



i) UNIT PROFILE

Grasim Industries Limited, a flagship Company of Aditya Birla Group of Industries was set-up in 1947 to produce Viscose Staple Fibre. The Company was accorded ISO 9002, ISO 14001, SA8000 & OHSAS18001. Today GRASIM's core businesses is Viscose Staple Fibre and Cement with Textile, Sponge Iron and Chemical form supplementary business.

As a backward integration, Chemical Division was set up in early 1970's to manufacture Caustic Soda, Chlorine and its allied products. Initially, a 100 Tons per day Mercury Cell plant based on DENORA, ITALY, Technology was established and thereafter by 1989 capacity was enhanced to 350 Tons Per Day.

Our present Installed Capacity for Caustic Soda Production is 1,90,800 TPA along with 1,40,000 TPA Liquid Chlorine and 73,000 TPA Hydrochloric Acid.

Grasim Chemical Division also expanded its operation by forward integration of its products like

Bleaching Powder (SBP)	Installed Capacity	15,000 TPA,
Poly Aluminium Chloride (PAC)	Installed Capacity	36,000 TPA
and ChloroSulphonic Acid (CSA),	Installed Capacity	16,500 TPA

as co-products of Chlorine and Hydrochloric Acid

BRIEF WRITE UP FOR ENERGY CONSERVATION

Manufacture of Caustic Soda is highly power intensive and major cost driver is power (60% of production cost). Energy Conservation obviously becomes the prime focus. **Cell Power of 3700 KWH per ton of Caustic Soda when started in 1972 was brought down to the level of 2820 KWH per ton AC in mercury cell (at 8 KA current density) over a period of time.** This reduction in power consumption could be achieved through in-house developments and innovations like introduction of DSA Metal Anodes in place of graphite anodes, Anode Protection Device (APD) and Mechanized Anode Operation. **This cell power in mercury cell process is considered to be best in the country. (CSE study rated our Mercury cell power consumption as best in the country – rated No.1).**

In pursuit of our efforts to conserve energy further and our concern to environment we have installed a 260 Tons Per Day Caustic Soda Plant based on Membrane Process with know-how and technology from M/s. Uhde GmbH, Germany in the year 1994.



Group philosophy had been to excel in the operational performances of various businesses we are in. Our technology supplier has rated our Membrane Cell plant as **“WORLD REFERENCE PLANT”**. This has been possible with regular interaction with the technology supplier, in-house innovations and creativity through knowledge integration programmes (K.I.P).

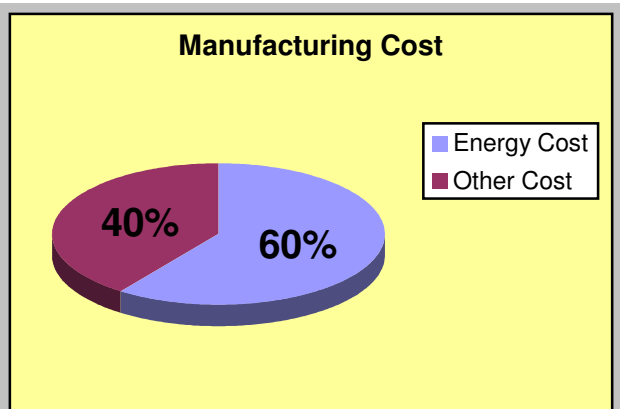
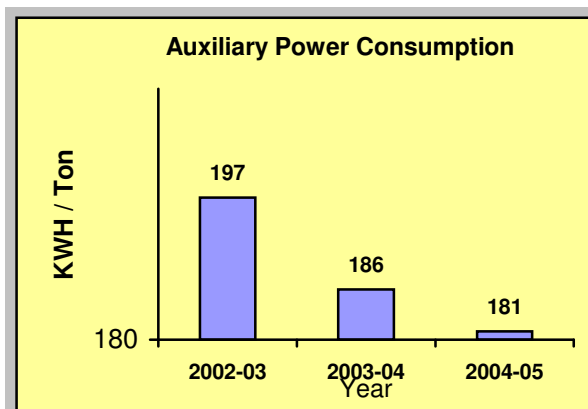
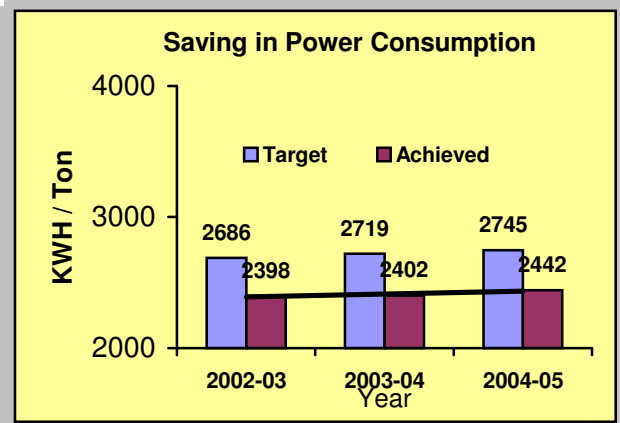
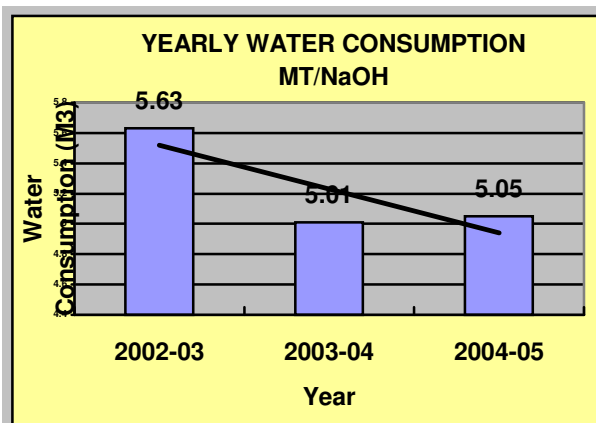
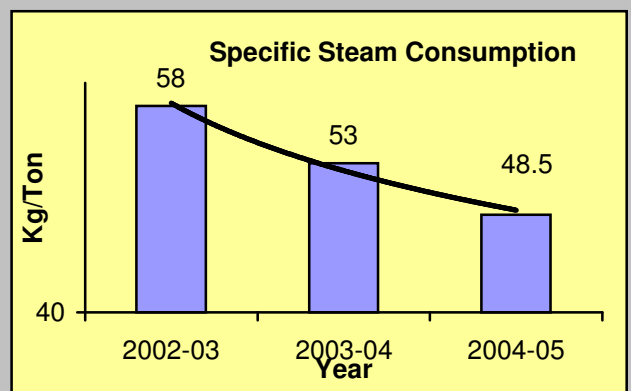
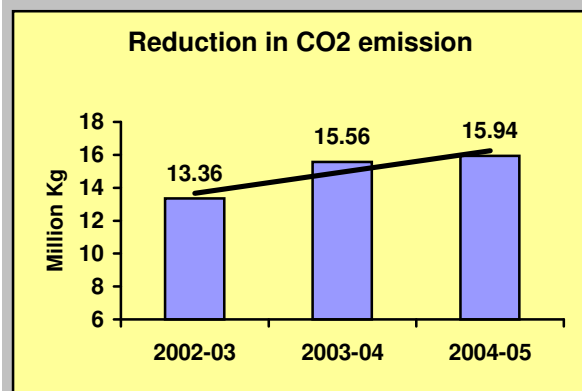
Cell Power consumption at Chemical Division’s Membrane Cell Plant has become the benchmark even for the plants operating with latest technologies of M/s. Uhde GmbH, Germany, and similar technologies.



ii) Energy consumption

Year	Cell Power		Aux. Power		Total Power		Saving achieved (KWH/ T)	Annual saving achieved (million KWH)	Annual saving achieved in Rs. in lacs)	Reduction CO2 emission in Million kg)
	Target*	Achieved	Target*	Achieved	Target	Achieved				
2002-03	2419	2201	267	197	2686	2398	288	26.73	1144.41	13.36
2003-04	2452	2216	267	186	2719	2402	317	31.12	1362.15	15.56
2004-05	2485	2261	260	181	2745	2442	303	31.89	1285.10	15.94

* Target is based on startup figures of 1994-95 and giving effect for life of membrane, anode and cathode coatings which increases 33 KWH/Ton annually.

