removed, RO water saved.



Savings: 156 MT Bio Mass Briquette , 4680 KL RO water , 0.025 Kwh. Rs. 8.89 Lac-2016. Rs 25 lac annualised.

Investment : 6.5 Lacs.

Encon. No 6 - Automatic Power Factor Correction

Goal : Automatic Power Factor to maintain at 0.99

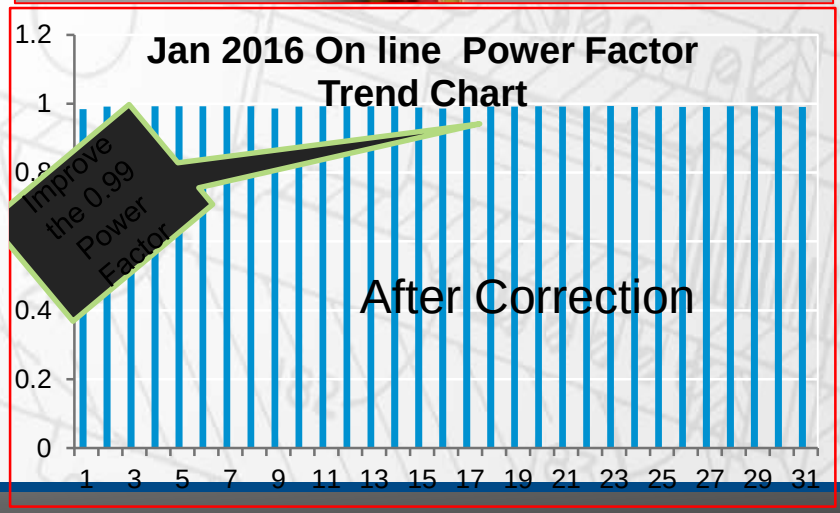
Problem Statement : Due to Low Power Factor, Equipment do not run efficiently and also Overloading of the Transformer , bus bar and Cable heat experienced leading to Increase in Losses

Action : Installed Automatic Power factor Correction meter in to the capacitor bank ckt which will take care of Automatic switching of Cap bank based on Inductive load to maintain PF band of 0.99.No manual intervention is required.

Benefit : Lower Energy Consumption

Savings: **0.18 Lac kWh Rs. 1.46 Lac**
Annualized saving 4.38 Lac.

Investment : 0.25 Lacs



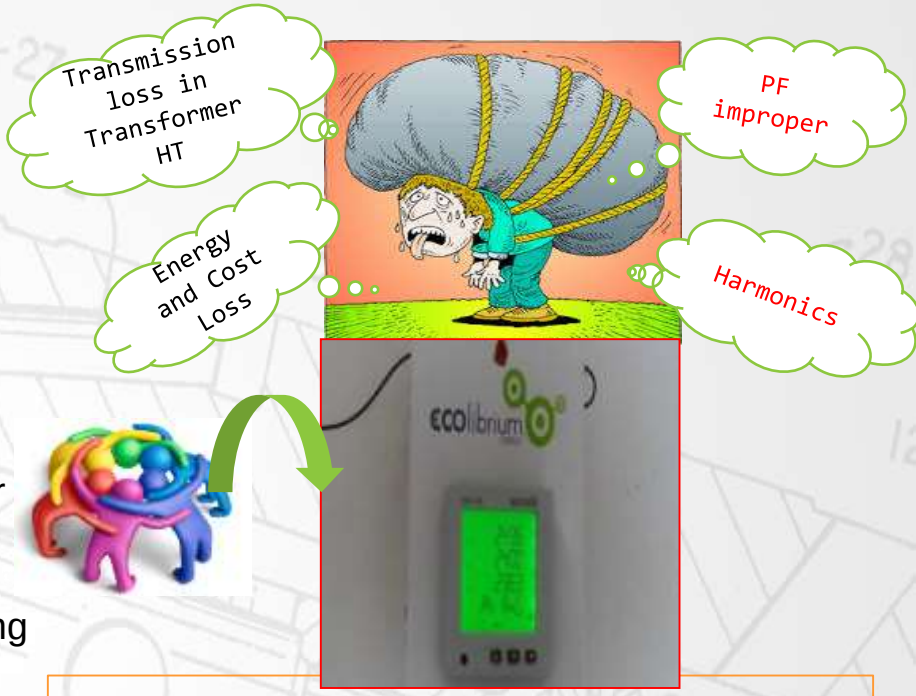
Encon. No 7 Energy Losses Reduction- HT Incomer/LT Panel

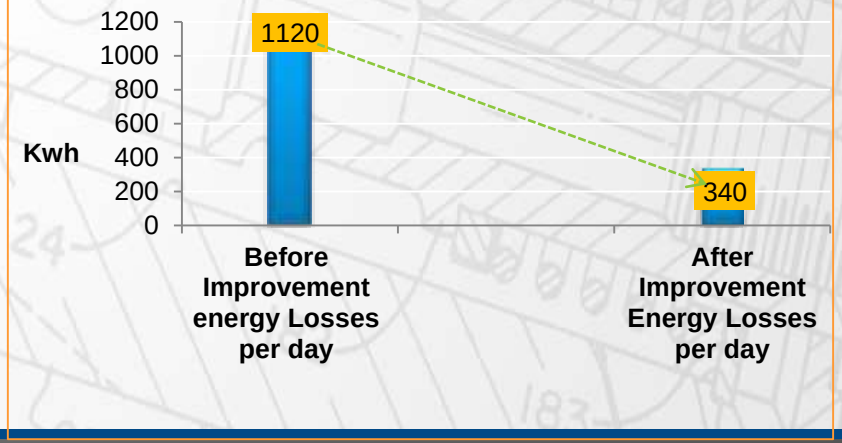
Goal : Reduce Losses from HT Incomer to MV Panel

Problem Statement: Daily 1120 Kwh. lost with or without Load

Action :. Using Ecolibrium meter, following actions are taken after mapping of losses.

- Faulty capacitor indentified and new one replaced
- HT Incomer Cable Moisture and ohmic very less , heater bank added on the VCB
- Tr. Secondary Bus duct vibrations and Noise heard during full load , properly supported and maintained Bus duct
- Found high Temp on incomer ACB , incomer terminals Burnt .Removed defective New 1600 Amps ACB provided .Predictive and preventive measures appended.





Savings: 0.93 Lac kWh Rs. 5.53 Lac

Investment : 0.45 Lacs.

Encon. No 8 Chiller Plant –Energy Optimization by VFD Installation

Goal : Chiller Plant power reduction

Problem Statement : Found heat observed on the Cable and Motor , frequent cable and Motor Failure

Action Plan : VFD installed with 24 Hours operation in the chiller by speed reduction.

- ❖ Chiller pump 22 kw Motor working with VFD @ 45 HZ
- ❖ Cooling tower 11 Kw working with VFD @ 15 HZ
- ❖Condenser pump 30 KW working with VFD
- ❖ After above changed total full load amps reduced from 140 A to 98 Amps

Savings: 0.17 Lac kWh Rs 1.35Lac

Investment : 2.06 Lac.

220 Kwh/day
Reduction realized.
TOTAL VFD
INSTALLED – 21 nos

Encon no 9 ZERO INVESTMENT – Conversion From

Goal : Reduce the Fixed Energy Consumption

Problem Statement : Blower Fan Consuming High Energy Consumption

Action : Brain Storming of En con team resulted in change of all Air Blower Fan and AHU Motor's Convert from Delta To Star Connection.

Benefit :

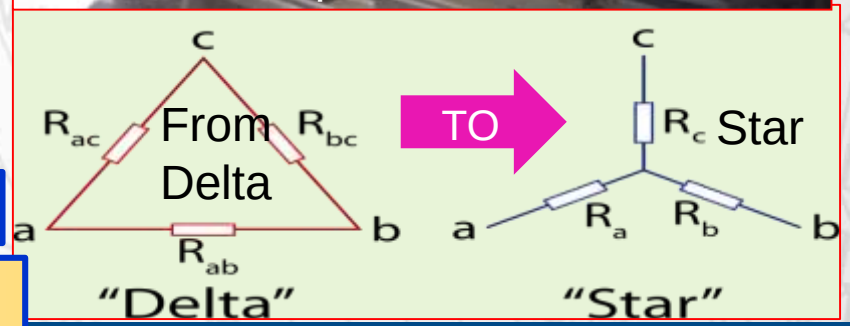
❖Current reduced from each motor by10 Amps for a motor Capacity of 22 KW

❖ Reduction in voltage Drop , improvement of power factor

❖Motor Operating efficiency improved


Star Connection in AHU panel


Blower Operate Star connection



Savings: 0.083 Lac kWh Rs 0.65 Lac

Investment : Zero

Encon. No 10 AHU Efficiency Optimization & BLDC fan Motor

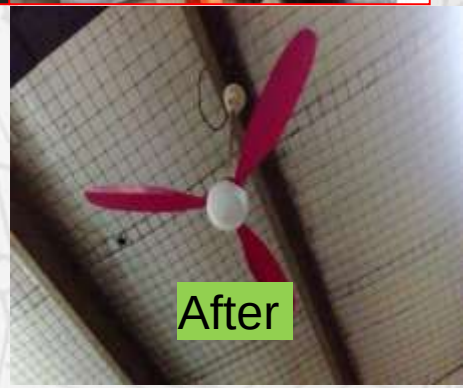
Goal : Improve the AHU Efficiency

Problem statement : Due to Insufficient air Flow quantity Cold Room Temperature not met the Specific Limit

Action : AHU internal and external coil cleaned by Jet Cleaner machine instead of Manual cleaning by use Detergent powder

Benefit :

❖After Cleaned improved the AHU delivered air quantity , Increase the CFM , Maintaining the Cold room Temp. 25 Degree , Reduce the Blower Fan Current reduction @5% , VAM Chiller Outlet Temperature increased from 7 Degree to 10 Degree During day Hours and Night Hours 14 degree.



1. Less Power Consumption Super Fan has been provided at Canteen Dining Hall
2. DC 4 W 20 N's of Fan provided at 1st level
3. High speed
4. Common Remote control operate with all Fan
5. Various speed Control
6. Less power Consumption

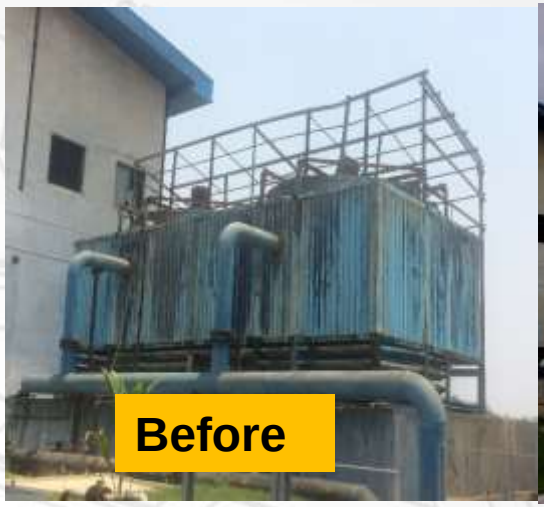
Savings: Rs 0.074 Lac kWh Rs 1.0 Lacs
60 MT Bio briquette reduction
Cost saving 3.42 Lacs

Investment : Minimum cost (< 0.20 Lacs)

ENCON SAVING PROJECT 11 Cooling Tower Retrofit

Why Project Selection : High Power Consumption and In efficient operation

Action : converted into square Type Direct Driven FRP cooling tower with FRP fan Blade ,Use of Honeycomb Fills, Energy Efficient low speed motor. After Installation drift and water losses reduced .



