

**Best Practices Adopted  
By  
Shriram Alkali & Chemicals Jhagadia  
To improve Energy Efficiency**



**Navin Jaiswal  
Addl General Manager  
DCM Shriram Ltd**

# The Company – DCM Shriram Ltd.

- DCM Shriram Limited is formed in 1990 consequent to restructuring of DCM Ltd. (founded in 1889) over 100 years of standing in Indian business
- Turn over - Company : Over 5500 Rs. /Crores (1000 Million USD)
- Shriram Alkali & Chemicals : Over 450 Rs. /Crores ( 80 Million USD)
- Company's Business portfolio comprises of

Agri-Rural Business	Chlor-Vinyl Business	Value Added Business
-Urea	-Caustic Soda & Chlorine	-Fenesta UPVC Windows
-Sugar	-Calcium Carbide	
-Hybrid seeds	-PVC Resin	
	-PVC Compound	
	-Cement	

- All Plants Certified to ISO 9001(QMS)/ 14001(EMS) & OHSAS 18001
- All locations have energy monitoring cell

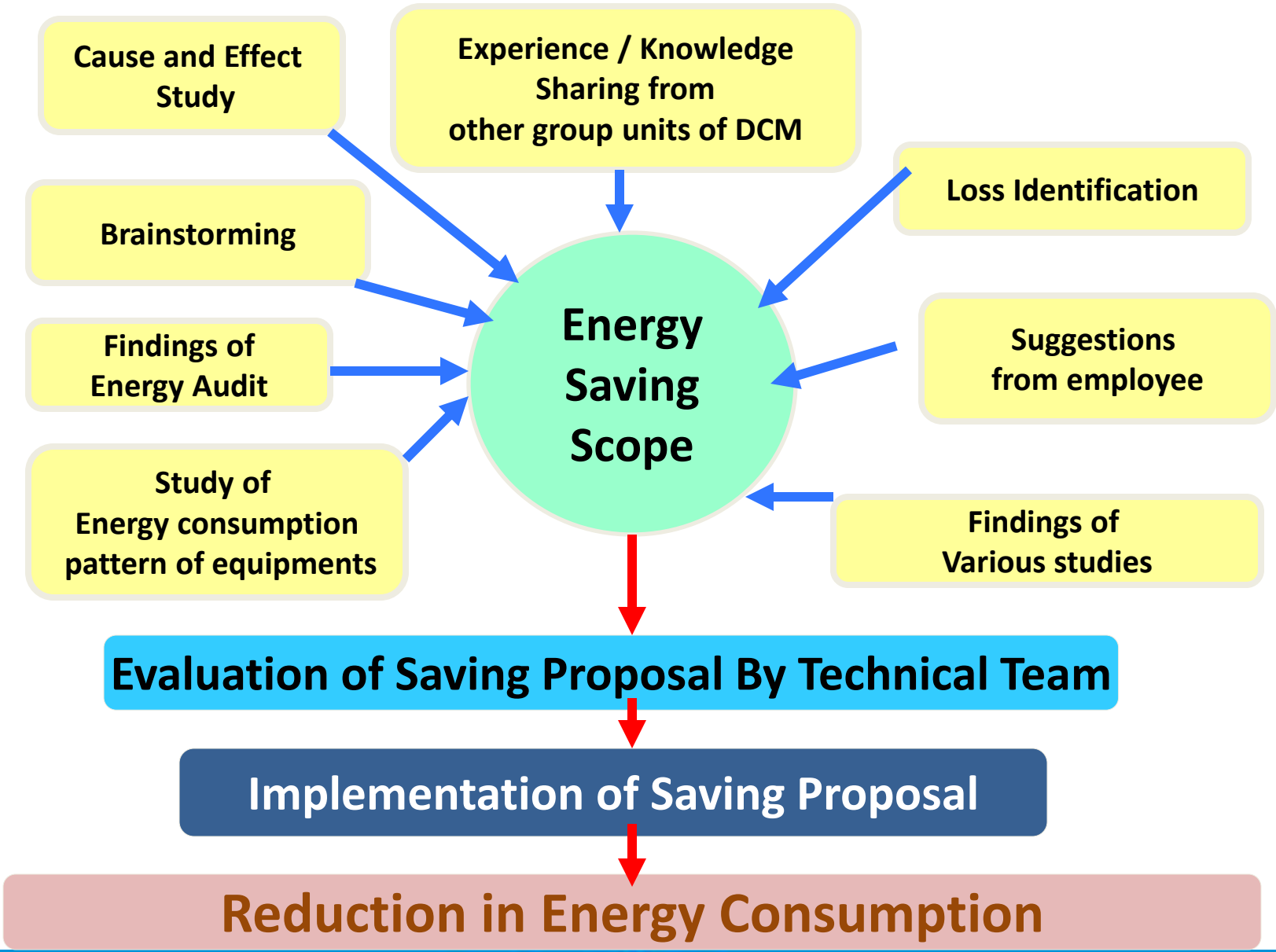
- **Location** **GIDC Jhagadia, Distt. Bharuch, Gujarat, India**  
**large scale industrial estate specially developed by Govt. of Gujarat for “water intensive chemical industries”**
- **Operating** **: Since March-1996**
- **Technology** **: Membrane Cell Based Chlor-Alkali Plant**
- **Plant/Facility** **: Caustic Soda                              - 171000 TPA**  
**: Captive power plant   - 55 MW Coal based**