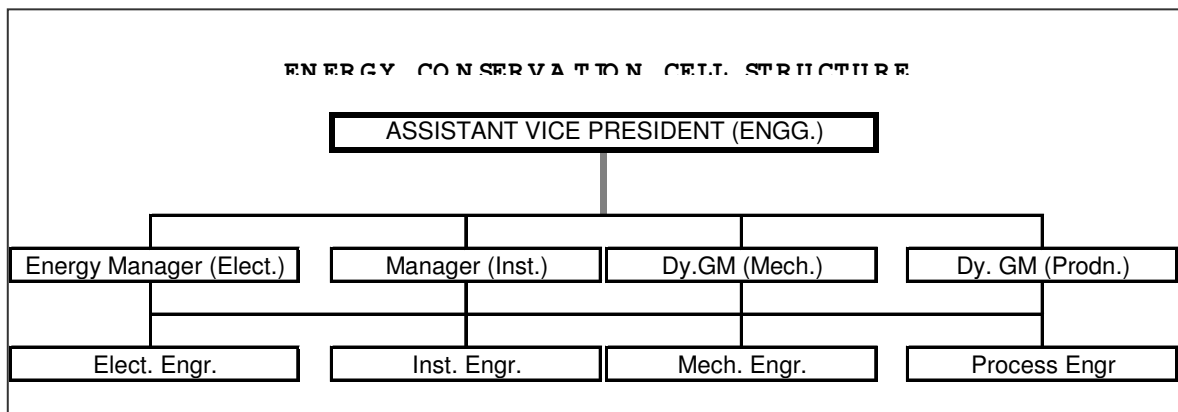


iii) Energy conservation commitment, policy, set up.

The Unit has Energy Conservation Cell and is headed by Assistant Vice President (Engineering) assisted by the Energy manager and supported by Section Heads of other Engineering Function & Process Section. This team finds various energy saving potential in their areas, brings the proposal to Energy Cell for elaborate discussions and brainstorming sessions for finalization and



implementation. The unit committed to fine tuning operations & maintenance continuously to achieve the goal, technology upgradation with energy efficient process and equipments, and motivating, training & encouraging employees to achieve a target of reducing specific energy consumption by minimizing 1% in Cell Power 5% in Aux. Power.



Commitment

“Continuous improvement” has been the way of life at Chemical Division with special emphasis on Energy Conservation:

- Unit ‘Energy Cell’ identifies various energy saving schemes and submit the same to Management for approval.
- Central Technical Cell was created for Aditya Birla Group of Industries for continuous monitoring, auditing and giving suggestions for various energy conservation measures.
- Both Central Technical Cell having its Head Quarters at Baroda and Unit Technical Cell consist of highly qualified and well-experienced experts/specialists.
- For Knowledge Integration among the employees of various Group Units of Aditya Birla Group, employees regularly exchange information through Knowledge Integration Programme (KIP).
- To encourage involvement and commitment of the employees, a Suggestion Scheme was introduced among the employees, in which very practical Energy Saving Suggestions were also received and implemented.
- Aditya Birla Group Chairman’s Gold Medal Award for manufacturing excellence and competitive advantage.



- Continuous interactions with the Technology Suppliers and visits and interaction with best Chlor-Alkali plants in India and benchmarking various parameters is an on-going exercise at Chemical Division.
- Energy Policy – company has institutionalized “Energy Conservation Policy” and strictly adheres to procure energy efficient equipments.
- Unit has certified Energy Manager (approved by **BEE (NPC Chennai), May 2004 (Regn. No.655)**).
- Every day energy consumption are reviewed in daily plant coordination meeting and corrective actions are taken and best achieved consumption is taken as target. (a sample sheet is given below).

Sample Sheet

A/c date : 2nd September'05

Plant		Production in TPD or NM3 per day				Power in KWH/T or KWH/KNM ³			
		Target	Actual			Target	Actual		
			Yesterday	Today	Average		Yesterday	Today	Average
Membrane	Caustic	322	322.864	319.979	314.881	2250	2311	2290	2311
	Chlorine	235	240	240	221.29	105	119	121	119
	HCl	48	45.597	40.658					
Mercury	Caustic	159	175.584	155.021	174	2860	2809	2773	2809
	Chlorine	122	137	123	135	120	132	124	134
	HCl	17	17.27	13.709	18				
CSF		65	79	79	79	45	45	45	47
Steam from H2 Boiler			82.6	25					
CSA		41	40.288	40.35	40.319	26	32	33	32
SBP		68	70.050	66.400	68.225	120	128	132	128
PAC	Liquid	173	220	140	200.2	10	11	15	11
	Powder(O)	20	13.075	2.875	15.768	180	220	380	220
	Powder(N)		21.63	3.13		150	139	242	139
H2 Bottling		9000	8108.8	8310.4	9251.2	312	363	299	363
Water			Remark				Caustic	SFD Stock	
Target	Yesterday	Today							
4.5	4.26	4.93					172	1212	



- Benchmarking – Unit always do the benchmarking exercise for various parameters for consumptions to achieve lowest specific consumptions.
- Energy audit was awarded to CII for the year 2003-04.

QUALITY POLICY

GRASIM INDUSTRIES LIMITED (CHEMICAL DIVISION) BIRLAGRAM, NAGDA (M. P.)

SAFETY & HEALTH POLICY

We, at GRASIM INDUSTRIES LIMITED, CHEMICAL DIVISION, BIRLAGRAM, NAGDA (M. P.) intend to commit ourselves for Safe & Healthy Environment in and around the Industrial Complex. PURSUANT TO THIS GOAL

- We shall abide by all applicable Legislation & Regulations.
- Awareness on Safety, Health & Environment Aspects shall be created among Employees, Contractors, Transporters & Customers, through proper Information, Education & Training.
- We shall always strive for Technological Development and Safe Operating Practices for efficient utilization of resources.
- A Clean and Green Environment shall be developed & maintained in and around the premises.
- Continuous Improvement in Safety, Health & Environment Aspect shall be made by carrying out Safety Audit & Taking Subsequent corrective measures.
- We shall encourage effective participation of our Employees on Safety Matters through participative forums like Safety Committees, Shop Floor Committees, Safety Suggestions Scheme etc.
- Recognizing contributions made by individual Employee in Maintaining Safe & Clean Environment.
- We shall observe Safety in all sphere of Management including Purchase of Plant, Machineries, Equipments and Materials as well as selection & Placement of Personnel.

Date : 05.08.2002


SUNIL KULWAL
EXECUTIVE PRESIDENT

ENERGY CONSERVATION POLICY

Chemical Division of Grasim Industries Limited at Nagda is committed to conserve energy at all levels, through sustained efforts. We continuously strive hard to conserve energy and are energy conscious and contributes to conserve natural resources of the planet. This is achieved by :-

1. To buy energy efficient equipment wherever possible.
2. To create awareness on energy conservation among all employees through appropriate training.
3. Always comply with energy conservation act and other relevant regulation & legislation.
4. To be energy efficient always.

The policy is made available to all employees and on request, to interested parties.


