

Grasim Industries Limited Chemical Division Denora

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 Chloro Sulphonic 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 2870 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).

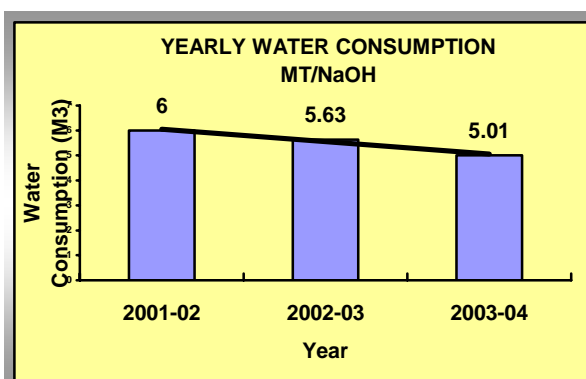
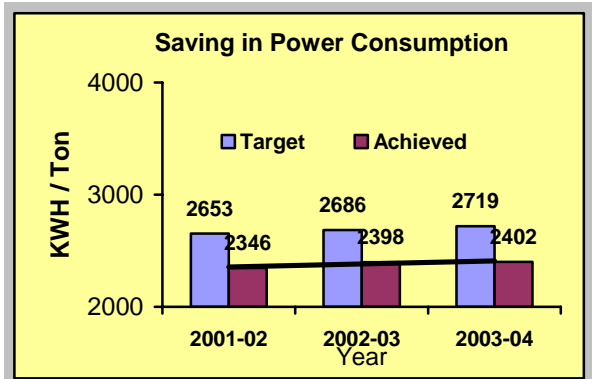
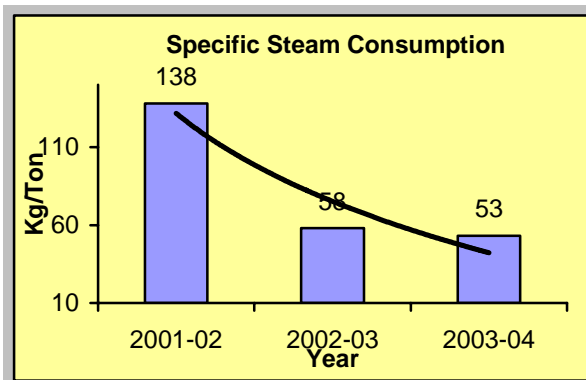
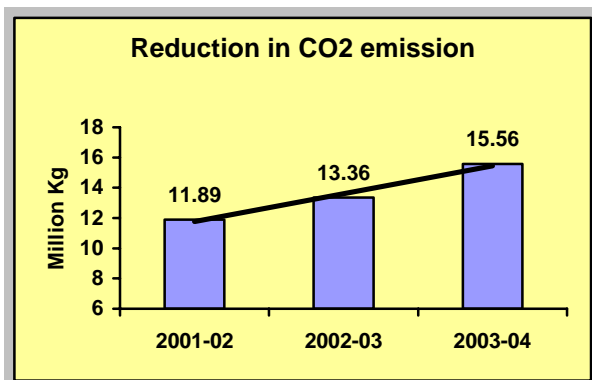
Cell Power consumption at Chemical Division’s Membrane Cell Plant has become the benchmark even for the plants operating with latest technologies of M/s. Uhde GmbH, Germany, and similar technologies.



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				
2001-02	2386	2135	267	211	2653	2346	308	23.77	930.83	11.89
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

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



iii) Energy conservation commitment, policy, set up.

“**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 FICCI in 2001 and **also recently 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.