Each motor 12.5 Kw @ 20 Amps Taken with 10 Hz low Efficiency operate the Cooling Tower

Each motor 10 Kw @ 12 Amps Taken run with 30 Hz, Night Hours Turn off ONE Cooling tower

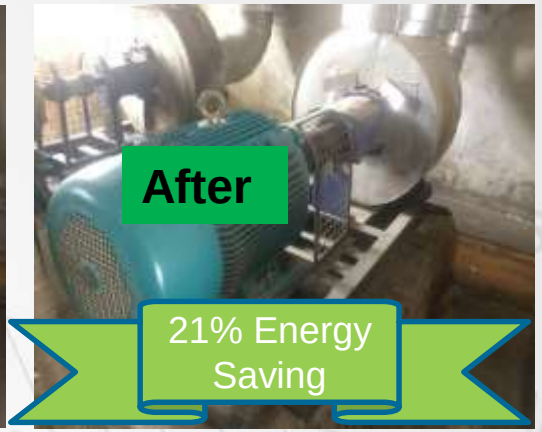
PAY BACK	INVESTMENT : 12.5 Lakhs Month : 30
COST	SAVING : 52416 Kwh , 3360 KL Water ,INR 4.64 Lakhs UNINTERRUPTED PRODUCTION .

ENCON SAVING PROJECT 12 IE3 CONVERSION

Improve the Motor Efficiency

Why Project Selection : High Energy Consumption

Action : Upgrade from Inefficient Pump cum motor assy to IE3 Energy efficient pump without compromise on process parameter such as pressure , flow rate pump header and suction line



Existing Pump

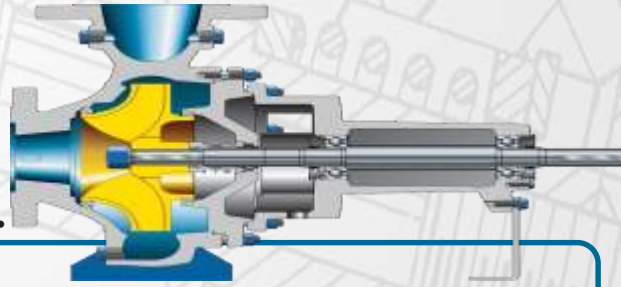
41 amps @ 50 Hz

Energy Efficient Pump

32 Amps @ 50 Hz

Bronze CC480K-

GS / LTB2 with Copper Rotor.



PAY BACK

INVESTMENT : 1.87 Lakhs **MONTH : 5**

COST

SAVING : 52416 Kwh INR 4.61 Lakhs

ENCON SAVING PROJECT 13 VFD with IE3 Motor

Why Project Selection : Chiller Plant Energy Consumption High

Action : Allow Accurate output of Voltage and Current ,select Different range of speed and depend on the load Requirement , Lower Speed ,No starting Current During power failure Genset load slowly increase . No compromise on Process parameters .

Without VFD Operate In efficient Water Pump

22 Kw 50 HZ @ Normal water pump 41 Amps

22 Kw 38 HZ @ Energy Efficient water pump 22.5

PAY BACK

INVESTMENT : 0.80 Lakhs MONTH : 4

COST

SAVING : 26208 Kwh , INR 2.30 Lakhs

ENCON SAVING PROJECT 14 Evaporative Air Cooler

Why Project Selection : Air Blower high power consumption

Action : Replacement of High volume Evaporative Heavy Duty Industrial Cooler installed at 5 different location and removed the 60 kw Centrifugal air Blower . Air cooler of 30000CMH with power Capacity 1.1 kw ,serves with Delta T of 4-5 Deg.

3 no's 20 kw Motor

15 Hours operation

Total energy Losses 45670 Kwh @ 4 month

PAY BACK	**INVESTMENT : 3.90 Lakhs Month : 19**
COST	SAVING : 26950 Kwh@ 4 Month INR 2.39 Lakhs

ENCON SAVING PROJECT 15 Heat Treatment High Bay LED

Project Selection : Lighting Load optimization by LED Lights in Heat Treat shop from Florescent Lamp due to Low Illumination level, Freq Bulb Failure ,lighting load high.

Action : 60 no's replacement of 36w Florescent lamp (2.1 kw) to 150 w High bay LED fitting 8 No's

Before

After

60 No's of 36 w Florescent lamp Illumination at entire Shop floor

8 No's of 150 w High Bay LED Lights

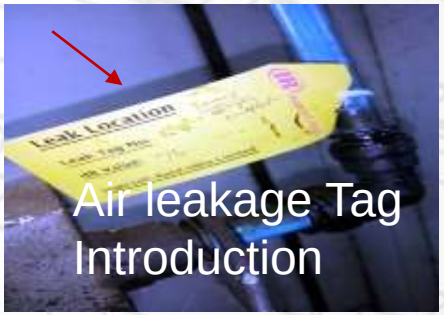
PAY BACK	**INVESTMENT : 1.75 Lakhs Month : 7**
COST	SAVING : 33814 Kwh , INR 2.97 Lakhs

ENCON SAVING PROJECT 16 Compressor Air Optimization

Project Selection : Compressor Energy optimization by analysis of load pattern and Leakage reduction.

Action : Based Air Audit ,started the optimization work with

- **68 points Air leakage arrested**
- **Damaged Compressor main header pipe line replaced with FRP Coated**
- **After rectification compressor energy saved**



Air leakage Tag Introduction

PAY BACK	**INVESTMENT : 1.65 Lakhs Month : 10**
COST	SAVING : 21000 Kwh , INR 1.86 Lakhs

OTHER ENCON PROJECTS (Minimum saving)

List Of projects	Photo Copy	Year Of Implementation	Annual Electricity Saving	Investment	Pay Back
Install the Star rated Air conditioner at Tool room, Application center . Server & CMM	 	2016-17	16200 Kwh 1.43 Lakhs	2.12 lakhs	17 M
Condenser feed water pipe line completely insulated properly with heat resistance wol and aluminum sheet gladding		2016-17	25 Ton of Bio Mass Briquette 1.42 Lakhs	0.75 Lakhs	6 M
BLDC 25 W fan 30 No's installed at shop floor, canteen Dining hall, security office, worker rest room and removed 70 w celling fan.		2016-17	5640 Kwh 0.49 Lakhs	0.68 Lakhs	16 M

OTHER ENCON PROJECTS (Minimum saving)

List Of projects	Photo Copy	Year Of Implementation	Annual Electricity Saving	Investment	Pay Back
❖ Heat Treatment Vacuum cooling tower Water Pump conversion to IE 3 Energy Efficient Improve the motor Efficiency from 64% to 86 % , ❖ A/C Condenser Fan , Toilet Exhaust Converted in to Energy efficient Axial Fan	 	2016-17	10964 Kwh 0.97 Lakhs	1.28 Lakhs	16 M
Pump Calibration machine Identified Diesel leak in fip at running condition with help of improved LED Lamp		2016-17	7488 Kwh 0.66 Lakhs	1.25 Lakhs	22 M
2 Ton spilt A/C continues replacement of Smaller capacity of bottle cooler for Raw Chemical storage		2016-17	5400 Kwh 0.478 Lakhs	0.65 Lakhs	16 M

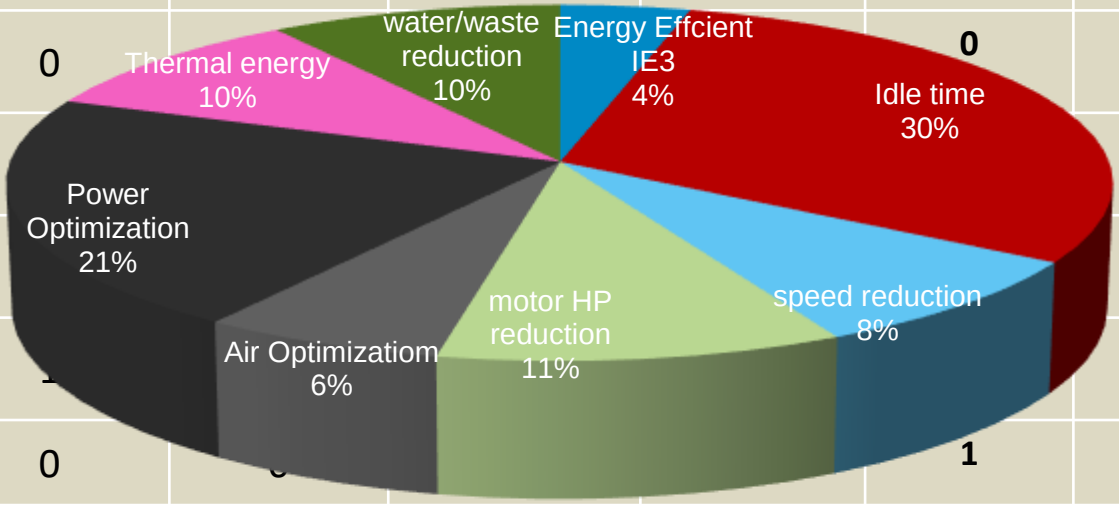
ENCON PROJECTS-ZERO INVESTMENT

List Of projects	Photo Copy	Year Of Implementation	Annual Electricity Saving
CNC Machine's Idle Hours reduction thru Logic Modification - Akshya grinding machine Lube Oil pump running Hrs reduction , Akshya gun drill Coolant pump , Twin flushing machine		2016-17	Power saving per annum 62596 Kwh
Motor Elimination - STUDER S21 NEW chiller unit circulation pump removed and coolant line directly connected to main pump. Micrometric grinding machine 1no's of coolant pump removed and put the butterfly valve		2016-17	Annual saving 27242 Kwh through motor elimination machine's and utility
Heat Treatment SQF Cooling tower Temperature Controller installed		2016-17 ,	Power saving per annum ~ 10800 Kwh
Oil Mist collector Air always ON condition , Circuit modification end of the cycle Turned ON the Valve and open the Air		2016-17	Annual Power Saving 6552 Kwh
Automatic Door closure only for material movement, circuit modified material with man only sense sensor until can't open the door		2016-17	Average per day 10 Times 1.81 * 10 = 18.5 Kwh/ Day * 26 Days = 478 Kwh and Biomass briquette 10 ton saving

ENCON TREND CHART

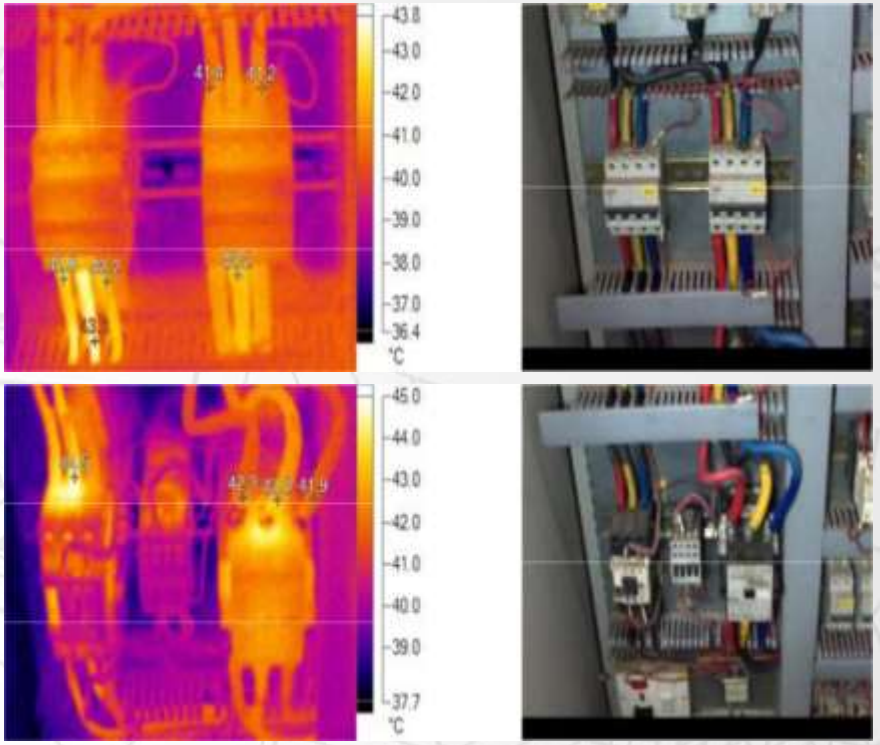
Encon. Category	2012-13	2013-14	2014-15	2015-16	2016-17	Total
Energy Efficient Conversion (IE3)	0	0	0	0	4	4
Idle Time Reduction	2	4	12	[illegible]	4	28
Speed Reduction	0	2	[illegible]	[illegible]	1	8
Motor HP and Capacity reduction	2	[illegible]	[illegible]	4	2	10
Optimization of Air	1	1	0	2	2	6
Power Factor Improvement	0	[illegible]	[illegible]	[illegible]	0	3
Power Optimization	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20
Thermal Energy Reduction	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9
water waste Reduction	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9
Renewable Energy	0	[illegible]	[illegible]	[illegible]	1	2
Star rated A/C	0	0	0	0	2	2

