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gtz

# **Compendium** of the One Day Programme for **Designated Consumers in Kerala**



**energy management centre – kerala**

department of power, government of kerala

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## PROGRAMME SCHEDULE

### ONE DAY PROGRAMME FOR DESIGNATED CONSUMERS IN KERALA

<b>Venue</b>	<b>Riviera Suit, Kochi</b>
<b>Date</b>	<b>03-February-2009; Tuesday</b>

Registration:		09.30 - 10.00
Introductory Address	EMC	10.00 - 10.15
Tea Break		10.15 - 10.30
EC Act 2001, Role of DC , Filings; International Experience.	<b>Dr. Rudolf Rouch, GtZ</b>	10.30 - 12.30
Lunch		12.30 - 01.30
EE & EC , Audit Methodology, Best Practices among DCs	<b>Mr. K.K.Chakarvarti, GtZ</b>	13.30 - 15.45
Tea Break		15.45 - 16.00
DCs Expectation/Presentation from BEE/ SDA - Interactive Session	GtZ/EMC	16.00 - 1700

<b>List of DC s in Kerala</b>		
<b>Sl No</b>	<b>Name of the Industry</b>	<b>Sector</b>
1	HINDUSTAN NEWS PRINT LTD	Pulp and Paper
2	TRAVANCORE COCHIN CHEMICALS LTD (TCC)	Chlor-Alkali
3	NTPC	Thermal power station
4	KDPP	Thermal power station
5	BDPP	Thermal power station
6	BSES	Thermal power station
7	KPCL	Thermal power station
8	MALABAR CEMENT	Cement
9	GTN Textiles Ltd	Textile
10	Patspin India Ltd	Textile

## ABOUT THE PROGRAMME

Energy Management Centre (EMC)-Kerala as part of SDA activity conducted the training programme for designated consumers for annual reporting of Energy data in the State at Riviera Suite, Cochin on 3<sup>rd</sup> of February 2009. The programme was devised for a knowledge transfer on EC Act 2001, Role of DC , E Filings; International Experience in E fillings and best practices in the respective industries; EE &EC , Audit Methodology, Best Practices among DCs. Delegates from 7 sectors attended the programme.

**Mr. Rudolf Rouch**, gtz ,Manager IGEN- had a session on “EC Act 2001, Role of DC , Filings; International Experience.” and **Mr. K.K.Chakarvarti**, gtz - Senior Programme Specialist had a session on ” EE &EC , Audit Methodology, Best Practices among DCs” .

Delegates from different sectors had presentation on best practices on energy conservation at their industries (i.e. about industries Energy policies, Energy Management System, Energy Conservation Achievements, Energy Audits / Studies Co-ordinated, Major Energy Conservation Schemes, Renewable Energy Front Initiatives ,Strategic Em Plan For The Future) .The Programme concluded with an interactive session with representatives of EMC and gtz. Mr. K K Chakarvati (Senior Programme Specialist, IGEN) and Mr. Rudolf Rouch (Manager IGEN) of gtz shared their experience with the participants

## PRESENTATION BY

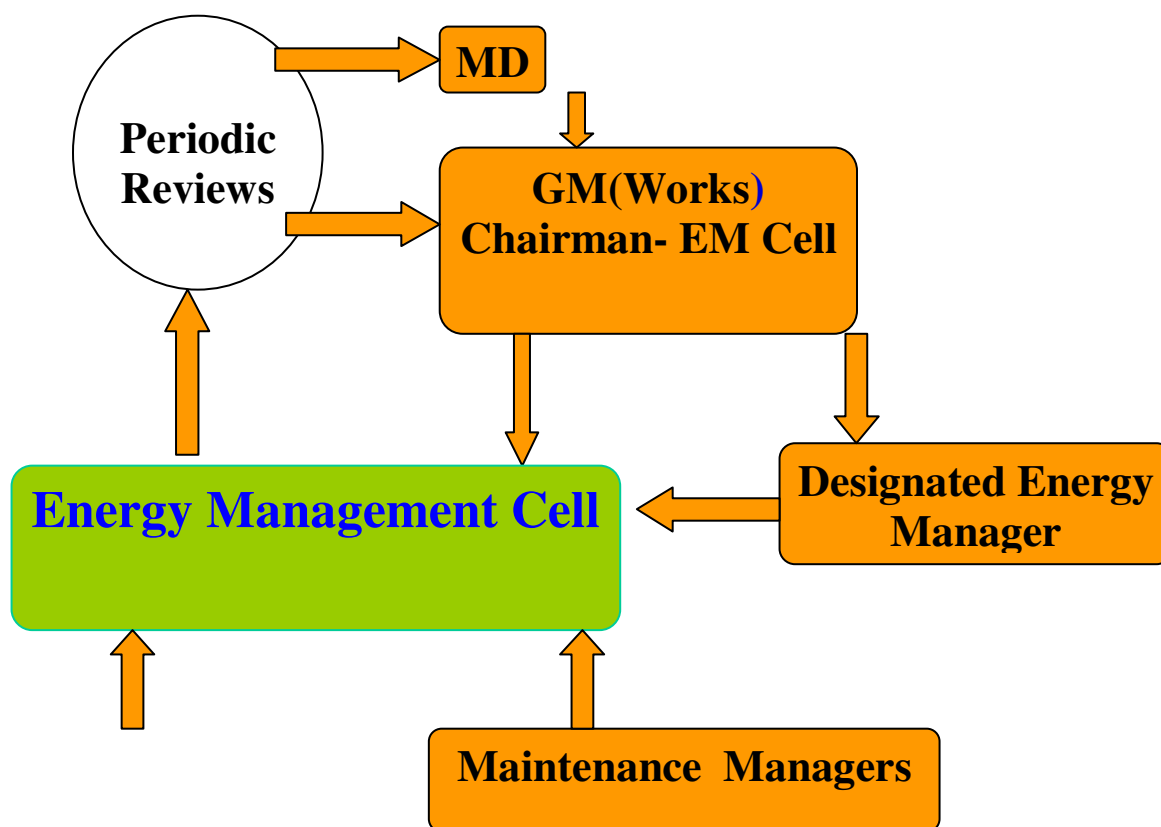
**SREEKUMARY**

Sr Manager (Energy)

Hindustan Newsprint Limited, Kerala

## BEST PRACTICES ON ENERGY CONSERVATION AT HINDUSTAN NEWSPRINT LIMITED, KERALA

### Energy Management Structure



### HNL- Energy Policy

- Create awareness among all employees to conserve energy and natural resources.
- Monitor closely and control consumption of various forms of energy through an effective energy management system.
- Optimize the ratio of grid to captive power.
- Reduce specific energy consumption.
- Upgrade technology and improve efficiency of equipment and process.
- Enhance efficiency of steam generation.
- Reduce coal consumption by utilization of non- conventional fuels for steam generation.
- Carry out external energy audits periodically to identify areas for continual improvement.

## Training for 100 % Technical staff

- EC Act -2001
- On going Energy Conservation schemes.
- Latest Technologies for Energy Efficiency improvement.
- Brain storming sessions on identifying new avenues.

