

INDIAN ALUMINIUM COMPANY LIMITED BELGAUM WORKS (KARNATAKA)

Company Profile:

Aluminium plays a vital role in various fields in day-to-day life. INDAL has been a pioneer in the field of development of Aluminium industry in India and caters to most of the usage segments of the market in the country today.

INDAL was incorporated as a private limited company in December 1938, under the name 'Aluminium Production Company of India Ltd.'. In 1944, the name changed to 'Indian Aluminium Company Ltd.'. Since its inception Alcan Aluminium Ltd., Canada had been its principal shareholder. Indal benefits from a continuous technology and personnel exchange with Alcan. Professionally managed, Indal has around 30,000 shareholders and over 8000 employees. In the year 2000, Alcan sold its stake in Indal to the A.V. Birla group – Hindalco w.e.f. from 27th June 2000.

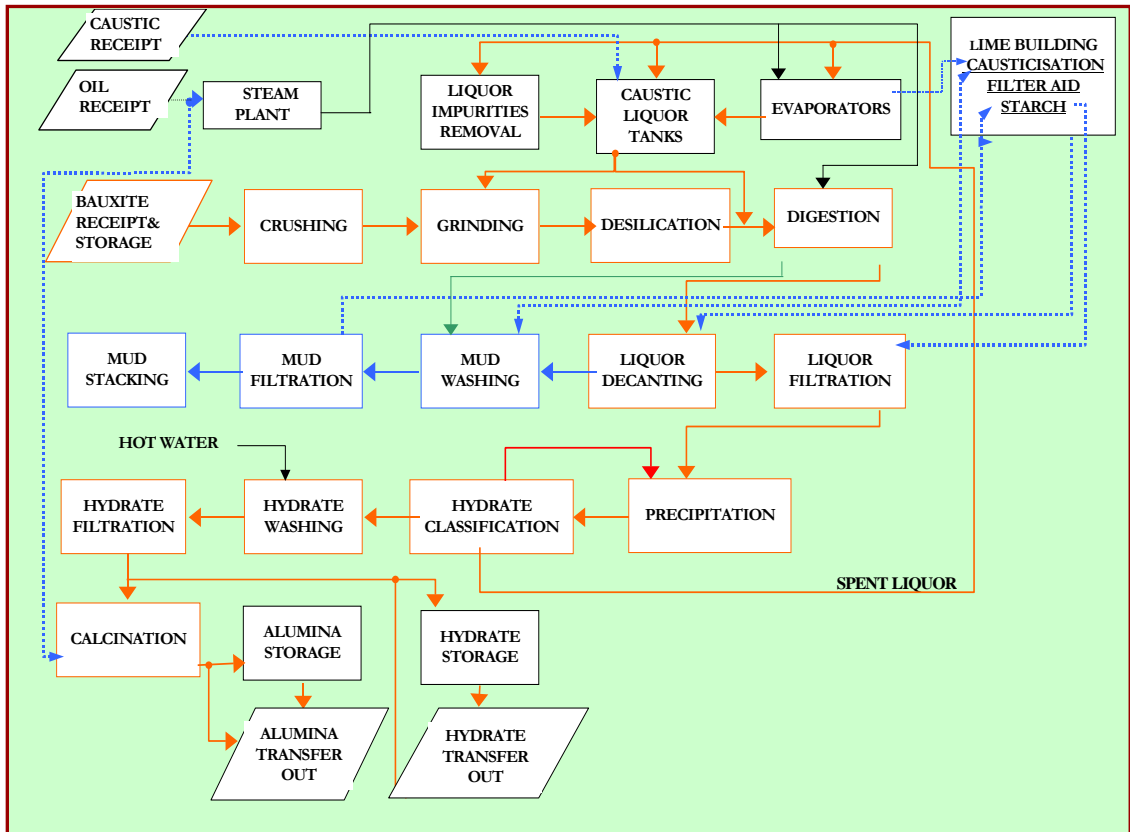
INDAL is one of the largest private limited companies in India and the first to embark on the production of Aluminium in the country. With a nation wide network of production facilities and offices, INDAL is engaged in all phases of the Aluminium industry, from Bauxite mining, Alumina refining through smelting to manufacturing of a wide range of finished Aluminium products.