Sunil Kulwal



ग्रेसिम केमिकल डिविजन बिरलाग्राम, नागदा पर्यावरण नीति

ग्रेसिम इण्डस्ट्रीज लिमिटेड, केमिकल डिविजन, नागदा स्वस्थायी उन्नति के द्वारा स्वच्छ पर्यावरण देने हेतु प्रतिबद्ध है।

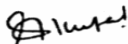
कंपनी अपनी गतिविधियों, उत्पादों व सेवा से जुड़े पर्यावरण संबंधित कार्यों में सतत सुधार लाने के लिए प्रयत्नशील रहेगी।

इनकी प्राप्ति होगी :-

- (1) सभी पर्यावरण संबंधित नियमों व कानूनों का पालन करके।
- (2) बेहतर संचालन व रख-रखाव के अभ्यास द्वारा पदार्थों के गिराव व रिसाव पर रोक लगाकर।
- (3) वेस्ट (व्यर्थ सामग्री) की प्रभावी व्यवस्था व निष्पादन द्वारा प्रदूषण को रोक धाम करके।
- (4) सभी कर्मचारियों में उचित प्रशिक्षण द्वारा पर्यावरण के प्रति जागरूकता पैदा करके।
- (5) प्राकृतिक स्रोतों जैसे बिजली एवं पानी का संरक्षण करके।

यह नीति सभी कर्मचारियों के लिए उपलब्ध रहेगी तथा अन्य इच्छुक पार्टियों को निवेदन करने पर उपलब्ध करायी जायेगी।

5th Aug. 2002


अधिसारी अध्यक्ष



GRASIM CHEMICAL DIVISION Birlagram, Nagda QUALITY POLICY

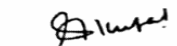
GRASIM INDUSTRIES LIMITED CHEMICAL DIVISION, Nagda is Committed manufacture quality products to the satisfaction of customers.

The Company aims at continuous improvement of technology for higher production cost effectiveness and consistent quality products.

This is achieved by :

- i) Dedicated efforts to build quality in the activities performed at all levels in the Company.
- ii) Adoption of Quality Management System as per ISO 9002 : 1994.
- iii) Continuous improvements through participative management and human resource development.

5th Aug. 2002


Executive President



ENERGY CONSERVATION ACHIEVEMENTS CARRIED OUT IN BETWEEN 2002-2005

SI No	Title of Energy Saving project implemented	Year of Implementation	Annual Electrical Savings achieved	Total Annual Savings	Invest. Made	Payback months
			Units Million	Rs Million		
1	Installation of VFD (15 Nos.)	2002-03	0.76	2.43	3.24	16
2	By changing motor connection from Delta to Star (2 Nos.)	2002-03	0.01	0.04	0.00	0
3	Right sizing the motor	2002-03	0.16	0.51	0.04	1
4	LT capacitor/EE lighting/others	2002-03	0.55	0.18	0.68	46
5	Energy efficient motors (66 Nos.)	2002-03	0.39	1.25	3.29	32
6	Replacing with low RPM motors (32 Nos.)	2002-03	0.34	1.08	0.61	7
7	Installation of 3rd Rectifier	2002-03	0.73	2.32	2.00	10
8	Copper Bus Bar Configuration	2002-03	0.12	0.40	2.03	61
9	Bus bar millivolt drop monitoring	2002-03	0.02	0.07	0.00	0
10	Reducing transmission losses by rearranging feeder, rationalising cable rack route.	2002-03	0.17	0.54	0.00	0
11	Using of spare cell elements	2002-03	1.69	5.40	0.00	0
12	65 TPD Chlorine Compressor	2002-03	1.80	5.75	12.50	26
13	Energy Efficient Motors	2003-04		2.59	3.49	16
14	Variable Frequency Drives (12Nos)	2003-04		1.22	2.35	23
15	Energy Efficient Pumps	2003-04		0.00	1.6	0
16	1 No. Electrolyser remembraning	2003-04	20.00	48.00	130	33
17	Remembraning/reconfiguration of 68 finite gapless electrolysers	2003-04	13.58	32.59	95	35
18	Schemes to utilise surplus Hydrogen to generate steam	2003-04	63.75	153.00	200	16



19	Scheme to replace 2 x 20 TPD Cl ₂ liquefaction units with one 65 TPD plant	2003-04	12.45	29.88	124.5	50
20	Scheme for generating 80TR vapour absorption refrigeration	2003-04	3.91	9.38	32	41
21	Scheme for 100 TPD Caustic Evaporation plant	2003-04	33.48	80.35	500	75
22	Caustic concentration by flash evaporation	2003-04	26.41	63.40	50	9
23	Adding one more electrolyser	2004-05	5.168	17.231	64.773	45
24	Remembraining of Membrane cell electrolysers	2004-05	1.059	3.529	10.000	34
25	Installation of Variable Frequency Drives	2004-05	0.159	0.529	1.925	43
26	Installation of Energy Efficient Pumps	2004-05	0.091	0.303	0.600	23
27	Replacing with high efficiency vacuum pumps	2004-05	0.238	0.794	0.230	3.5
28	Replacing of low capacity Chlorine compressors with high capacity Chlorine compressors	2004-05	0.657	2.191	8.500	46
29	Replacing with energy efficient fan blades	2004-05	0.211	0.704	0.300	5
30	Installation of low voltage Transformer for lighting circuit	2004-05	0.015	0.050	0.050	12
31	Installation of neutral compensator	2004-05	0.018	0.060	0.150	30
32	Replacing with energy efficient transformer	2004-05	0.079	0.264	0.750	34
		TOTAL	188.03	466.03	1250.60	



PLANNING & BUDGETING 2004-2005
INITIATIVES - ELECTRICAL
(Ref. No. Electrical A1)

Scheme **Energy Conservation by installing Variable Frequency Drives.**

Savings

	Equipment		HP/KW	Present		Savings in KW	Savings Per Day in KWH	No Of Days	Savings Per annum in KWH	Savings Per Year Rs. In lacs @ Rs.3.26 per KWH	Investment in Rs Lacs	R O I
	Name	Code		Running load without drive in KW	With Drive in KW							
1	Cooling Tower Fan (M/C)	MCT 20003 E	20/15	12.30	9.50	2.80	67.20	240	16128	0.53	1.20	43.81%
2	Cooling Tower Fan (M/C)	MCT 20003 F	20/15	13.05	9.75	3.30	79.20	240	19008	0.62	1.20	51.64%
3	Cooling Tower Fan (M/C)	MCT 20003 B	40/30	20.85	16.55	4.30	103.20	240	24768	0.81	2.50	32.30%
4	Cooling Tower Fan (M/C)	MCT 20003 C	50/37	22.55	18.50	4.05	97.20	240	23328	0.76	2.50	30.42%
5	Air Blower (M/C)	MC0707 A	20/15	8.95	6.88	2.07	49.68	330	16394	0.53	1.20	44.54%
6	Air Washery Pump (M/C)	13 U 001-202	10/7.5	6.55	4.25	2.30	55.20	240	13248	0.43	1.00	43.19%
7	HCL Dilute Pump (M/C)	MP 903 A	15/11	10.30	7.42	2.88	69.12	330	22810	0.74	1.20	61.97%
8	Padding Air Compressor	MC 704 A	25/18.5	16.17	13.50	2.67	64.08	330	21146	0.69	1.45	47.54%
9	Cooling Tower Fan (N/P)	MCT 020003 B	40/30	22.50	16.55	5.95	142.80	240	34272	1.12	2.50	44.69%
10	Cooling Tower Fan (N/P)	MCT 020003 D	40/30	23.00	17.00	6.00	144.00	240	34560	1.13	2.50	45.07%
11	Padding Air Compressor (N/P)	MC 0704 A	20/15	14.00	12.50	1.50	36.00	330	11880	0.39	1.20	32.27%
12	Air Washery Pump (N/P)	13 U 001-202	10/7.5	6.55	4.25	2.30	55.20	240	13248	0.43	1.00	43.19%
13	Air blower (PAC New Powder)	F 001 A	20/15	13.55	11.25	2.30	55.20	300	16560	0.54	1.20	44.99%
14	Air blower (PAC New Powder)	F 002	10/7.5	6.50	4.25	2.25	54.00	300	16200	0.53	1.00	52.81%
15	Air blower (PAC New Powder)	F 003	10/7.5	6.55	4.20	2.35	56.40	300	16920	0.55	1.00	55.16%
16	Air blower (PAC New Powder)	F 004	12.5/9.5	7.25	5.85	1.40	33.60	300	10080	0.33	1.20	27.38%
TOTAL						48	1162		310550	10.12	23.85	42.45%

