

Indian Rayon & Industries Ltd
Unit : Rayon Division , Veraval (Gujarat)
Caustic Soda Plant

(i) Unit Profile :

The Indian Rayon and Industries Limited, Rayon division has installed a Caustic soda Plant, which was commissioned in 1997. The technology & principal items are supplied by M/S Krupp UHDE of Germany & Basics & detailed engineering is done by M/S UHDE India Ltd. Mumbai. In the Process Caustic Soda Lye, Chlorine Gas, Hydrogen gas are simultaneously produced from UHDE Bipolar Membrane Cell. The Products produced are of high quality, since the process demands very high quality of Raw Materials for membrane cell Technology. Caustic soda Lye produced is of 32% concentration. Chlorine and Hydrogen gas from cells are further purified in respective sections. The main Product is Caustic Soda Lye 100.00 TPD. Chlorine Gas 88.60 TPD, Hydrogen 29400 nm³ TPD are by products. The Hydrochloric acid is produced with chlorine gas and Hydrogen gas. The capacity of HCl is 90.0 TPD on 32% . 30% of Caustic Soda is for self-consumption and remaining is for sales. A 50 TPD Flaking Plant is purchased from M/S Bertrams of Switzerland, which was commissioned in January 1998 The Capacity of the Plant increased to 115MT caustic in the year Sep-2003 by de bottlenecking the critical equipments.

(ii) Energy Consumption :

Include information on total energy consumption (i.e Coal , Oil , Gas , Electricity and Money value)

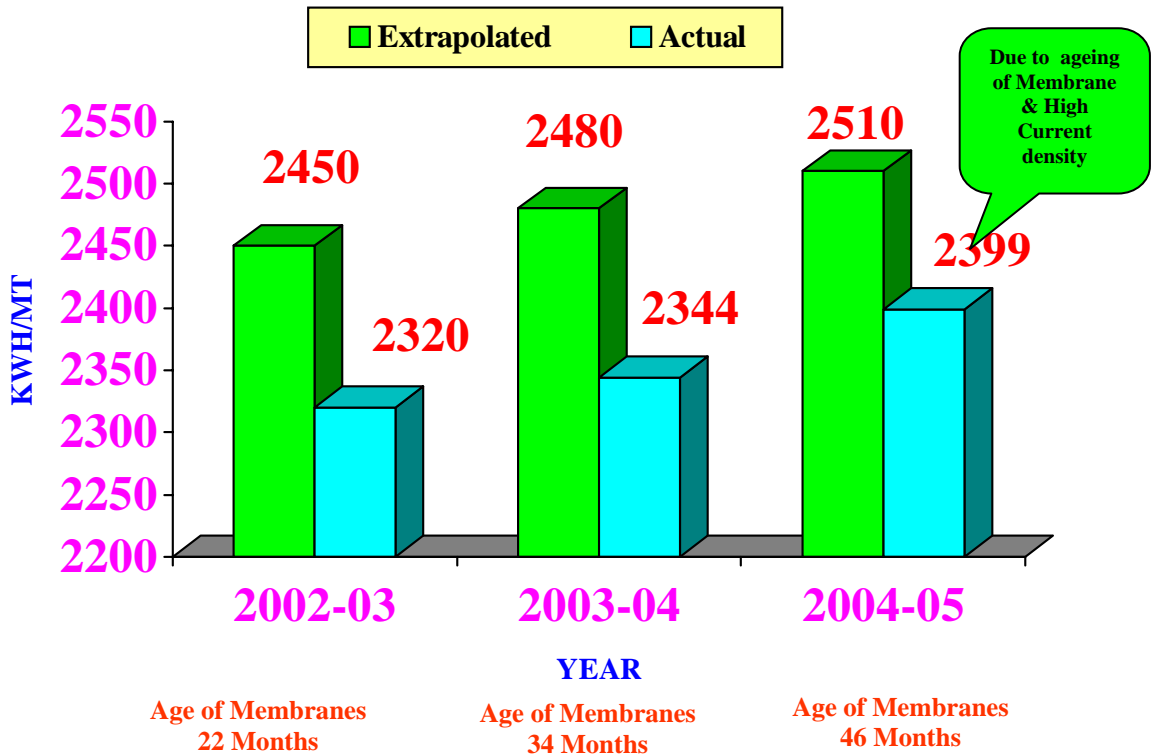
Information on Energy consumption in terms of % of manufacturing cost should also be presented .Also , it should highlight the specific energy consumption for the period 2002-2003,2003-2004 &2004-2005. Good computer graphic presentation related to specific Energy consumption may also be incorporated .

Total energy consumption as electrical energy & thermal energy for last years are shown in the table below, Which depicts continual reduction in Thermal Energy consumption over the years due to our sustained efforts to conserve it with the implementation of various energy conservation measures & ideas to increase efficiency of equipments.

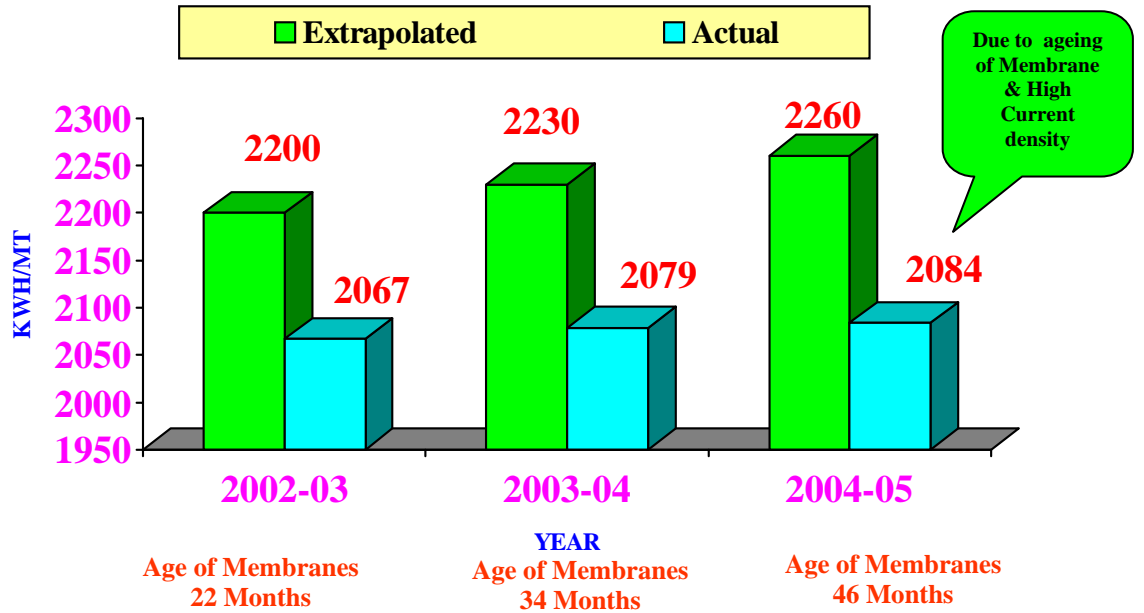
DESCRIPTION	UNIT	2002-03	2003-04	2004-05
Electrical Energy	KWH/T	2319	2344*	2399*
Thermal Energy	M Kcl/T	0.5576	0.4816	0.4145
Total Manufacturing Cost	Rs.lakhs	4598.49	5188	6758.54
Total Energy Bill	Rs. Lakhs	3005.54	3601	4559.31
Energy as % of Total cost of Production	%	65.36*	65.98*	67.46*

- Energy consumption was increased as plant operated at higher current density & also ageing of Membranes.