Belgaum Unit :

Belgaum unit of Indian Aluminum Company, Limited is located near the West Coast of India amidst undulating topography. The 33 year-old Alumina plant commenced operation in 1970 with an initial capacity of 70000 T of hydrate. Through capacity augmentation in stages the plant has reached a name plate capacity of 300000 T and currently operates at 123 % of rated capacity.

Focus shift was initially made to load Alumina plant to its capacity and produce Special Aluminas/Hydrates and later in early 90's to predominantly export of metallurgical Alumina in large tonnage's. This being cyclical yet good business, the Alumina plant was expanded twice, first time in 1993 to a level of 220000 T and later in 1995-96 to 260000 T. Since then, through in-house efforts and plant modifications involving minimum capital expenditure, the plant is currently producing at 370000 T capacity.

Process Flow Chart

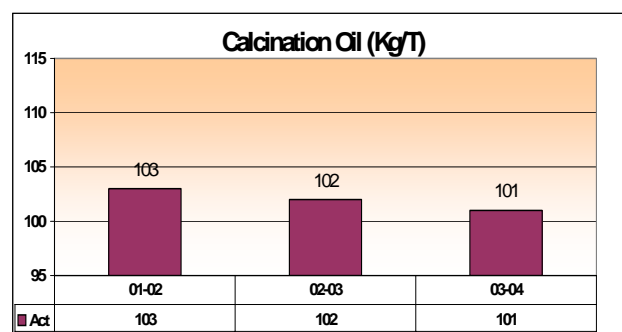
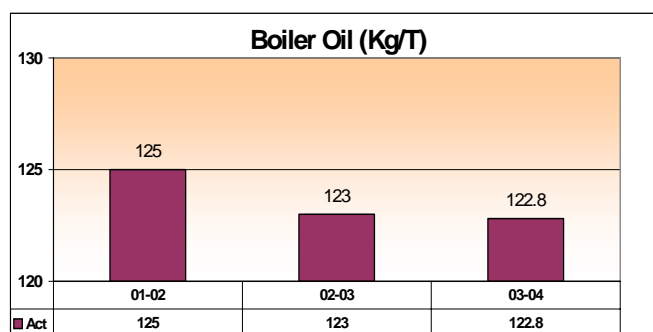
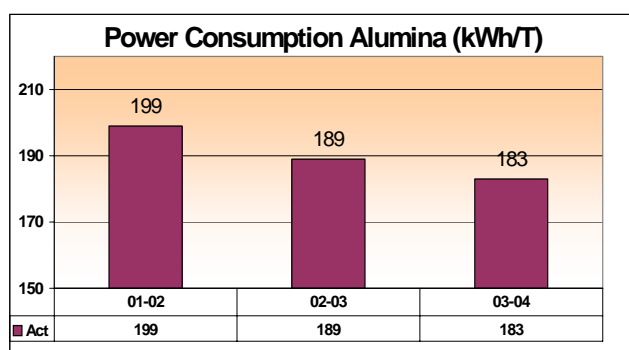
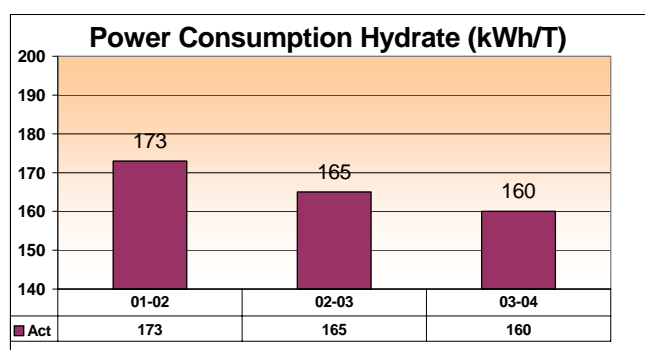


Energy consumption:

The primary energy inputs in Belgaum Alumina Plant are furnace oil, Diesel/LDO & electricity. The steam, which is used to heat up the process streams, is generated in oil fired boilers using furnace oil as fuel. The furnace oil is also used as fuel in rotary kilns for calcination of hydrate. Electricity is used to operate the pumps, compressors and other equipment. LDO/Diesel is used to operate DG set for critical loads.