**An overview of the plant**

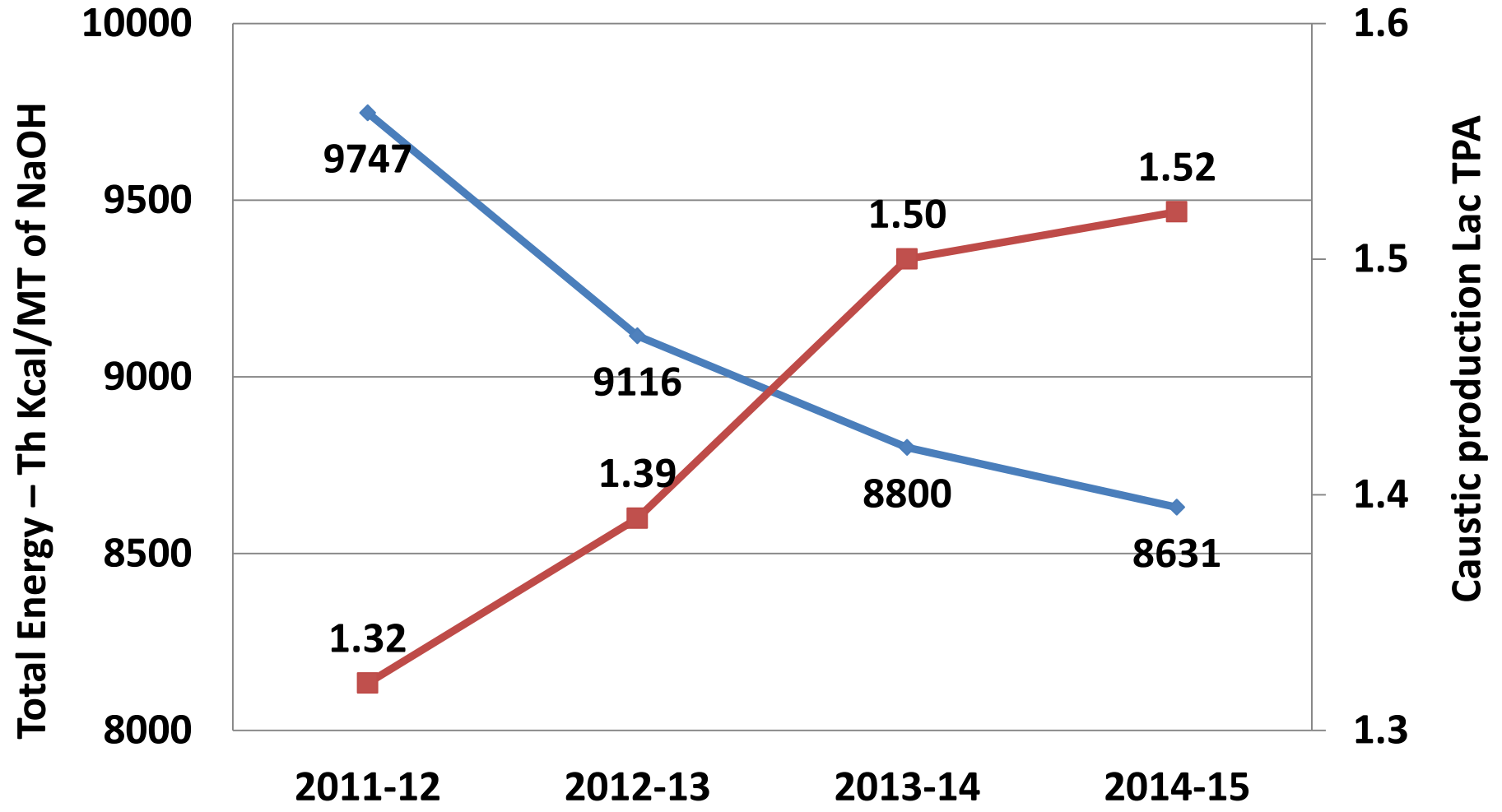
# Methodology Adopted

# Methodology Adopted By DCM For Energy Conservation



# Key Performance Outcome

Total Energy consumption – Th Kcal/ T of NaOH





# Some case studies

- Cell Power : 90-92% Contributor

## Initiatives taken at DCM for Cell power Reduction

- Adoption of latest zero gap technology. ( **India's first ZERO Gap electrolyzer installed at DCM in March-2006** )
- Installation of one more electrolyzer for reduced current density operation for overall power reduction.
- Timely re-membraning & recoating of electrolyzer.
- Improvement in brine quality for sustaining the electrolyzer efficiency

- **Auxiliary Power (8-10% Contributor)**

- Real challenging task.
- Low cost solution.
- Needs systematic improvement ,dedicated team efforts and in-house modification.

## **Initiatives taken at DCM for Auxiliary Power Reduction**

- Encourage innovation by motivation like Energy Conservation Award
- Installation of VFD's for energy conservation
- Complete overhauling of plant in annual shut down for maintaining the efficiency of equipments
- Hydro-jet /Chemical cleaning of heat exchangers for better heat transfer



- Energy Monitoring System (EMS) is installed.
- All motors (5.5 kw and more) provided with energy meters.
- For the close monitoring section wise energy consumption captured for analysis on regular basis.
- Energy consumption review on daily basis.
- Corrective actions for deviation / improvement.
- Following section wise energy consumption is measured on daily basis
  - Individual rectifier power consumption
  - Chlorine Compressor
  - Freon Compressor
  - Air Compressor & Padding Air Compressor
  - All motors having rating of 5.5 kw and more

# Installation of one energy efficient Zero Gap Electrolyzer

To reduce the current density & hence reduction in power consumption one more electrolyzer (9<sup>th</sup> electrolyzer) with state of art “Zero Gap Technology” from M/s Asahi Kasei ,Japan