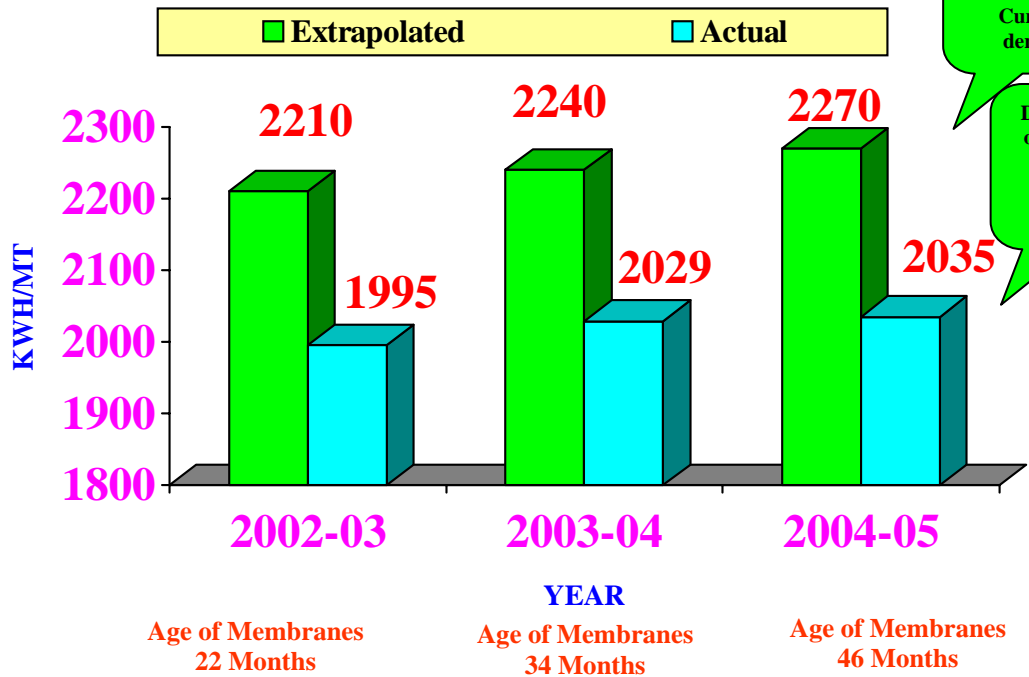
TOTAL POWER CONSUMPTION FOR THE PLANT



DC POWER CONSUMPTION / MT CAUSTIC LYE



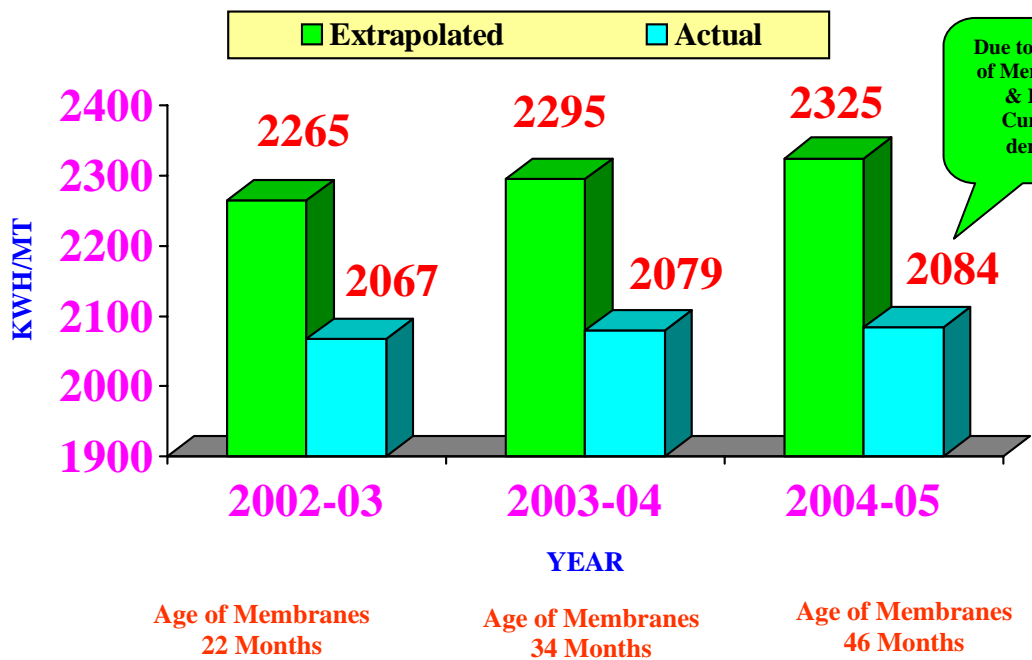
DC POWER CONSUMPTION / MT CAUSTIC LYE AT 3.0 CD