There has been a study decrease in the Electrical & Thermal Energy consumption.

Year	Annual Energy consumption					Prod. in tons or any other unit of prod. ***	Specific Energy Consumption		Redn. in Specific Energy consn. Over previous year (%)		Product
	Electrical	Thermal					Electrical Kwh / T	Thermal Tons/ T	Electrical	Thermal	
	KWH x Million	Rs Million	Type of fuel	Tons	Rs Million						
01-02	29.81	118.64	FO	21606	200.77	172850	172.45	0.125			Hydrate
	33.24	132.29	FO	38247	355.39	167750	198.18	0.228			Alumina
	63.05	250.94				340600	185				Total
02-03	27.62	117.93	FO	20591	227.72	167410	165	0.123	4.32	1.60	Hydrate
	35.64	152.18	FO	42433	469.26	188590	189	0.225	4.63	1.32	Alumina
	63.26	270.11				356000	177		4.32		Total
03-04	26.79	124.84	FO	20591	215.39	167410	160	0.123	3.03	0.00	Hydrate
	37.07	172.74	FO	45380	474.68	202590	183	0.224	3.17	0.44	Alumina
	63.86	297.58				370000	173		2.25		Total



Energy Conservation Commitment, Policy and Set up:

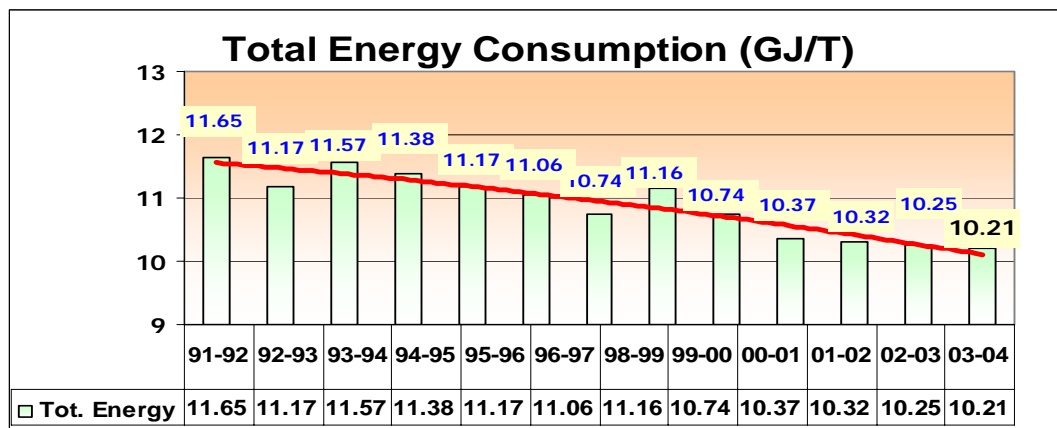
Energy Conservation Policy, - Attached

There are continuous efforts being put to reduce the energy consumption in Belgaum Alumina Plant as the total energy bill contributes around 48%. The annual energy bill for Belgaum works is around Rs. 9877 Million, which comprises 48% of total production cost of the total cost of Alumina produced. This is however a combination of efficiency as well as issue rate. Since issue rates are soaring up day by day, it is more prudent to put continuous efforts for energy conservation in order to survive in such a competitive market. The thrust areas for our approach towards energy conservation are listed below.