## Focus on Employee participation

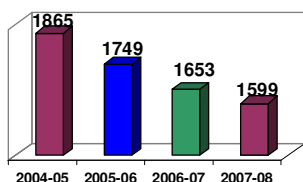
- Suggestion Schemes, Interactive Task Forces.
- Energy Conservation Week.
- Energy Quiz, Technical Sessions.
- Campaign among colony occupants.

## Energy Management System Tools

- Centralized Energy Monitoring System  
- Enercon eLAN
- Integrated Management Information System  
- ERP (BaaN IV)
- Integrated Process Automation  
- DCS

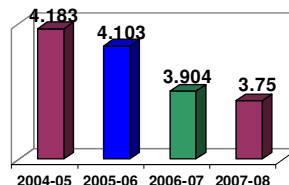
## Energy Conservation Achievements

Specific Electrical Energy:  
kWh/ MT of Newsprint



14%

Specific Thermal Energy:  
M KCal/MT of Newsprint



	Investment	Energy Saving		Cost Saving
	Rs Lacs	Lakh kWh	MT of Coal	Rs Lacs
2004-05	356	99	3804	442
2005-06	371	84	4678	336
2006-07	70	85	3293	345
2007-08	62	51	3560	212

## Energy Audits / Studies Co-ordinated

- Energy Conservation Survey in Pumps & Fans by Sri KS Raghavan, Project Consultant.
- Energy Audit in Compressed Air System by M/s IR.
- Comprehensive Energy Audit by M/s CIL.

## Major Energy Conservation Schemes

### (1) Variable Frequency Drives for 91 Pumps/Fans in 3 Phases



Phase	No. of VFDs	Invest. Rs Lakhs	Power Saving: KW	Annual Energy Saving Lakh kWh	Cost Saving: Rs Lakhs	Year
I	14	95	344	29	101	2004-05
II	31	152	556	38	133	2004-05
III	46	132	510	28	97	2005-06
<b>Total</b>	<b>91</b>	<b>379</b>	<b>1410</b>	<b>95</b>	<b>331</b>	

### Energy Conservation Scheme : Compressed Air System

**Equipment:** Single Centrifugal Compressor- 6400m<sup>3</sup>/hr, 650KW

**Background:** Air System audit conducted through M/s Ingersoll Rand.  
Re-orientation of Air Distribution Network to reduce pressure drop.

**Result:**

Compressor Discharge Air Pressure Setting could be reduced from 7 to 5.7 kg/sq cm.  
Daily Energy Reduced from 14,500 to 12,000 units (Saving:104 KW)

Annual Energy saving: 8.5 Lakhs.

Energy Cost Saving: Rs 34 Lakhs.

Investment: Rs 2,00,000

### **Innovative Schemes**

#### **1.Optimisation of Patterns of Refining Segments , leading to 2 Stage Refining, instead of 3 stage, in CMP plant**

Power Saving: 1350 KW

- Annual Energy Saving: 75.67 Lakh kWh
- Annual Energy Cost Saving: Rs 227 Lakhs.

Investment: NIL

#### **2. Avoided extra refining of CMP pulp in Paper Machine plant by stopping 2 nos 400KW Refiners:**

Power Saving: 290 KW

Energy Saving: 24.5 Lakh KWh

Energy Cost Saving: Rs 73 Lakhs

## **Major Energy Conservation Schemes.**

- Energy Efficient Pumps
- All the 26 Dynodrives replaced with EE motors & VFDs
- Energy Efficient Impeller for Agitator
- Energy Efficient Aerators
- Speed Control of Agitators using VFDs
- Energy efficient Motors
- Energy Efficient Indication Lamps using LEDs
- Installation of Thermo compressor for steam saving in Paper M/c.

## **Renewable Energy Front Initiatives:-**

- Solar Lighting for Factory Main gate lights
- Solar water heaters for Guest House, Officers' Hostel & 4 Residential Quarters.
- 1 Cub M Biogas Plant for Sr Officers' Hostel
- 10 Cub M Biogas Plant for Factory Canteen

## **Plans Ahead!**

Scheme	Anticipated Savings: Lakh kWh	Saving: Rs Lakhs	Investment planned	Project Start & Completion year
Repalce 5 nos low efficiency pumps in Pulp mills by energy efficient pumps	2.74	9.6	17.75	November 2007, March 2009
Optimize operation of Reject dilution pump	6.49	22.72	4	April 2008, March 2009
Reduce seal water inlet temperature and improve the performance of the vacuum pumps	3.09	10.8	6	April 2008, March 2009
Replace existing DM Water Booster pump with energy efficient pump	0.43	1.5	2.88	October 2007, August 2008
Optimise the operation of river water pumping system using EE pump	1.54	5.4	10	October 2007, March 2009
Replace the existing ETP Dilution pump with correct head pump	0.34	1.2	1.5	November 2007, March 2009
Install VFD to De-superheating pump	0.3	1.06	1	October 2007, December 2008
Optimise the operation of Mill water pumping system using EE pump	1.93	6.75	10	October 2007, March 2009
Replace the existing Recovery Boiler FD fan with energy efficient fan	0.55	1.92	3	November 2007, March 2009
Optimise the operation of power bilers using energy efficient FD fan system	3.43	12	20	July 2008, December 2009
Optimise the oxygen percentage levels in power boilers	1750 MT Coal	52.23	10	October 2007, December 2009.



## **PRESENTATION BY**

**Noorul Hassan. M**  
Malabar Cements Ltd.  
Cement Grinding Unit, Cherthala

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## **BEST PRACTICES ON ENERGY CONSERVATION AT MALABAR CEMENTS LTD.CEMENT GRINDING UNIT, CHERTHALA**

### **Highlights of Achievements**

- Commissioning of Walayar Plant – 02.02.1984
- Kerala State Pollution Control Award – 1990 - 1991
- Secured 1st State award for Energy Conservation - 1992
- VSSC Rolling Trophy for Safety measure - 1994 & 1995
- Company obtained ISO : 9002 certification – Nov 1996
- Kiln automation with Fuzzy Logic Expert – Nov 1997
- NCBM National Award for the Best improvement in Energy - 1998
- Commissioning of 600 TPD Grinding Unit – 07.08.2003
- Introduced SAP – ERP System – 01.08.2007