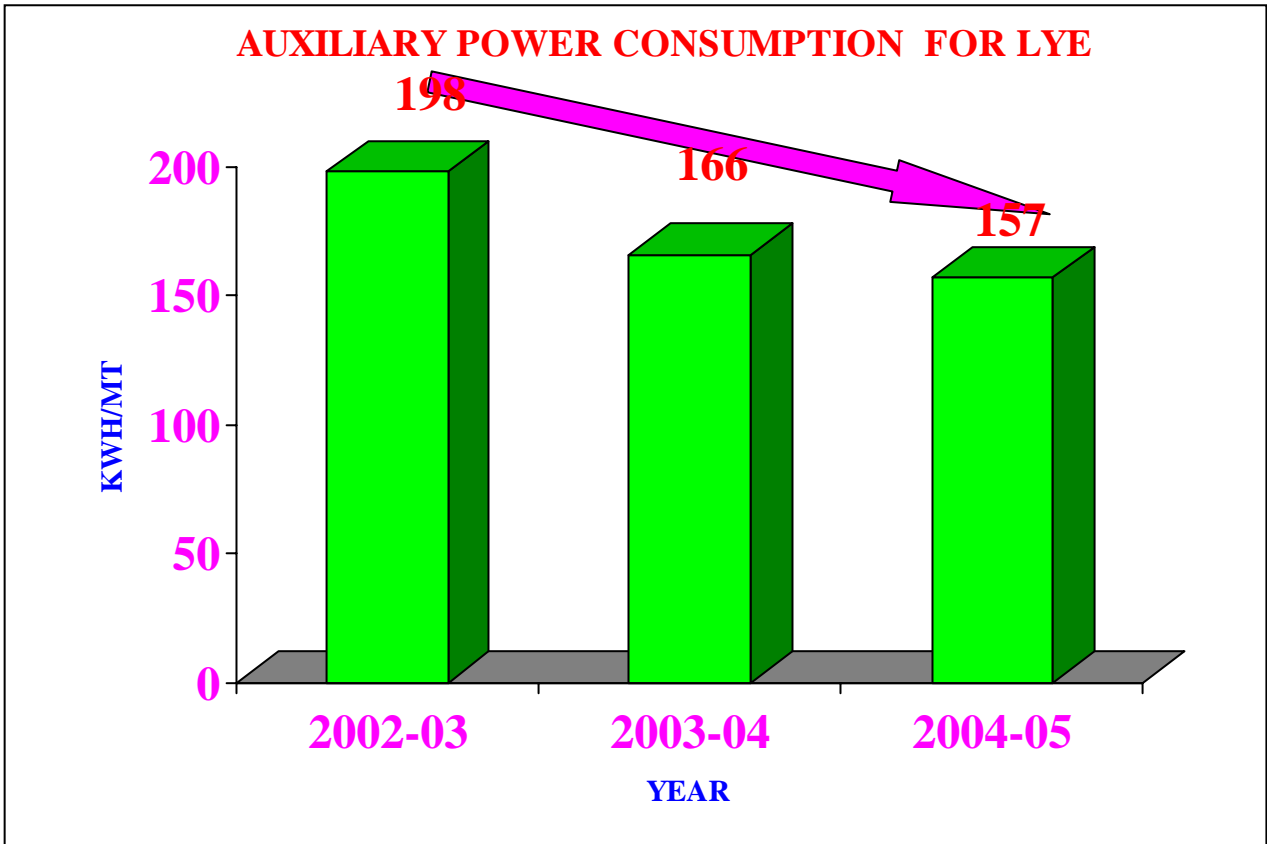
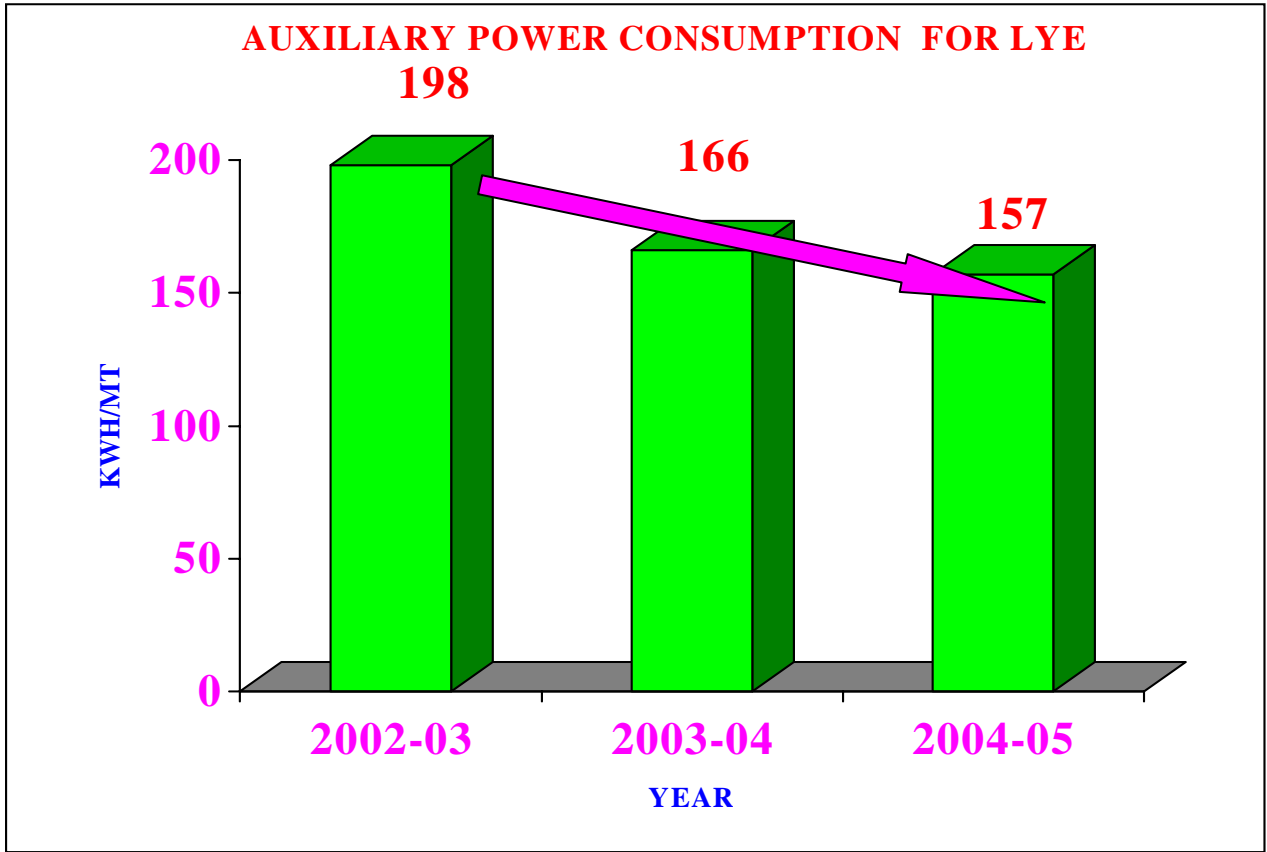
Due to ageing of Membrane & High Current density

