CORPORATE PRESENTATION & INDUSTRIAL CASE STUDIES FOR ENERGY EFFICIENCY

About Us

Anama Enertech Solutions is a group company of 17-year-old Anama Energies Pvt. Ltd. dedicated to provide Cogeneration and Trigeneration solutions in Steam, Gas and Liquid fuel-based systems.

Energy conservation begins with Optimum utilization of energy resources and to optimize the same Anama has created a niche entity Anama Energy Solutions Pvt. Ltd. which is dedicated to offer services in the field Energy Audit and optimization.

Our Commitment

- **Mission:** Providing services to industrial sectors to improve their energy efficiency on a sustainable basis, thereby enhancing their competitive edge and profitability.

- **Vision:** To be a global leader in energy conservation domain, through energy audit services, energy efficiency project implementations, training in energy management and execution of green eco-friendly projects.

AREAS OF OPERATION

Anama Energies Pvt Ltd:

- **Steam Turbine Based Cogeneration and Trigeneration.**
  - Tailor made CHP solutions through extensive range of steam turbines
  - Back pressure, Extraction cum condensing as well as condensing turbines

- **Natural Gas based Cogen**.
  - CHP solutions using Gas Engines and Turbines with Waste heat recovery system
  - Vapor Absorption, Process heat projects from waste heat of gas engines

- **Biogas/Biomass based Power generation and CHP.**
  - Sole representative of Schmitt Enertech
  - Technology licensee of IISC – Bangalore
  - Biomass briquette based process steam and CHP
  - **Biomass gasification for process/power**

AREAS OF OPERATION

Anama Enertech Solutions Pvt Ltd:

- Comprehensive Energy Audits for Electrical and Thermal Systems.
- Energy Efficiency Project Implementation.
- Energy Management Training Programs.
- Energy Management services for Gas Turbine Power plants
- CDM Projects for Carbon Credits.
- Waste Heat Recovery and Cogeneration Feasibility.
- Water System Audits.

PEOPLE & LOCATIONS

ANAMA Energies Pvt. Ltd.
COGENERATION : An Investment in Productivity

- **H.M. Kamat: (Managing Director)** – IITian with 23 years of professional experience in energy and power field in companies like Thermax and Alfalaval.

- **Pramod Kembhavi (Managing Director: Anama Enertech Solutions Pvt Ltd)** Certified Energy Auditor with distinction in the certification examination conducted by Bureau of Energy Efficiency (Government of India). Expertise on Boilers Design/performance optimisation, Energy conservation opportunities for Utilities including Thermal and electrical systems.

- **Sanjay Pethe (Founder Director)** IIT, MS (USA), MBA (USA). Over 23 years experience in energy and power with Thermax, Aspentech and currently with Conco Phillips USA.

- **Deepak Mahurkar (Technical Advisor to be taken on Board)** BE, MBA, PhD (Pursuing) 18 years of technical experience. Currently with Price waterhouse Cooper in the capacity of Associate Director.

- **Shireesh Kedare:** Adjunct Associate Professor IIT Bombay and an authority on Wind and Solar energy. His fields of specialization includes Concentrating Solar collectors, Industrial energy storage and thermal hybrid systems with solar devices.

- **Ratnakar Gokhale:** An Engineer MBA having Over 20 years of experience in Sales & Marketing, Business Development, Operations and Management. Having a rich experience with organizations like Akzo Nobel Coatings India, Thermax, Kirloskar, Mazda & Schlumberger.