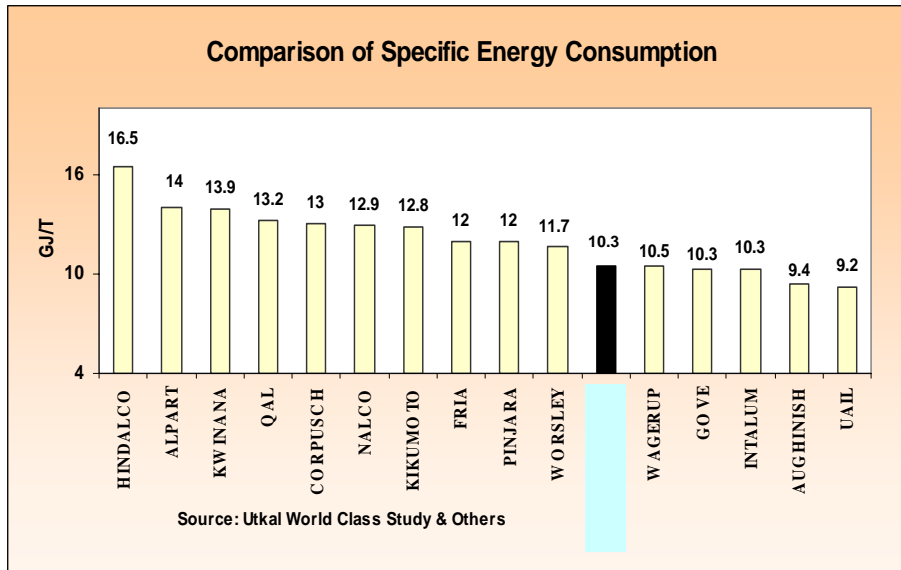
- .. Improve volume and productivity
- .. Process optimization.
- .. Improve capacity utilization
- .. Resizing of process pipelines
- .. Replacement of low efficient pumps and motors
- .. Improve the heat recovery from condensate
- .. Improve condensate management
- .. Routine insulation check
- .. Introduction of VFD's
- .. Usage of fuel additives to improve combustion efficiency
- .. Introduction of low excess air burner
- .. Effective Predictive & Preventive maintenance practices.
- .. Conducting regular energy audits through external & internal agencies & Implementation of the recommendations.

Energy conservation Achievements:

The most sincere efforts of Belgaum team towards energy conservation has resulted in achieving a mile stone by recording a lowest ever specific energy consumption at 10.21 GJ/T in 2003 – 2004. This is the best specific power consumption no. compared to any of Alumina Plants in the country and one of the best among the similar size plants in the world.



COMPARISON OF SPECIFIC ENERGY OF OUR BELGAUM PLANT WITH SOME OF THE ALUMINA PLANTS ACROSS THE GLOBE (Fig's AS OF 2001)



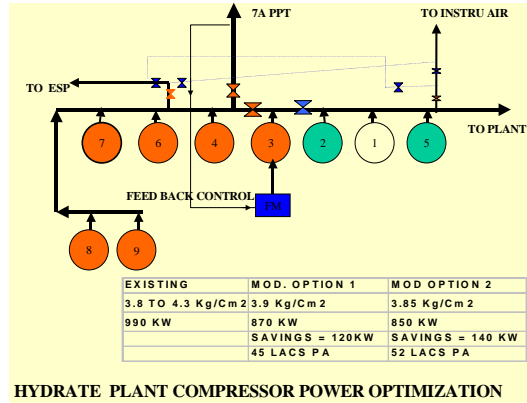
PROVISION OF VFD & CLOSED LOOP FOR PRECIPATOR AIR COMPRESSOR

1)Background : Air compressors are used for keeping Hydrate agitation.

2)Observation: Whenever the tanks are being isolated or taken into service there is a variation in pressure of compressed air.

3)Technical & Financial Analysis:

A constant pressure maintained by installing a PID close loop control and VFD for compressor motor.
 Savings :7 Lakh KWH
 Savings Amount Rs:32 LakhsPA
 Investment :Rs 8 lakhs



4)Impact of Implementation:
 Reduced Energy Consumption.

PROVISION OF VSD & CLOSED LOOP CONTROL FOR AIR COMP

1)Background : In our Plant the Air compressors are used for process

2)Observation: It was noticed that during production the feed to the equipment is varied as per need basis resulting in pressure variation and energy wastage

3)Technical & Financial Analysis:

Constant pressure maintained by PID close loop control and VFD for compressor motor.
 Savings :2.3 Lakh KWH
 Savings Amount Rs:10.5Lakhs PA
 Investment :Rs 5.5 lakhs



4)Impact of Implementation:
 Reduced Energy Consumption.