Due to ageing of Membrane & High Current density

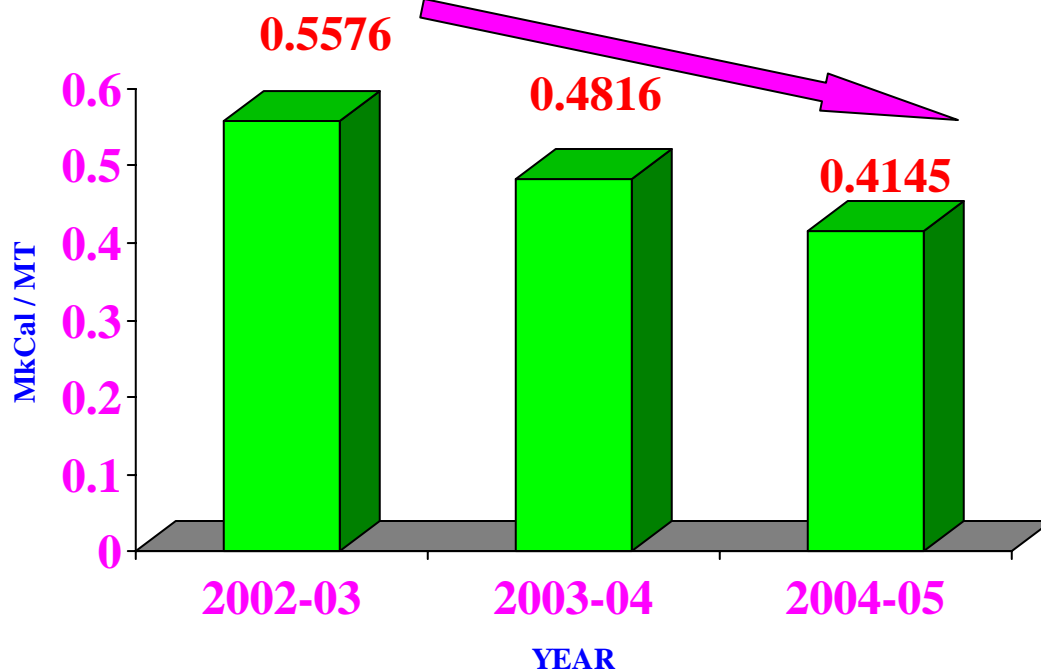
EXTRA POLATED AC POWER CONSUMPTION (AT STANDARD) V/S ACTUAL



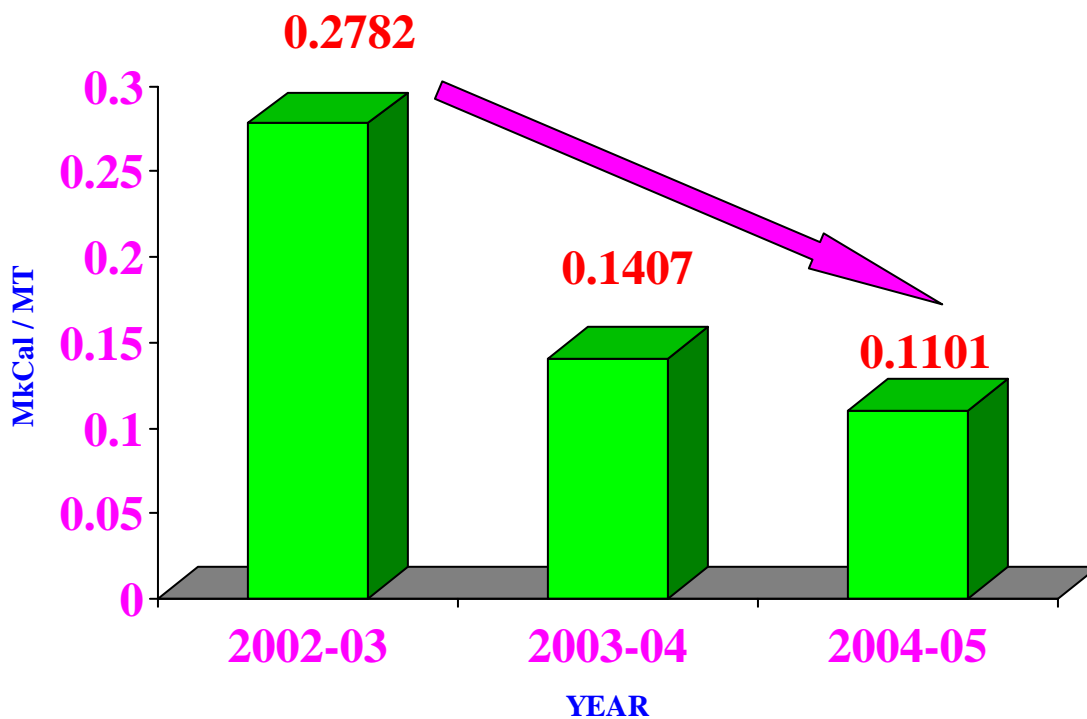
Due to ageing of Membrane & High Current density



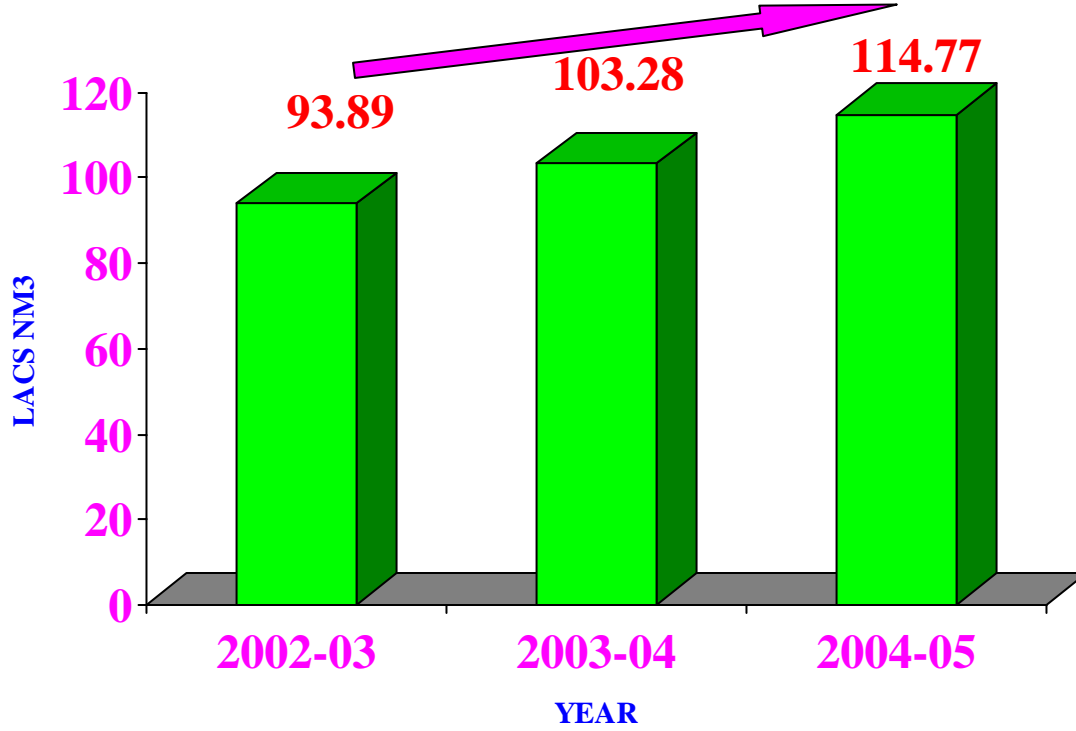
STEAM CONSUMPTION MkCal / MT CAUSTIC INCLUDING FLAKING & EVAPORATION.