LOCATIONS

- Pune (Head office)
- Baroda
- Bangalore

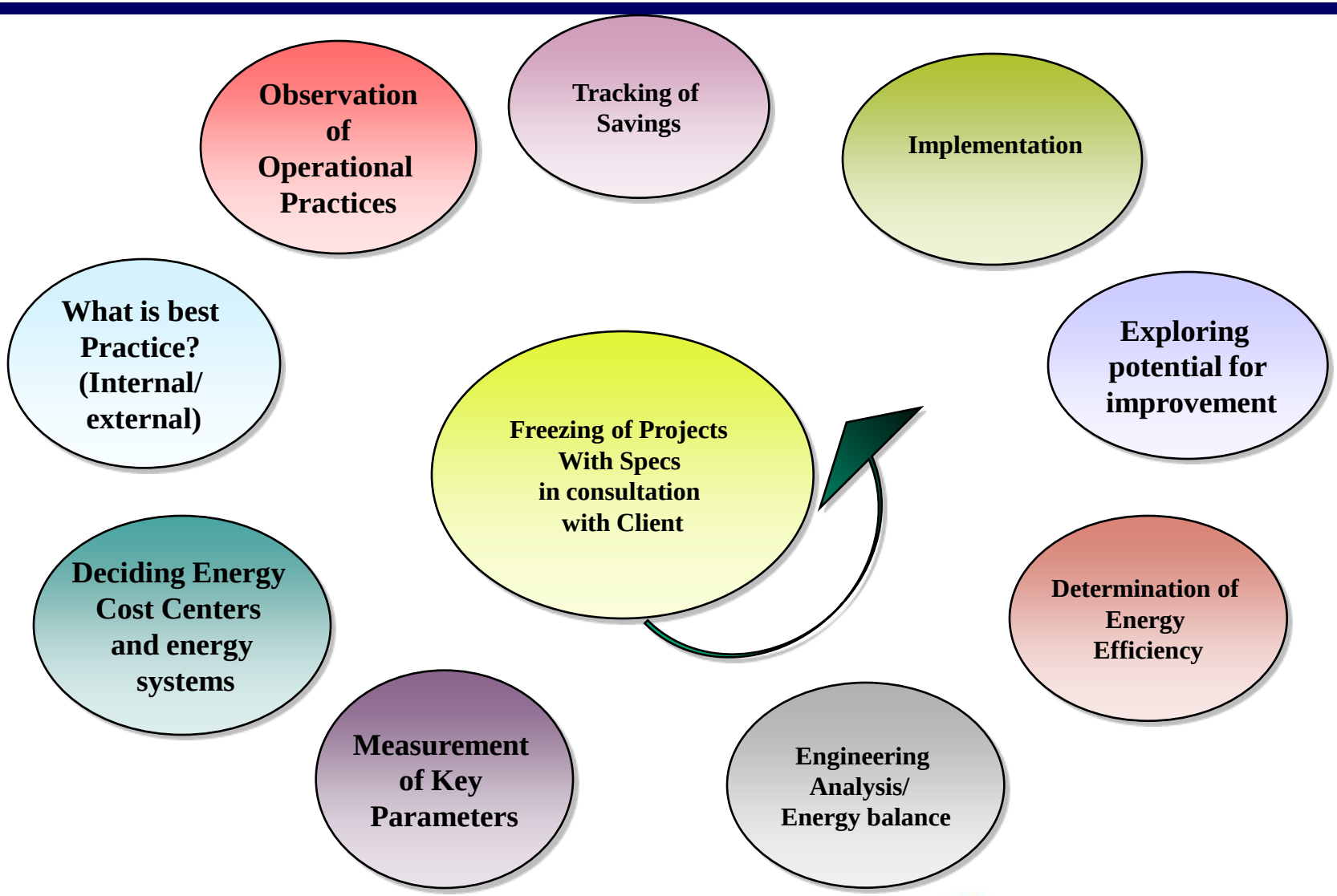
Objectives of Energy Audit

- ✓ To study the present pattern of energy consumption
- ✓ Examination and evaluation of energy efficiency of major energy consuming systems, processes and equipments
- ✓ Identify the potential areas for energy optimization
- ✓ To recommend energy conservation proposals with cost benefit analysis
- ✓ To identify CDM, cogeneration and renewable energy projects
- ✓ Training to plant personnel for effective energy management

Major instruments used for energy audit

- ✓ 3 phase power quality analyser
- ✓ Single phase power analyser
- ✓ Flue gas analyser – Measurement of parameters in flue gas
- ✓Contact type temperature indicators
- ✓ Infra-red non contact temperature indicator
- ✓ Ultrasonic flow meter – Fluid flow
- ✓ Anemometer – Air velocity

OUR APPROACH FOR ENERGY AUDIT



Areas Covered in Audits

- **Thermal System:** Boilers, Hot Water Generators, Waste Heat Recovery Systems, Steam distribution system, Insulation, Steam Traps, Condensate and Flash Recovery system, Insulation, Steam Traps, Condensate and Flash Recovery system, Thermic Fluid Heaters, Instrumentation and Controls, Monitoring , Cogeneration & Fuel switch over options.
- **Electrical System:** Transformers, Distribution, Analysis of Demand, PF, Improvement, Motor Loading, Optimizing measures for equipment and system performance such as Blowers, Pumps, Fans, Compressors, option of Variable Speed Drives, Controls and Monitoring System, Cable Size analysis etc.
- **Compressed Air System:** Compressor Efficiency, Distribution, Distribution, Line Sizing, Layout, Accessories, Air Quality, Leakage Identification, Pressure Drop, Controls and Monitoring system
- **Water System:** Water Balance, Line Sizing, Pump Selection, Piping Layout, Accessories, Optimization of Consumption,
- **HVAC and Refrigeration System :**Chiller performance , AHU , optimization of A/C loads, Cooling Towers , Pumps
- **Lighting Systems**

OUR ESTEEMED CLIENTELE
ENERGY AUDITS - 2008

AUTOMOTIVE & TYRE
• BAJAJ AUTO LTD.
• BADVE GROUP
•APPOLO TYRES

STEEL
• ISPAT INDUSTRIES LTD.
• UTTAM GALVA STEELS LTD.

HOTELS
• TAJ GROUP OF HOTELS
• INTERCONTINENTAL GROUP OF HOTELS
• LE-MERIDIEN
• BHARAT GROUP OF HOTELS

STARCH
• RIDDHI SIDDHI GLUCO BIOLS

PHARMA
•BRIOCIA
•BIOCON

OUR INTERNATIONAL CLIENTS

• Al Sallan Foods SAOG – Oman
• Strategic Foods – Dubai (Britannia group)
• Bidco Oil Refineries (Kenya)
• Ispat / Kremikovetzi(Bulgaria)
• Pure Ice cream (Sharjah)
• Taj Pamodzi (Zambia)

TEXTILE INDUSTRY
• BHARAT VIJAY MILLS – TEXTILE DIV.

FOOD & BEVERAGE INDUSTRY
• KWALITY BRAND COMPANIES
• UNITED BREWERIES LTD.

ENERGY EFFICIENCY IN /FOUNDRIES MINING / STEEL INDUSTRY

ENERGY CONSERVATION AVENUES

HEAT TREATMENT FURNACE EFFICIENCY OPTIMIZATION

WASTE HEAT RECOVERY FROM FURNACES / DG SETS

OPTIMIZATION OF BOILERS / STEAM SYSTEM

COGENERATION POSSIBILITY THROUGH WASTE HEAT RECOVERY

TEMPERATURE CONTROL OF MELT TO AVOID OVER HEATING

INSULATION FOR FURNACE LID

OPTIMIZATION FOR FURNACE LOADING AND CHARGE PREPARATION

OPTIMIZING CYCLE TIME FOR THE PROCESS (INCLUDING CHARGE HOLDING TIME)

ALTERNATE FUELS FOR FIRED FURNACES

CHANGE OVER FROM ELECTRICAL HEATING TO GAS / LPG

UTILITIES

OPTIMIZATION OF MOTOR LOADING

OPTIMIZATION OF COMPRESSED AIR SYSTEM

OPTIMIZATION OF PUMPING SYSTEMS / BLOWERS

OPTIMIZATION OF A/C AND LIGHTING SYSTEMS

COOLING TOWERS OPTIMIZATION

MAXIMUM DEMAND CONTROL

PF OPTIMIZATION / TRANSFORMER LOADING OPTIMIZATION

ENERGY AUDIT FINDINGS AT UTTAM GALVA

S.NO.	DETAILS	SAVINGS RS. LAKH/year	INVESTMENT RS.LAKH	PAYBACK MONTHS
1	SHORT TERM MEASURES WITH MODERATE INVESTMENT	312.5	111.4	5
2	LONGTERM MEASURES WITH CAPITAL INVESTMENT	541.5	360	8
	Total	**854.1**	**471.4**	**7**

ENERGY AUDIT FINDINGS AT ISPAT-DOLVI

S.NO.	DETAILS	SAVINGS RS. LAKH	INVESTMENT RS.LAKH	PAYBACK MONTHS
1	SHORT TERM MEASURES WITH MODERATE INVESTMENT	489	175	5
2	LONGTERM MEASURES WITH CAPITAL INVESTMENT	8364	3990	6
	Total	**8853**	**4165**	**6**

Case Study 1: Pumping Power Optimization

Pump House – With all 3 VFD at fixed frequency
No feedback of pressure

To plant

To machine

Pump House – With 2 running completely and 1 pressure sensing VFD

Auto - throttling

Auto valve shut
When section stopped

Case Study 1: Pumping power optimization

Before Implementation

There is no feedback of pressure for VFD operation. Water flow is continuous even though particular section/machinery are not in operation

Water flow in few section not optimized.