Daily review of specific energy consumption in plant coordination meeting

Plant		Production					Power					
		Unit	Target	Actual			Unit	Target	Actual			
				Yesterday	Today	Average			Yesterday	Meter Readings	Today	Average
Membrane	Caustic	TPD	320	159.104	279.301	218.393	Kwh PT	2246	2179	617650	2211	2179
	at 320 TPD											
	Chlorine	TPD	240	210	211	156.71	Kwh PT	105	104	21863	104	112
	HCl	TPD	42	37.005	34.988	31.67						
Mercury	Caustic	TPD	176	159.104	156.452	139.347	Kwh PT	2860	2878	444884	2844	2828
	at 180 TPD											
	Chlorine	TPD	139	123	114	105.581	Kwh PT	120	118	13066	115	124
	HCl	TPD	20	18.508	24.519	17.429						
CSF		TPD	65	72	71	57.516	Kwh PT	45	47	3296	46	49
CSA		TPD	32	50.275	50.422	48.556	Kwh PT	25	31	1477	29	30
SBP		TPD	68	56.35	59.225	57.968	Kwh PT	131	118	7632	129	132
PAC	Liquid	TPD	146	200	190	164.03	Kwh PT	9	13	2147	11	12
	Powder(O)	TPD	17	0	0	13.084	Kwh PT	200	215	362	#DIV/0!	228
	Powder(N)	TPD		0	3.95		Kwh PT	150	178	1045	265	197
H2 Bottling		Nm3 Per day	12500	10348.8	10460.8	8692.55	Kwh per Nm3	315	320	3220	308	322
Water Consumption PT of Caustic			Remark									
Target	yesterday	today						DI		SFD		
4.75												

- 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.

SUNIL KULWAL
EXECUTIVE PRESIDENT

Date : 05.08.2002



ENERGY CONSERVATION POLICY

Chemical Division of Grasim Industries Limited a 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 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 स्वल्पाची 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 पर्यावरण के मिटाव व दिसाव पर रोक लगाकर।
- (3) बेस्ट (थर्मल सामग्री) की प्रभावी व्यवस्था व निष्पन्न 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 अवर



GRASIM CHEMICAL DIVISION

Birlagram, Nagda

QUALITY POLICY

GRASIM INDUSTRIES LIMITED CHEMICAL DIVISION, Nagda is Committed to 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

iv. Energy conservation achievements carried out in between 2001-04

SI No	Title of Energy Saving project implemented	Year of Implementation	Annual Electrical Savings achieved (units million)	Total Annual Savings (Rs. Million)	Invest. Made Rs. Lacs	Payback months
1	Installation of VFDs (6 Nos.)	2001-02	0.26	0.76	0.94	15
2	By changing motors connection from Delta to Star (4 Nos.)	2001-02	0.06	0.16	0.00	0
3	Right sizing the motor (4 Nos.)	2001-02	0.09	0.27	0.00	0
4	LT Capacitors/EE lighting/Others (7 Nos)	2001-02	0.20	0.57	0.58	12
5	Replacing generation I elements by reconfiguration and using high performance membranes	2001-02	16.21	51.70	172.28	40
6	Installation of VFD (15 Nos.)	2002-03	0.76	2.43	3.24	16
7	By changing motor connection from Delta to Star (2 Nos.)	2002-03	0.01	0.04	0.00	0
8	Right sizing the motor	2002-03	0.16	0.51	0.04	1
9	LT capacitor/EE lighting/others	2002-03	0.55	0.18	0.68	46
10	Energy efficient motors (66 Nos.)	2002-03	0.39	1.25	3.29	32
11	Replacing with low RPM motors (32 Nos.)	2002-03	0.34	1.08	0.61	7
12	Installation of 3rd Rectifier	2002-03	0.73	2.32	2.00	10
13	Copper Bus Bar Configuration	2002-03	0.12	0.40	2.03	61
14	Bus bar mill volt drop monitoring	2002-03	0.02	0.07	0.00	0
15	Reducing transmission losses by rearranging feeder, rationalizing cable rack route.	2002-03	0.17	0.54	0.00	0
16	Using of spare cell elements	2002-03	1.69	5.40	0.00	0
17	65 TPD Chlorine Compressor	2002-03	1.80	5.75	12.50	26
18	Energy Efficient Motors	2003-04	0.64	2.59	3.49	16
19	Variable Frequency Drives (12Nos)	2003-04	0.37	1.22	2.35	23
20	Energy Efficient Pumps 3 Nos.	2003-04	0.36	1.60	1.6	8
21	1 No. Electrolyser remembraning	2003-04	20.00	48.00	130	33
22	Remembraning/reconfiguration of 68 finite gapless electrolysers	2003-04	13.58	32.59	95	35
23	Schemes to utilise surplus Hydrogen to generate steam	2003-04	63.75	153.00	200	16
24	Scheme to replace 2 x 20 TPD Cl2 liquefaction units with one 65 TPD plant	2003-04	12.45	29.88	124.5	50
25	Scheme for generating 80TR vapor absorption refrigeration	2003-04	3.91	9.38	32	41
26	Scheme for 100 TPD Caustic Evaporation plant	2003-04	33.48	80.35	500	75
27	Caustic concentration by flash evaporation	2003-04	26.41	63.40	50	9
		TOTAL	198.51	495.44	1337.13	