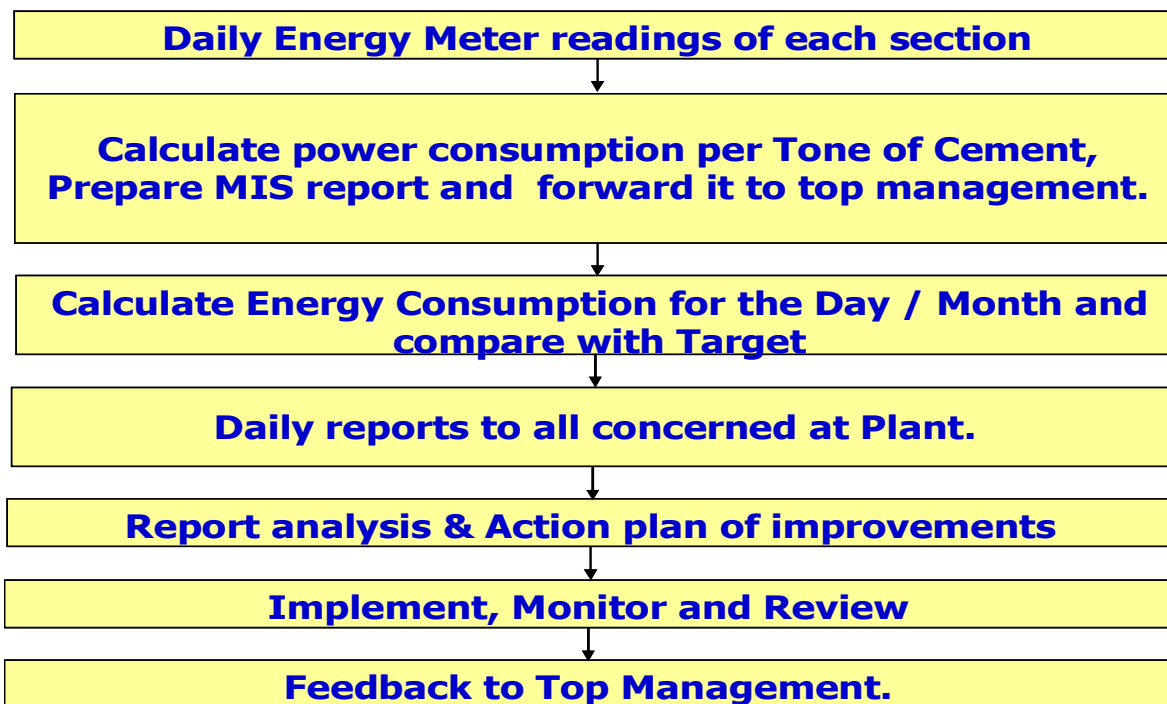
### **Energy Policy**

#### **AIM:**

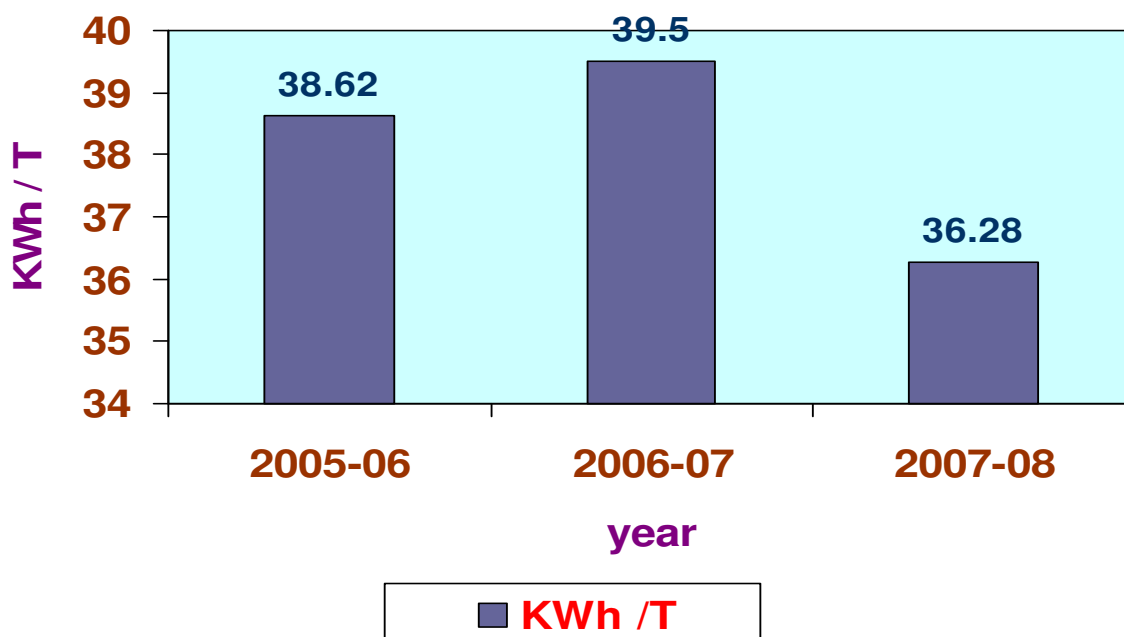
- To optimally utilize various forms of Energy (Fuel & Power) in a cost effective manner to ensure conservation of energy resource.
- Reduce specific energy consumption by identifying areas of energy saving potential in the process.
- Set energy consumption targets and monitor continuously.
- Involve all the employees to work towards progressive improvement of targets of energy consumption.
- Promote awareness towards energy conservation.
- Implement innovative ideas for modification, improvement and up gradation of the equipment & process for optimizing energy consumption.



## Energy Management System



## Specific Power Consumption



**Best Practices - Energy Conservation Summary of Savings**

Sl. No	Section	Annual Saving Lakhs KWh	Annual Savings Rs. Lacks	Investment Rs. In Lacks
1	Contract Demand Reduction	3452 KVA	9.32	NIL
2	Raw Material Handling	0.27	1.08	NIL
3	Cement Mill Section	5.08	20.42	7.25
4	Compressor & Pumps	0.57	2.28	NIL
5	Lighting	0.4	1.3	0.0470
	<b>TOTAL</b>	<b>6.32</b>	<b>34.3</b>	<b>7.2970</b>

**Best Practices - Cement Mill**

Sl. No	Project Description	Details of Project Work	Annual Saving Lakhs KWh	Annual Saving Rs. Lacks	Investment Rs. In Lacks
1	Reduction of Contract Demand	Reduced CD from 3000 to 2500 KVA on 15.05.2007	3452 KVA	9.32	NIL
2	Installation of VVVF drive for Recirculation Fan – 132 KW.	Power Saving – 33 KW / Hr	1.98	7.92	5.0
3	Installation of VVVF drive for Mill Vent Fan – 55 KW.	Power Saving – 22 KW / Hr	1.32	5.28	2.25
4	Reduction in idle running of Belt No. 491 DP1 in RMS.	On/Off control by providing interlocking in PLC	0.16	0.64	NIL
5	Reduction in idle running of Belt No. 491 BC1 by providing no-material interlocking.	Control system interlocking provided in PLC	0.11	0.44	NIL

Sl. No	Project Description	Details of Project Work	Annual Saving Lakhs KWh	Annual Saving Rs. Lacks	Investment Rs. In Lacks
6	Removed 611 FN2 Bag Filter Fan 11 KW.	Modified the Bag Filter Fan Line of Fly Ash Feeding to Mill Vent Fan – 55 KW	0.66	2.64	NIL
7	Removal of one 11 KW water pump in cooling water pump house.	Redesign the water circuit & make energy efficient.	0.495	1.98	NIL
8	Automation of Compressor Governing System	Reduction of Loading Time of Compressor and Energy Saving.	0.075	0.30	NIL
9	Combined two Feed Belts and removed one Drive – 11 KW	Combined two short belt conveyors and removed one Motor – 11 KW	0.66	2.66	NIL
10	Study & optimize Bag Filter Purging Time & reduction in the DP across the filters.	Reduction in consumption of compressed air – 177 mtr <sup>3</sup> / Hr	0.46	1.84	NIL