Present power consumption of pumps	=	646	kW

After Implementation

- Optimization water usage in all sections by throttling,
- Automating the usages of water in each section based on return temperature
- Installation of pressure boosters for specific applications
- Pressure sensor feedback to be given to pump VFD
- Operation of one/two pumps on full load and modulating the final pump

Saving Achieved	=	53	kW
Total saving	=	24	lakh/yr
Investment	=	10	lakh
Payback period	=	5	months

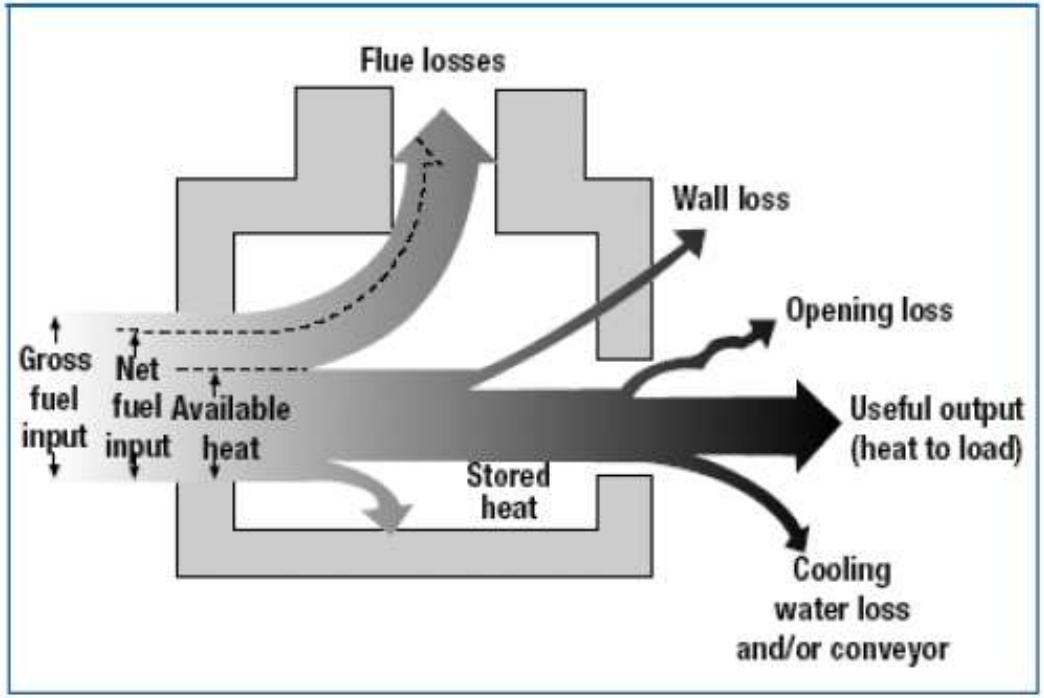
Energy Balance of a Furnace

Heat Loss Contributors

1. Useful heat carried by material
2. Flue gas loss
3. Stored heat
4. Opening loss by radiation
5. Wall losses
6. Miscellaneous losses

Assumptions for Energy Balance

1. Steady state condition
2. Leakage/ infiltration etc. considered as miscellaneous losses

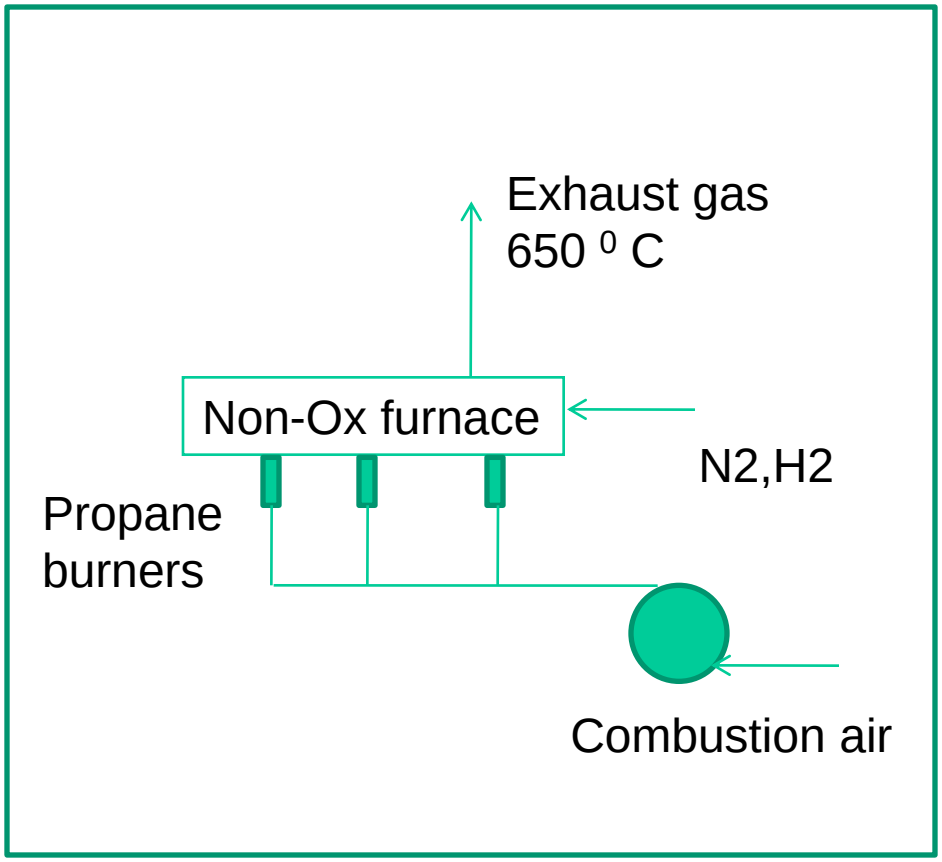


Efficiency (Direct Method) : The ratio of useful heat input to total energy consumption