PROVISION OF ECONOMISER FOR BOILER NO 3

1)Background : Waste heat recovery

2)Observation: High stack temp.

3)Technical & Financial Analysis:
Installation of economizer

Savings :326.31 KILO LITERS
Savings in F.Oil:3.19 million kilo cal
Savings Amount Rs:34.1 Lakhs PA
Investment :Rs 30 lakhs

4)Impact of Implementation:
Reduced oil Consumption.



PROVISION OF VFD & CLOSED LOOP COMBUSTION CONTROL FOR BOILER NO 3

1)Background : Combustion air is controlled by using damper for the FD fan.

2)Observation: Variation in the boiler load & damper control.

3)Technical & Financial Analysis:
Instead of a Pneumatic actuator which was used to vary the damper position a VFD is introduced for smooth control of the air flow.

Savings :1.7 Lakh KWH
Savings Amount Rs:7.5Lakhs PA
Investment :Rs 3 lakhs

4)Impact of implementation: Reduced stack losses & Energy saving



AUTO ON/OFF OF COMPRESSOR COOLING FAN & OTHER MIS

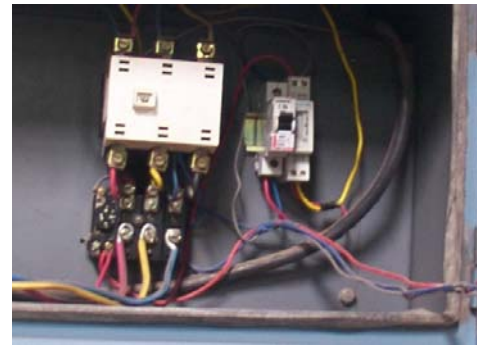
1)Background : In our compressor section we have a forced air cooling system in the area surrounding compressors.

2)Observation: The cooling fan is ON continuously 24 hours.

3)Technical & Financial Analysis:
After further study it was observed that the environment was hot during the day time only and was naturally gaining to lower temperature in the evening. Hence a Timer was introduced to keep the fan ON only during day time.

Savings :3.83 Lakh KWH
Saving Amount Rs:17 Lakhs
Investment :Rs 0.3 lakhs

4)Impact of Implementation:
Reduced Energy Consumption.



CHANGING OF EXISTING FLUID DRIVE WITH ENERGY EFFICIENT MOTOR & VFD

1)Background : Replacement of fluid coupling with VFD & installation of efficient pumps.

2)Observation: poor flow control & increased maintenance of FC

3)Technical & Financial Analysis:
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Savings :2.7 KWH
Savings Amount Rs:12.4 Lakhs PA
Investment :Rs 15 lakhs

4)Impact of Implementation:
Reduced Energy Consumption.



PROVISION OF VFD & CLOSED LOOP CONTROL FOR PRODUCT PUMP

1)**Background** : Variable load

2)**Observation**: Energy Wastage due to throttling

3)**Technical & Financial Analysis**:
Installation of VFD .

Savings :1.1 Lakh KWH

Savings Amount Rs:5.0 Lakhs PA

Investment :Rs 2 lakhs

4)**Impact of Implementation**:
Reduced Energy Consumption.



CHANGING OF EXISTING INEFFICIENT MOTORS WITH ENERGY EFFICIENT MOTOR & VFD FOR TT U/F PUMPS

1)**Background** : Variable load

2)**Observation**: Energy Wastage due to throttling

3)**Technical & Financial Analysis**:
Installation of VFD & efficient motor with proper sizing.

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Savings :2.2 KWH

Savings Amount Rs:10 Lakhs PA

Investment :Rs 21 lakhs

4)**Impact of implementation**: Energy saving.



PROVISION OF VFD FOR SPECIAL FILLING PUMPS

1)Background : Variable load

2)Observation: Energy Wastage due to throttling

3)Technical & Financial Analysis:
Installation of VFD .

Savings :2.2 KWH

Savings Amount Rs:10.2 Lakhs PA

Investment :Rs 6 lakhs

4)Impact of Implementation:
Reduced Energy Consumption.