#### **BEST PRACTICES - Lighting**

Sl. No	Project Description	Details of Project Work	Annual Saving Lakhs KWh	Annual Saving Rs. Lacks	Investment Rs. In Lacks
1	Conversion of 250 W HPMV lighting fixtures to 125 W MH fixture.	Optimize lighting system design	0.05	0.175	NIL
2	Conversion of 125 W HPMV lamps to 70 W MH lamps.	Retrofitting mercury vapour lamps with MH lamps	0.29	0.939	0.0225
3	Removal of unwanted 250 W lighting fittings in Clinker Storage Area	Power Saving 7.5 KW / Day	0.03	0.09	NIL
4	Reduction in lighting consumption by installing energy saving tube-lights.	Using energy efficient tube lights	0.01	0.016	0.0245
5	Rearranged Lighting Control floor wise.	Provided separate control Floor wise to reduce consumption.	0.02	0.08	NIL

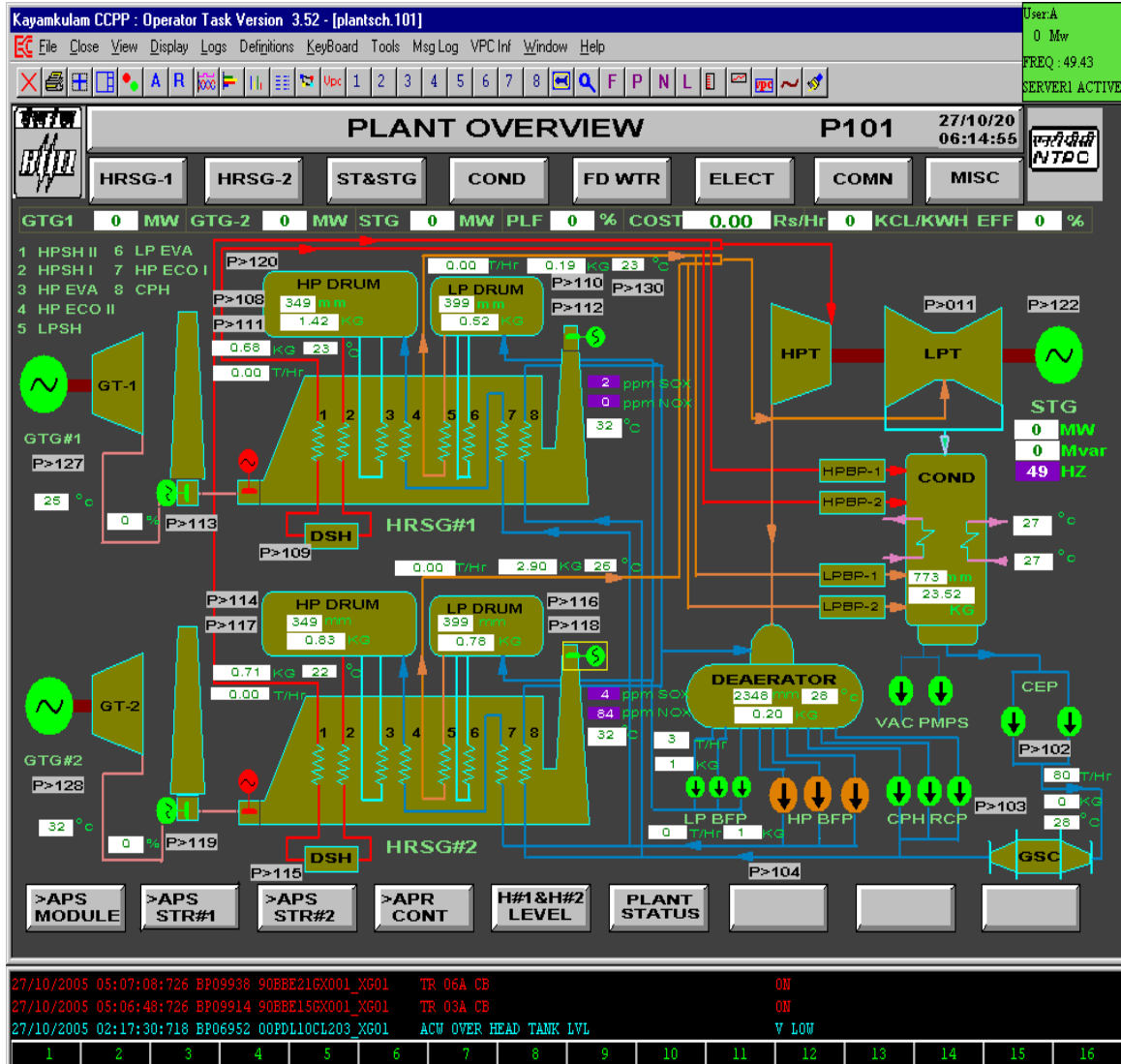
## PRESENTATION BY

**K.Fazal Mohamed, Sr.Suptd. (MTP/EEMG)**

**P.Kannan, Dy.Suptd. (EEMG)**

**Rajiv Gandhi Combined Cycle Power Project Kayamkulam**

## Best Practices in RGCCPP



## **1. Lubrication Oil System Audit**

### **Scope**

- Analysis of past records of oil consumption patterns
- A walk down site visit of all relevant areas along with respective area maintenance engineer
- To identify, attend and arrest lub. Oil leakages

### **Savings**

- Estimated savings by arresting the major quantified leak areas is between Rs. 33000 to 45000 per annum
- The major leaks were attended during the Major overhauls

## **2. APC Audit**

Electrical Research & Development Association (ERDA) has conducted the APC audit

- Boiler Feed Water Pumps
- Condensate Extraction Pumps
- CPHRC Pumps
- CW Pumps, Cooling Tower and auxiliaries (WHRB & STG)
- GT Module Cooling Systems and auxiliaries (Gas Turbine)
- ACW & DMCW Pumps
- Air Compressors

### **APC-Savings Potential**

Sl. No	Energy Conservation Measures	Anticipated Savings/Yr (Rs. Lakh)	Approx Invest. (Rs. Lakh)	Payback Period (Months)
1	Reduction of air pressure of service air system to 3.5 kg/cm <sup>2</sup>	4.13	Nil	Not Applicable
2	Reduction of operating pressure of boiler feed water pumps	129	15	1.4
3	Performance improvement of boiler feed water pump # C	20.7	5.0	2.9
4	Performance improvement of CW Pump # C	3.43	1.0	3.5
5	Performance improvement of CPHRC # C	8.0	3.0	4.5
6	Changing the existing impeller of DMCW Pumps with lower size impeller	27.6	10.0	4.3
7	Performance improvement of cooling tower fans	4.6	2.0	5.2
8	Installation of lower capacity CEP for single unit operation	21.0	15.0	8.6
9	Performance improvement module cooler CW Pumps	5.18	5.0	1.6