TOTAL 101 Encon. Improvement Various Category



PREDICTIVE MAINTENANCE - Thermography

- Use of Thermal Camera to detect heat loss/insulation damage.
- Observed SQF Power Contactor R & B phase Terminal Temperature
- Thermograph used for all Electrical panel, BBT and CNC Machine Control panel
- Thermograph test is incorporated in periodic check.
- High priority thermal image immediate Corrective action
- 6 month once Review critical points completed and periodical Maintenance work followed by Encon. Team



Stanadyne

Stanadyne India private limited

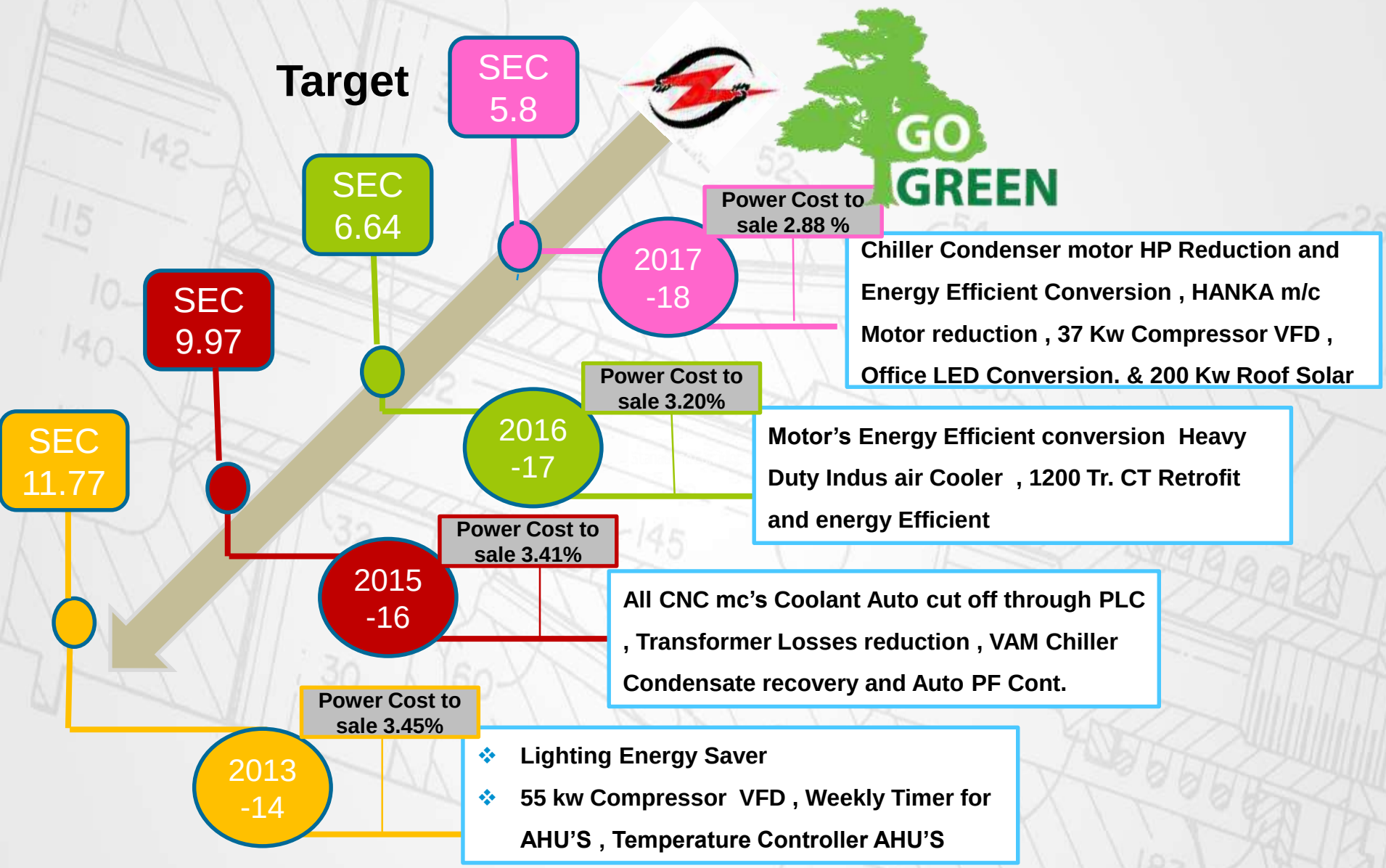
DOC.NO:	TS/FO/MNT/
REV.	
DATE:	1/3/2016

PREDICTIVE MAINTEN… …ITICAL MACHINES FEB-2017

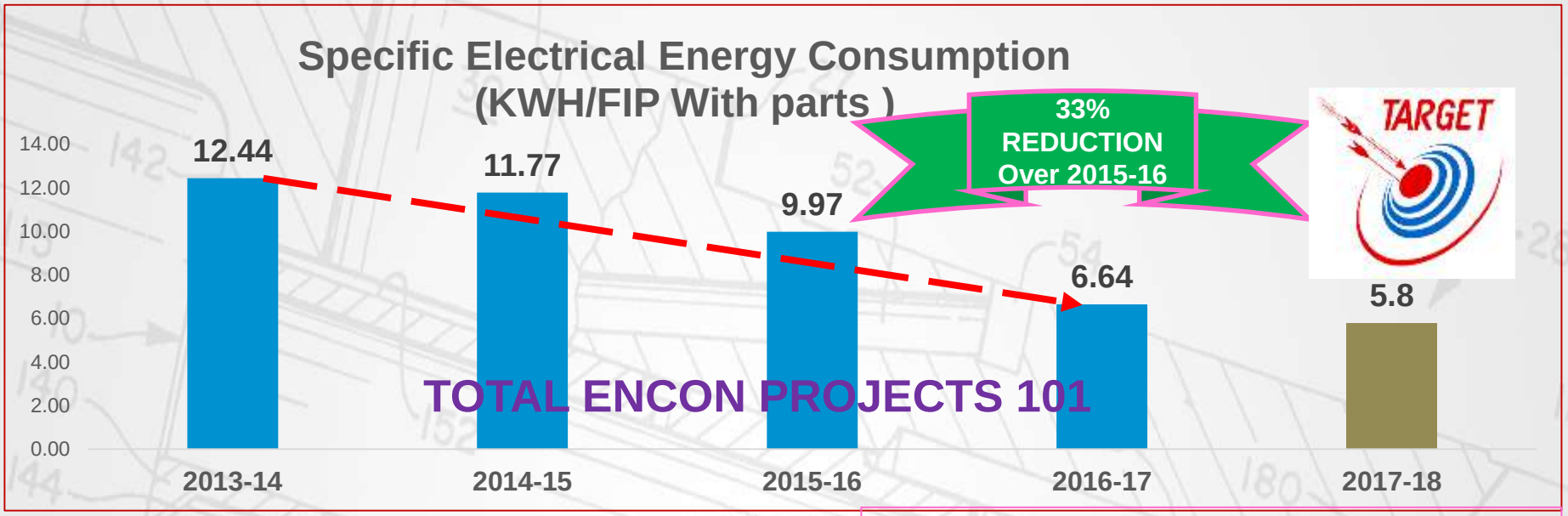
SL.NO	DESCRIPTION	LOCATION	PRIORITY LEVEL	BEFORE TEMPERATUR…			AFTER TEMPERATURE	STATUS	Verified
1	To HT Incomer-Incoming busbar	MV PANEL	HIGH	78			-		
2	To Compressor Incoming Cable		HIGH			…May-17	45	Completed	
3	To UPS MP Switch		H…		…ness	May-17	48	Completed	
4	EB Incomer				-	Nov-17			
5	Bus Coupler Back Side			…3	-	Nov-17			
6	UPS MP Busbar			90.8		Nov-17			
7	Capacitor - 11		…IGH	74.4	cable tightness	Apr-17		completed	
8	Capacitor - 13		HIGH	79.6	cable tightness	Apr-17		completed	

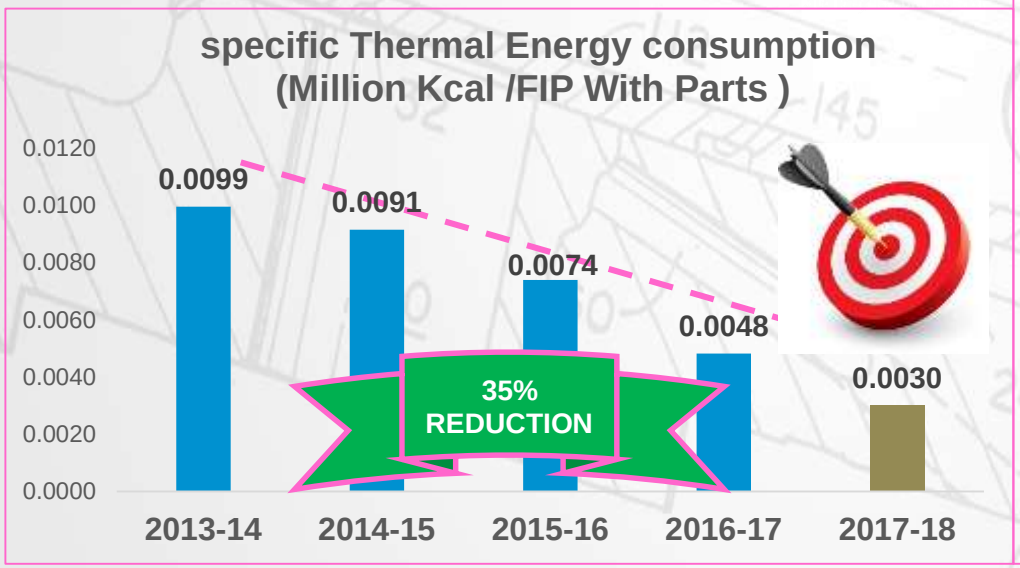
Thermography Corrective Action Report

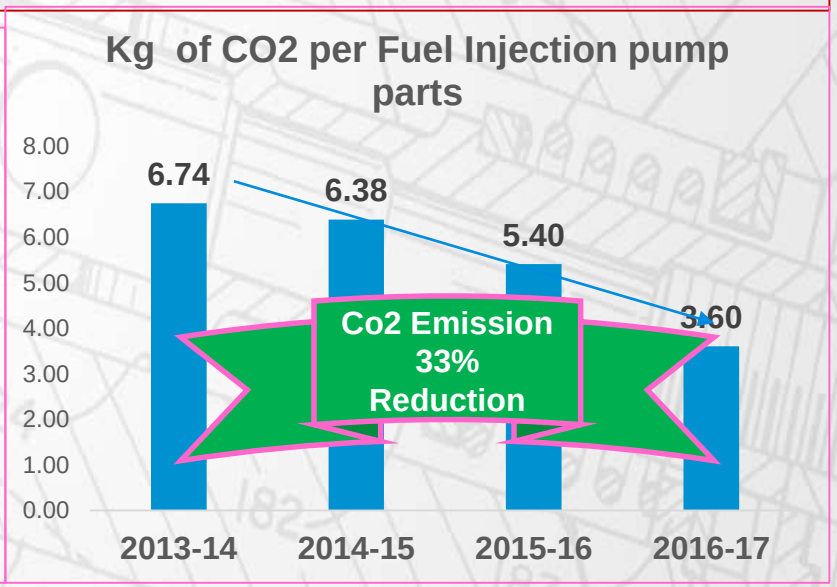
ROAD MAP TO ACHIVE ENERGY REDUCTION 2014-17