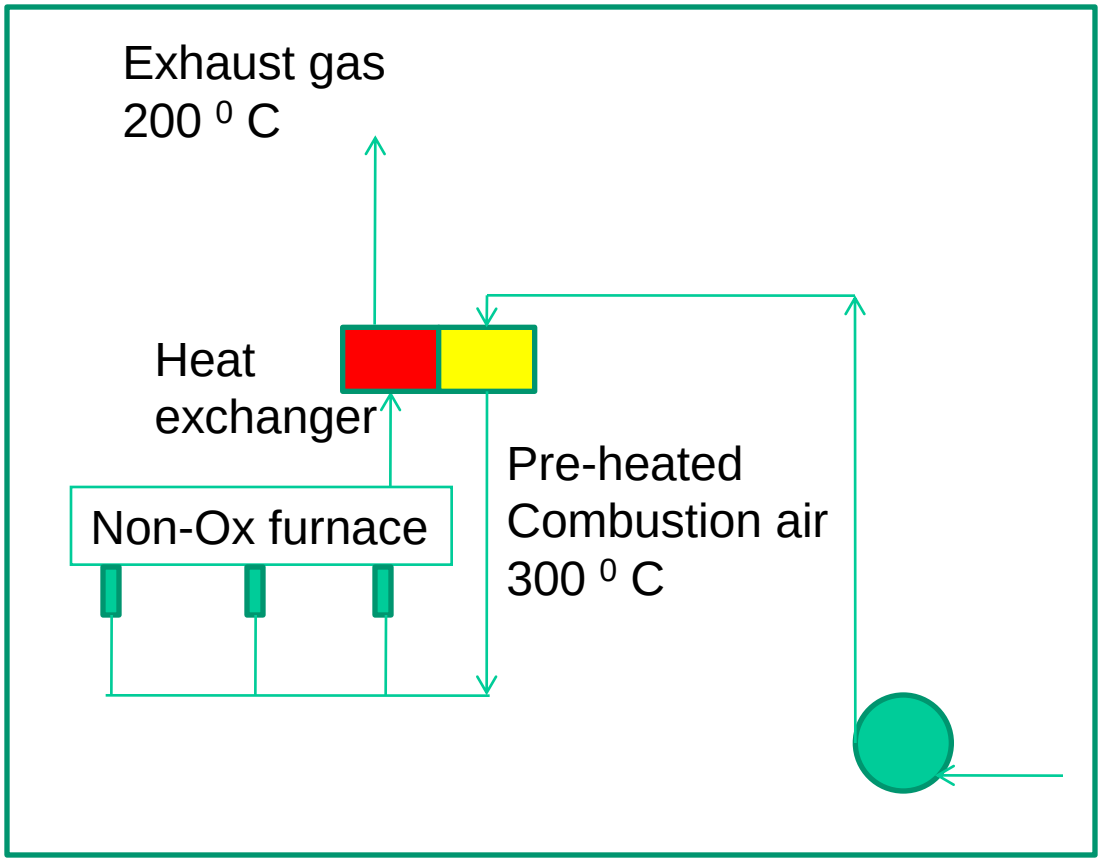
Efficiency (Indirect Method) : Total Heat input – Unused heat losses