PROVISION OF VFD FOR LIQUOR DECANTOR OVERFLOW PUMPS

1)Background : Variable load

2)Observation: Energy Wastage due to throttling

3)Technical & Financial Analysis:
Installation of VFD .

Savings :1.75 KWH

Savings Amount Rs:8 Lakhs

Investment :Rs 2.5 lakhs

4)Impact of Implementation:
Reduced Energy Consumption.



INTRODUCTION OF EFFICIENT LIGHTING

1)Background : Higher supply voltage in the night hours leads to high power consumption in ltr ckt.

2)Observation:It was noticed that there was lighting voltage variation resulting in unwanted energy wastage.

3)Technical & Financial Analysis:
a) Maintain a constant low voltage of about 220V AC We get 20% reduction in power consumption. This is done by installation of CVT.
b) Installation of electronic chokes & high life efficient tubes.
Savings :1.7 Lakh KWH
Amount Rs:7.2 Lakhs
Investment :Rs 2 lakhs

4)Impact of Implementation:
Reduced Energy Consumption.



13 A EVAPORATORS-PROCESS OPTIMIZATION
(Vacuum optimization, hooking of HW & CW Pumps & CT air fan optimization)

1)Background : Evaporator Hot well and cold well pumps run continuously for the flow control the delivery valve is throttled.

2)Observation: a)It was noticed that there was continuous energy wastage during throttling of the valve.

b)Excess cooling air for cooling tower.

3)Technical & Financial Analysis:

a)VFD introduced.

b)One FAN was stopped after observing water temperature profile.

Savings :5.9 Lakh KWH

Savings Amount Rs:24 Lakhs

Investment :Rs 4.5 lakhs

4)Impact of Implementation:

Reduced Energy Consumption.



Energy conservation plans and targets:

Our efforts to reduce energy consumption further would continue in the future too with the same pace. Some projects i.e. Replacement of inefficient pumps & Fans, installation of economizer for Boiler 1&2, Dg Automation for rapid power restoration instead of continuous running, Modification of Drum filter for increasing through put, Conversion of V belt drives to flat belt, Compressor & Pump efficiency monitoring are being implemented and few others are in conceptualization stage. The implementation of these projects will bring down the specific energy consumption by 3-4 KWH/T, & Reduce power cost equivalent to Rs 30/T, which is equal to reduction of 6Kwh/T. Currently our Electrical power requiring is met through SEB & Thermal energy through FO based low pressure boilers. Now it has been proposed install 140 TPH steam, 24MW capacity coal based Cogeneration plant.

Currently, classical direct fired rotary kilns are used at Belgaum Alumina Plant for calcination process which consume significantly higher oil compared to stationary calciner. Being high investment project (replacement of existing rotary kiln with stationary calciner), it has been considered under the scope of proposed expansion plan. This technology change would reduce the specific oil consumption for calcination by 25 - 30 litre/T.

Short time plans are as mentioned below

ENCON PROJECTS PLANNED FOR FUTURE				
Energy Conservation Measure	ANTICIPATED SAVINGS PER ANNUM		APPROX. INVESTMENT	Project completion Date
	L.KWH	Rs Lac	Rs in Lac	
Installation of Ecoventilators	0.22	1	1.8	Oct-04
Action plan for improvement of cooling water quality & flow to be made	0.50	2.5	0.3	Dec-04
15A & 15B CT Fans to be converted to FRP	0.67	3	3.5	jun-04
Improving Efficiencies of water/Liq. pumps- 5/31 Nos	0.54	2.6	6.2	01-Mar
Conversion of V belt to Flat belt - 30 Nos drives	7.78	35	30	Jun-05
Efficiencies & Sizing FC blowers, 12D DC fan, Exhaust fans of MM1 ,2&3, Kiln#2 Primary air fan. Kiln I &II , SGAD & Boiler house fans	4.44	20	20	Dec-05