Year Of Installation - Dec-2013

Electrical saving : 132 KWh/T

Total investment - Rs. 21 Cr

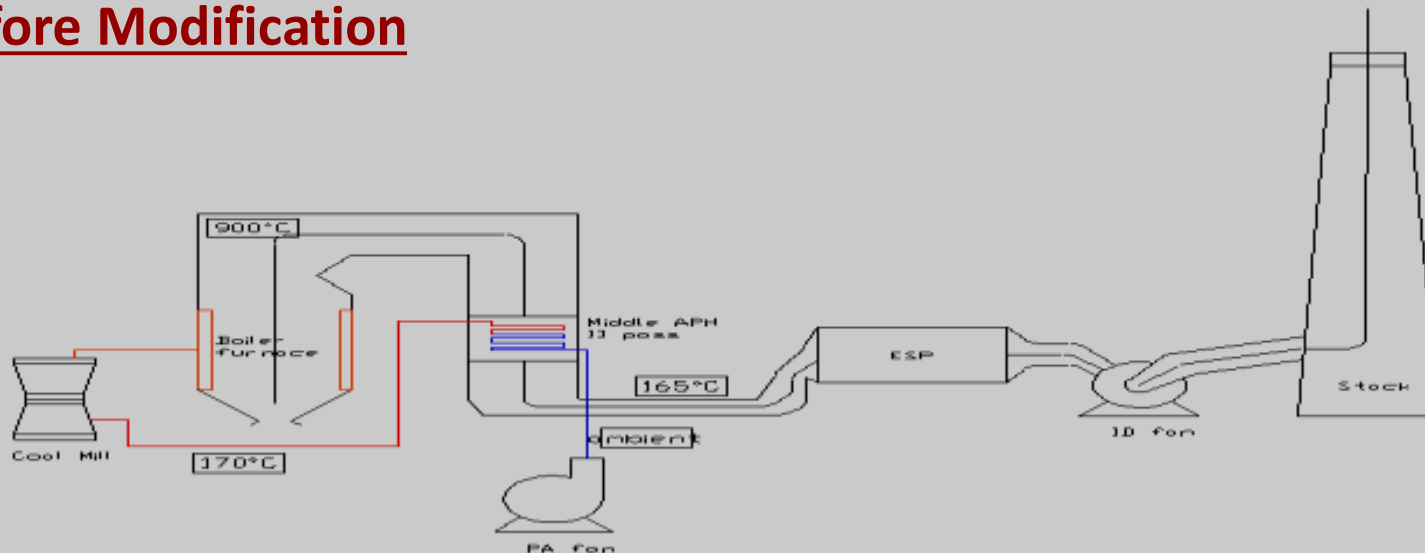


- At full load capacity, the flue gases temperature at the exit of boiler was **163 to 165° C**.
- This was causing energy losses due to high exit temperature of the flue gases.
- Additional sections of air preheater were designed and installed in the existing Boiler during the plant shutdown **in July-2014**.