Case Study 2: Waste Heat Recovery from Non-Ox furnace - Recuperator

EXISTING SYSTEM



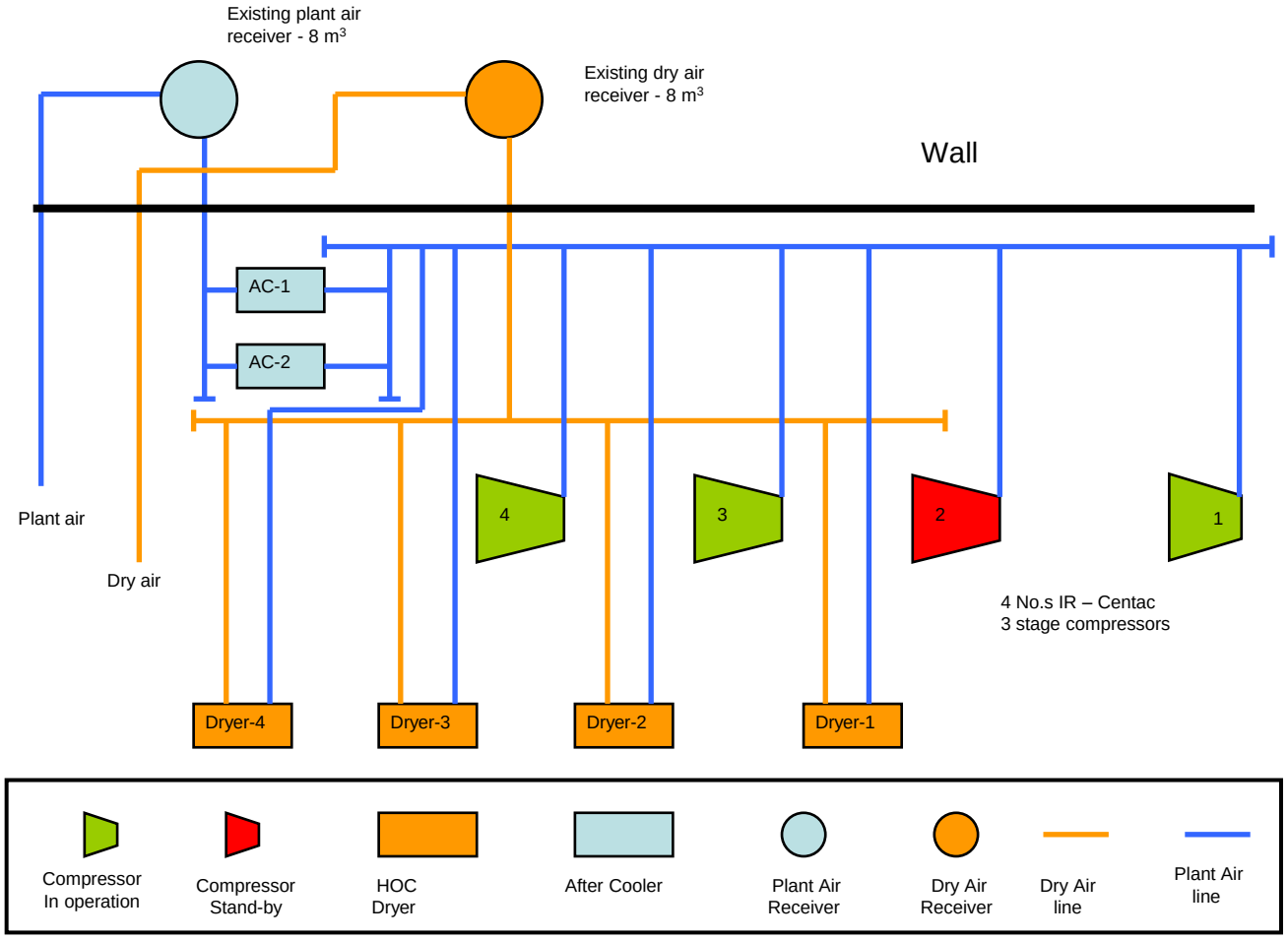
PROPOSED SYSTEM



Saving Potential	=	Rs. 27	lakh/year
Payback period	=	9	months

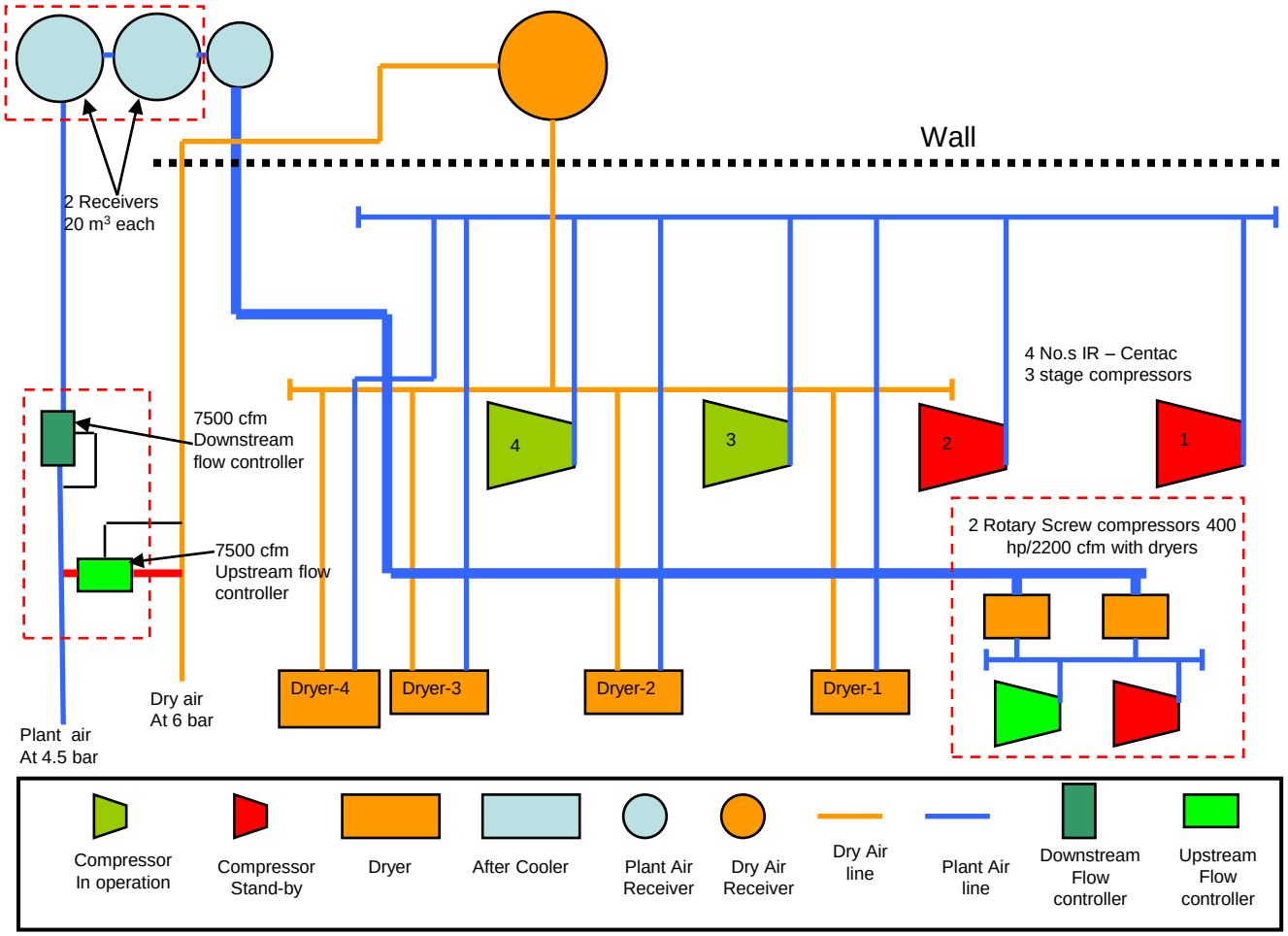
Case Study 3: Implemented scheme for compressed air