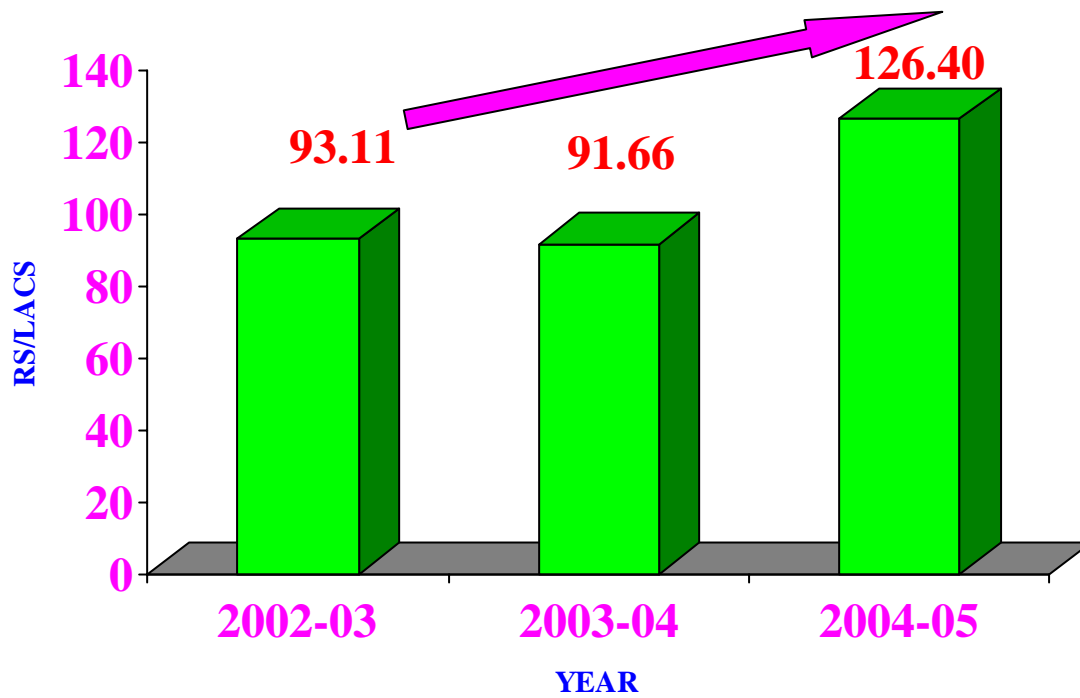
STEAM CONSUMPTION MkCal / MT CAUSTIC LYE



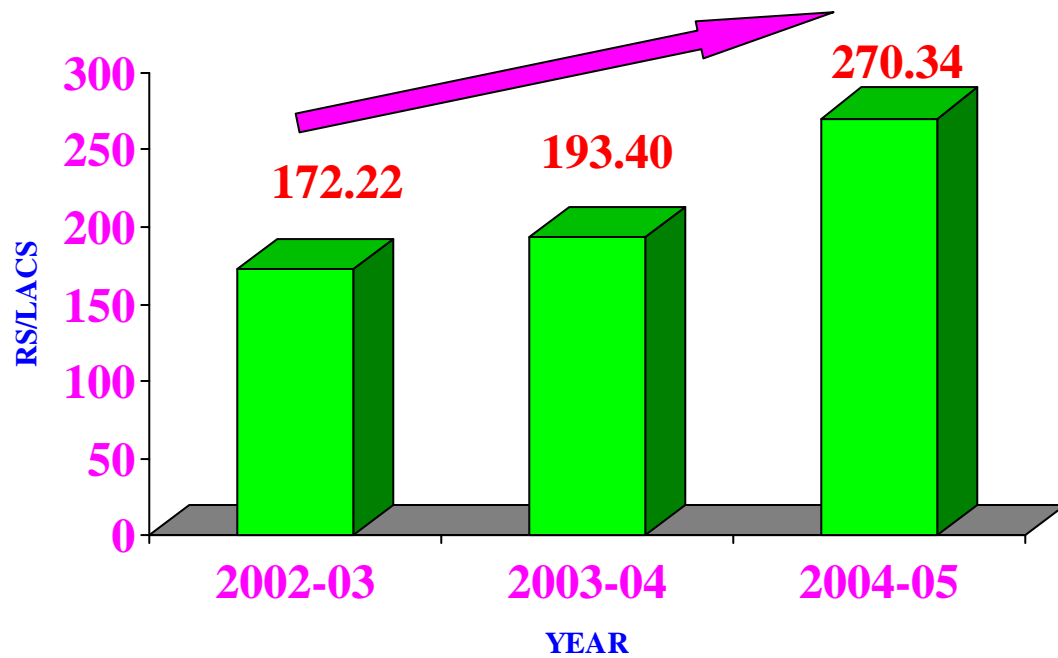
INCREASE IN HYDROGEN UTILIZATION



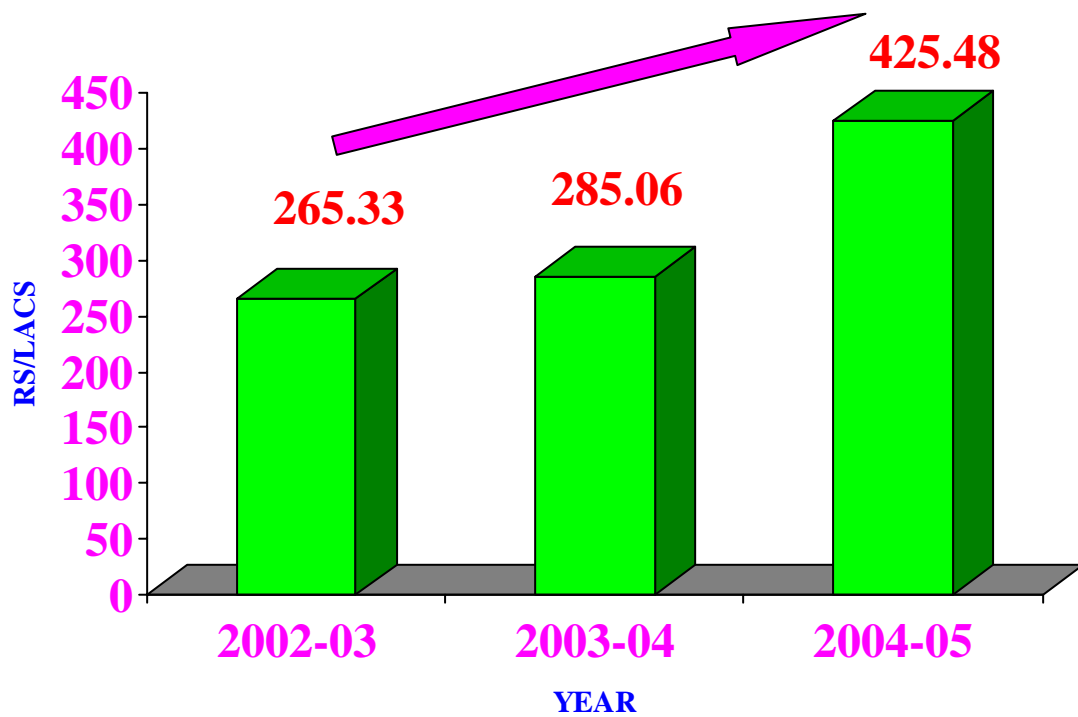
ACHIEVEMENT OF ENERGY SAVING



ACHIEVEMENT OF ENERGY SAVING BY USING HYDROGEN IN PLACE OF FURNACE OIL



TOTAL ENERGY SAVING





**INDIAN RAYON AND INDUSTRIES LIMITED
(RAYON DIVISION)
VERAVAL**



ENERGY MANAGEMENT POLICY

Indian Rayon and Industries Limited, Veraval is committed to demonstrate excellence in Energy Management Performance on a continual basis. To achieve this, we are committed for -