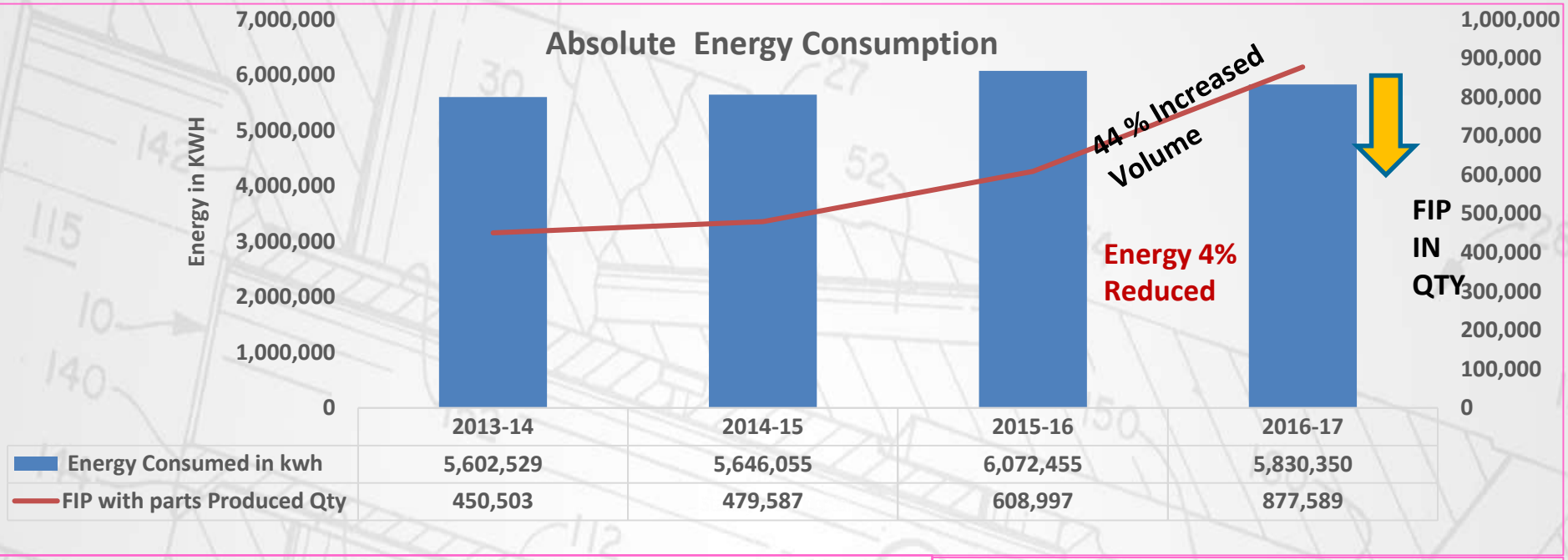
SPECIFIC ENERGY CONSUMPTION TREND



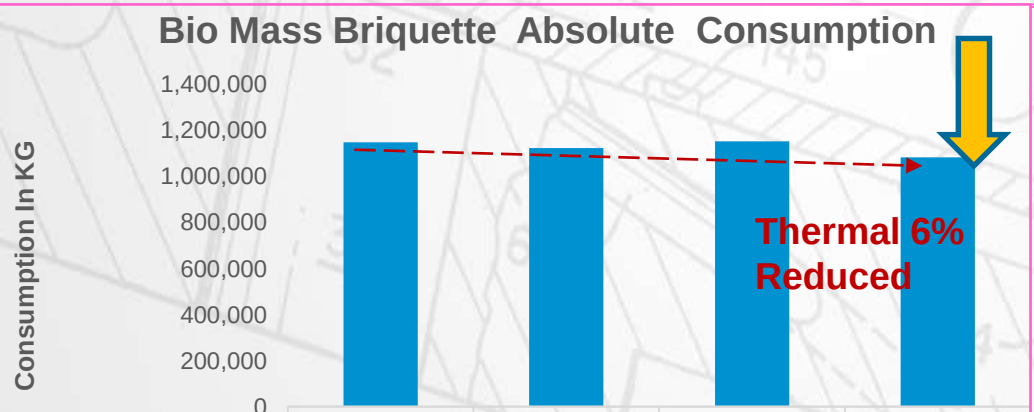




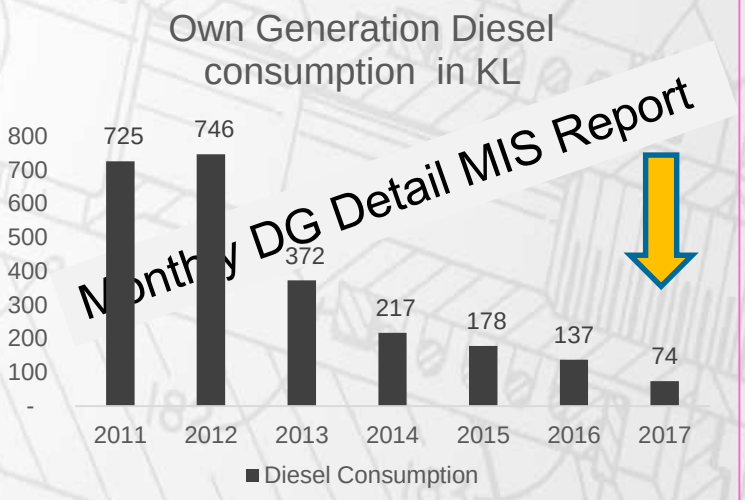
ABSOLUTE ENERGY REDUCTION TREND



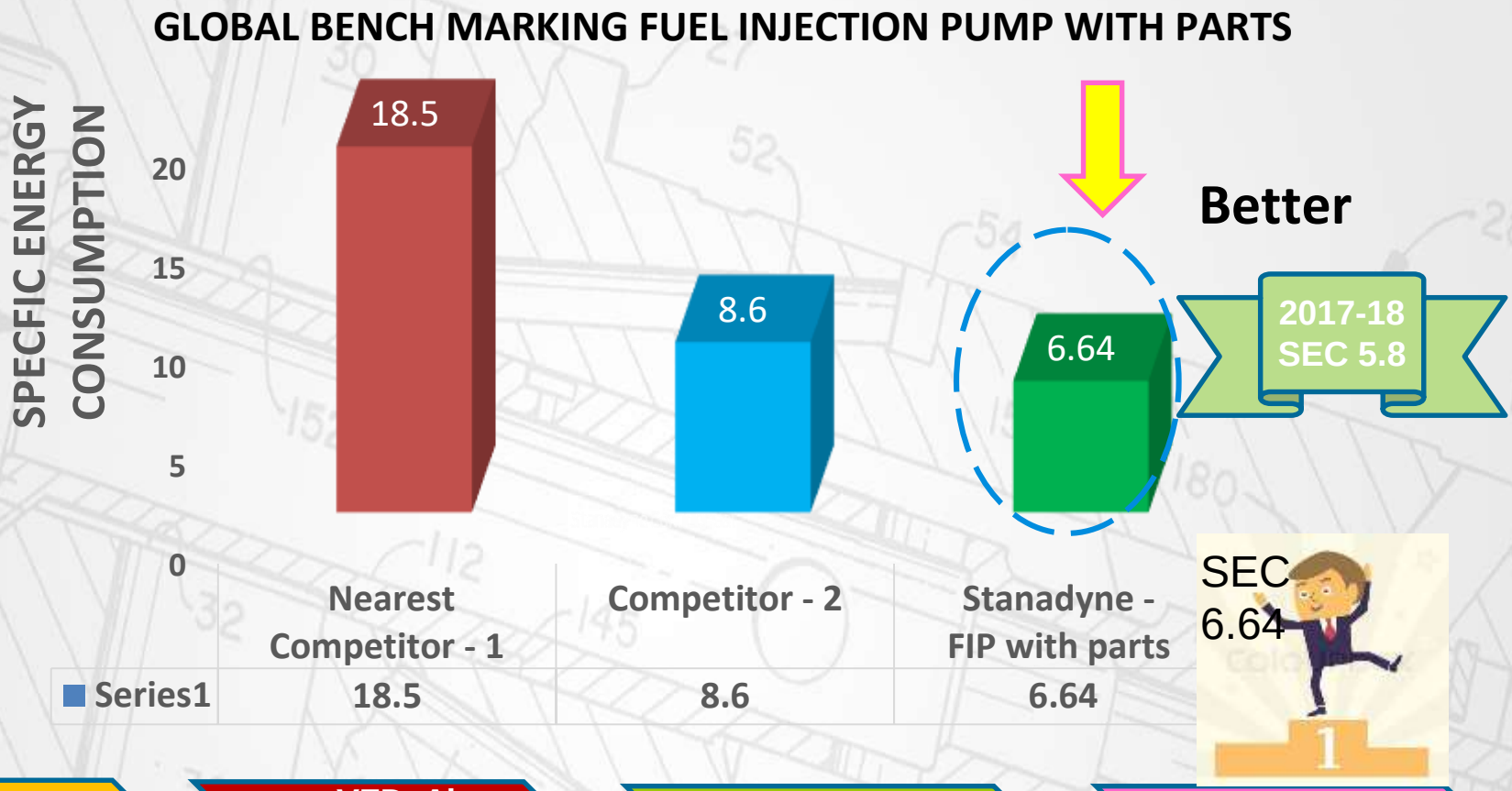
	2013-14	2014-15	2015-16	2016-17
Energy Consumed in kwh	5,602,529	5,646,055	6,072,455	5,830,350
FIP with parts Produced Qty	450,503	479,587	608,997	877,589



	2013-14	2014-15	2015-16	2016-17
Bio Mass Briquette Consumption in kg	1,148,829	1,123,434	1,152,946	1,083,022



GLOBAL BENCH MARK -SEC



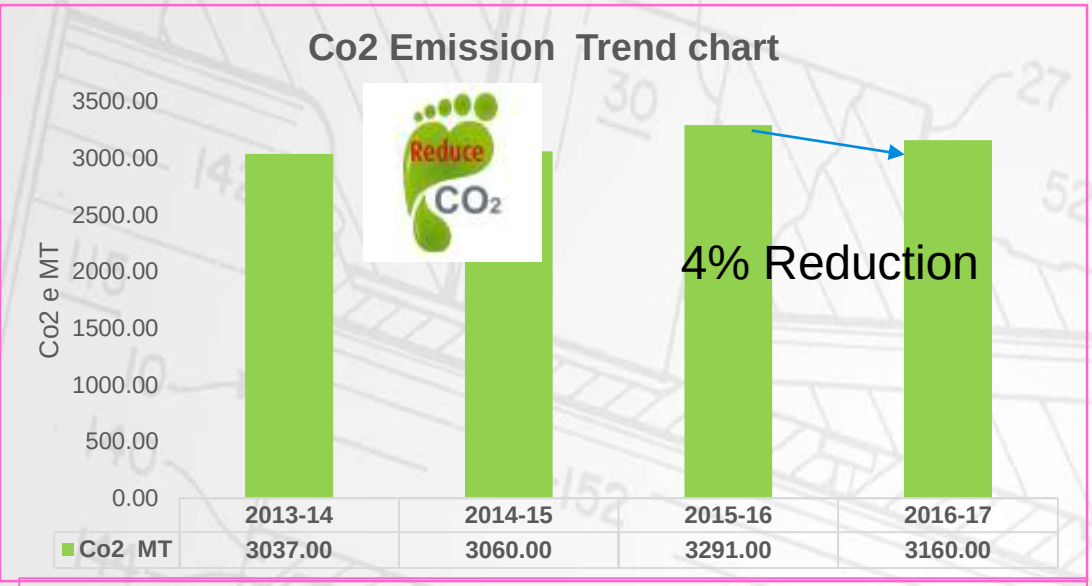
Energy Efficient Technology

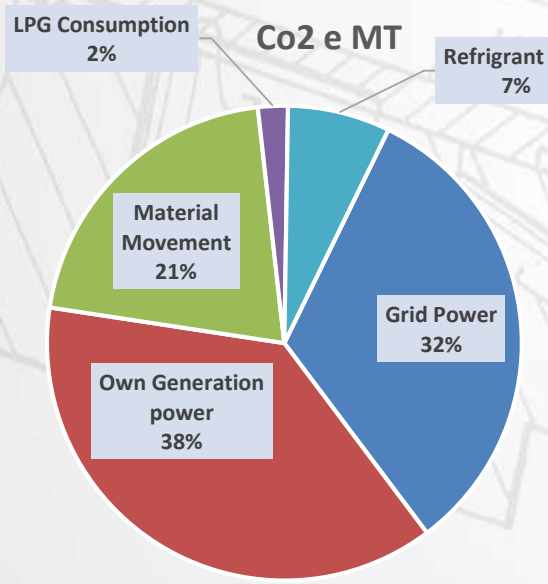
VFD, Air Compressor Optimization , High Volume Air cooler

Motor Elimination and Idle Hours Elimination

Heat Recovery and Thermal Loss prevention

GHG INVENTORISATION





Action Encon. Project

- **Dedicated EB Power Diesel reduction**
- **Modify the Transport layout**

- **Scope 1 Emission Debit :**

State Grid Power in Kwh.