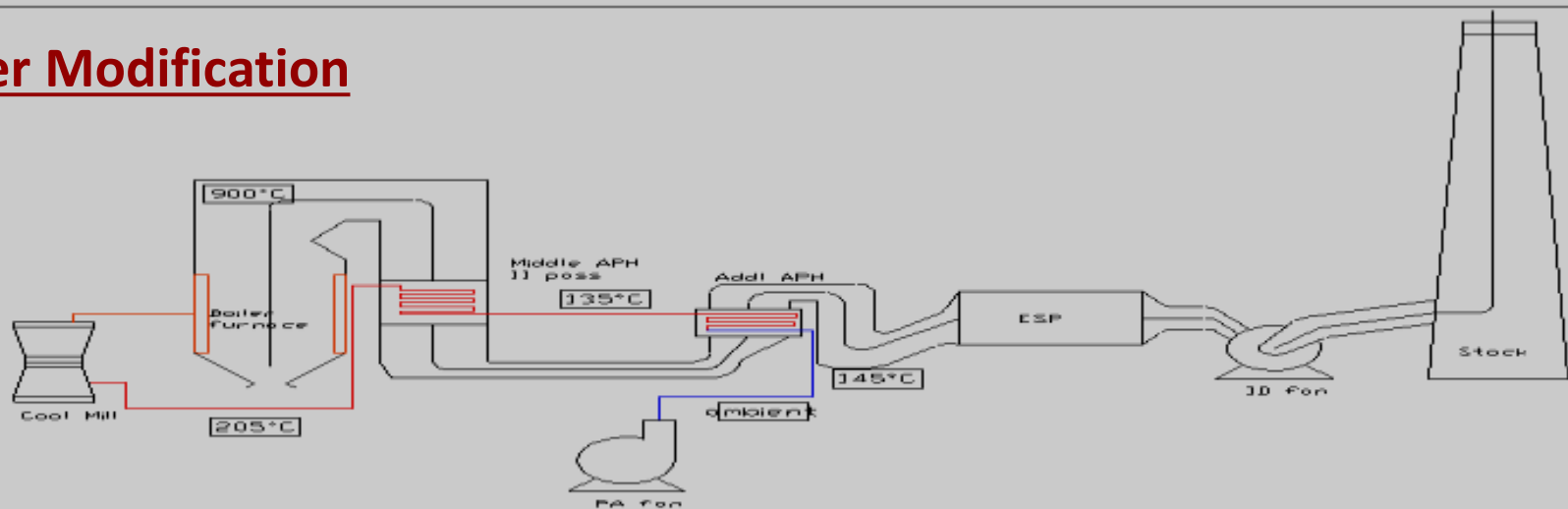
### Improvement Achieved

- Temperature of flue gases at the outlet of additional APH is in the range of **143 to 144° C** at full load of Boiler.
- There is reduction in flue gas temperature by 20° C i.e. **improvement in boiler efficiency by 1.0 %**
- **Investment of 1.5 Cr/Rs**
- **Saving : 1.4 Cr/Rs/annum**