Energy Conservation by installing Variable Frequency Drives in the year 2003-04

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							
Cooling Tower Fan (CSF)	MCT 812 A	15/11	8.50	6.35	2.15	51.60	240	12384	0.40	1.40	28.84%
Cooling Tower Fan (SBP 1&2)	MCT 1115 A	7.5/5.5	5.50	3.75	1.75	42.00	240	10080	0.33	1.20	27.38%
Cooling Tower Fan (SBP 3rd)	MCT 01115 A	7.5/5.5	5.55	3.80	1.75	42.00	240	10080	0.33	1.20	27.38%
Cooling Tower Fan (PAC)	MCT 17 A	7.5/5.5	6.05	3.88	2.17	52.08	240	12499	0.41	1.20	33.96%
Cooling Tower Fan (CSA)	MCT 101 A	7.5/5.5	5.50	3.65	1.85	44.40	240	10656	0.35	1.20	28.95%
Cooling Tower Fan (CSA)	MCT 101 D	7.5/5.5	5.50	3.80	1.70	40.80	240	9792	0.32	1.20	26.60%
HCL Dilute Pump (NP)	MP 0903 A	7.5/5.5	4.85	3.00	1.85	44.40	330	14652	0.48	1.20	39.80%
Wash Water Pump (NP)	MP 0402 A	7.5/5.5	3.85	2.50	1.35	32.40	330	10692	0.35	1.20	29.05%
Vacuum Pump (NP)	MP 0512 B	15/11	9.05	6.50	2.55	61.20	183	11169	0.36	1.20	30.34%
Caustic Transfer Pump (NP)	MP 0201 C	25/18.5	15.50	11.55	3.95	94.80	183	17301	0.56	1.75	32.23%
TOTAL					17.57	422		96229	3.14	10.15	

Control Valves replacement with VFD

Saturator Level Control -Brine	MP100	30/22	15.82	13.42	2.40	58	330	19008	0.62	2.00	30.98%
Reactor Level Control	MP107	30/22	18.5	15.9	2.60	62	330	20592	0.67	2.00	33.56%
Hydrogen Blower (PAC(P))	A & B	10/7.5	5.34	2.84	2.50	60	330	19800	0.65	2.40	26.90%

180 59400 1.94 6.40

602 155629 5.07 16.55

Energy savings in KWH Per Day

602 KWH

Energy Saving in Rupees per Annum

5.07 Rs Lacs

Nett saving

5.07 Rs Lacs

Investment

Cost of 12 No.s Variable frequency drives with all accessories

16.55 Rs Lacs

Return on Investment

31%

Implementation Time

4 Months

REPLACEMENT OF OLD REWOUND MOTORS WITH ENERGY EFFICIENT MOTORS - 2003-04

RATING		Quantity			Rate In RS	Cost of Motors * In RS	KW
		Life in Years					
KW	HP	15	21	Total			
3.7	5	39	41	80	9670	773600	296
5.5	7.5	29	36	65	13970	908050	357.5
7.5	10	7	20	27	15700	423900	202.5
11	15	20	10	30	27130	813900	330
15	20	7	15	22	33760	742720	330
18.5	25	8	6	14	45500	637000	259
22	30	9	7	16	48460	775360	352
55	75	4		4	143560	574240	220
75	100	5	3	8	187390	1499120	600
	Total	128	138	266		7147890	2947
						7147890	

Nett KW	In KW	2947
Load Factor		0.85
Actual KW	In KW	2505
Actual Consumption/Day	In KWH	60119
Present efficiency	In %	87.56%
Expected Efficiency	in %	90.84%
Expected Consumption /Day	In KWH	57942
Saving in consumption / Day	In KWH	2177
Saving in consumption / annum	In KWH	794427
Saving per annum	In Rs Lacs	25.90
Nett Saving per annum	In Rs Lacs	25.90

Cost Of Motors as per prevailing Price list	In Rs Lacs	71.48
Cost Of Motors on Discounted Price @ 45 %	In Rs Lacs	39.31
Less Cost of resale of old Motors @ Rs 150/ KW	In Rs Lacs	4.42
Nett Investment on Prevailing Price List	In Rs Lacs	67.06
Nett Investment on Discounted Price	In Rs Lacs	34.89