- Monitoring and Control of consumption of Energy through effective Energy management System and periodic energy audits.
- Continuous Upgradation of process with energy efficient & eco-friendly technology to optimize the energy cost.
- Promoting & Propagating Energy Awareness among all the employees.
- Bench marking our performance with the best and endeavoring to be ahead in the world.

**(K.C. Jhanwar)
EXECUTIVE PRESIDENT**

Include one paragraph write-up on each major energy conservation project implemented during the year 2004-05 only.

During the period 2002– 2005, 100 nos. of energy saving & improvement ideas generated. out of which 31 ideas are for energy saving schemes implemented and achieved a saving of Rs. 311.104 Lacs with an investment of Rs. 226.28 Lacs with different pay back periods . With this energy conservation we have achieved 25.66 % reduction in thermal energy & 20.71% In auxiliary Power consumption during last three years as shown in the tables below.

Year	Product	*kWh/Tonne	% Reduction	*MKCal/Tonne	% Reduction
			over 2002-2003		over 2002-2003
2002-2003	Caustic Soda	2319	-	0.5576	-
2003-2004	Caustic Soda	2344	-1.08 *	0.4816	19.73
2004-2005	Caustic Soda	2399	-3.45 *	0.4145	25.66

Remarks (if any) : * Due to aging of membrane and Plant operated at higher current density.

Reduction in Auxiliary Power & Thermal Energy consumption

Year	Product	*kWh/Tonne	% Reduction	*MKCal/Tonne	% Reduction
			over 2002-2003		over 2002-2003
2002-2003	Caustic Soda	198	-	0.2782	-
2003-2004	Caustic Soda	166	16.16	0.1407	49.42
2004-2005	Caustic Soda	157	20.71	0.1101	60.42

Remarks (if any) :

	At 3.0 CD Guarantee AC Power Consumption /MT Caustic extrapolated with aging of the plant	Actual AC Power Consumption /MT Caustic at 3.0 CD	Reduction in AC Power Consumption/MT caustic
Year	1	2	(3) = (1) – (2)
2002-2003	2265	2067	198
2003-2004	2295	2079	216
2004-2005	2325	2084	241

Following are the Energy conservation measures Implemented during 2004 – 2005

1. Energy saving by Changing conventional lighting system to High efficient lighting System
2. Energy saving by Changing 80 Watt HPMV lighting fixtures to 45 Watt CFL fixtures

3. Energy saving by changing conventional indication fixtures to LED type energy Efficient Fixtures
4. Energy saving by installing Supermizer (Inverter with special feature) for 32P203A Pump (42% NaOH Pump).
5. Energy saving by Installing 105 TPD Cl2 Compressor in place of 55 TPD Cl2 compressor
6. Thermal Energy (steam)saving by operating plant @130 MT / day
7. Energy saving by Modifying Rectifier Cooling system outlet of Rectifier Transformer .
8. Energy saving by Segregating Cooling water supply line into High head and Low head.
9. Increasing in Thermal Energy Utilization by consuming surplus Hydrogen in Caustic Flaking Unit to enhance the capacity of Flaking Unit
10. Saving of Chemical by Monitoring of Salt Quality (Raw material)
11. Caustic & HCl Saving through Process Monitoring
12. Soda Ash Saving by Process Monitoring
13. Saving of Auxiliary Material

Implementation Of Energy Conservation Measures For The Year 2004 - 2005

Scheme – 4

Energy saving by installing Supermizer (Inverter with special feature) for 32P203A Pump (42% NaOH Pump).

Brief Particulars Of Scheme :

We have installed a. supermizer on 32P203A (42% NaOH Pump) Motor. . By these supermizer we have achieved saving of energy as details given here under.

Saving :

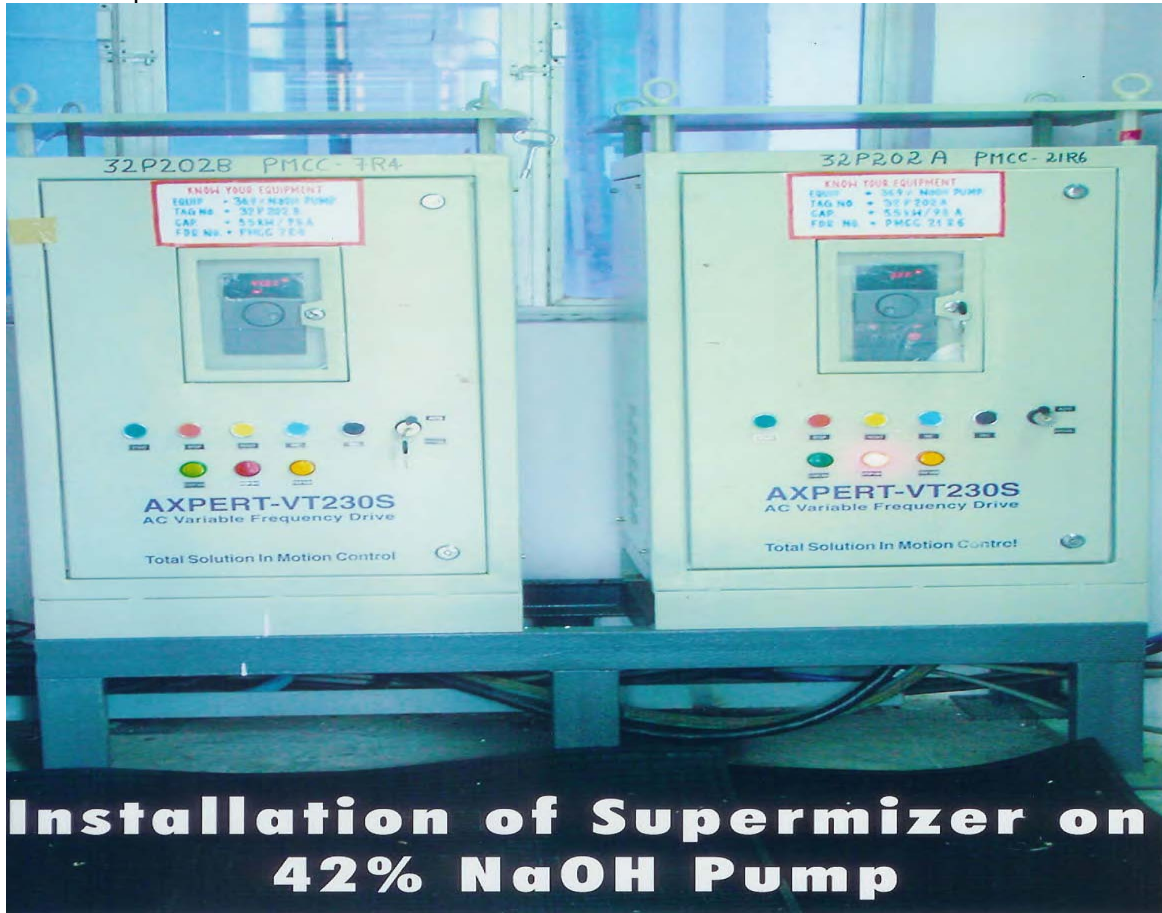
Power Consumption of 32P203A Pump Motor (W/O Supermiser) =	132 kWh / day
Power Consumption of 32P203A Pump Motor (With Supermiser)	= 72 kWh / day
Saving by Installing Supermiser on 32P203A	= 60 kWh/ day
Working days / year	= 360 days
Net kWh saving per year	= 21600 kWh / Year
Cost of Power	= Rs. 3.24 / kWh
Saving Per Year in Rs	= Rs. 69984.00