Energy savings in KWH Per Day	1162	KWH
Energy Saving in Rupees per Annum	10.12	Rs Lacs
Less Interest on 100 % of Investment @ 10% per annum	2.39	Rs Lacs
Nett saving	7.74	Rs Lacs
Investment		
Cost of 16 No.s Variable frequency drives with all accessories	23.85	Rs Lacs
Return on Investment	32.45%	
Implementation Time	4	Months



MAJOR ENERGY CONSERVATION PROJECT IMPLEMENTED DURING 2004-05



**VAPOUR ABSORPTION
MACHINE**



**ADDITION OF 9TH
ELECTROLYSER**

OTHER PROJECTS IMPLEMENTED DURING THE YEAR 2004-05

1. Continuous monitoring and rectification of Bus bar joint drops resulted in saving of 21625 KWH per year.
2. Installation of Variable Frequency Drives resulted in saving of 3,10,550 KWH per year.
3. Installation of vapour absorption machine to stop chilled water unit, achieved saving of 630512 KWH/Year.
4. Replacing low capacity HCl absorption pump with energy efficient pump.
5. By installing energy efficient 65 TPD chlorine compressor and stopping 2 x 20 TPD compressors.
6. Replacing pneumatic controllers & recorder with electronic controller (air conservation & energy conservation).
7. Stoppage of one Chlorine & Freon Compressor at the same level of production by modifying internals of compressors and achieved a saving of 28 KWH/Ton.



8. Right sizing of Motors and trimming of pump impellers resulted in saving of 1,29,600 KWH per year.
9. Use of sunlight by installing FRP Transparent sheets on the roof in Plants to reduce- lighting consumption.
10. Use of aerodynamic FRP Blades and changing the Blade angle of Cooling Tower Fans. Saving achieved – 211046 KWH/Year.
11. Using energy efficient lighting luminaries.
12. Use of spare cell elements by adding in the existing electrolyzers to reduce cell power by 7 KWH/Ton.
13. Using low voltage transformer for lighting circuits resulted in saving of 15330 KWH per year.
14. Using energy efficient tube lights of 29 watts in place of conventional 40 watts (54 watts) tube lights resulted in saving of 61,868 KWH per year.
15. Using energy efficient motors in place of old rewind motors resulted in saving of 92567 KWH per year.
16. Replacing high RPM motors with low RPM motors (22 Nos.) resulted in saving of 90,228 KWH/Year.
17. Lean brine from Vacuum tank to saturator was insulated to avoid heat losses and this has resulted in saving of steam.
18. Heat recovery system was modified to recover heat from DM Water for Caustic and brine makeup resulting into saving steam.
19. By sweating of assets optimised plant operation to run with high capacity utilisation resulting in savings of steam consumption

A c h i e v e m e n t s

List of Certifications (ISO-9000/14000) Encon, Environment, Quality, Productivity and other Awards won during 2002 – 2005

CERTIFICATION

- 2003 - OHSAS 18001 Occupational health & safety Assessment Series.
- 2003 - SA 800 Social Accountability.
- 2002 - ISO 14001 Environmental Management System
- ISO 9002 Quality Management Systems (Conversion to 2000 Version due in Sept'03)

AWARDS



- We have been awarded prestigious National Energy Conservation Award - Certificate of Merit in Chlor-Alkali Sector for the year 2000
 - We have been awarded prestigious National Energy Conservation Award - First Prize in Chlor-Alkali Sector for the year 2001.
 - 2002 - Greentech Environmental Excellence Award
 - 2002 - Indira Gandhi Memorial National Award for Best Environmental control.
 - 2002 - Chairman's Young Achiever Award.
 - 2002 - Aditya Birla Group Chairman's Gold Award for Best Practices in a World Class Manufacturing which works as TPM Practices.
 - 2003 - Rajiv Gandhi J.Paryavaran Award for Best Pollution & Ecological Control.
 - 2003 - Greentech Safety / Health / Environment Gold Award.
 - 2003 - Social Accountability 8000 (2001)
 - 2003 - Occupational health & safety assessment series 18001
 - 2003 - ISO 9001-2000
 - 2003 - Greentech Environmental Excellence Silver Award
 - 2003 - World Class Manufacturing - Team Excellence Award
 - 2003 - Anubhav Case study award
 - 2004 - E-Learning Silver Award
 - 2004 - Jawaharlal Nehru Memorial National Award for Environmental & Ecological Gold Award
 - 2004 - Rajiv Gandhi National Quality for Overall Excellence
 - 2004 - CII Energy Conservation Award
 - 2004 - Greentech Environmental Gold Award
 - 2004 - Greentech Safety Award
 - 2004 - The Stevie - The American International Business Award for the "Best Product Developer" in 2004.
 - 2005- Greentech Safety / Gold Award
 - 2005 - Environmental & Ecological Gold Award
 - 2005 - Golden Peacock Eco-Innovation Award.
- Aditya Birla Group Chairman's Gold Award 2003-2003 for Best Practices in a World Class Manufacturing which works as TPM Practices.

Shortlisted for

= National Award for Excellence in Energy Management 2005 by M/s. CII.

(v) ENERGY CONSERVATION PLANS & TARGETS



NEW SCHEMES (INITIATIVES 2005-06)			
S. No.	Schemes	Investment (Rs.lacs)	Return
1	Existing Mercury Cell Conversion to energy efficient Membrane Cell (225 TPD)	15000.00	13%
2	Adding 1 more 10 KA Rectifier	160.00	19%
3	Variable frequency drives (4 Nos.)	4.20	26%
4	Replacement of cooling tower pump with energy efficient pumps	10.00	29%
5	Energy efficient motors	4.90	35%
6	Replacement of reciprocating air compressor with screw air compressor.	45	36%
	TOTAL	15224.10	13%

vi) **ENVIRONMENT AND SAFETY**

ENVIRONMENT AND SAFETY

Steps For Environment Protection:

Grasim Chemical Division considers important to fulfill its societal responsibility by being proactive, integral and responsible towards the environment. The company is committed to the implementation of all environmental safeguards. The company policy demonstrates its commitment to the environment.

Adoption Of Environment-Friendly & Efficient Technology And Products:

The company's selection and design process for its products and services and the production / delivery processes take into account the regulatory, legal and ethical requirements and the current and potential risks / impact associated with its products / services and operations.

Adoption of membrane cell process is one example of taking care of community at large . The membrane process is superior in many ways to the mercury process. Membrane Cell process does not use mercury at all, mercury pollution in air, water and solid waste is totally eliminated. The sturdy and modern design of bipolar cell results into high purity chlorine with no emissions. Electricity consumption is cut down by 20% to 30%. The membrane cell process offers high quality products, e.g. low sodium chloride content in the Caustic Soda and highly purity of chlorine gas. It is therefore not an exaggeration to state that adoption of membrane cell technology leads to zero pollution and thereby offering safest and clean environment, with advantage of energy conservation.