Return On Investment on prevailing Price List	in %	38.62%
Return On Investment on Discounted Price	in %	74.22%

HYDROGEN FIRED BOILER



VAPOUR ABSORPTION SYSTEM



Flash Evaporation System



VARIABLE FREQUENCY DRIVES



1. Continuous monitoring and rectification of Bus bar joint drops resulted in saving of 22520 KWH per year.
2. Installation of Variable Frequency Drives resulted in saving of 2,87,575 KWH per year.
3. Installation of vapour absorption machine to stop chilled water unit, achieved saving of 620352 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. By installing additional Thyristor rectifier, achieved a saving of 11,01,600 KWH/Year.
8. 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.
9. Right sizing of Motors and trimming of pump impellers resulted in saving of 1,29,600 KWH per year.
10. Use of sunlight by installing FRP Transparent sheets on the roof in Plants to reduce- lighting consumption.
11. Use of aerodynamic FRP Blades and changing the Blade angle of Cooling Tower Fans.
12. Using energy efficient lighting luminaries.
13. Use of spare cell elements by adding in the existing electrolyzers to reduce cell power by 7 KWH/Ton.
14. Using low voltage transformer for lighting circuits resulted in saving of 28,800 KWH per year.
15. Using energy efficient tube lights of 29 watts in place of conventional 40 watts (54 watts) tube lights resulted in saving of 36,500 KWH per year.
16. Using energy efficient motors in place of old rewound motors resulted in saving of 7,20,000 KWH per year.

17. Replacing high RPM motors with low RPM motors (22 Nos.) resulted in saving of 2,44,800 KWH/Year.
18. Bus bar configuration resulted in saving of 194000 KWH/Year.
19. Lean brine from Vacuum tank to saturator was insulated to avoid heat losses and this has resulted in saving of steam.
20. Heat recovery system was modified to recover heat from DM Water for Caustic and brine makeup resulting into saving steam.
21. Generation of Chilled water by non conventional method of Chlorine Vapourisation resulted in no use of steam & stoppage of chilled water compressors.
22. Started using brine instead of salt for water Softner regeneration. This has reduced our NaClO₃ level and resulted in saving of Steam for Chlorate destruction unit
23. By sweating of assets optimised plant operation to run with high capacity utilisation resulting in savings of steam consumption

Cost benefit ratio achieved by implementing all the above schemes

2002-03			2002-03			2003-04		
Investment	Saving	% Of ROI	Investment	Saving	% Of ROI	Investment	Saving	% of ROI
172.35	85.14	49.40%	233.46	168.22	72.05	470.25	245.95	52.30

Achievements

List of Certifications (ISO-9000/14000) Encon, Environment, Quality, Productivity and other Awards won during 2000 – 2004

CERTIFICATION

- Certification of 2003 OHSAS 18001 Occupational health & safety Assessment Series.
- Certification of 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.
- 2004 – The Stevie – The American International Business Award for the “Best Product Developer” in 2004.
- 2003 - Rajiv Gandhi J.Paryavaran Award for Best Pollution & Ecological Control.
- 2003 - Greentech Safety / Health / Environment Gold Award.

- 2002 - Greentech Environmental Excellence Award
- 2002 - Indira Gandhi Memorial National Award for Best Environmental control.
- 2002 - Chairman's Young Achiever Award.
- Aditya Birla Group Chairman's Gold Award 2003-2003 for Best Practices in a World Class Manufacturing which works as TPM Practices.
- Optimal level performance certificate issued by technology supplier (Krupp Uhde, Germany) - Enclosed As Annexure

Shortlisted for

- = National Award for Excellence in Energy Management 2004 by M/s. CII.
- = Aditya Birla Group Chairman's Platinum Award 2003-04 for Best Practices in a World Class Manufacturing which works as TPM Practice.
- = Aditya Birla Group Chairman's SUN Award 2004 for Business Excellence through peoplisation.
- = Aditya Birla Group Chairman's Planet Award for
 - (a) Excellence in Employee Engagement
 - (b) Excellence in Strategy To Execution