System before implementation of project



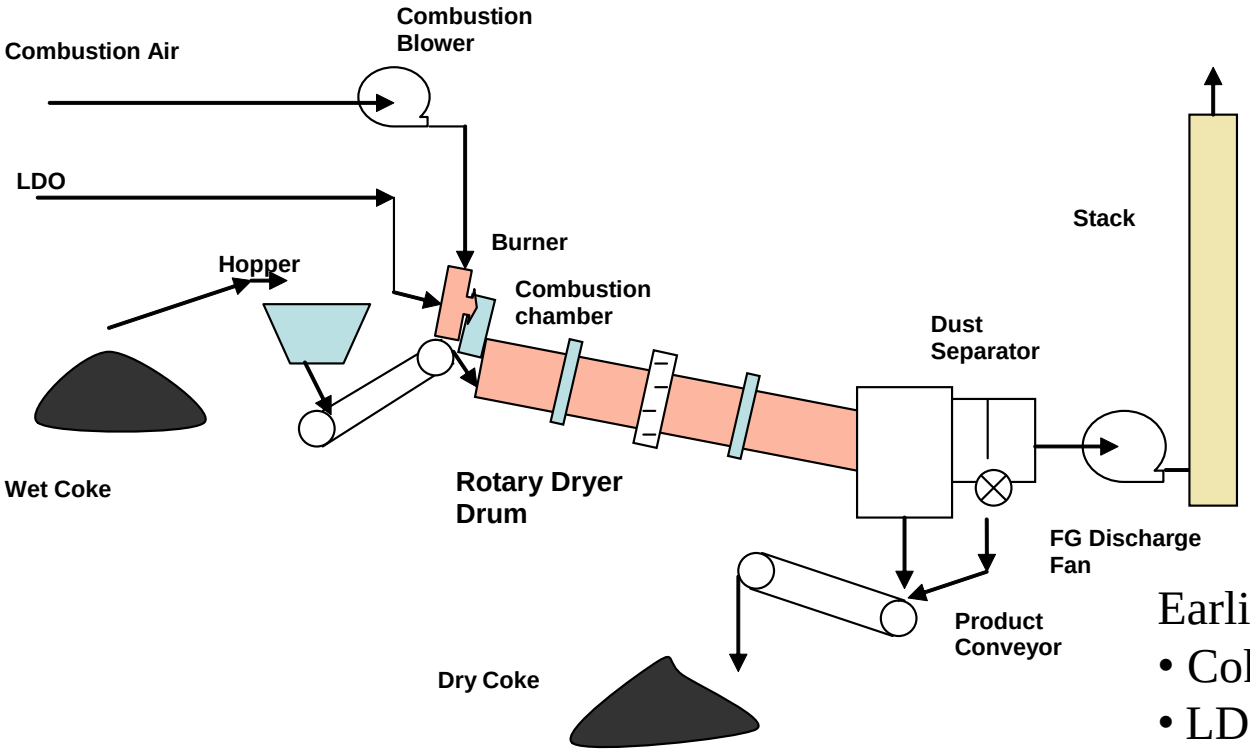
- Separate supply of plant air and dry air
- Dry air & Plant air both at 6.5 kg/cm^2
- One receiver of 8 m^3
- Large variation in compressed air usage
- Venting of air from centrifugal air compressors
- No control for compressed air
- Total power consumption = 3.5 MW

Case Study 3: Implemented scheme for compressed air



- Additional receivers for plant air
- Smaller capacity compressors for trim load
- Downstream / Upstream flow meter
- Pressure lowered for plant air
- Pressure regulated for dry air
- Stoppage of 1 centrifugal compressor
- Total expected power saving = 450 kW
- Total saving potential
= 450 x 8760 x 4.3
(@ 8760 hrs/year, Rs. 4.3/kWh)
= Rs. 1.7 crore / year
- Investment = Rs. 1.8 crore
- Payback period = 13 months

Case Study 4: BF gas for coke drying



Earlier System

- Coke drying by burning LDO
- LDO consumption = 14000 lit/month
- Blast Furnace (BF) gas being flared
- Low temperature requirements for drying
- Temperature variation acceptable