(Approx. Rs. 0.70Lakh)

Investment :

Cost Of Implementation

= Rs. 0.50Lakhs



Implementation Of Energy Conservation Measures For The Year 2004 - 2005

Scheme – 7

Energy saving by Modifying Rectifier Cooling system outlet of Rectifier Transformer .

Brief Particulars Of Scheme :

In our Caustic Soda plant, Rectifier Cooling system outlet water was being returned to Cooling Tower through Rectifier Pit Pump. Rectifier pit was common for Rectifier Cooling as well as Rectifier transformer cooling .We have connected the rectifier cooling outlet directly in cooling tower line.

Saving :

Power Consumption of Rectifier Pit Pump (When Rectifier cooling outlet & Rectifier Transformer cooling outlet being pumped)	=	14.34 k Watt
Power Consumption of Rectifier Pit Pump (After Rectifier cooling outlet was connected directly in Cooling Tower line)	=	7.51 k Watt
Saving in the consumption of Rectifier Pit Pump	=	163.9 kWh / day
Working days / year	=	360 days
Net kWh saving per year	=	59004 kWh / year
Cost of Power	=	Rs. 3.24 / kWh
Saving Per Year in Rs	=	Rs.191173.00

(Approx. Rs. 1.91 Lakh)

Investment :

Cost Of Implementation

= Rs. 0.20 Lakhs



Implementation Of Energy Conservation Measures For The Year 2004 - 2005

Scheme – 8

Energy saving by Segregating Cooling water supply line into High head and Low head for Caustic Soda Plant .

Brief Particulars Of Scheme :

In our Caustic Soda plant, Cooling system was having a common cooling water supply line for High head and Low head water requirement of Equipments. We have Segregated cooling water line for High head and Low head equipments.

Saving :

Power Consumption of Cooling Water Pump (Before Segregating Cooling Water line)	=	130 k Watt
Power Consumption of Cooling Water Pump (After Segregating Cooling Water line)		
For High Head	=	35 k Watt
For Low head	=	55 k Watt
Total Power Consumption of Cooling Water Pump	=	90 k Watt
Saving in the consumption of Cooling Water Pump	=	960 kWh / day
Working days / year	=	360 days
Net kWh saving per year	=	345600 kWh / year
Cost of Power	=	Rs. 3.24 / kWh
Saving Per Year in Rs	=	Rs.1119744.00

(Approx. Rs. 11.20 Lakh)

Investment :

Cost Of Implementation = Rs. 2.00 Lakhs



Implementation Of Energy Conservation Measures For The Year 2004 - 2005

Scheme – 9

Increasing in Thermal Energy Utilization by consuming surplus Hydrogen in Caustic Flaking Unit to enhance the capacity of Flaking Unit

Brief Particulars Of Scheme :

Earlier Caustic Flaking Plant was operated at 65 TPD by utilizing Hydrogen gas as fuel. The Caustic Flaking Plant capacity was increased to 70 TPD with some in house modifications. Our main Caustic Soda Plant was having surplus Hydrogen which being vented in the atmosphere . Now some part of surplus Hydrogen is being used to increase Caustic Soda Plant Flakes Production from 65 TPD to 70 TPD.

The details of energy savings & investment are given below :

Saving :

Hydrogen gas required to Produce 1 Ton of Caustic Soda Flakes=	375NM ³
For 5 MT Caustic Soda Flakes Hydrogen gas	= 1875 NM ³ / day
Cost of 1 NM ³ Hydrogen gas	= Rs.10.00
Saving per day	= Rs.18750.00
Working days / year	= 360 days
Net saving per year	= Rs.6750000.00
Net saving per year	= Rs.67.50Lakhs

Investment :

Cost Of Implementation = Rs. 1.50Lakhs



(v) Energy conservation Plans and Targets.

1. To increase the Plant capacity to 160 TPD by adding one more Electrolyser
2. To install 105 TPD Cl₂ Compressor in place of 55 TPD Cl₂ Compressors
3. To increase the H₂ utilization by increasing Flaking Plant capacity to 95 TPD.
4. To install one Freon Screw Compressor in place of 2 nos. Reciprocating Compressors
5. To reduce the Steam consumption by installing new Evaporation unit of 120 TPD.

(vi) Environment and Safety:

I. Environment

Thick Green Belt developed in and around the plant. Aforestation has been given the highest level of priority. We have internally defined objectives for planting minimum 2000 trees per year in and around the plant. we have planted 2700 in the year 2002-03 ,2560 in the year 2003-2004.& 2004-05 we have planted 2600 trees / shrubs. Trees/ Shrubs are developed on the Zinc sludge area. We have full-fledged horticulture department to take care of the ecosystems & spices. Photographs of the in and around the Plant area is enclosed. Plantation target for the Year 05-06 is 2000 Trees/Shrubs.