(v) ENERGY CONSERVATION PLANS & TARGETS

NEW SCHEMES (INITIATIVES 2004-05)			
S. No.	Schemes	Investment (Rs.lacs)	Return
1	Various Energy Saving Schemes INHOUSE - (Energy Efficient motors, tube lights, transformers, VFDs, Copper Flexibles, Pumps, Fans, etc.	69.05	27%
2	Various Energy Saving Schemes Suggested by CII - Generated out of CII suggestions Under Implementation Under Study	37.00 154.80	56% 97%
3	Scheme to replace 2 x 20 TPD Cl2 liquefaction units with one 65 TPD plant	149.40	28%
4	Harmonics Capacitor Filter Banks	60.00	24%
	TOTAL	470.25	52.30%

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 45% reduction in water consumption in process from 10 m³ / t of NaOH to 5.63 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

-  Use of R.O. reject water in place of raw water.
-  Recycle of effluent in respective section.
-  Recycle of tonner washing water.
-  Use of R.O. reject in R.O. II
-  Throttling of water valves at various places in plant.
-  Restricted blow down of cooling towers.
-  Reuse of steam condensate.
-  Check & immediate repair of leakages if any.
-  C.S.F. effluents recycle in scrubbers.
-  Use of P.A.C. effluent for various formulations.
-  Operation of cooling water system in a 100% closed loop.
-  Recycling of hot water rejection of HCL furnace.

-  **Recycling of end box wash water of cells in Cell House.**
-  **Segregation, recycle, reuse of the waste water generated in various sections of the plant.**
-  **Disposal of brine mud sludge in cake form in place of slurry.**
-  **Reuse of HCL gas scrubbing water in process.**
-  **Recycle of condensate from Chlorine and Hydrogen pipeline.**
-  **Use of treated domestic water for plantation within premises.**
-  **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.APROX. 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 CELL PLANT	NO WASTE WATER IS GENERATED FROM THE PROCESS.	NO EFFLUENT 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 unliquefied chlorine gas is scrubbed through solution of caustic soda to form sodium hypochlorite and this is used in Staple Fibre Division (Our sister

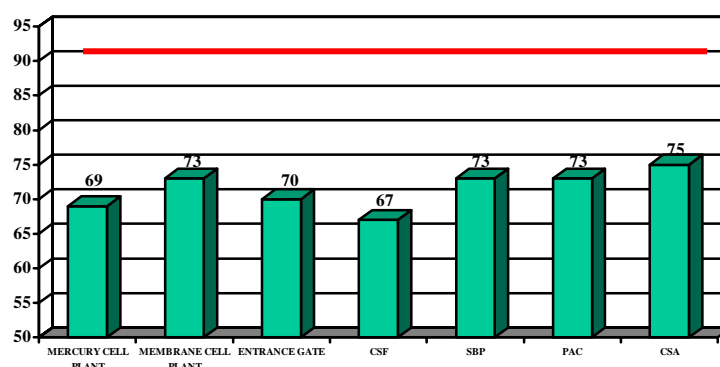
concern) for bleaching the fibre. The scrubbing system is provided with emergency power supply, which automatically switches on in case of normal power supply failure. A 100% standby absorption tower is always kept ready. Air Pollution sources and their controls are as follows;

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.
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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.
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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 BLACKKEANA	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. 170 crores
2	Capital invested for pollution control measures	Estimated cost is around Rs.2.5 Crores
3	Annual recurring expenditure for pollution control measures	Rs. 44.20 lacs per annum

In the field of energy conservation the cost benefit ratio is as under

2001-02			2002-03		
Investment	Saving	% of ROI	Investment	Saving	% of ROI
172.35	85.14	49.40	233.46	168.22	72.05

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 2002-03	Target 2003-04
Environment monitoring	Air act 1981	Works /town	Stack emission monitoring Work area environment Ambient air quality	Air pollution	15micro gms cl2 /m3 of air	10micro gm/m3 of air
Environment	Water act -1974	Works outlet drain	Measurement and analysis of	Water pollution	0.25 m3 /t	0.20 m3 / t

monitoring			effluent water	n	NaOH	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 conservation	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/welfare/sales/excise tax act	Corporate/suppliers/imports/assets	Filing of returns & assess Payment of custom duties Issue of declaration	Legal action	100% compliance	100% compliance
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

SPECIAL FEATURES OF ENVIRONMENT MANAGEMENT

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's environmental policy demonstrates its commitment to the environment "**Continual Improvement**" has been the way of life at Chemical Division with special emphasis on Environmental Improvement.