- **Scope 2 Emission Debit** :

Diesel Consumption for DG set, LPG for Canteen Kitchen Cooking ,Diesel Consumption for Vehicle material movement.

- **Scope 3 Emission Debit** : Diesel Consumption for Furnace Boiler and Coal power , Refrigerant Gas for A/C

Emission Credit

- ✓ **Wind Power Used @ 85%**
- ✓ **Bio Mass Briquette 95 % Utilization /month**
- ✓ **Regular Tree Plantation Inside factory**

Innovative Project 1 - Housing manufacturing line

❖ **TITLE OF THE PROJECT:**

Conservation of energy in Housing manufacturing line

❖ **Current set Up** : Housing machining consists of HMC Machines, ***which consume 40kw power*** and also low speed/ low productive

❖**WHY Choose these Machines :** Idea Generated by Stanadyne India private Limited discussed with Cross functional Team through brain storming, on how to Reduce the Power consumption & cost and SEC. The purpose of this project is to Mainly Focus in energy reduction to target the energy requirement within the existing demand. new project is implemented within the existing Power transformer & Machine UPS in built connected load.

Mori –Power 40kva

New M/C ing Cell- Implementation of Lesson Learnt

❖ **Machine selection –** selected 5 axis CNC VMC machines are of ***20KW connected load and high speed machines*** which can yield 300nos/day.

❖ **Tangible Benefit-** Annual power saving 0.24 Million Kwh. /Year

❖investment for the Power Transformer, UPS 750 KVA & 1500kVA Genset with higher capacity for additional of 5 no's housing machines saved

❖**Specific Energy Reduction -** 2.06KW /Housing as against bench mark of 9 KW / part. In house Team selected mc and MC OEM with Tool depth Function , safety function, breakage prevention function ,Energy Saving function, Idle time sleep mode function, etc so as to Keep SEC well under bench mark level.

New M/C ing Cell- Implementation of Lesson Learnt

Implementation of Lesson Learnt-Power

- Less Power-High Speed
- Mist Collector-Clean Air
- Swarf' s -Auto Disposal
- User Friendly Logic
- Auto Retraction-In Power Failure

Total Cost saving :

- yielded 300 Amps reduction also contributed for the above project savings
- Power Cost saving – 16.56 Lac.
- Other Saving - 32 Lac.

Transvector Nozzle

Housing area LED Lights

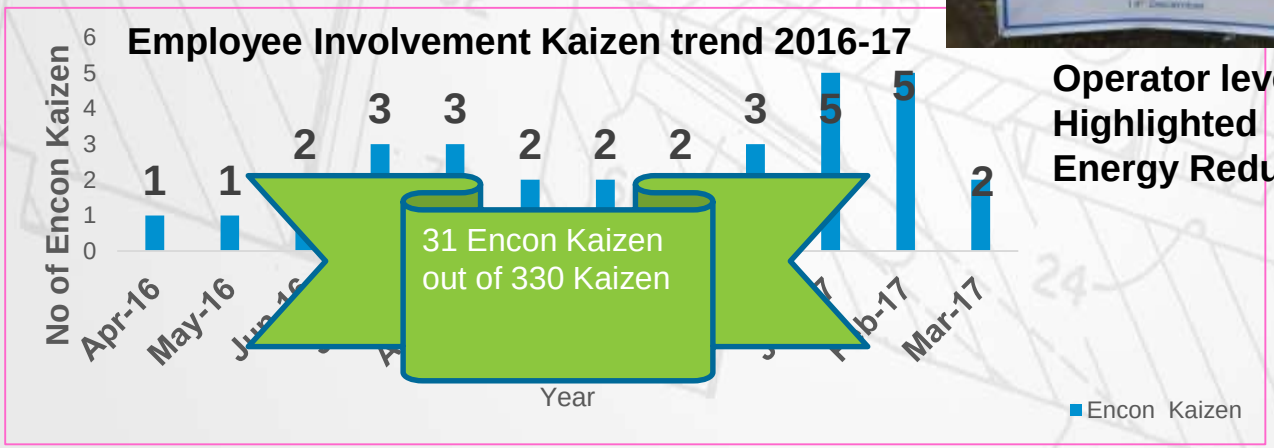
Energy Efficient Pump

Energy meter

TOTAL EMPLOYEE INVOLVEMENT

Energy Kaizen 1st price Reward to Encon. members

Encon. Team 2nd prize Continues won



Operator level Highlighted Energy Reduction

- VAM Chiller water setting Temp. increased 3rd shift
- Cooling tower manually shut off during 3rd shift and Sunday minimum production
- AHU VFD Speed Reduction by Operator start 3rd shift due climate control change
- No production AHU shut off
- Compressor pressure reduced

TOTAL EMPLOYEE INVOLVEMENT-Kaizen Reward

Employee participate Kaizen reward

Encon Team with Top Management

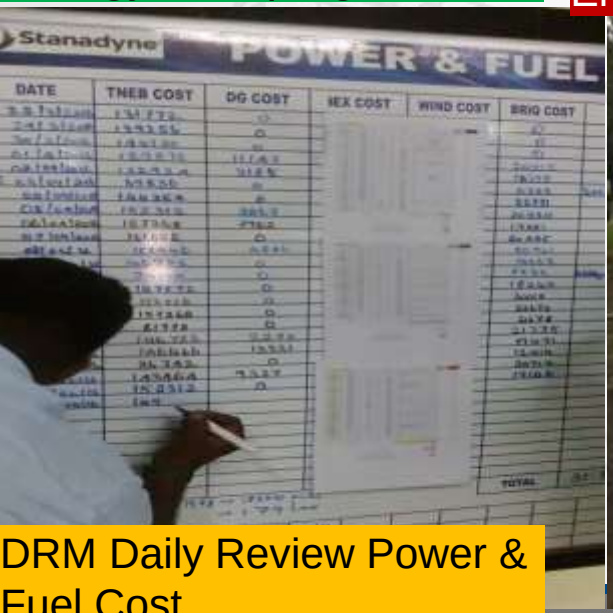
Encon Review with Top Management

Top Management Engagement on Encon Project Initiatives

Energy Campaign Board

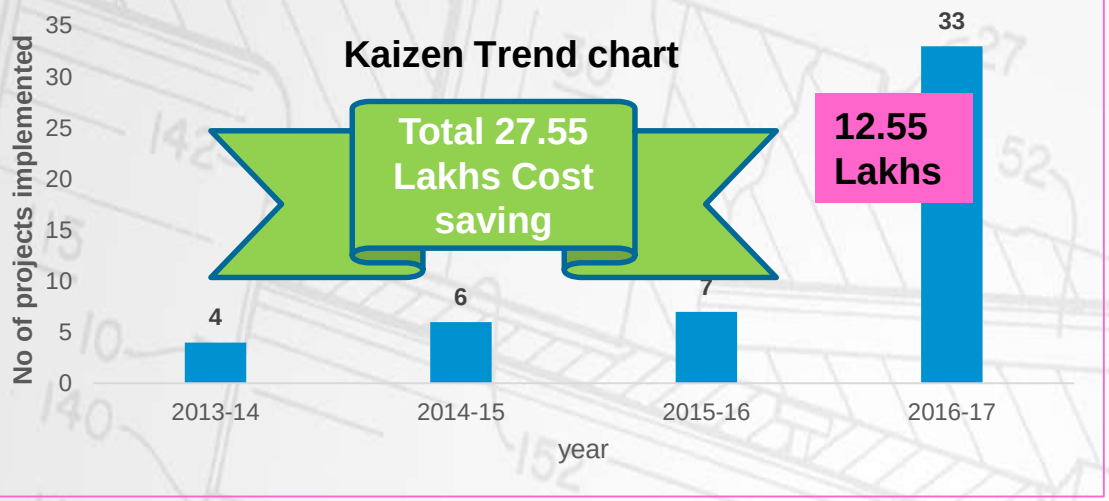
Energy Conserve. Kaizen 1st prize

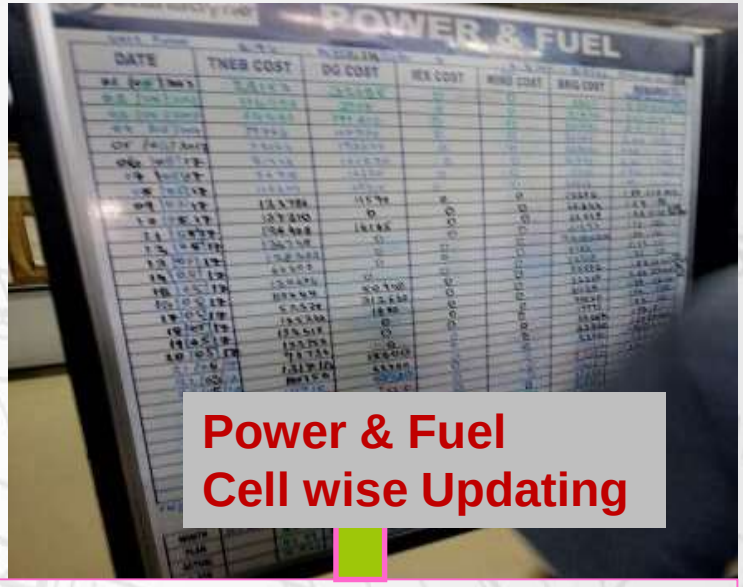
. Energy Conservation Day Encon Team Cash award and certificate



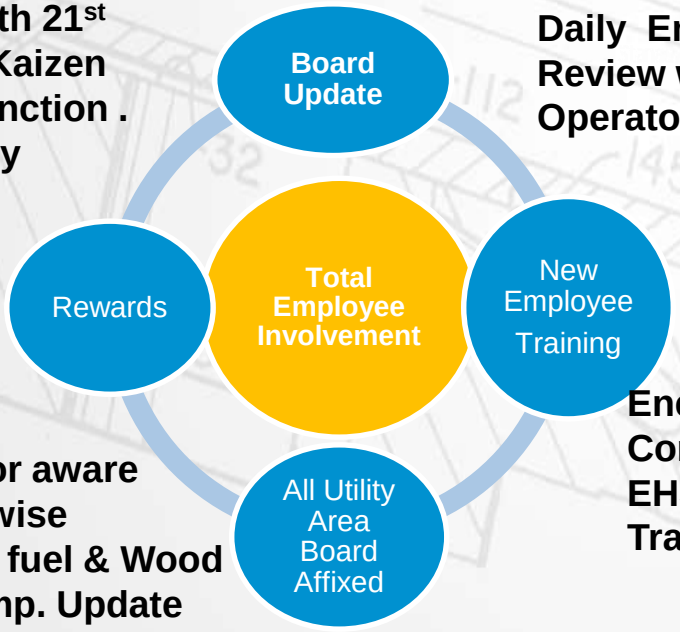
DRM Daily Review Power & Fuel Cost

ENCON TEAM WORK





Every month 21st Celebrate Kaizen Reward Function . Awarded By Operation Director