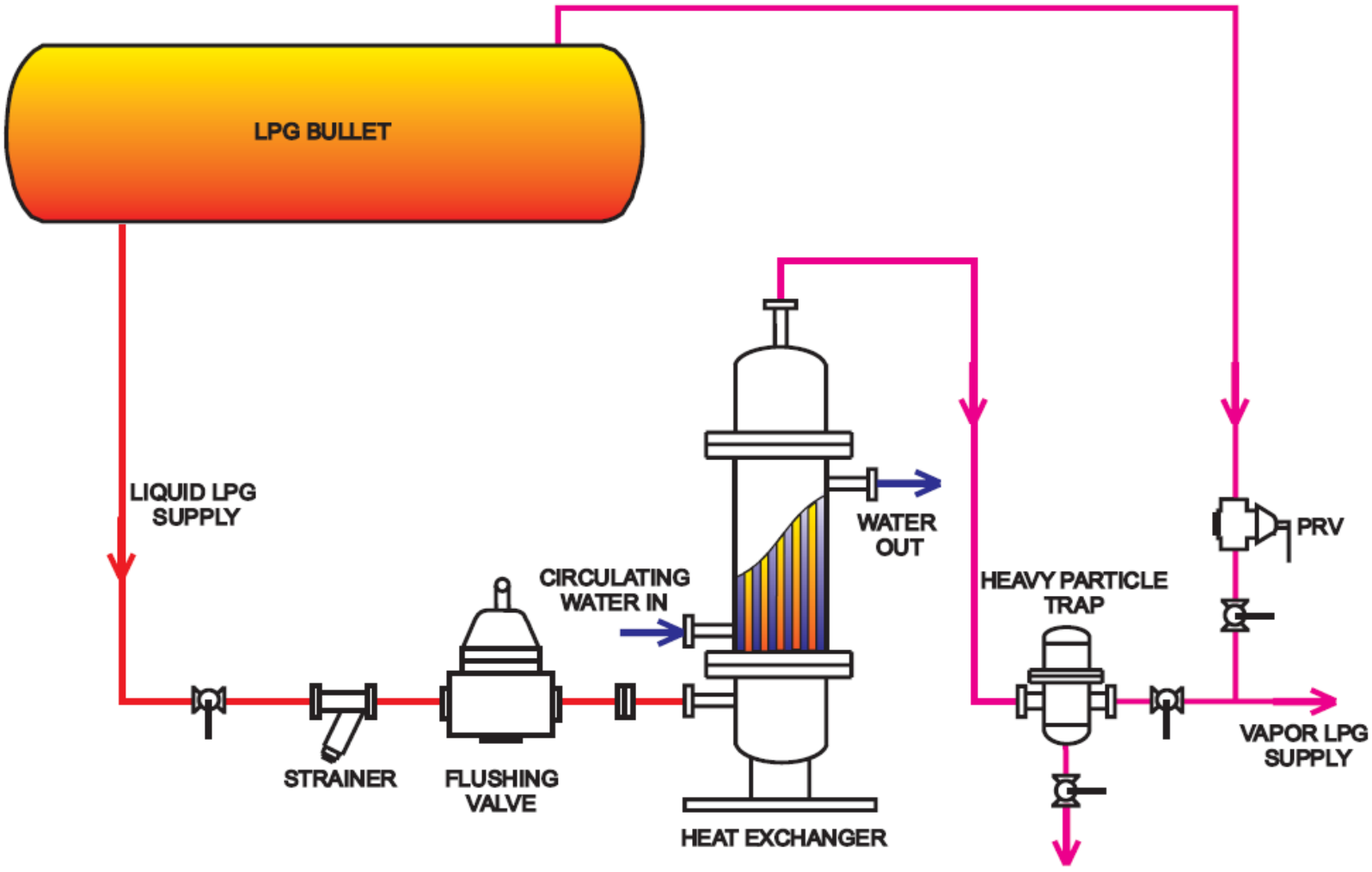
Case Study 4: BF gas for coke drying

Given calorific value of the BF gas	=	750	kCal/Nm^3
Equivalent BF gas consumption	=	1210	Nm^3/hr
Present fuel consumption	=	14850	lit/month
Expected reduction in the LDO consumption (Considering 10% LDO support for BF burner)	=	90%	
Expected annual savings	=	Rs. 40	lakh /year

Cost benefits :

Total investment	=	Rs. 50	lakhs
Payback period	=	14	months

CASE STUDY 5 - LPG Vaporiser using environmental heat



CASE STUDY 5 - LPG Vaporiser using environmental heat

- Boiling point of LPG at 1.2 kg/cm^2 (g) = 1^0 C
- Vaporiser uses electrical power to vaporise LPG
- As pressure decreases, boiling point lower (easy vaporisation)

Average present power consumption of LPG vaporiser	=	20	kW
No. of units consumed per day	=	480	kWh/day
Power requirement after installation vaporiser	=	50	kWh/day
Saving potential= 430 x 300 x 5	=	Rs. 6.5	lakh/year

Investment	=	Rs. 8.75	lakh/year
Payback	=	16	months

Case Study 6 - Heat recovery from flash steam for FO heating

Present System

Electric heater is used to maintain the temperature of FO.

Average Power consumption of electric heater used for FO heating = 13 kW

Equivalent heat = 13 x 860 = 11180 kCal/hr

Proposed System

It is proposed to use flash steam to stop this electric heater.

Quantity of flash steam required = 11180/ (647-123) = 21 kg/hr

This amount of flash steam is easily available.

Saving calculation

Electrical energy savings = 13 x 330 x 24 x 4.3 = Rs. 4.4 lakh per year

(@330 days per year, 2 hrs/day and Rs. 4.3/kWh)

Investment	=	Negligible
Payback	=	Immediate

Case Study 7 – Energy Efficient motors for continuous duty applications

Present System

Present air compressor motors are not energy efficient type and do not have an optimal full load efficiency. Present full load efficiency is about 85 %

Proposed System

It is recommended to replace the motors by energy efficient motrs.
It is estimated that there will be about 5% reduction of power consumption by implementation of this measure. Full load efficiencies of 93-95 % is possible with energy efficient motors.

Saving calculation

Total saving potential= 130 x 2 x 0.05 x 8000 x 4.3 = 4.5 lakh/year
(@ 130 kW for each motor, 2 motors and 8000 hours operation per year)

Investment	~	10	lakh
Payback Period	=	26	months

ENERGY EFFICIENCY IN HOTEL INDUSTRY

ENERGY AUDIT FINDINGS IN HOTELS

S.NO.	DETAILS	SAVINGS RS. LAKH/year	INVESTMENT RS.LAKH	PAYBACK MONTHS	% Savings
1	Taj Residency- Aurangabad	11	5.6	6	10
2	Taj Pamodzi- Zambia	36	46	15	24
3	Intercontinental The Grand Goa Resort- Goa	100	129	16	21
4	Le Meridien - Pune	34	15	6	7

Common Energy Conservation proposals - Hotels

Sr. No	Section	Savings Obtained in energy bill	Measures	Investment
1	Boiler/Hot water generator	3%	1. Tuning of Boiler/ Hotwater generator	Nil
			2. Fuel Substitution High Speed Diesel (HSD) to Light Diesel Oil (LDO)	Nil
2	Steam distribution	2%	1. Condensate recovery	Medium term
			2. Improvement in insulation	Medium term
			3. Trap repair & leakage reduction	Nil
3	Chilled water system	4%	1. Increase in evaporator set temp	Nil
			2. Chiller pump optimization	Nil
			3. Installation of VFDs for condenser/chilled water pumps	Medium term
			4. Timer controls for air handling unit blowers	Short term
4	Electricity Bill	2%	1. Maximum Demand optimization	Medium term
			2. Optimization of tariff slots	Nil
5	Lighting	1.5%	1. Replacement of incandescent lamps with milky effect CFL	Medium term
			2. Stoppage of excess lighting in daytime	Nil
			3.Voltage control in areas like kitchens, laundry, back office etc.	Medium term

Case Study 1 : Installation of Three way valve for lobby AHU

- **Present System**

It is observed that in lobby area temperature is lower than required level at present. Still AHU is working continuously without sensing the temperature.

Present lobby AHU TR delivery = 15.5 TR

- **Proposed system**

It is proposed to install temperature based three way valve system. Cooling load is reduced by avoiding periods of excess cooling.

- **Saving calculation**

Present power consumption = 1.1 kW/TR for system x 15.5

= 17 kW

Expected reduction in power consumption = 15%

Expected savings = 0.15 x 17 x 15 x 365 x8.3

= 1.1 lakhs/yr

- Investment = 1 lakh
- Payback = 10 months

Case Study 2: Optimization of valves for chilled water circuit

- **Present System**

There are valves provided for passing chilled water to chiller no. 1 and 2 even when they arenot in operation. This leads to excess pump power to pass water through additional equipment.

Total power requirements for pumping of chilled water = 31 kW

- **Proposed System**

It is proposed to close the valves to avoid flow of the water to chillers unnecessarily. This leads to reduction in pump power.