Following Features Makes Our Organization Strong Candidate For The Award

- ❖ Unit has ISO 14001 certification since Apr. 2002 and have certified internal auditors team for carrying out six monthly environmental audit.
- ❖ Our CEO is a member of the executive committee, Alkali Manufacturers Association of India and has a key role in study of critical equipments of the Chlor Alkali industry.
- ❖ CREP- Corporate Responsibility on Environment Protection, CREP is an understanding between industry & regulatory authorities. GRCD has

proactively participated in AMAI meetings and all requirements are being met with as per targets. Action plan with status is enclosed.

- ❖ Grasim Chemicals was rated best mercury cell plant in a study by CSE.
- ❖ Water conservation measures over last two years have reduced water consumption from 8.5 m³/t to 5.0 m³/t product.
- ❖ Zero discharge of effluent.
- ❖ Second largest Chlor-Alkali plant in the India.
- ❖ Adoption of World Class Manufacturing (WCM) concepts in all areas of industrial activities. WCM encompasses TPM & TQM systems also. We have won gold medal for manufacturing excellence (20-03).
- ❖ Energy conservation measures adopted and saving of Rs. 117.21 lakhs achieved.
- ❖ 77 % reduction in soda ash consumption w.r.t. to 1999-00.
- ❖ 12.27 % reduction in consumption of Hydrated lime w.r.t. 1998.
- ❖ 04% improvement in productivity as compare to last year.
- ❖ Most modern effluent treatment plants for industrial and domestic effluents. 100% effluent confirms excellent quality of treated wastewater.
- ❖ Many water conservation, energy conservation & waste reduction initiatives are taken.
- ❖ There is continuous reduction in waste loads and inputs are very near to stoichiometry.
- ❖ Senior management involves in all environmental & pollution related matters and meets all shop floor staff every week to deliberate on problems & initiatives.
- ❖ Every day environmental related issues are discussed in daily plant coordination meeting and corrective actions are taken, if any.
- ❖ Unit 'Environmental Cell' identifies various environmental improvement schemes and submits the same to management for approval.
- ❖ Environmental and Safety task force was created for Aditya Birla Chemical business units for continuous monitoring, auditing and giving suggestions for various environmental protection / improvement measures.
- ❖ Environmental & safety task force consist highly qualified and well-experienced experts on environment & safety from each unit.
- ❖ For Knowledge Integration among the employees of various Group Units of Aditya Birla Group, employees regularly exchange information through Knowledge Integration Programme (KIP) on environmental issues.
- ❖ To encourage involvement and commitment of the employees, a Suggestion Scheme was introduced among the employees, in which very

practical Environmental improvement Suggestions were also received and implemented.

- ❖ Continuous interactions with the Technology Suppliers and visits and interaction with best Chlor-Alkali plants in India and benchmarking various environmental parameters is an on-going exercise at Chemical Division.
- ❖ Environmental Policy – company has institutionalized “Environmental Policy” and strictly adheres to comply with all points of policy
- ❖ Benchmarking – Unit always do the benchmarking exercise for various environmental monitoring parameters by setting its own target much below the specified target.
- ❖ Our CEO gave presentation on “The Indian Chlor Alkali Scenario” during international Chlor Alkali Conference held at Houston, USA.

Steam Generation By Using surplus Hydrogen as fuel in Hydrogen Fired Boiler.

A. BACKGROUND OF THE PROJECT

- Energy Consumption is Generation of Energy.
- We are venting the surplus Hydrogen in the Atmosphere.
- Hydrogen is a Environment friendly and a High Calorific Value Fuel.
- Natural Resource Conservation.

B. OBSERVATION MADE

- Formed the cross-functional team of Operation, Engineering and Finance.
- Brain storming to find various alternatives for usage of excess Hydrogen.
 - Use in New Product development.
 - Use in Power Plant Boiler
 - Develop the market of Compressed Hydrogen.
 - Use in Generation of Steam for Plant Use.
- Evaluation of Proposed Alternatives.
 - Use in New Product: Could not Identify Economical Feasible Product.
 - Use of Hydrogen in Power Plant Boiler: Not Feasible.
 - Develop the market of Compressed Hydrogen: No potential in Market.
 - Use in Generation in Steam for In House Plant Use: Suitable.
- Selection of Best Alternative: Use in Generation of Steam for in house existing plant Use and In New Project – VAM Machine and Caustic Concentration Plant.