Water Pollution Control:



Effluent generated from different processes in company is treated in Effluent Treatment Plant to meet stipulated standards before discharge from factory outlet. Domestic wastewater is treated in Sewage treatment plant. More than 20% reduction in water consumption in process from 6.33 m³ / t of NaOH to 5.05 m³ / t of NaOH has been achieved. In view of critical situation arising out of water shortage, further conservation of water has been done even at the cost of quality and equipment health and higher operating cost including cost of transporting treated effluent usage for process and gardening.

Example of Resource Conservation Recycling of Water at Grasim Chemical Division

- Π Use of R.O. reject water in place of raw water.
- Π Recycle of effluent in respective section.
- Π Recycle of tonner washing water.
- Π Use of R.O. reject in R.O. II
- Π Throttling of water valves at various places in plant.
- Π Restricted blow down of cooling towers.
- Π Reuse of steam condensate.
- Π Check & immediate repair of leakages if any.
- Π C.S.F. effluents recycle in scrubbers.
- Π Use of P.A.C. effluent for various formulations.
- Π Operation of cooling water system in a 100% closed loop.
- Π Recycling of hot water rejection of HCL furnace.
- Π Recycling of end box wash water of cells in Cell House.
- Π Segregation, recycle, reuse of the waste water generated in various sections of the plant.
- Π Disposal of brine mud sludge in cake form in place of slurry.
- Π Reuse of HCL gas scrubbing water in process.
- Π Recycle of condensate from Chlorine and Hydrogen pipeline.
- Π Use of treated domestic water for plantation within premises.
- Π Recycle of pump gland cooling water.

Water Pollution Sources and their controls are as follows;

S.NO.	SOURCE	QUANTITY	DISPOSAL
1	NEW PLANT OF CAUSTIC SODA	VERY SMALL QUANTITY IS GENERATED i.e. APPROX. 38 M3 / DAY	MAXIMUM POSSIBLE WASTE WATER IS REUSE / RECYCLED REMAINING IS TREATED AT E.T.P. AND DISCHARGED 1.5 KM AWAY FROM COMPANY AND FINALLY MEETS THE RIVER IN DOWN STREAM.
2	MEMBRANE	NO WASTE WATER IS	NO EFFLUENT



	CELL PLANT	GENERATED FROM THE PROCESS.	DISCHARGED.
3	S.B.P. PLANT	EFFLUENT GENERATED IN A VERY SMALL QUANTITY IS COLLECTED IN COLLECTION PITS AND IS RECYCLED IN THE PROCESS.	NO EFFLUENT IS DISCHARGED.
4	P.A.C. PLANT	EFFLUENT GENERATED IN A VERY SMALL QUANTITY IS COLLECTED IN COLLECTION PITS AND IS RECYCLED IN THE PROCESS.	NO EFFLUENT IS DISCHARGED.
5	C.S.A. PLANT	NO EFFLUENT IS GENERATED	NO EFFLUENT IS DISCHARGED.

Air Pollution Control:

Various measures have been taken to control Air Pollution. For example in Caustic Soda Plant: Sniff Chlorine gas, which comes out from liquefier as unliquified chlorine gas is scrubbed through solution of caustic soda to form sodium hypochlorite and this is used in Staple Fibre Division (Our sister concern) for bleaching the fibre. The scrubbing system is provided with emergency power supply, which automatically switches on in case of normal power supply failure. A 100% standby absorption tower is always kept ready. Air Pollution sources and their controls are as follows;

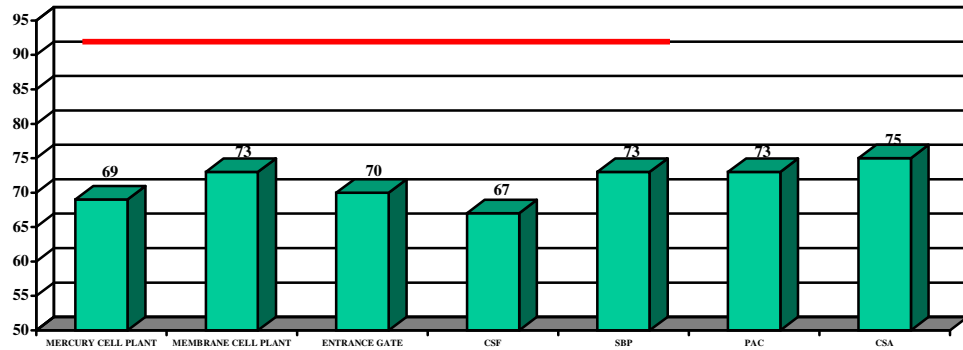
S.NO.	POLLUTANTS	SOURCE	CONTROL SYSTEM
1	CHLORINE GAS	MEMBRANE CHLORINE PLANT	ALKALI SCRUBBERS
2	HCL FUMES	MEMBRANE HCL PLANT	WATER SCRUBBERS
3	OTHER EMISSIONS	CAUSTIC PLANT	CHILLERS, WAHING TOWERS AND ADSORPTION SYSTEM
4	CHLORINE GAS	NEW CHLORINE PLANT	ALKALI SCRUBBERS
5	HCL FUMES	NEW HCL PLANT	WATER SCRUBBERS
6	S.B.P. DUST	S.B.P. PLANT	BAG FILTERS
7	HCL FUMES	PAC PLANT	WATER SCRUBBERS
8	HCL FUMES	CSA PLANT	WATER SCRUBBERS



Noise Pollution Control:

The ambient as well as industrial source noise levels are well within the critical noise exposure limit for 8 hour.

AVERAGE NOISE LEVEL IN THE PLANT AREA



Solid Waste:

Brine sludge generated from Caustic Soda plant is stored in LDPE film lined lagoons adjacent to main plant.

Noise, Effluent & Pollution Hazards:

Chemical Division has initiated various environmental friendly processes to reduce pollution hazards.

Health Risk:

Company has taken various initiatives to address health risk in its operations. Following measures are taken to avoid health risk to the employees / nearby communities-

- Follows safe practices recommended by safety council.
- Carrying out analysis for on-site and off-site risk.
- Ensured public liability insurance.
- Created emergency response cell, conducting mock drill etc.
- Conducted environment and safety audit.
- Maintains first aid room within factory premises.

Organisations Occupational Health Services Set Up And Achievements

A very well equipped 123 bed hospital named 'Indubhai Parekh Memorial Hospital' is run by our organization for all the employees (contractor worker, workers & staff)



and the general public for treatment of any type of diseases / occupational health check-up.

The Doctors working in Hospital are well qualified and experienced. At least 1-2 doctor along with full staff of nurses & assistants is present round the clock in the hospital to take care of any emergency.

The company has given credit facility to the employees and his family members for medical treatment and purchase of medicine.

Following facilities are available at 'Indubhai Parekh Memorial Hospital':

S.No.	Facility	Nos.
1	Intensive care unit 'ICU'	9 beds
2	Male ward	7 beds
3	Female ward	40 beds
4	Maternity ward	10 beds
5	General ward	57 beds
6	Eye ward	1 no.
7	Operation theater	1 no.
8	Labour room	1 no.
9	X-ray deptt.	1 no.
10	ECG deptt.	1 no.
11	Sonography deptt.	1 no.
12	Pathological lab with blood bank	1 no.
13	Separate dressing room	1 no.
14	Car	1 no.
15	Ambulance	2 no.

The routine medical examination of all the employees is carried out once in a year. Health register in the form no. 21 of M.P. factories rules, 1962 is being maintained at our organization.

Apart from above facilities our organization also has strong set up of first aid treatment. First Aid Centre manned with two first aid attendants.

Our first aid center is having two rooms and provided with necessary medicines and equipments:

First aid room
Dressing room
Beds
Oxygen cylinders
Stretches
First aid medicines
Sterility facilities
Qualified first aid attendants
First aid boxes



At least one watchman trained in first aid is present in 2nd and 3rd shift. About 30 employees are trained in first aid. One jeep is always available in the factory for any emergency. If any accident occurred in the factory, the injured employee is given first aid and sent to ESIC hospital / Indubhai Parekh Memorial Hospital.