Plantation undertaken in and around the industry locations / sites. Trees/ Shrubs

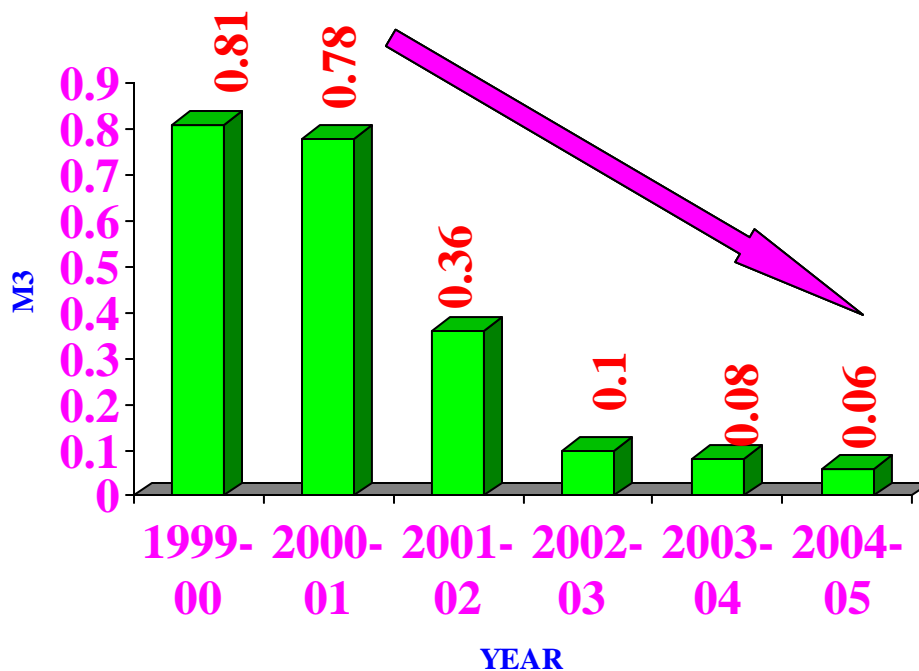
1	Rayon Plant	-	5365
2	Caustic Soda Plant	-	3265
3	Power Plant	-	3616
4	Greenbelt (CSP)	-	7786
5	Colonies (Township)	-	4712
	Total	-	24744

a) Liquid Effluent.

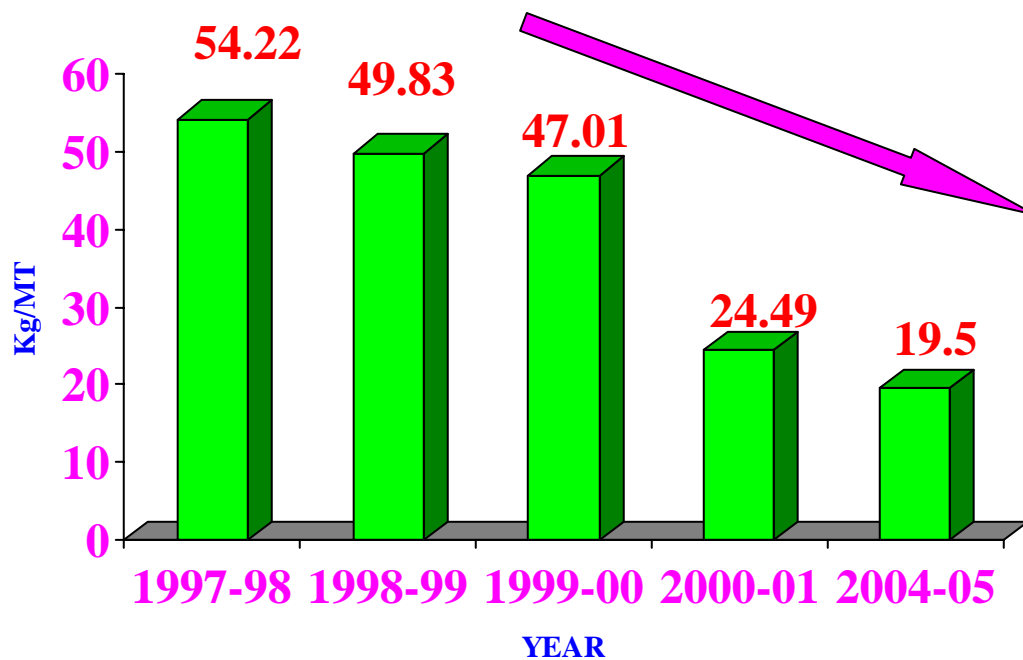
The liquid waste generated from all the areas of the Plant is collected in effluent treatment plant where the effluent is neutralized with caustic and pumped to main ETP at Rayon division. There is no final effluent discharge to out side. All measures have been taken to reduce the liquid effluent quantity 0.36 M³/MT to 0.08 M³/MT during 2001 to 2005 . Recovery of all the water streams to the saturators .

Graphical presentation of Reduction of Liquid effluent is enclosed.

**REDUCTION IN WASTE WATER GENERATION /MT
CAUSTIC**



**REDUCTION IN SOLID WASTE GENERATION /MT
CAUSTIC**



b) Solid Waste:

The only source of solid waste generation is Primary brine area. The solid waste is generated from impurities of salt. Saturated brine solution is prepared in saturators and the brine is sent to Clarifier after treatment of soda ash and Caustic soda to precipitate the impurities of Calcium and magnesium in the brine. The brine sludge contains Calcium Carbonate, Magnesium Hydroxide, Sodium chloride, Moisture & remaining is acid insoluble matter like sand and clay. A decanter is provided to separate the sludge and brine from the under flow of the Clarifier. The decanted brine is sent back to the system. The solid waste produced from decanter is disposed off in a specified area within the factory premises.

Process modification to reduce the solid waste from 24.49 kg/ MT to 19.45 kg/MT CS Lye produced during 2001-2005

Graphical presentation of Reduction of Solid Waste is enclosed.

c) Air:

Regarding control of air pollution 17 on line chlorine sensors are installed through out the plant. All stacks gases & ambient air qualities are regularly monitored. Height of the stacks is maintained as per the GPCB norms. All the gases emission is always found within the prescribed norms of GPCB. Installation of Vapor Absorption Machine for chilled water to eliminate Freon consumption in the year 2003-2004. Our Industry has got ISO 14001 certification and we are committed to follow all the guidelines as per ISO standards. Graphical presentation of Reduction of Ambient Air & Stack Analysis is enclosed.

Indian rayon & industries ltd, Caustic Soda Plant stands 3rd in the recently conducted green rating by Centre of Science & Environment, New Delhi. We stood 1st amongst all Chlor-alkali Plants in Specific Power Consumption & are Bench Marked for minimum Power consumption amongst membrane cell units in India. A Xerox copy of the rating is enclosed.

II. Social Accountability

Being the part of the largest Industrial hopes the industry realizes the need for Social accountability practices. We have implemented SA-8000 requirement and awarded SA-8000 certificate – enclosed

III. Safety :

We have implemented OHSAS 18001. The entire ranges of activities are covered and analyzed for hazards and associated risks. We have already assessed for the compliance of the standards requirements. Certificate of OHSAS-18001 is enclosed. Accident free days are 1901 up to 31st March-05. We have also installed Fire Alarm system for the entire Plant in the month of February, 2005.



Fire Alarm System