TECHNICAL & FINANCIAL ANALYSIS & IMPACT OF IMPLEMENTATION

C. Execution aspect

- Prepared the action plan for completing the project.
- Find the Best Suitable Vendor for Supply of Hydrogen Boiler for Steam Generation.
- Weekly review of implementation.
- Preparation of Drawing and Design of Equipment.
- To erect and commissioned the project in Time bound Condition.

D. Impact

Saving

Steam Consumption (supply to various sections) (50 TPD x 375 Rs/T. 300 days)	Rs.56.25 lacs
Cost of Boiler (7.5 Ton/Hr.)	Rs.200.03 lacs
Interest on 50% of block of Rs.200.03 lacs @ 12.5%	Rs.12.5 lacs
Net saving (Rs.56.25 – 12.5 lacs)	Rs.43.75 lacs
ROI	21.87%

E. Key Learning and Plans for Sustainability

- Understand the Importance of Energy.
- Utilization of Waste/Surplus Material or Product.

A Flash Evaporation of Caustic in Membrane Cell Plant

B. BACKGROUND OF THE PROJECT

GRCD is using two processes to manufacture caustic i.e. Mercury Process & Membrane Process. Caustic produced in Membrane cell is further concentrated in Mercury cell. GRCD is unable to utilize full capacity of MC plant because Mercury Cell capacity is not enough to concentrate entire caustic produced in MC. Membrane cell process is energy efficient. Thus any increase in Membrane cell production could result in saving of power cost.