### **3. GT Compressor and Open Cycle Efficiency**

#### **Open Cycle Efficiency Table**

<u>UNIT</u>	<u>Last audit 19/03/07</u>	<u>Present audit 25/01/08</u>
<u>GT # 1</u>	<u>27.71</u>	<u>27.46</u>
<u>GT # 2</u>	<u>28.06</u>	<u>27.99</u>

#### **Compressor Efficiency Table**

<u>UNIT</u>	<u>Last audit 19/03/07</u>	<u>Present audit 25/01/08</u>
<u>GT # 1</u>	<u>91.32</u>	<u>90.05</u>
<u>GT # 2</u>	<u>92.58</u>	<u>92.45</u>

### **4. Off Line Water wash**

<u>Unit</u>	<u>Offline WW</u>
<u>GT#1</u>	<u>03/03/08, 18/09/08</u>
<u>GT#2</u>	<u>21/03/08, 27/09/08</u>

- Each Offline wash yields the improvement of 3 MW in output
- Improvement in open cycle heat rate : 20kCal/kwh
- Improvement in Combined cycle heat rate : 5kCal/kwh
- Saving of 48 MT of naphtha equivalent
- Total savings (Annual): Rs.28 lacs

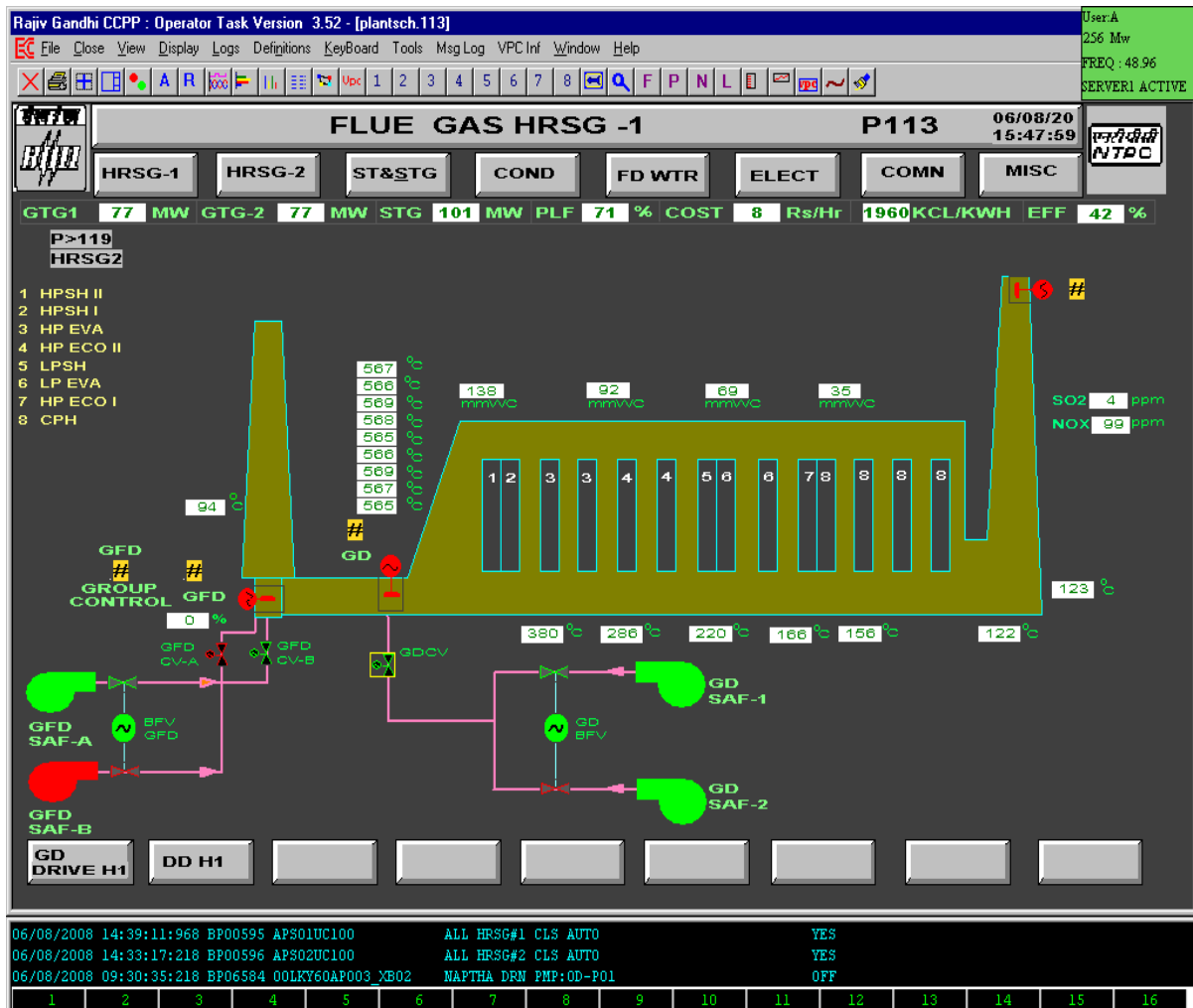
### **5. On Line Water wash**

- On line water wash system was installed in GT#1
- Frequency of Online water wash and Off line water wash were optimized based on cost benefit analysis
- Water wash is being carried out every alternative day
- GT#2 Compressor efficiency is able to sustain for longer duration because of Online Water Wash
- Output of GT#2 is 3 MW (Average) more than GT#1
- Energy Saved : 1.5 Kcals/kwh
- Savings is Rs. 87.7 Lacs

## 6. HRSG Audit

### Recommendations

- Thermal efficiency
  - HRSG#1 : 82.04 %
  - HRSG#2 : 81.62 %
  - Design : 82.42 %
- Flue Gas temperature at CPH outlet :
  - HRSG#1 : 124.1 OC
  - HRSG#2 : 126.6 OC
  - Design : 120.3 OC
- Heat Carried Away by Flue Gas:
  - HRSG#1 : 1.47 MW
  - HRSG#2 : 2.44MW
- Hot spots (HRSG#1-31 and HRSG#2-22) were identified and recorded through Thermo Vision camera
- Periodical thermo-vision survey to be included in PM





## **7. Other Measures**

- WI flow is maintained in such a way that Nox will be nearer to 100 ppm
- Occupancy Sensor Installation
- Replacement of 40 W TL with 36 W FL
- Replacement of Indicators with LED indicators
- Solar Panel installation in Canteen and Guest House
- Summer Cooling in Naphtha Tanks to minimize evaporation loss
- Pressure Gauges are provided in CT fan riser pipes to equalize the flow
- Energy Management System (EMS)

## **Upcoming Audits (Before March'09)**

- Water Balance Audit
- Thermal Insulation Audit

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## PRESENTATION BY

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**GTN Textiles Limited, Alwaye**

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### Company profile

The company was Established in 1964 .It is a Manufacturer of 100% cotton spun yarn 90% export to Europe, Japan, Korea etc. Company's Turnover during the year 2007-08 is 115 crores .Installed spindle capacity is 58864. ISO 9001 and 14001 certified EHT consumer of KSEB since Sept 2007 .Contract Demand : 4500 kVA .Supply voltage : 110 kV

### **Energy Policy**

- ❖ Constantly strive and look for saving of costly and scarce energy through continuous energy conservation efforts
- ❖ Optimise capacity utilization of production equipments, keeping in view the least energy requirement.
- ❖ Generate power from DG sets at the most economic rate by optimum capacity utilisation and following good maintenance practices.
- ❖ Continual up gradation of technology so that production operations can be carried out with least consumption of energy.
- ❖ Audit and establish a system of regular checks and measurements to effectively monitor the consumption of energy.
- ❖ Educate, motivate and involve every employee in the fulfillment of the company's energy goals.
- ❖ Ultimate goal is to reduce units consumed per kg of yarn.