Other Indices For Effectiveness On Environment Protection:

In addition to the above indices for measuring effectiveness on environmental protection, Chemical Division has been obtaining the various other requirements through-

- The 'Environment Impact assessment (EIA) study
- Nearby community requirements
- Requirements received from other different bodies
- Yearly environment audit. Environment statement is submitted to MPPCB every year.

All these also form the basis of formulating plan for environmental / community care activities. The environmental cell derives annual action plan defining goals, responsibilities. A budget for environmental care and community initiatives is drawn up.

Measures Taken For Ecological Balance:

Company has taken various measures to protect ecological imbalance. The organization has been able to balance the various ecology parameters successfully through following initiatives.

Pollution control: Water , air & solid waste	Set up effluent treatment plant and solid waste disposal arrangement.
Environment Management System implementation	ISO 14001 environmental Management System implemented
Plantation	Number of trees planted.
Resource conservation, waste recycling	Refer preservation of resources
Noise reduction	Well within limit in all area.

Number Of Environmental Incident / Accident : None

Green Belt Development

Grasim Chemical Division has carried out extensive plantation all around the Grasim plant located at Birlagram, Nagda in the state of Madhya Pradesh.

The lush greenery all around Grasim, complex is result of extensive plantation and horticultural activities carried out over the years.

Steps taken to protect plantation:

1. Survey of soil and site for survival of appropriate species.
2. Sapling preparation in nursery.
3. Plant staking and tree guards.
4. Periodic watering.



5. Manure and fertilizer addition.

6. Spray of pesticides, fungicides and plant hormone at fixed interval

Survival rate of plantation is 100% as we have replaced the plants in case of any mortality.

Following varieties of Plants / spices have been planted in and around Grasim Complex

S.NO.	SPECIES	S.NO.	SPECIES
1	EUCALYPTUS HYBRID	13	THUJA COMPACTA
2	THESPESIA POPULNEA	14	BOUGAINVILLEA
3	CALISTEMON LENSOLETUS	15	POLYALTHIA PENDULA
4	ACACIA AURICULAEFORMIS	16	IXORA
5	AZADIRACHTA INDICA	17	MANGOLIA GRANDIFLORA
6	BOUHINIA BLACKEANA	18	FICUS ELASTICA
7	THEVETIA NERIFOLIA	19	HIBISCUS ROSA SINENSIS
8	FICUS BENJAMINA	20	BOTTLE PALM
9	CAESALPENIA	21	MANGOES
10	NERIDIUM ODORUM	22	PEACHES
11	TABERNAE MONTANA CORONERIA	23	GRAPES
12	GARDENIA FLORIDA	24	COCONUT

TOTAL NOS. OF TREES IN AND AROUND GRASIM COMPLEX IS AROUND 1.95 LACS .

Effluent Treatment Plant

Grasim's chemical division caustic soda plant at Nagda has a lot of in-built design features, which go a long way towards pollution abatement.

The central liquid effluent treatment system treats the effluent to achieve limits set by the central board for prevention and control of water pollution.

Cost Benefit

Cost Of Environmental Protection :

Company makes conscious effort toward environment protection and various control measures. Separate cost of environment protection and in turn benefits cannot be very accurately measured, however the company investment in environment protection is as follows:



Investment On Environment Protection & Effective Implementation

S.No.	Description	Details
1	Capital invested on industry	Rs. 192 crores
2	Capital invested for pollution control measures	Estimated cost is around Rs.3.31 Crores
3	Annual recurring expenditure for pollution control measures	Rs. 50.20 lacs per annum

Key Practices, Activities, Risks And Measures Related To Legal And Regulatory Norms

Grasim Industries Limited Chemical Division considers the fulfilling of its societal responsibility as an opportunity to serve society and for going well beyond the mere compliance of regulatory and legal norms. Some of the norms that are required to be complied with are shown below. Grasim Chemical Division meets its obligations completely and goes beyond statutory requirements year after year.

Key practices	Legislation / regulation	Area/ Coverage	Activities	Risk associated	Achieved 2004-05	Target 2005-06
Environment monitoring	Air act 1981	Works /town	Stack emission monitoring Work area environment Ambient air quality	Air pollution	8 milli gms cl2 /m3 of air	7 milli gm/m3 of air
Environment monitoring	Water act – 1974	Works outlet drain	Measurement and analysis of effluent water	Water pollution	0.18 m3 /t NaOH	0.15 m3 / t NaOH
Waste utilization/disposal	Environment protection act 1986	Works / town	Solid waste disposal	Land / water pollution	100% in own secured land fill area with in organization campus	100%
Resource conser-vation	Environment protection act 1986	Works	Reduction of specific raw material consumption Water consumption Energy consumption	Depletion of natural resources, cost overrun, env. pollution	5.63 m3/t NaOH	5.0-5.50 m3/t NaOH
Legal compliance	Income/wealth/sales/excise tax act	Corporate/suppliers/imports/assets	Filling of returns & assess Payment of custom duties	Legal action	100% compliance	100% compliance



			Issue of declaration			
Legal compliance	P fund	Employees	Rec. deposit & returns	Legal action	100% compliance	100% compliance

Impact On Society:

Number of general complaints: None

Number of general infringement : None

Number of safety related accident : No major accident occurred.

List Of Major Safety Appliances, Equipment & Devices

S.No.	Safety Appliances	Safety Equipment	Safety Devices
1	Safety Belt	Scaffolding	High / Low Level Alarm For Tanks
2	Safety Helmet	Net	
3	Safety Goggle	Crawling Board	Overflow Alarms For Tanks
4	Face Shield	Portable Ladder-Rope And Aluminium Ladder	Emergency Trip Switches At Cell House
5	Hand Gloves	Siren / Hooter	Exhaust System
6	Suit / Apron	Chlorine Emergency Kit	Interlocking Of Equipment Tripping With Power
7	Life Jacket / Suit	Portable Electrical Appliances / Tools	Isolating Valves At Strategic Points
8	Gas Masks	Safety Tools	Electrical Earthing Of Equipments, Pipelines, Machine, Vessels Etc.
9	Breathing Appratus	Portable Public Address System	Scrubbing System
10	Gum Boots	Electric Discharge Rod	System To Avoid Any Reverse Flow Of Liquid And Gases
11	Chlorine Emergency Kit	Bund Wall / Dyke	Pipeline, Valve, Flange Joints And Instruments As Per P & I Diagram



Write-up On Anode Recoating

Development of Electrode Coating Technic/Technology for Mercury Cell and Membrane Cell Electrodes.

Grasim Chemical Division is India's second largest Chlor-Alkali Industries which produces 520 TPD Caustic Soda and array of downstream value added products like Liquid Cl₂, CSF, SBP, PAC (L&P), CSA, Hydrogen Gas with two roots of technologies i.e. Mercury and Membrane Cell. Electrical Power consumption contributes around 65 % of total manufacturing cost, therefore, it becomes major cost driver in Chlor - Alkali Industry.

In both the technologies we are having metal electrodes coated with precious metal oxides, which is having certain life and major impact on cell performance. Cell voltage increases as the coating conditions of electrodes deteriorates resulted in increase in cell power consumption, therefore, metal electrodes requires recoating after certain interval. In Mercury Cell anode coating life is around 16 months & in Membrane Cell technology Anode and Cathode coating life is around 8 years. In India electrode coating technology is guarded by few technology suppliers like M/s TEAM & TITNOR, therefore, the recoating cost is very high and the dependency remains only on two suppliers (causing high delivery time). For Mercury Cell Plant, anode coating was being done by M/s TEAM, for this they established Anode Recoating Work Shop at Nagda. In 1995, this work-shop was purchased by GRCD but coating solution supply was remained with M/s TEAM, for which their charge was very high.