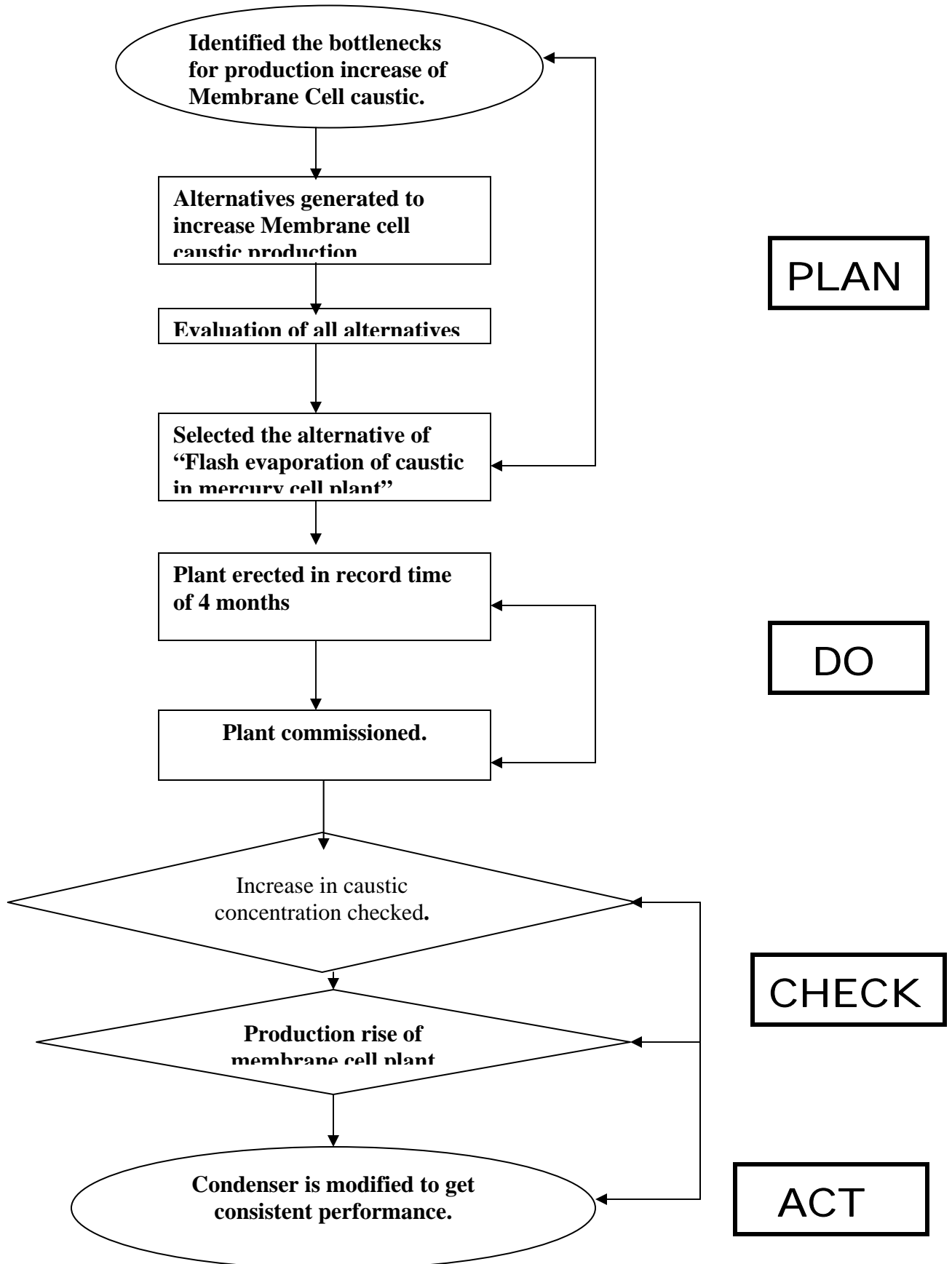
C. OBSERVATION MADE

- Formed the Cross-Functional Team consisting of Operation, Engineering and Commercial People.
- Brainstorming was done to generate various alternatives.
- We referred many technical magazines, searched the internet & interacted with Technical experts
- Caustic output of Mercury plant is at 105 deg.C which is cooled & sent to storage tank. We decided to utilize this sensible heat energy of caustic by Flash Evaporation.

D. Execution aspect

- Action plan was prepared to implement the project.
- We identified the critical equipment (e.g. Condenser, Flash Tank & Vacuum Pump) & put special effort to procure them in shortest possible time.
- We developed new vendors for quick delivery of materials
- Process was implemented successfully in record time.

PDCA



E. TECHNICAL & FINANCIAL ANALYSIS & IMPACT OF IMPLEMENTATION

- Concentration of caustic is increased by 1% in mercury plant, which resulted in **18 TPD** increase in production in Membrane Cell.
- This project is managed in only Rs.27 lacs against sanctioned Rs.36 Lacs thus achieved a saving of **25%** of total project cost.
- Average realization of Caustic / ton = Rs. 3000
- Total increase in production = 18 TPD (Of MC).
- Additional revenue generated / day = Rs. 54000
- Additional revenue generated / year = Rs 162 lacs
- Power Saving = 600 KWH / MT
- Cost of power = Rs 2.40 / KWH
- Power saving per annum

$600 \text{ KWH} \times 18 \text{ TPD} \times 300 \text{ days} \times 2.40 = \text{Rs } 77.7 \text{ lacs}$

- Total saving = 162 + 77.7 = **Rs 239.7 Lacs**

F. Key learning's & plans for sustainability.

- Customized equipment designing.

Generation of 80 TR Refrigeration By Using surplus Steam

A. BACKGROUND OF THE PROJECT

- Energy Consumption is Generation of Energy.
- We find that we have surplus steam.
-

B. OBSERVATION MADE

- Formed the cross-functional team of Operation, Engineering and Finance.
- Brain storming to find various alternatives of surplus steam
 - Use in New Product.
 - Use in Generation of chilled water for Plant Use.
- Evaluation of Proposed Alternatives.
 - Use in New Product: Could not Identify Economical Feasible Product.
 - Use in Generation of chilled water for Plant Use Suitable.
- Selection of Best Alternative: Use in Generation of chilled water for plant Use – VAM Machine.

TECHNICAL & FINANCIAL ANALYSIS & IMPACT OF IMPLEMENTATION

C. Execution aspect

- Prepared the action plan for completing the project.
- Find the Best Suitable Vendor for Supply of VAM Machine.
- Monitoring and the follow up Implementation Weekly.
- To erect and commissioned the project in Time bound Condition.

D. Impact

Savings	
Saving in power consumption	22.48 Lacs
By stopping Four Chilled water units (4 No.s 19.2 KW x 24 Hrs x 360 days x3.38Rs./KWh)	
<u>Less</u>	
Steam Consumption: 8 TPD.	10.80 Lacs
Rate of Steam: Rs.375/Ton.	
On account of maintenance	.30 Lacs
Net Gain	11.38 Lacs

Investment

Cost of VAM with all accessories 32.00 Lacs
Interest on 50% of block of Rs 32 Lacs @ 12.5%
Total Savings after considering interest on block Rs. 9.38 lacs/Annum.

B. Key Learning and Plans for Sustainability

- Understand the Importance of Energy.
- Utilization of Waste/Surplus Material or Product.