### **Best Practices On Energy Conservation**

- ❖ Installation of on line Energy Management System for continuous monitoring of Dept. wise Energy Consumption.
- ❖ Implementing process optimisation with support of Production, Maintenance and Quality depts.
- ❖ Modifying and stream lining of existing compressed air piping network, compressed air leakage auditing and arresting of leakages.
- ❖ Introducing new energy efficient techniques and equipment.
- ❖ Maintaining motor history and data.
- ❖ Maintaining system power factor at unity
- ❖ Installing VFDs in production machines and humidification plants.
- ❖ Providing energy efficient lighting system

### **Installation of on line Energy Management System**

Energy management system was installed in Feb 2004 for on line monitoring of dept wise power and daily the dept wise energy consumption report generated is circulated to the concerned for awareness, analysis and feedback.

### **Implementing process optimization**

Constantly efforts are made for optimizing production process for achieving least UKG.

To cite an example, in Nov 2008, in Centralised.Waste evacuation plant for carding two waste Transporting fans 7.5 kW and 5.5 kW were eliminated through modification of the plant saving nearly 230 units per day.

### **Modification of compressed air system**

❖Two separate lines are provided one for high pressure (7 kg/cm<sup>2</sup>) and one for low pressure (5.5kg/cm<sup>2</sup>) with Variable feed control system in May 2004.

❖Also the High pressure piping was streamlined and replaced with PPR piping during Feb 2008

❖This has resulted in saving of around 1000 units per day.

❖Separate compressor and piping is provided for cleaning purpose.

### **Introducing new energy efficient techniques and equipment.**

Conversion of diesel fired boiler to electrical heating system in steam conditioning machine.

This was done in July 2008 and achieved considerable cost saving of Rs.1500 per day with a payback of one year.

### **Maintaining motor history and data.**

❖Detailed history of motors above 3HP is maintained including technical specs, failures of bearing/winding etc.

❖The company policy is to replace the motor with new energy efficient motor after three re-windings.

### **Maintaining system power factor at unity**

❖Total connected capacitors 2840 kVAR

❖APFCR panel is installed at the power house for automatic correction of power factor

80% of the capacitors are installed at the load side Switchboards to reduce the cable losses.

❖Getting full incentive of 1.5% of Energy charges from KSEB.

### **Installing VFDs with PID controller for pumps in humidification plants.**

- ❖ Actual need based requirement is met by application of Variable frequency drives in production machines and thus saving energy .
- ❖ Also for humidification plants, VFDs are provided for fans and pumps wherever feasible and based on the ambient conditions their running is optimised and even manually switched off when not required.
- ❖ Saving of around 2000 units per day was achieved on account of this.

### **Providing Energy efficient lighting system.**

- ❖ A separate transformer has been provided for lighting and the voltage set at 385 volts
- ❖ Only energy efficient Electronic ballasts and tubes (36 W) are being used.
- ❖ Periodic measurements of lighting Lux level is taken and twin tubes are converted to single tube wherever possible.

### **Solar water heater for canteen**

- ❖ Solar water heater is provided for preheating the water fed to boiler for cooking and dish washing in canteen.

**PRESENTATION BY**  
**The Travancore-Cochin Chemicals Ltd;**  
**Udyogamandal P.O**

### Company profile

The Travancore-Cochin Chemicals Ltd popularly known as TCC is a distinguished member in the Udyogamandal Industrial belt of Kerala. TCC is presently a Kerala State Government enterprise originally established by M/S Sheshasayee Brothers Travancore Ltd in the year 1950. Started commercial production in 1954 with a capacity of 20 TPD caustic soda. First ever unit in the India to produce rayon grade caustic soda by Mercury process. Presently TCC is Having Annual Installed capacity of 57750 MT of Caustic soda all through State of the art and environment friendly Membrane cell Process. We market our products all over India. The Electrolyser Plant Technology is provided by Asahi Glass Co. Japan, and UHDE India Ltd, Mumbai. TCC utilization was about 103.54% in the year 2006-2007 and 73.24% in the year 2007-2008 (lower capacity utilization due to a major equipment breakdown in the year 2007-2008) contributes to about 2.5% of the total Caustic Soda Production capacity in India. The annual sales revenue of TCC is about Rs 1250 Million (USD 31.25 million). Annual Power and fuel bill consists of 50 % of total revenue (USD 15 million)

### Installed Capacity

<u>Product</u>	<u>Annual Installed Capacity</u> <u>MT</u>	<u>Annual Production for 2007-2008,</u> <u>MT</u>
Caustic Soda	57750	42298
Liq. Chlorine	23760	12925
Commercial HCl Acid	127742	78684
Sodium Hypochlorite	15000	11842
Caustic Soda Flakes	30000	12925

### Achievements And Awards

**1993** - Best Performance award for Energy Conservation in the State of Kerala under group "Chemical & Fertilizers – above 3000 KVA" from Government of Kerala.

**1998** - Best performance award for Energy Conservation in the State of Kerala under group "Major Industries" from Energy Management Centre, Govt.of Kerala.

**2003**- Kerala State Energy Conservation Award (2000) in the category of Large Scale Industry

**2005**- National Energy Conservation Award in the Chlor-alkali Segment

### Electrical System Parameters

Power supply from : KSEB  
Category : EHT  
Supply Voltage : 110 KV  
Present Contract Demand : 24000KVA  
Normal Demand : 19540 KVA  
Peak Demand : 19467 KVA  
Off Peak Demand : 24655 KVA  
Average Power Factor : 0.99  
Average monthly units consumption : 12434867 kWh  
Average Monthly Bill : Rs 4,30,61,635  
Average unit rate of KSEB : Rs 3.46 (Now Rs 4.00)