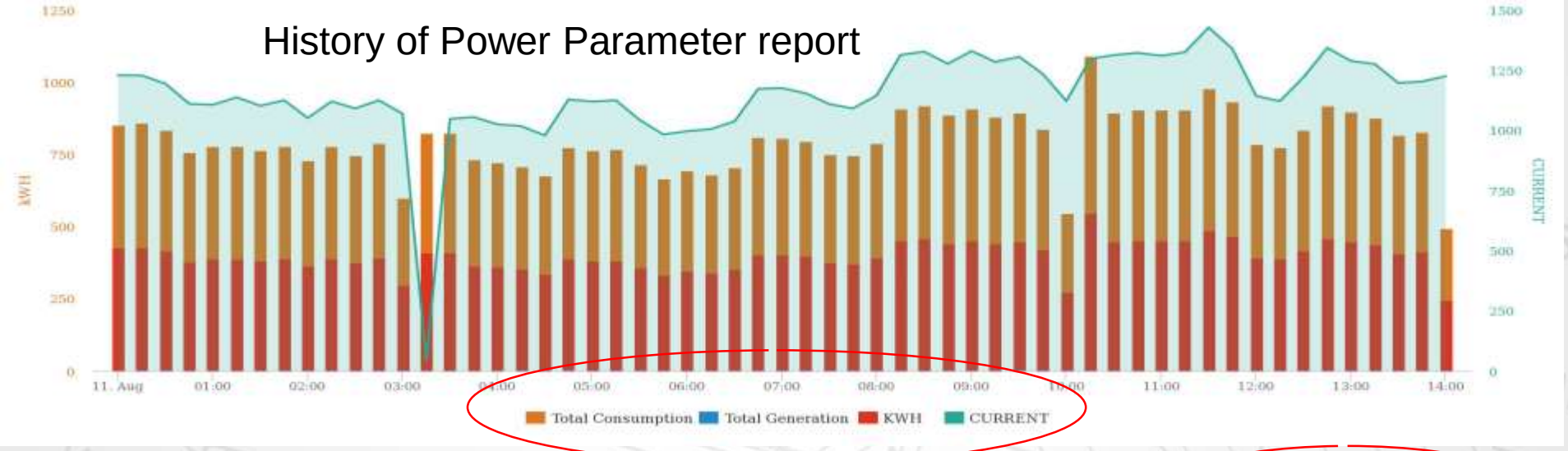
Daily Encon Review with Operator

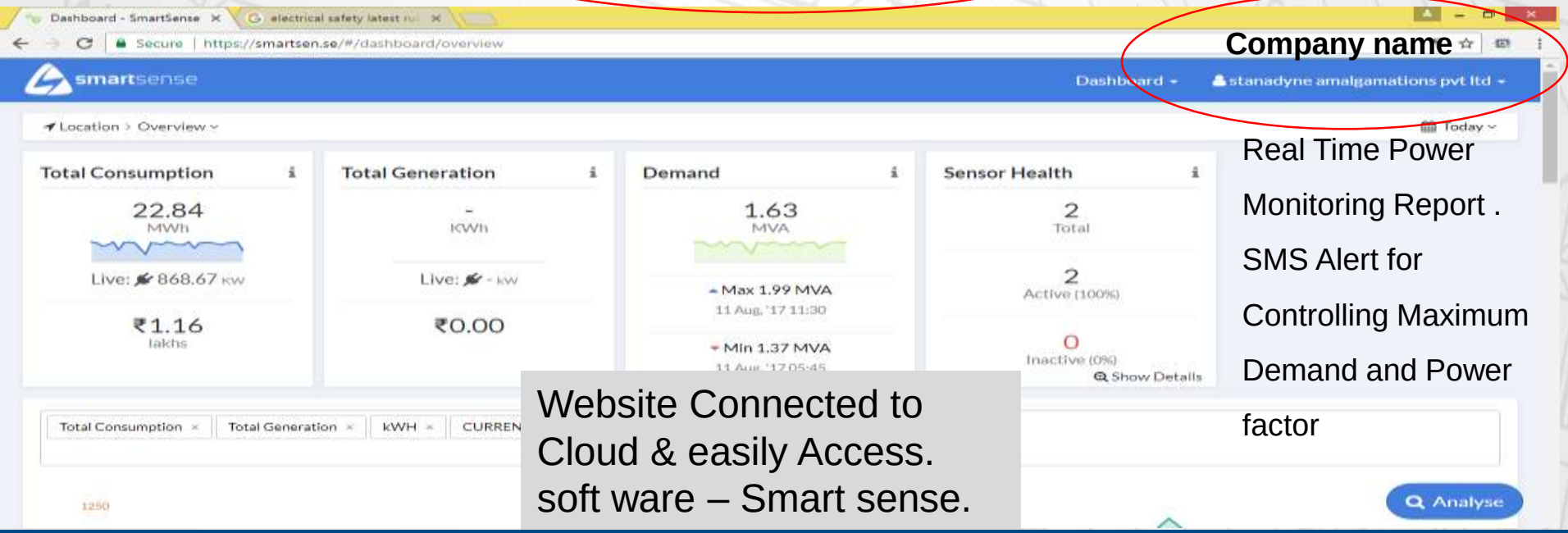
Energy Conserve EHS Training

Operator aware Month wise Power , fuel & Wood Consump. Update

Daily Power and Fuel Cost Updating on Daily review meeting , which is create the awareness on the all employee . Every one knows the daily power cost against our per day target . Daily review the Management meeting and reason for increase the power cost

ON LINE ENERGY CONSUMPTION -Sample Report





Company name

Real Time Power Monitoring Report .

SMS Alert for Controlling Maximum Demand and Power factor

Website Connected to Cloud & easily Access. soft ware – Smart sense.

ENCON IMPLEMENTATION METHODOLOGY

2016-17 – 300 Amps Reduction

Management Commitment

2017 -18 200 Amps Reduction

TARGET – 200 AMPS REDUCTION ENERGY CAMPAIGN BENCH MARK year of 2017

Target No 1- 200 Amps Eqv. Encon Challenges 2.53 Lakhs Kwh Annual Reduction
Target No 2 – En con team members 1 Kaizen per month linked to KRA

Encon Fund Approval Corporate	Encon Team . Identify List of Projects	Monthly Encon. Review with Team
Investment Project .	Zero Investment Project .	Each project Action and Target Date
Drive Project	Completed Q1	Share with Completed Project

STANADYNE'S CERTIFICATION

TÜV NORD

CERTIFICATE

Management system as per
ISO 14001 : 2004

STANADYNE INDIA PRIVATE LIMITED
No.98, Aranvoyal Village,
Thiruvallur District - 602 025,
Tamil Nadu,
India

Design and Manufacture of Fuel Injection Systems & Components

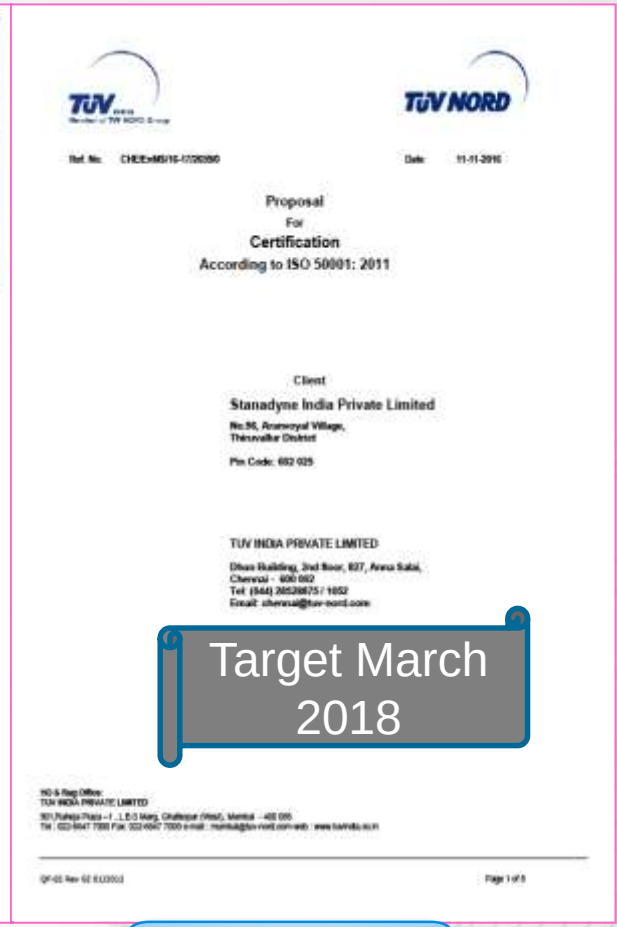
TÜV NORD

CERTIFICATE

Management system as per
BS OHSAS 18001 : 2007

STANADYNE INDIA PRIVATE LIMITED
No.96, Aranvoyal Village,
Thiruvallur District - 602 025,
Tamil Nadu,
India

Manufacture of Fuel Injection Systems & Components



TÜV NORD

Proposal
For
Certification
According to ISO 50001: 2011

Client
Stanadyne India Private Limited

TUV INDIA PRIVATE LIMITED

Target March 2018

ISO 140001 & 18001 Certified

ISO 50001 :2011Certification Proposal

GREEN-CO CERTIFICATION PROPOSAL and ENCON INVESTMENT

GreenCo
Green Company Rating System

How Green is your Company?

Confederation of Indian Industry
CII – Sohrabji Godrej Green Business Centre
Survey No 64, Kothaguda Post, Near Hitech City, Ranga Reddy Dist., Hyderabad – 500 084, INDIA
Tel: +91-40-6418 5111 Fax: 91-40-2311 2837
Email: greenco@cii.in
Website: www.greenbusinesscentre.com

N Muthusezhiyan
Principal Counsellor

7th Sep 2016

To,

Mr Murugesan
Director Operations
Stanadyne Amalgamations Pvt Ltd.

Dear Mr. Murugesan,

Proposal for Implementing
GreenCo, Green Company Rating System

Thank you for the interest expressed in availing the services of CII – Sohrabji Godrej Green Business Centre (CII – Godrej GBC) to implement GreenCo, Green Company Rating System at Stanadyne Amalgamations Pvt Ltd., Chennai unit. We are pleased to submit our proposal on GreenCo Rating for your kind consideration.

1.0 Introduction & Background

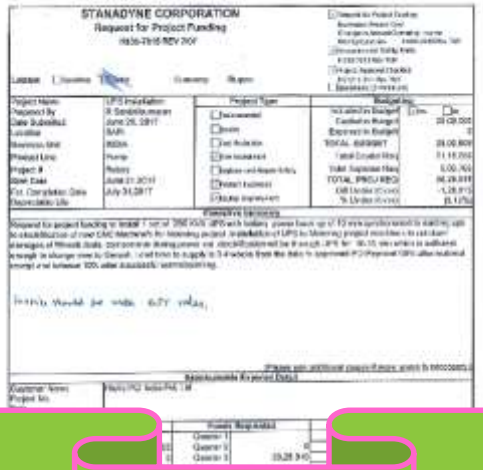
Organizations across the globe agree that Resource scarcity & Climate change will transform how Businesses are conducted in the years to come. They have to deliver the growing population who are constantly seeking a better lifestyle, from a planet with finite resources, many of which are now rapidly running out. Going Green is no longer a philanthropic afterthought but an approach to embed more forward thinking and responsible business practice into how a business produces and delivers its goods and services.

A holistic view on how to make business practices more efficient and green opens several new opportunities that can help companies manage costs and gain the much needed competitive edge. As more and more companies appreciate the cost benefits of going green, a clear holistic mechanism was not available for evaluating their performance and gaps along with a growing need for expert insight. A step towards this direction is the launch of GreenCo Rating by CII, a "first-of-its-kind in the world" framework that provides guidance and leadership to organizations to tread the green path.