So, to become self reliance and to reduce cost for electrode coating GRCD took challenge to develop electrode recoating technology.

Increase in Productivity by Asset Sweating and Cost reduction is one of the prime goal of GRCD and this directly meets the requirement of Stake Holders, therefore, development of electrode coating technic / technology for mercury and membrane cell becomes one of the major initiatives for GRCD.

A. Approach for Execution of Project (Development of Recoating Solution):

The cross functional team was formed and responsibilities to individual team members were assigned to execute the project.

Sr. No.	Activity	Responsibility
1	To coordinate overall project	Mr. Ashok Gupta
2	To refer Technical books about Titanium Coating and Net surfing	Mr. Sanjay Solanki
3	Study & analysis of chemical reaction during solution preparation & coating process. Study & analysis of properties of ingredients.	Mr. Ashok Gupta Mr. Sudesh Joshi
4	Locate the vendors for procuring the coating ingredients.	Mr. Arun Dubey
5	Small-scale experiments were conducted for preparation of solution.	Mr. Sudesh Joshi Mr. Suresh Rathore Mr. Sanjay Patil

The journey started from the identification of the constituents for coating solution. Through extensive net surfing a list of various constituents for coating was prepared, then through literature survey properties of each constituents searched. These constituents are of precious metal compounds (compounds of Paladium, Ruthenium,

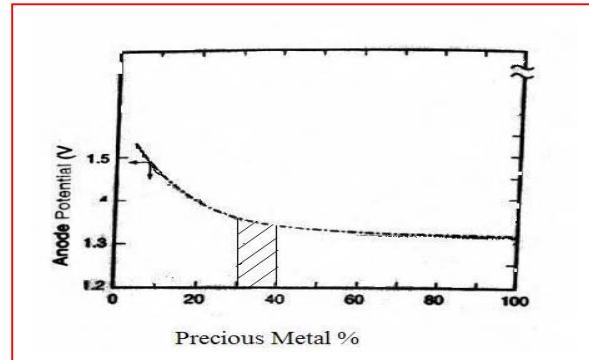


Write-up On Anode Recoating

Platinum, Iridium, Rhodium, Titanium etc.) which are high cost items. On the basis of cost economics and properties of constituents we selected two constituents (X & Y).

From our earlier experience we know the color of the solution (dark Tan with no suspensions) which was confirmed through literature and Net surfing.

Now, the challenge is to find out the solvent to dissolve the constituents(X & Y) and the ratio of ingredients. On the basis of the properties of ingredients, we have short listed two solvents (A&B). From literature we got one graph which shows relationship between one of our constituents (X) v/s power consumption.



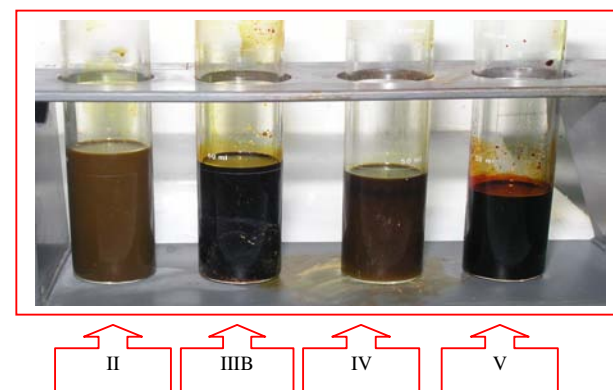
With this information we have started our Laboratory experiments.

Initially, we could not get success to dissolve constituent in solvents (A&B), again we studied the properties of the solvents and after number of experiments we concluded that the solvent 'A' is appropriate.

But, we could not get the success in making right solution for coating as suspension was present in the solution (ref picture I), then we discussed with seniors. With their advice we checked constituents in our laboratory and there we found that these constituent contain oxides.



Then the team did brain storming and have come out with the conclusion that to convert oxides to chlorides addition of hot Hydrochloric Acid is required. No. of experiments were conducted and failed (ref. picture II, III & IV...),with every failure team learned some new things and implemented learnings in the next experiment. After struggling a lot by working day and night for about two-three months,ultimately the team got success to develop anode coating solution (ref. picture V) .



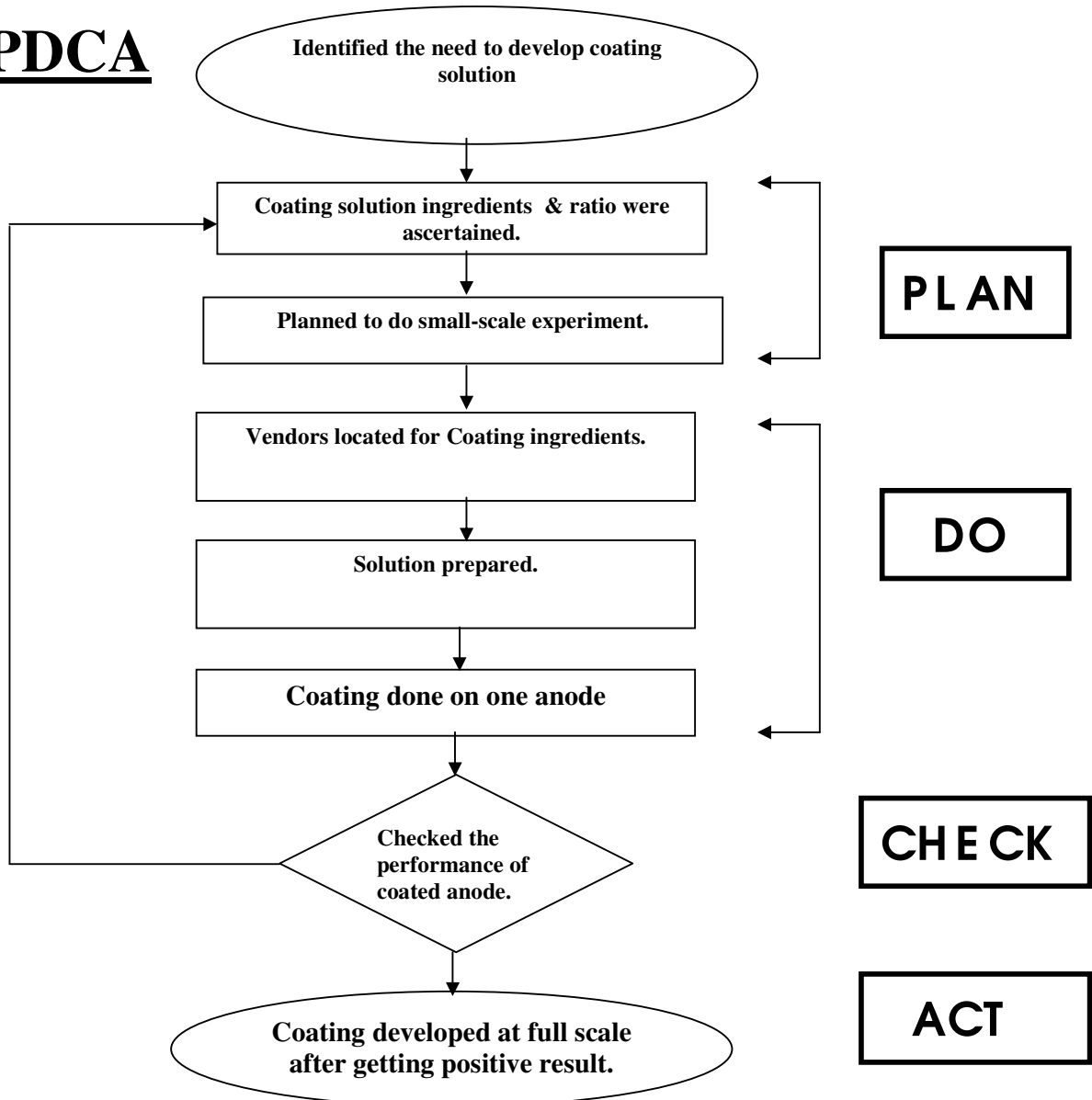
Then one set of anode was recoated with this developed solution and installed in one cell at Mercury Cell Plant to study its performance.To ensure its performance the current



Write-up On Anode Recoating

efficiency test was conducted and results were found encouraging (Current efficiency achieved +96%). Now this preparation of anode coating solution was standardized and GRCD started anode coating of Mercury Cell Plant by this developed technology without any help of M/s TEAM and saved worth **Rs.21 lacs/Annum**.