## Before Modification



## After Modification



# Anti-friction ceramic based coating of cooling water pumps

Anti-friction ceramic based coating applied in cooling water pumps wetted parts to reduce the friction loss hence improve in efficiency



Total investment : 5.5 Rs/Lacs

Savings : 7.9 Rs/Lacs



Details of improvements made	Investment Rs in Lacs	Savings (Rs/lacs annum)
Arresting steam leakage from balance piston gland resulting improvement of Turbine heat rate	45	300
Heat recovery from CBD from boiler by heating Makeup water to deareator	9.8	30
Replacement of leaky/passing ARC valve and it's by pass assembly in boiler feed water pump A & C respectively	9	43

# Energy Saving Through VFD

Initiative	Energy Saving KWh/Day
Installation of VFD in Return brine Pump 45KW	405
Installation of VFD in Cl2 washing tower pump 30KW	149
Installation of VFD in 3 <sup>rd</sup> to 1 <sup>st</sup> effect circulation pump 18KW	117
Installation of VFD in CPP CWP blow down -7.5KW	76
Installation of VFD in Filtered brine pump - 55KW	380
Installation of VFD in Clarified brine pump - 45KW	310
Installation of VFD in Chlorine drying tower pump - 30KW	207
Installation of VFD in Effluent discharge pump - 30KW	104

Total investment – Rs 10.5 lacs

Saving - Rs 25 Lac /annum

# Energy Saving Through Innovative Process Improvement

Energy Saving achieved by loss identification and process modification with almost **without investment**

Details of improvements made	Saving KWh/Day
1. 48 % caustic soda circulation pump stoppage during C shift	30
2. Energy saving by reduction in de-aerator makeup pump operating hours by utilising DM water supply from caustic soda plant	17
3. Energy saving by reduction in turbine oil centrifuge operating hours from 8 Hrs/ Shift to 5 Hrs per shift	21
4. Stoppage of process air compressor	77
5. Stoppage of CCU condensate pumps - 2 Nos	240
6. Modification in discharge duct of PA fan 1 thereby reducing pressure drop of the system and reduction in power consumption	60
7. Energy saving in coal mills by Increasing classifier angle of coal mill from 60 to 65°.	192
8. Stoppage of dust extraction system 1&2 of coal handling plant during monsoon period.	26

Total investment – NIL

Saving - Rs 10 Lac /annum

- **Separate low voltage transformer is installed for lighting**
- **Other measures taken for further energy saving**
  - Door switch installed for switching off the light is cabinet is closed.
  - Energy saving done by providing ON/OFF push button on both side door of PMCC
  - Energy saving by removing excess lighting in power plant turbine building without affecting lux level
  - Phase wise replacement of conventional fluorescent light with energy efficient LED light.

**Total Investment : Rs 1 Lacs**

**Total Saving : Rs 2 Lacs annum**

# Summary

S.N	Factors resulting high energy consumption	Corrective Action
1	High power due to high current Density operation	Installation of one more electrolyzer to reduce current density hence power consumption.
2	High power consumption due to aging of membrane and coating	Schedule replacement of membrane and coating of elements
3	High power consumption due to adverse brine quality	Brine quality maintained <10ppb all the time On line analyzer installed for continuous monitoring Use of 100% washery washed salt
4	High flue gas temperature	Installation of additional APH to recover heat from Boiler outlet flue gases
5	High energy consumption due to fouling in heat transfer quipment	<ul style="list-style-type: none"> <li>• Maintaining cooling water parameter on continuous basis</li> <li>• Hydrojet / chemical cleaning of heat exchanger in annual shut down</li> <li>• Condenser chemical cleaning for improving vacuum of turbine and thereby reduction in specific steam consumption of turbine</li> </ul>
6	Varying production level, lower capacity utilization	VFD installed for power reduction.