Power measured after closing valves during audit = 24 kW

- **Saving calculation**

Saving potential	=	7	kW
Hours of operation per year	=	8000	hrs / year
Total saving potential	=	7 x 8000 x 0.051	
	=	140000/year	

- Investment = Nil
- Payback Period = immediate

Case Study 3: Increase in evaporator set point for chiller

- **Present System**

The chiller set point is low at present. Chilled water temperature was measured to be approximately 6-7.5 ^{0} C.

Present power consumption = 206 kW

- **Proposed System**

It is recommended to raise the set point temperature of the chiller to 9 deg C for most part of the year. Every degree rise in evaporator set temperature reduces power consumption by 2-3 % without affecting performance.

Expected power consumption after changing set point = 195.7 kW

Specially in winter months, set temperatures should be maintained as high as possible

- **Saving calculation**

Reduction in power consumption	=	10.3	kW		
No. of hours of operation per year	=	8000	hrs/year		
Saving potential	=	3 x 8000 x 3.6	=	Rs 2.96	lakh/ year
Investment	=	Nil			
Payback Period	=	Immediate			

ENERGY EFFICIENCY IN PHARMACEUTICAL INDUSTRY

ENERGY CONSERVATION AVENUES

- BOILER / HOT WATER GENERATOR / TF HEATER EFFICIENCY OPTIMIZATION
- OPTIMIZATION OF OPERATING PARAMETERS
- OPTIMIZATION OF STEAM SYSTEM / CONDENSATE AND FLASH RECOVERY SYSTEMS
- FUEL SWITCH OVER / COGENERATION POSSIBILITY
- WASTE HEAT RECOVERY POSSIBILITIES
- CHANGE OVER FROM ELECTRICAL HEATING TO GAS / LPG
- DEHUMIDIFICATION AND A / C LOAD OPTIMIZATION
- WASTE MANAGEMENT AND INCINERATION
- USE OF RENEWABLE ENERGY SUCH AS SOLAR FOR HOT WATER
- BIOGAS BASED COGENERATION FROM EFFLUENT
- AUTOMATION
- MONITORING
- **UTILITIES**
- OPTIMIZATION OF MOTOR LOADING
- OPTIMIZATION OF COMPRESSED AIR SYSTEM
- OPTIMIZATION OF PUMPING SYSTEMS / BLOWERS / VFD FOR THESE
- OPTIMIZATION OF A/C AND LIGHTING SYSTEMS
- OPTIMIZE VENTILATION SYSTEM
- COOLING TOWERS OPTIMIZATION
- MAXIMUM DEMAND CONTROL
- PF OPTIMIZATION / TRANSFORMER LOADING OPTIMIZATION

ENERGY EFFICIENCY IN BUILDINGS

ENERGY CONSERVATION AVENUES

- ENVIRONMENT ARCHITECTURE :Climate Responsive Designs to optimize enrgy use for space cooling / heating
- WATER CONSERVATION / RAIN WATER HARVESTING
- ENERGY EFFICIENT LIGHTING : CFL /T8/T5/LED USAGE
- ENERGY EFFICIENT STAR EQUIPMENT (MIN.4 STARS) FOR CELING FANS,EXHAUST FANS,REFRIGERATORS,AIRCONDITIONERS ETC.
- ENERGY EFFICIENT PUMPING SYSTEMS : Automatic Level controls , Hydro pneumatic pumping system with VFD etc.
- LIFTS : VARIABLE VOLTAGE / Variable Frequency Drives, Duplex controls for 2 or more lifts, Interlocking for fans/lighting
- SOLAR ENERGY FOR WATER HEATING
- GAS HEATERS INSTEAD OF ELECTRIC HEATERS
- OPTIMIZED HEAT RECOVERY FOR AIR CONDITIONED ROOMS
- INCREASE SET POINTS FOR A/C WITH FANS FOR COMFORT COOLING.
- INTERLOCKS FOR LIGHTING WITH TECHNOLOGIES SUCH AS OCCUPANCY SENSORS ETC.
- ENERGY EFFICIENT ELECTRICAL INSTALLATIONS : TRANSFORMERS / MOTORS/ PF OPTIMIZATION/ OPTIMUM CABLING
- EXTERNAL LIGHTING / PASSAGE LIGTING WITH VOLTAGE CONTROLS AND INTERLOCKS , PREFERABLY WITH SOLAR PV
- USE OF ELECTRONIC BALLAST IN PLACE OF CONVENTIONAL CHOCK
- AWARENESS ABOUT GOOD OPERATIONAL PRACTICES : Run Washing M/C full load, Turn off ventilation fans when not required, switch off lights while going out, Use day light as far as possible ,shut off computer monitor when not in use
- .BIOGAS GENERATION THROUGH KITCHEN WASTE

Energy Savings Observed across all sectors

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COGENERATION : An Investment in Productivity

S.NO.	DETAILS	SAVINGS RS. LAKH/year	INVESTMENT RS.LAKH	PAYBACK MONTHS	% Savings
1	Al Sallan Food Industries	7.5	3.5	6	11
2	Ispat Industries- Sinter Plant	127	108	10	2
3	Taj Residency- Aurangabad	11	5.6	6	10
4	Llyods Steel- Wardha	1217	932	10	4
5	Bajaj Auto Ltd- Aurangabad	231	248	13	10
6	Taj Pamodzi- Zambia	36	46	15	24
7	Apollo Tyres- Ranjangaon	162	81	6	11
8	Intercontinental The Grand Goa Resort- Goa	100	129	16	21

S.NO.	DETAILS	SAVINGS RS. LAKH/year	INVESTMENT RS.LAKH	PAYBACK MONTHS	% Savings
9	Bidco Oil and Soap Ltd- Tanzania	61	34	18	11
10	Bidco Refineries Ltd- Kenya	131	110	10	7
11	Gill Oil Ltd- Kenya	117	30	5	15
12	Sameer Africa Ltd- Kenya	134	40	4	
13	Riddhi Siddhi Gluco Biols Ltd- Gokak	221	140	8	9
14	Uttam Galva Steels Ltd- Khopoli	765	482	8	5.5
15	Le Meridien - Pune	34	15	6	7
16	United Breweries Ltd- Taloja	38	24	8	4


Thank You