2.0 Objective

CII Godrej GBC has developed the ***GreenCo Rating System the "first of its kind in the World"***. The objective is to define and assess "How Green is your company" and highlight the way forward to facilitate world class competitiveness through Green strategies. The assessment provides significant value addition and direction to businesses in terms of Resource Conservation, Greener Value chain, superior Ecological performance and an enhanced Corporate Green Image. The framework adopts a cradle to cradle life-cycle approach to evaluate the activities of the company on the ecological front.

Confederation of Indian Industry
CII-Sohrabji Godrej Green Business Centre


STANADYNE CORPORATION
Request for Project Funding

2016-17 ENCON . PROJECT APPROVAL FROM CORPORATE

- **2016-17 Plant Turn over Rs. 1762 Million**
- **Encon Projects Invested Rs 1.9 Million**
- **Investment is 0.10 %**

2017-18 Encon Project Proposal

- **ISO 50001 Certificate 1.98 Lakhs (Mar 2018)**
- **Green Co Certificate – 6 Lakhs ,**
- **Encon. Projects 20 Lakhs , Total Proposal – 28 Lakhs**

ENCON PROJECTS- IMPLEMENTATION SAVING BENEFITS

	April 16	May 2016	June 2016	July 2016	August 16	Sep 2016	Oct 2016	Nov 2016	Dec 2016	Jan 2017	Feb 2017	March 2017
Plan-Amps	25	25	25	25	25	25	25	25	25	25	25	25
Actual-amps	25	25	25	25	40	48	26	20	25	20	20	8
Cumulative Amps	25	50	74	100	140	188	214	234	259	279	299	307

Stanadyne

TOTAL ENCON PROJECT WITH COST AND ENERGY SAVING 2013-17

Year	No of project	Annual Electrical Saving, Million kWh	Annual Electrical Cost Saving, Rs Million	Annual Thermal Saving, Million kcal	Annual Thermal Saving, Rs Million	Total Annual Savings, Million Rs	Investment Rs million
2013-14	16	0.47	3.40	69.00	0.24	3.63	1.04
2014-15	21	0.34	2.82	131.52	0.75	3.57	1.33
2015-16	28	0.40	3.18	752.31	1.02	4.21	1.54
2016-17	20	0.51	4.41	124.72	0.71	5.12	2.87
Total	85	1.21	9.41	952.83	2.01	11.41	3.91

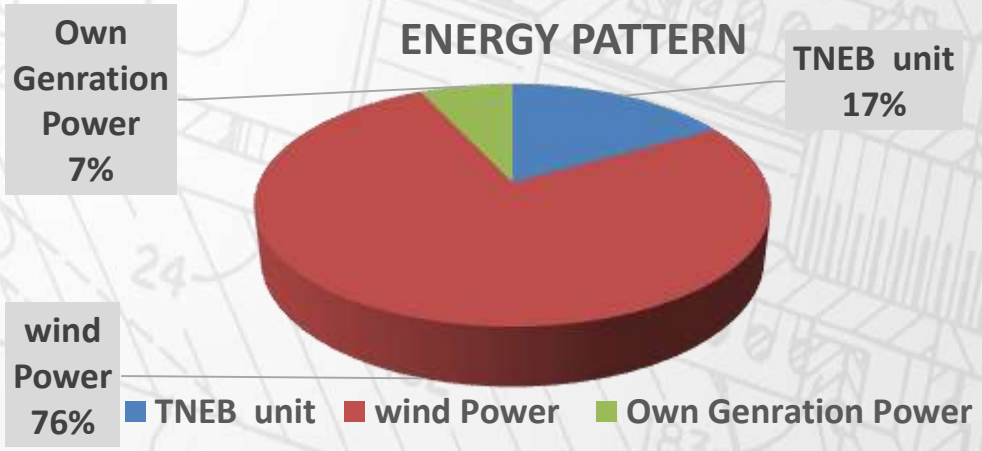
In tangible benefit-

- 1.Transfomer up gradation eliminated
- 2.VCB change eliminated
- 3.Cable and MV panel change avoided
- 4.Spending of 75 lacs been avoided
- **Tangible Benefit**
  - CNC M/c `s Idle Hours Eliminated
  - Equipment's with VFD working
  - Compressor Optimization
  - Energy Efficient pump conversion
  - Valuable Process change and Eliminate M/c
  - Motor Elimination
  - 5 Star A/C installation
  - Light optimization

Additional connected load- 100kw for 2016-17

RENEWABLE ENEGY SUBSTITUTION – WIND ENERGY

- Wind Power consumption at **Stanadyne India private limited**, is valued at Quantum of 0.55 MW/Hr for round the clock connected to the State Grid
- 80 % of Total demand is subdued with Wind Power
- Wind Source Available from June 2016 to April 2017 .
- Annual Wind Generation **47 Lakhs KWH**
- Annual Power cost saving **Rs . 48 Lakhs**
- Mitigation of co2 **56.4**



SOLAR DAY LIGHTING SYSTEM WITH TURBO

Description of the Project: **Advance Day Lighting solution product is Combination of high performance Prismatic lens with Light Diffuser, which is High impact UV Resistant polycarbonate lens.**

Feature: **High light Transmission , Uniform Light Distribution , Double/Triple glazed system for control the heat , Noise reduction & Long life**

Energy Saving Calculation **Equivalent Electrical lighting 900 watts . Total cost saving 2.29 Lakhs,spare cost 10% reduction**

Investment 2.48 Lakhs ROI- 12 months

200 Kw ON GRID SOLAR - Pipe Line project

Project Plan – 200 kw solar Roof top On grid power model CAPEX Target for Solar installation- 2018 Feb . Basic activity like Quotation Comparison and product selection , suppler evaluation every thing completed . Proposal for 2 X 100 KW on Grid Solar Power listed below

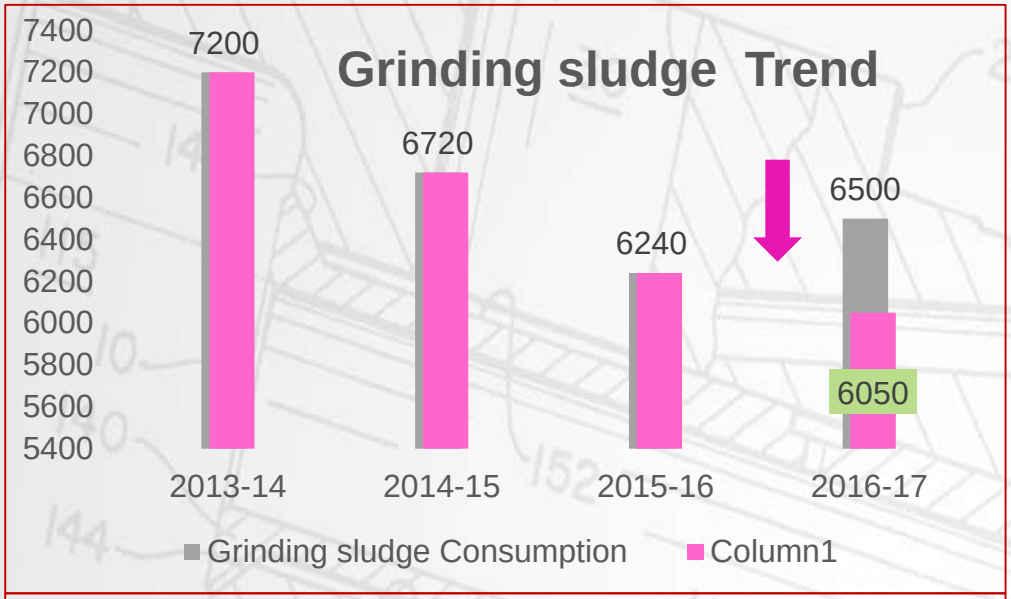
	Supplier -1	Supplier -2	Supplier -3	Supplier -4
Model	CAPEX	CAPEX	CAPEX	CAPEX
Capacity	2x100 Kw	2x99kwp	2x100kwp	2x100kwp
Cost	16034600.0	10616073.0	10764000.0	13900000.0
Installation	Included	1593900.0	936000.0	Included
ED	NA	NA	NA	NA
VAT/CST	5%	5% and Service Tax 14%	2% and Service Tax 14%	5%
Nett	16836330.0	12963922.7	12046320.0	14595000.0
Payment terms	50% Adv/40% against mat/10% after comm	50% Adv/50% against material dispatch	305 adv/10%/50% against mat/10% comm	30% adv/65% against mat/5% comm
Guaranted Power	3,21,720 kw hr	2,90,000 kw hr	2,90,000 kw hr	2,90,000 kw hr