# Summary

S.N	Factors resulting high energy consumption	Corrective Action
7	Manual intervention in VFD operation	VFD control through auto mode.
8	High power consumption due to frictional loss in cooling water pump	Anti-friction ceramic based coating of cooling water pumps wetted parts
9	High power consumption due to system constraint	Running hour of pumps reduced by load identification Some equipment stopped
10	High energy consumption due to leakage	Continuous monitoring on steam leakage On line arresting the steam leakage
11	High power consumption in air compressor area	Centralized air supply in entire campus. -Stopped one air compressor by plugging leakage and process optimization
12	High power in electrical motors	HT motor in place of LT motors for >160 KW motor
13	High power due to high voltage	Optimize operating Voltage of Aux. Transformers
14	High Lighting Consumption	Installation of low voltage transformer for lighting circuit -Phase wise replacement of conventional fitting with energy efficient fitting.

# Way Forward ...

- Expansion of caustic soda production facility and power plant with latest available technology.
- Energy Audit of plant to get more improvement opportunities.
- More focus on Latest Technology , Innovation and Skill Development.

# Roll of Honor

- 2014-2013-2012 - **“Sword of Honor “** by British Safety Council, UK for best safety management system continuously for three years
- 2011 - Sir Shriram Award for **Best Managed Chlor-Alkali Plant** by Alkali Manufacturer Association of India
- 2007 - Gujarat State Safety award for achieving accident free million man hours worked
- 2006 - Award for **Unique & Innovative efforts in Energy Conservation** by PCRA, Ministry of Petroleum & Natural Gas, Gov of India for 2005.
  - **Prashansa Patra** in recognition for developing & implementing effective Management Systems Occupational safety and health for the assessment period of three years – 2002 to 2004 by NSC.
- 2005 - Award for **Unique & Innovative efforts in Energy Conservation** by PCRA, Ministry of Petroleum & Natural Gas, Government of India
  - **Platinum award** ( Greentech in chemical sector for outstanding achievement in **Environment Management**
  - **Platinum award** ( 4<sup>th</sup> Annual Greentech Safety Award) in **chemical sector** for outstanding achievement in **Safety Management.**



# Roll of Honor

- 2004
  - **2nd prize in National Energy Conservation Award** in Chlor Alkali Sector by Ministry of Power , Government of India
  - Award for **unique & innovative efforts in Energy conservation** by PCRA, Ministry of Petroleum & Natural Gas, Government of India
  - Certificate of appreciation for achieving accident free million man hours in the year 2003 by Gujarat Safety Council
  - **Platinum award** ( Greentech in chemical sector for outstanding achievement in Environment Management
- 2003
  - National award for prevention of pollution and **Rajiv Gandhi Environmental award for clean Technology** for 2002-03 from Ministry of Environment and Forest.
- 2002
  - **2<sup>nd</sup> rank out of 34 Chlor-Alkali plants** in overall environmental rating of the Indian caustic-Chlorine sector by Centre for Science & Environment, New Delhi under their green rating project.
  - **1<sup>st</sup> prize in National Energy Conservation Award in Chlor Alkali Sector** by Ministry of Power , Government of India.
  - **Award for unique & innovative efforts in Energy conservation** by PCRA, Ministry of Petroleum & Natural Gas, Gov of India for 2002

# Roll of Honor

- 2001**
- **National Energy Conservation Award in Chlor-Alkali** Sector by Ministry of Power, Govt. of India for consecutive third year
  - **Award for unique & innovative efforts in Energy conservation** by PCRA, Ministry of Petroleum & Natural Gas, Government of India for consecutive second year.
  - **Corporate Environment Award 2000-01** by Tata Energy Research Institute in recognition of corporate leadership efforts towards environment management and sustainable initiatives in the category of “company with turnover below Rs 100 Cr.”
- 2000**
- **National Energy Conservation Award in Chlor-Alkali Sector** by Ministry of Power, Govt. of India for consecutive second year
  - Two awards for unique & innovative efforts in Energy conservation by PCRA, Ministry of Petroleum & Natural Gas, Government of India
  - **ICMA certificate of merit for excellence in energy conservation** and management
- 1999**
- **National Energy Conservation Award in Chlor-Alkali Sector** by Ministry of Power, Govt. of India for consecutive second year

Our journey towards  
**EXCELLENCE**  
is Continual . . .