PDCA



B. Approach for execution of project (development of recoating solution for Membrane Cell Anode and Cathode pan along with infrastructure):

After Successful development of Anode Coating solution preparation for Mercury Cell Plant the team was assigned higher task i.e. to develop coating solution for Membrane Cell Anodes and Cathodes. Both are made of different metals. Anode made of Titanium and Cathode made of Nickel. Therefore both were entirely different tasks. More ever



Write-up On Anode Recoating

GRCD don't had any infrastructure for Membrane Cell Pan recoating. So, this was divided in three major tasks.

1. To develop Coating Solution for Membrane Cell Anode Pan.
2. To develop infrastructure for Membrane Cell Pan Coating.
3. To develop Coating Solution for Membrane Cell Cathode Pan.

To excute this project responsibilites of Members were redefined.

Sr. No.	Activity	Responsibility
1	To develop coating solution for Membrane Cell Anode Pan	Mr.Ashok Gupta/ Mr.Sudesh Joshi
2	To create infrastructure for Membrane Cell Anode recoating	
2.1	Basic Engineering.	Mr. Ashok Gupta
2.2	Detail Engineering.	Mr. Sanjay Singh Mr. K.R.Schan Mr. Arun Dubey
3.	To develop coating solution for Membrane Cell Cathode Pan	Mr.Ashok Gupta/ Mr.Sudesh Joshi

The team worked hard and developed coating solution for Anode Pan. The coating of Membrane Cell Pan is having high impact on Cell Power consumption and replacements of Pans results in production loss; therefore, reconfirmation of coating solution quality becomes necessary.

GRCD negotiated Membrane Cell Anode and Cathode Recoating solution preparation method from CECRI (CENTRAL ELECTROCHEMICAL RESEARCH INSTITUTE).It was a great privilege for the team that the method developed by GRCD was almost matching with the method of CECRI with minor differences. At this stage GRCD did not have infrastructure for Membrane Pan recoating.

The team took challenge to develop infrastructure for Pan Blasting, Etching, Coating Booth, Furnace for heat treatment, appropriate cage for carrying Membrane pan for heat treatment without any external help. The team faced so many problems during developing the infrastructure like

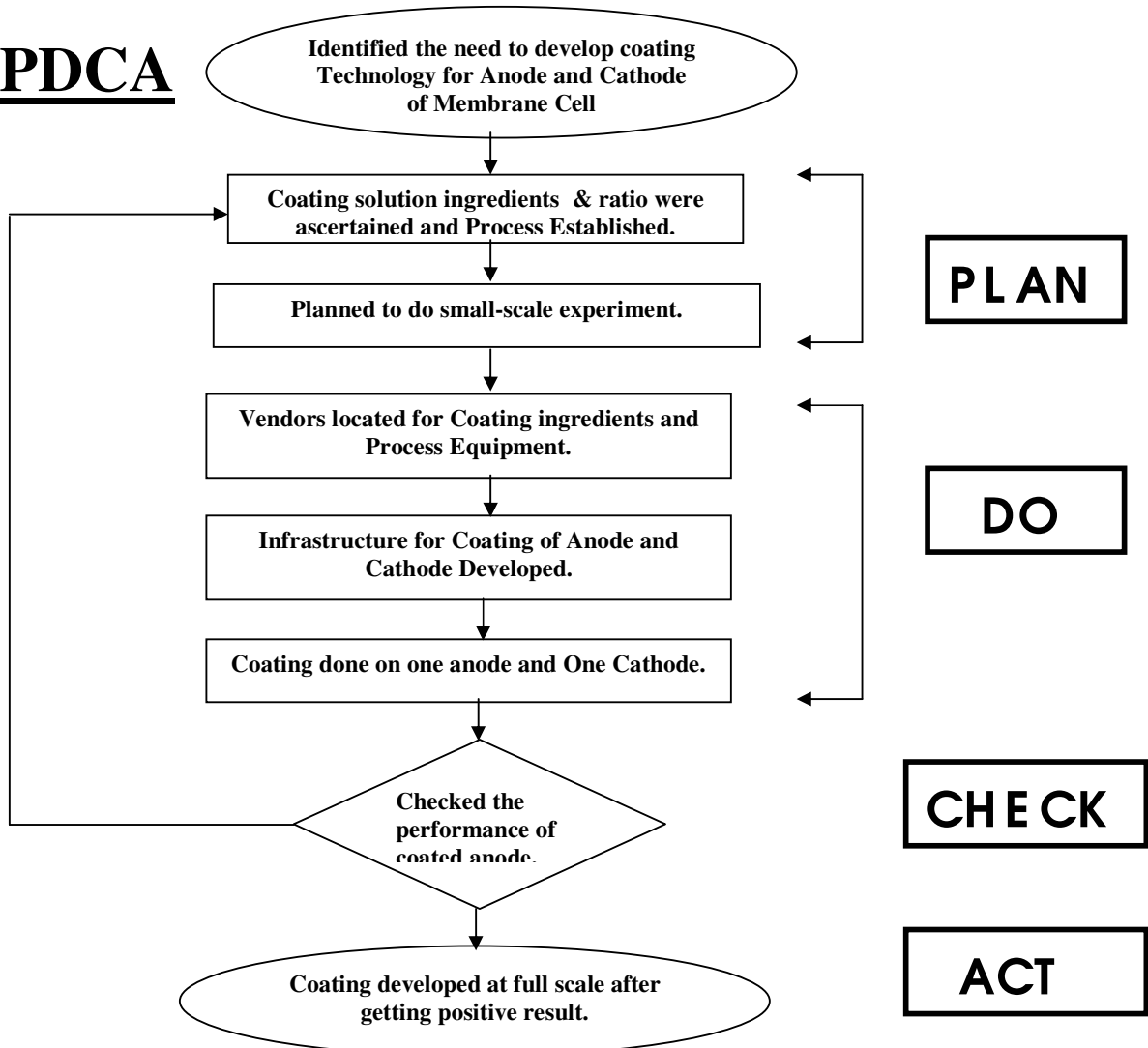
- ♣ During sand blasting pan got deformed and it was sorted out by developing appropriate frame to fix the pan.
- ♣ The blasting rate was very poor due to the less capacity of blasting machine and it was sorted out by in-house development in blast generator (increased greed carrying capacity and air pressure) the blasting rate was increased just to double.
- ♣ During etching operation complete pan body was getting immersed in acid bath in place of only electrolysis net causing loss of metal from pan and this was sorted out by redesigning the etching bath tub.
- ♣ During heat treatment pan was getting deformed and this was sorted out by redesigning of the pan carrying cage for heat treatment operation.

The complete basic engineering, selection and procurement of equipments, required civil construction, erection and commissioning of equipments was performed successfully by the team.



Write-up On Anode Recoating

PDCA



Key learnings – To reduce energy consumption

- Process of In-house development of technology.
- Enhance knowledge on Electrochemistry.
- Learned factors affecting on coating life.
- Potential in Marketing of Anode and Cathode Coating for other Caustic Soda Plants.
- Optimization of Process Parameter in Membrane Cell Plant.