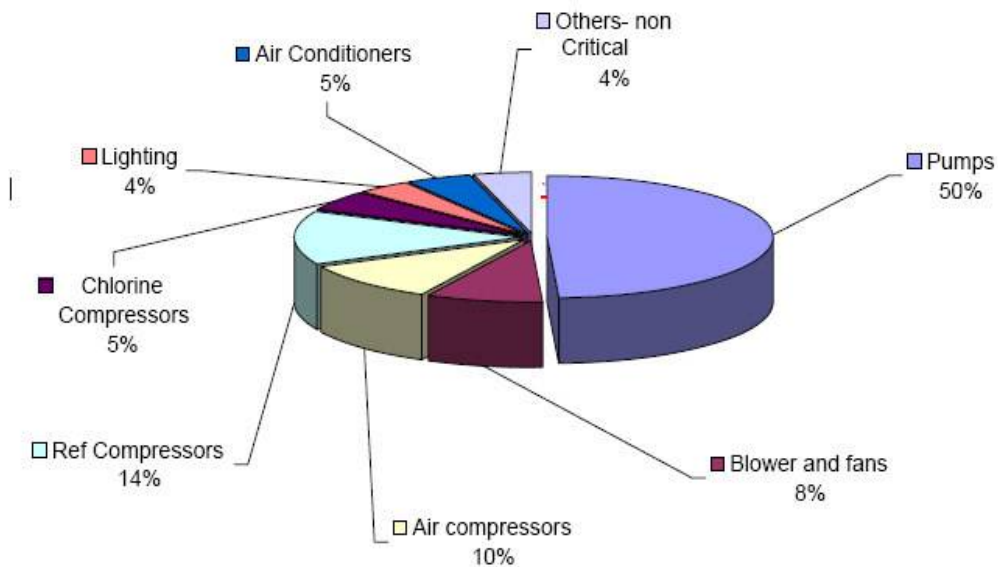
### Summary Of Energy Consumption

Year	Electricity		Furnace oil		Total Value Rs Crores	Hydrogen Nm3	Total Energy MKcals
	Kwh	Rs Crores	KL	Rs Crores			
2007-2008	115375800	41.12	3333.49	6.61	47.73	834594	134312
2006-2007	150691203	51.99	4564.16	7.43	59.42	1749196	179481
2005-2006	135186108	46.89	3821.18	5.68	52.57	1273544	157445

### Major Energy Consuming Equipments

No	Equipment/System	Load kw
1	Electrolyser AGC	12200
2	Electrolyser UHDE-1	2500
3	Electrolyser UHDE-2	2500
4	Cooling Towers	550
5	Chilled water system	242
6	Chlorine Liquefaction	320
7	Compressed air	120
8	Thermic fluid heater	5.26 millionKcals/hr
9	Boiler	8 tonnes/hr

### **Percentage Contribution of Auxiliary Loads – Total 1750 KW**

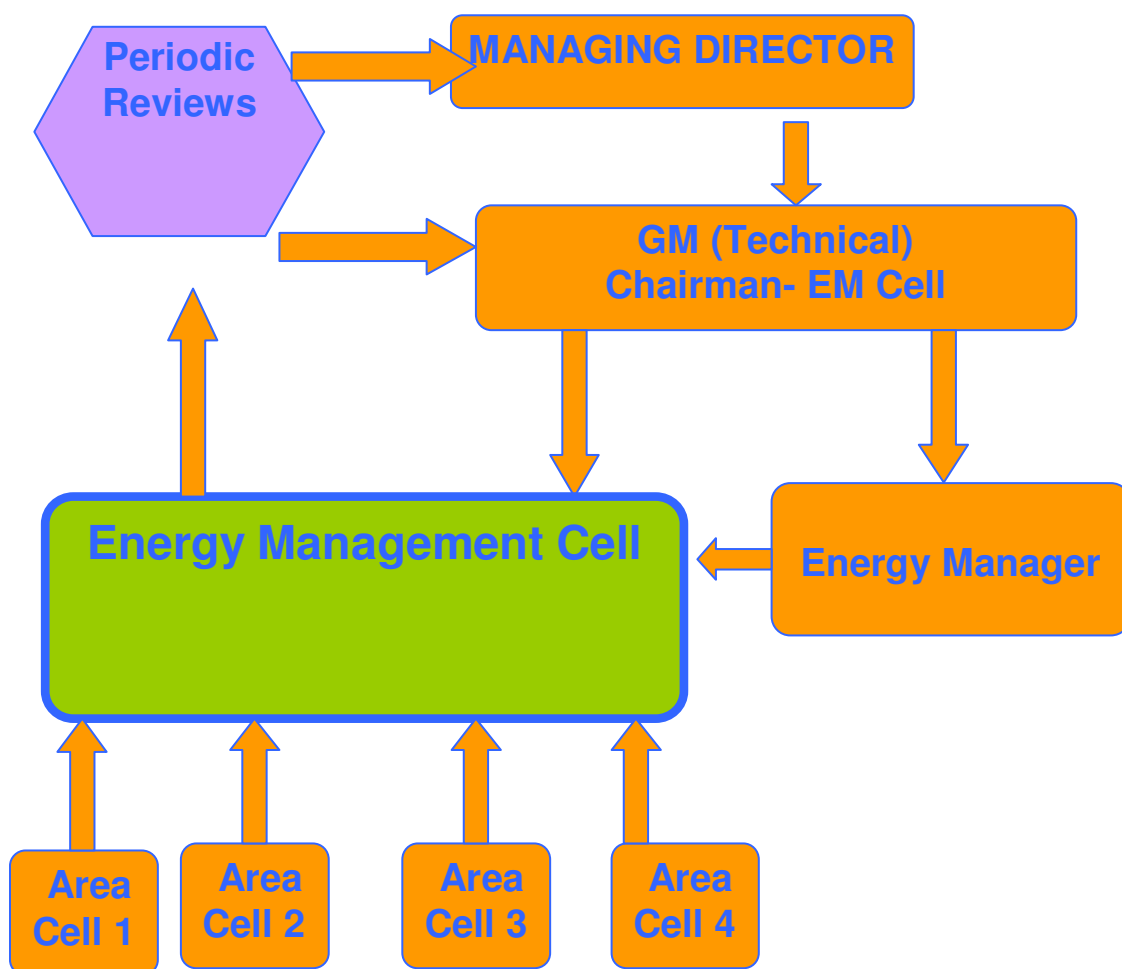




## Energy Management

TCC is a Designated Consumer under the Energy Conservation Act 2001, in the Chlor- alkali segment. Our annual Fuel and Electricity consumption is equivalent to about 18000 MT of oil equivalent per year. The energy management activity lead by a qualified energy Manager TCC carried our energy conservation activities in the past and now embarking on a comprehensive energy management plan

## The Energy Management Structure



### **Features of Energy Management Plan**

- Measurement, management, and documentation for continuous improvement for energy efficiency
- A cross-divisional management team led by an energy manager who is responsible for overseeing the implementation of the strategic plan
- Policies and procedures to address all aspects of energy purchase, use, and disposal
- Projects to demonstrate continuous improvement in energy efficiency
- A best practice manual for energy use
- Preparation equipment specification and procurement guidelines
- Identification of key performance indicators, unique to the company, that are tracked to measure progress
- Periodic reporting and review of progress to the management

### **Strategic Em Plan For The Future**

- To implement a software based energy monitoring system.
- Comprehensive energy conservation awareness programme among staff
- Strengthening the energy management cell
- Implement all low cost and no cost energy saving measures
- Gather international bench marks available in the chlor-alkali segments in electrolyser and other equipments and utilities energy consumption.
- Go for major equipment retrofits
- To become the lowest specific energy end user in the Chlor-alkali segment by 2012