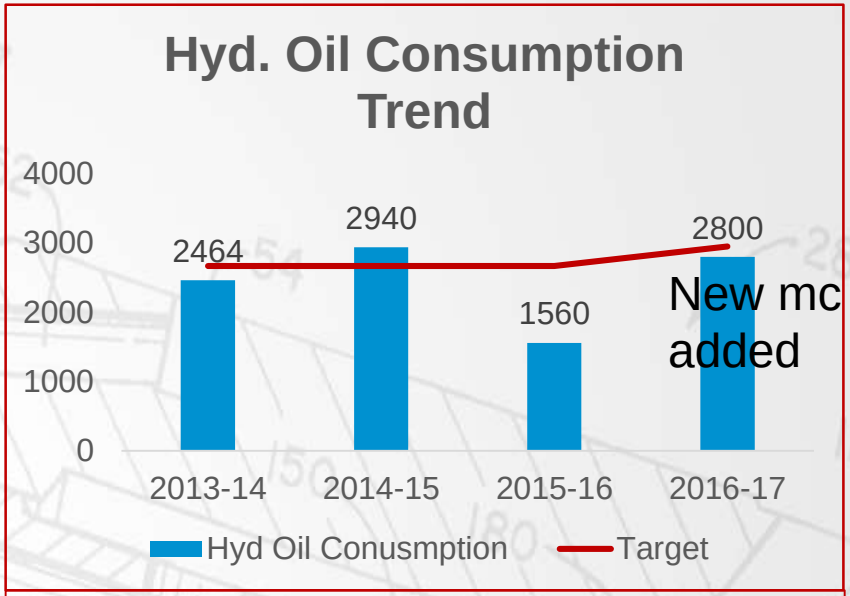
TARGET FEB 2018

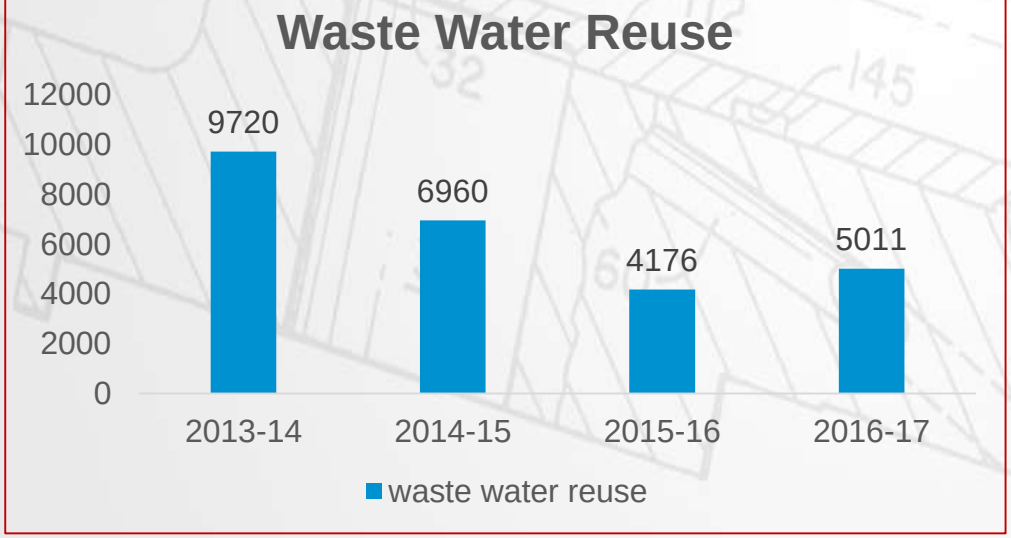
LIQUID WASTE UTILIZATION

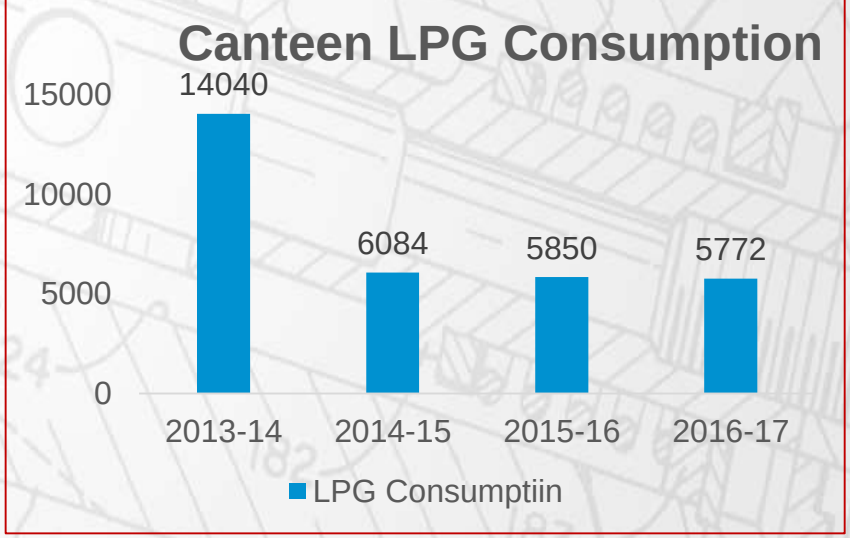
List Of projects	Photo Copy	Year Of Implementation	Annual Saving	Investment	Pay Back
Steam Trap Condensate water recovery and Utilizing for Boiler Feed water. Annually 15.6 KL of Condenser water collect from steam Trap and back to boiler feed water Tank		**2016-17**	**117 Million of Kcal Bio mass Briquette 1.71 Lakhs**	0.01	< 1 M
Oil skimmer has provided all CNC Machine's for skimming the Oil. Burr conveyor oil tank has modified segregate the oil at top layer and Burr kept stored bottom.	 	**2016-17**	**5 Liters of Hydraulic oil saved after modification, Monthly 150 liters** Water Based Coolant 3600 liters. Cost Benefit 0.42	1.85 Lakhs	1.25 M

WASTE CONSUMPTION TREND









GREEN SUPPLY CHAIN – BEST PRACTICES

Parts Localization to reduce lead time, Carbon Footprint through transportation and fuel consumption.

Description	Previous Source	Current source
Drive Shaft	China	India
Governor Cover	China	India
Housing	China	India
Sub Parts	USA	India
Various parts	USA	India

BENEFIT

Fuel injection pump parts Imported from china through ship , distance around 2980 Km . Development of Localized source of material supply helped to Mitigate Co2 Emission reduction by 26.2 ton per trip , similarly parts from USA To Localization will help to reduce 135 Ton of Co2 Emission reduced per trip .

Reduced 135 Ton per Trip of Co2 Emission

Total 156 Ton of Co2 emission Reduction

ENVIORNMENT PROJECT

Project No 1 : Eco Friendly Gen-set put into use as existing Gen-set had high fuel consumption and heavy white smote and oil leak. Installation of 500 KVA Electronic injection Gen-set delivers better Unit /Lit ratio 3.7-4.0 . Diesel Consumption has been reduced and Exhaust smoke ,Engine Oil leak has been wiped out.

Project No 2 : DURR 95C Hot Air Exhausted and Hydro carbon emission reduction by use of existing blower re-modified and Connected to exhaust Vent . Work zone temperature dropped by 4Deg , with auto shut of blower at the end of shift for energy saving.

Before

New 500 KVA

After

Capacity – 500 KVA
Cummins Make , Acoustic Enclosure.

ENVIORNMENT PROJECT

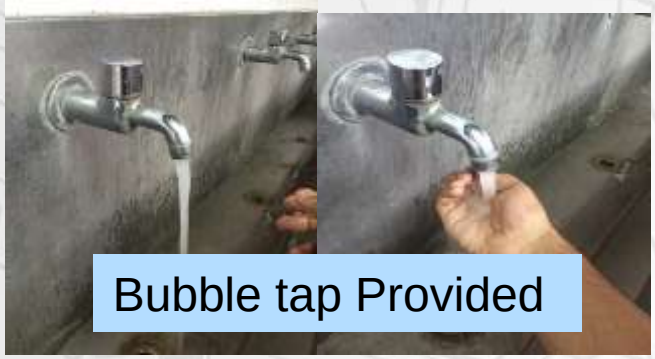
Project No 3 : In existing Diesel Pump frequently coil burnt, diesel leakage while running . Both Diesel Pump removed and Energy Efficient Diesel pump installed and existing Pipe line . After Connected no leakage on the Diesel to avoid Ground contamination & ensure safety Function .

Power saving – Annual 216 Kwh , Diesel – 200 litters.

Ambient air quality ,Indoor oil Mist, Stack for DG , Furnace ,Boiler ,sound & illumination Lux level Analysis .Based on report corrective action are initiated. As of now Nil NC report legal compliance and corporate compliance .


AAQ Equipment measure Air quality

WATER CONSERVATION



Bubble tap Provided

Ro reject water recovery

Water level sensor all Tank

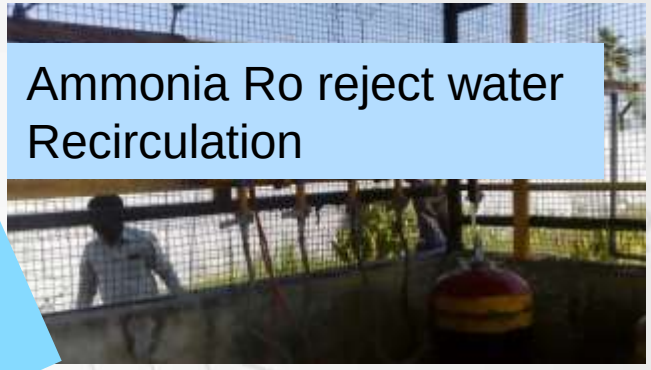
Major water Conserve

- ❖ Cooling tower RO Water Evaporation Losses red
- ❖ Water level sensor
- ❖ RO Reject water Reuse

Annual water saving 7200 KL

Annual water Consume. 24960 KL.

3 years 26 Kaizen implemented through Encon. Team Annual water save 7200 K.L



Ammonia Ro reject water Recirculation

Boiler Feed water Reduction

Under Ground pipe line Removed above the ground Valve ½ Position used

GREEN SHOTS

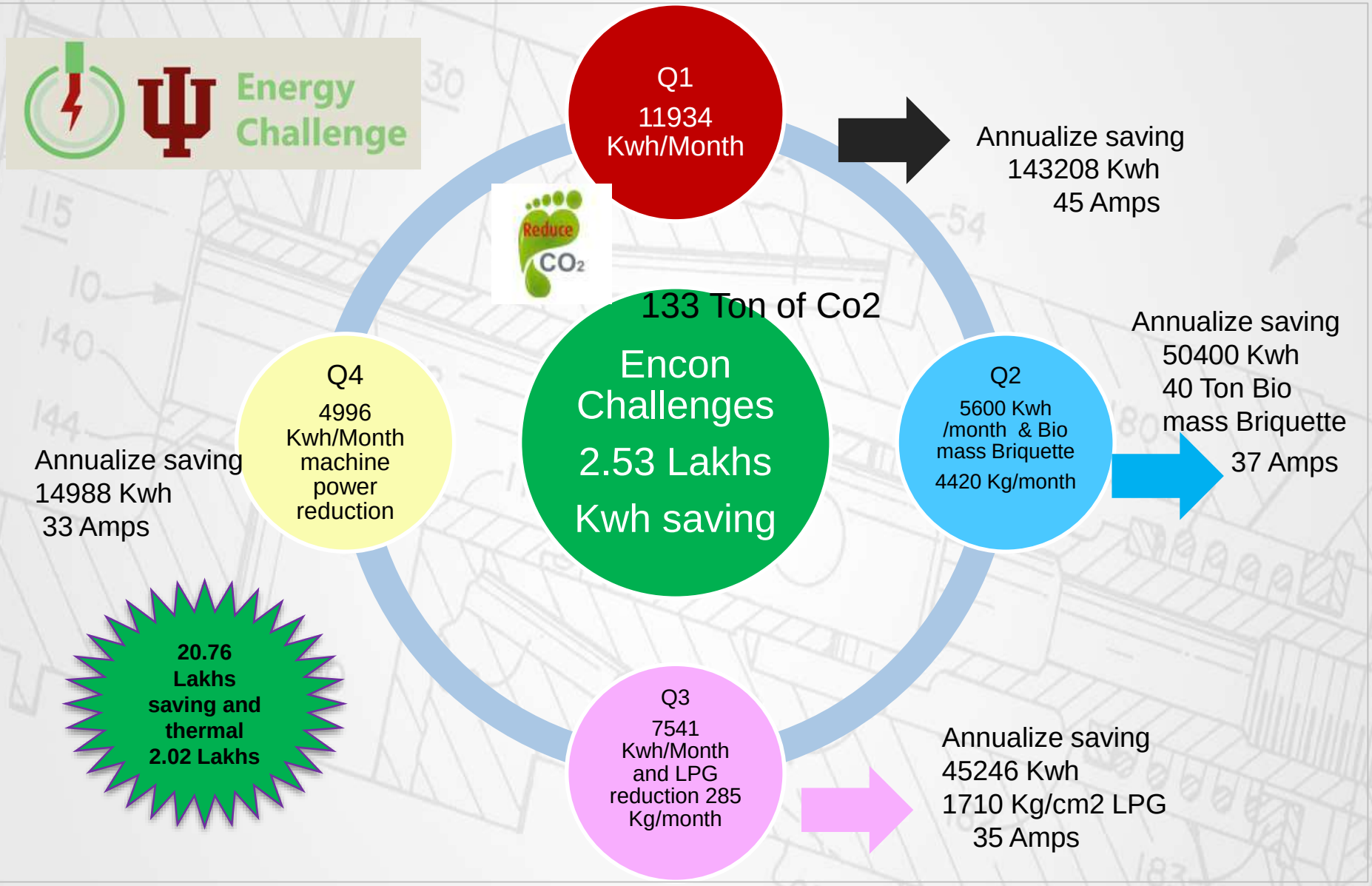
Factory entrance

Annually 100 Trees plantation
26% Green belt development
Per Hectare 177 Trees Planation
Green Belt development 1.62 hectare

Encon. – Pipe line projects Action Points

- **18** W 2 feet LED Lights office - PO Raised - Material received OCT 1ST WEEK Completed (10 Amps)
- AHU Flat belt – October 18th 2017 (8 amps) - **Completed**
- 30 KW VFD for Condenser – Quotation negotiated (P & E Raised) – Nov 15th 2017 (25 Amps)
- Occupancy sensor – Material received (Toilet trail done) – Oct 2017 (3 amps)
- Machine's – Gear box Modification – (PO done) – Nov 1st week completed – 9 amps
- Gardner Machine – 55 KW VFD Installation (Po done) – Nov 16th - 14 amps
- Chiller plant Motor Reduction after IE3 Conversion , 1 no of 22 KW stopped and another motor Operate with 45hz Frequency . – **Completed (36 Amps saved)**
- 37 Kw Compressor VFD installation , after Compressor run with 35 Hz – **Completed (20 Amps)**
- Higher Power Consumption Machine we installed smaller capacity compressor , reduce the Compressor power consumption **– Completed**

ENCON CHALLENGE AHEAD FOR 2017-18



ENERGY CONSERVATION AWARDS

NECC AWARD (Merit Certificate) 2014

CII ENERGY EFFCIENT AWARD 2015

CII ENERGY EFFCIENT AWARD 2016

CII ENERGY EXCELLENT EFFCIENT AWARD 2017

CII EHS Excellence Award 2017 – 4 star Rated

Our Journey towards Energy Conservation continues …….