### **Components**

- Top-down commitment to energy management
- Monitor of energy use (indexed to production);
- System to regularly assess and track energy performance
- Commitment to continuous improvement
- Energy budget and energy cost centers
- An initial energy audit to find where energy can be saved;
- set measurable performance goals

- ongoing and co-coordinated programme of energy saving projects, like.
  - ❖ a long-term savings scenario - say five years;
  - ❖ a factory-wide plan for the medium term;
  - ❖ a detailed project plan for the first year;
- action to improve energy management, including the establishment of an energy monitoring system if one does not already exist.
- An effective reward system for energy performance
- Awareness programmes and capacity building
- Training and Education programme
- An empowered energy Manager and Team

### **Energy Policy**

We at Travancore-Cochin Chemicals Udyogamandal are always committed to Conservation of Energy by all possible means

To accomplish our Mission, we strive for:

- Technological Up gradation to reduce Specific Energy Consumption.
- Conducting Energy conservation studies including Energy Audit and adopting the apt measures for Conserving Energy.
- Contacting other Organization and enriching our experience of energy conservation.
- Using renewable energy source to the extend possible.
- Disseminating knowledge and information on energy conservation to our employees.
- Low Energy fuels also to be tried depending upon feasibility.

### **Energy Audit**

Carried out Energy Audit in June 2008 through M/S Academy of Conservation of Energy Baroda

The major objective of the audit were:

- to review the present energy accounting system ,to establish the baseline specific energy consumption for better monitoring and targeting.
- To devise a strategic energy management plan for the future
- To identify areas for detailed energy auditing

### Energy Conservation Measures In 2007-2008

2007-2008	1. Installation of VFD for Raw Water Pump: there by reducing power demand by 9.5 kW	0.82	--	--	2.83	1.2
	2. Down Sizing of process water pump: from 110 kW to 45 kW resulted in power saving of 55 kW, by utilising a spare pump.	4.752	--	--	16.92	Nil
	3. Down sizing of Filtered brine pump: from 30 kW to 22 kW saving 5.47 kW	0.4332	--	--	1.54	2.2
	4. Down sizing of Sulphuric Acid Circulation pump from 3.7 kW to 1.1kW saving 2.2 kW	0.174	--	--	0.62	0.65
	5. Replacement of Motor of EE motor: Replaced 30 kW motor of vacuum pump in CCF plant with EE motor of Eff 1 class resulting in saving of 0.9 kW	0.0648	--	--	0.23	0.9
	<b>Sub Total</b>	<b>6.244</b>	<b>--</b>	<b>--</b>	<b>22.14</b>	<b>4.95</b>

## Some Specific Measures

### 1. UNDER SIZING OF PROCESS WATER PUMP.



*110 kW process water pump was replaced with a 45 kW spare pump available in the plant. This has resulted in power saving of 55 kW, there by saved 4.752 lakh kWh per annum*

*Energy Cost Saving : Rs 16.92 Lakhs*

*Investment : Nil*

### 2. INSTALLATION OF VARIABLE FREQUENCY DRIVE FOR RAW WATER PUMP



*Incorporated VFD to the 45 kW Raw water pump which resulted in power saving of 9.5 kW, there by saved 0.82 lakh kWh per annum*

*Energy Cost Saving : Rs 2.83 Lakhs*

*Investment : 1.2 Lakhs*



### 3. UNDER SIZING OF FILTERED BRINE PUMP



*30 kW filtered brine pump was replaced with a 22 kW new pump. This has resulted in power saving of 5.47 kW, there by saved 0.4332 lakh kWh per annum*

*EnergyCost Saving : Rs 1.54 Lakhs*

*Investment : 2.2 lakhs*

### Application Of Renewable Energy

- 500 lpd solar hot water system is installed in the Guest house
- Feasibility study for installing biomethanation plant for canteen waste is ongoing

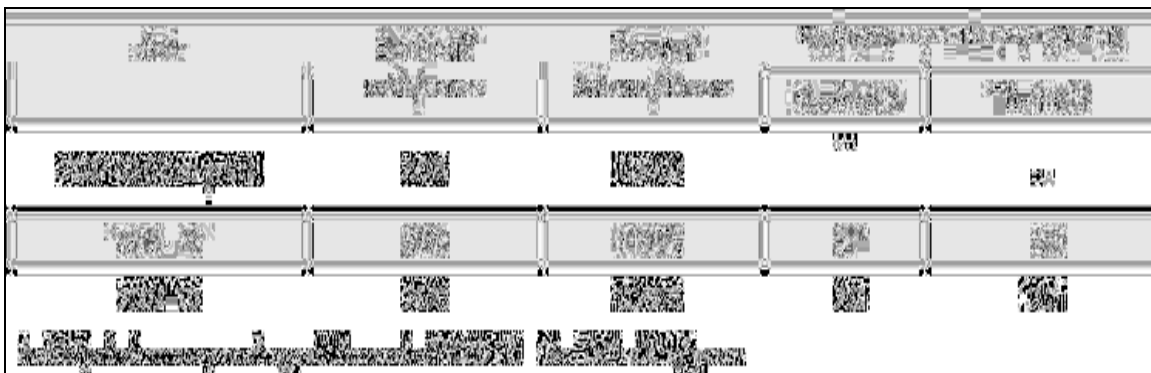
### Innovative Em/Env Measures

- Time of use tariff advantage by cycling load to the electrolyzers, in the background of power cut -Daily cost saving of Rs 30,000
- Waste steam From FACT
- Zero Effluent Status expected by Feb. 2009
- Tag a Leak Campaign

### Investment For Energy Conservation

- Budget for 2008-2009 : Rs 25 Lakhs
- Accrued savings from already implemented projects will be separately accounted for future investment in energy saving projects
- Investment planned for 2009-2010: Rs, 2 crores

### Future energy saving targets



### Future Energy Saving Measures

Energy Conservation Measures (Planned)	Anticipated savings in		Approx. investment (Rs.Lakhs)	Project Commencement & Completion year
	Energy Value	Rs. Lakhs		
1. Utilising Vent steam from FACT Ltd @ 4.5 Mt steam per hour for 300 days which save furnace oil equivalent to 2400 KL annually	23256 Million Kcal/Year	324	55	November 2008
2. Anticipated Energy saving during the fourth stage conversion of Mercury Cells to the membrane cell to the extend of 50 TPD (UHDE III), on the basis of reduction in energy obtained compared to the earlier mercury cell plant, while it was operated in the full load condition	166.98 Lakh kWh/yr	662.92	5300	2009-2010
3. Increased Utilisation of Vent Hydrogen From the present 40 % to 75%	3585.3 MKcal/Yr	111	nil	2008-2009



4. Replacement of standard Motors with Energy efficient motors	0.11 lakh kWh	0.45	0.8	2008-2009
5. Down sizing of pumps	1.98 Lakh kWh	7.86	10	2008-2009
6. Energy efficiency in compressed air system	0.8 Lakh kWh	3.14	2	2008-2009