DG automation	26.67	120	95	Jun-05
VFD for 13A body transfer pumps	4.00	18	12	Dec-05
Replacement of Boiler ID/FD fans by Efficient fans	2.00	10	10	Dec-05
Replacement of PH pumps by efficient pumps & VFD	2.50	12	4	Dec-05
Up gradation of press feed pumps P-28A-12A/B/C	2.08	10	53.7	Mar-05
Up gradation of filtrate pumps P-5A-5A/B	3.75	18	39	Mar-05
Common economizer to Boiler 1 & 2		15	43	01-12-2005
Bokela filter optimization in DF No 1	1.56	7.5	18	Dec-04
TOTAL	56.72	274.60	336.50	

Environment & Safety

Environment

Indal is very much conscious about the issues related to environment & safety. Our captive power plant at Hirakud and bauxite mines were the first in Asia to achieve ISO 14001 Environment Management System, Our alumina refinery at **Belgaum has attained ISO 14001 Environment Management System certification. in the month of April 2001.**

Highly efficient bag filters, dust collectors and electrostatic precipitators are installed at appropriate locations to ensure the dust emission always well below the stipulated norms of pollution control board.

To conserve resources like energy, water and reduce the discharge of wastes, innovative ways and means have been evolved. Through our clean production programs, resources conservation has received a significant boost. The water conservation efforts at Belgaum Plant have enabled us to overcome seasonal water shortage. The plant complies with the stipulated Zero-discharge of effluent as all of the plant effluent is recycled back to the process/cooling services. The plant practices Dry-Mud stacking technology for red-mud disposal, aimed at minimizing utilization of land for disposal as well as containing possibility of ground water contamination through mud disposal site. Green vegetation growth on the dry mud stacking to avoid dusting is our biggest achievements

System Development:

Air Environment:

Improvement in ESP operation: Significant improvements were achieved in increasing the ESP availability from 96 % to 99.5 % of kiln operating time

New ESP to SGAC : Up-gradation of ESP attached to SGAC Kiln has resulted in reducing the SPM levels in the stack emissions from about 300 mg/Nm³ to about 50 mg/Nm³. This has helped to achieve levels beyond legal compliance (limit -150mg/nm³) and also generated adequate assimilative capacity for future expansions.

Installation of Sprinklers in RMP: New and improved Dust suppression system – intermittent water sprinkling on need basis, have been installed in Red mud Pond area to suppress dust. The entire water required for dust suppression is sourced through wastewater recycling. The ambient dust levels have reduced from a level of 140 mg/m³ to 75 mg/m³.

Rehabilitation of RMP : For the first time in Alumina industries in the world, a scientific approach has been adopted for the red mud pond rehabilitation with vegetation. The dust nuisance of RMP is reduced, traditionally, by water spraying that uses large water and energy resource. In order to give a permanent solution to the dust issues of Red mud pond, a pilot scale study of rehabilitation of Red mud pond with vegetation has been taken up in one hectares of land. Selective species of plants, which can survive at high pH soil condition, are being grown. The results are encouraging and expected to achieve rehabilitation of red mud dump to merge with the nature's nutrient cycle.

Work area environment improvement: Installation of Zero energy ventilators – turbo ventilator- in the steam plant, for the first time, has reduced the levels of noxious gases due to fugitive leakage's by 80% through increased cycles of air circulation thereby improving the work area environment.

Water conservation:

Water conservation: Implementation of a comprehensive waste water recovery system has reduced the fresh water requirement by about 20%.

Land Conservation:

Red Mud stacking : For the first time in the world, vertical stacking of red mud in different layers / tires has been successfully done in-house. The vertical height has been increased by about 20% thereby conserving fresh land requirement for red mud storage by about 15%.

Solid Waste Management : A mechanism to segregate the solid wastes at the point of generation, collection and storage has been implemented. This has helped the organization in quantifying the wastes; encourage recycling of re-useable material and re-processing of wastes for alternate usage. Better segregation has improved revenues through higher realization through scrap sale.

Oil unloading system : Complete automation of furnace oil unloading and handling system has eliminated the spills and leakage's faced during manual operations. This has reduced the risk of open land and water body contamination related to oil spillage's, to a great extent.

Reduction in caustic seepage through process drains : A comprehensive spill management and recovery of plant trade effluents has been implemented. This has reduced the loss of very valuable raw material – Caustic soda – through seepage losses by about 40%. The land contamination due to caustic seepage has been reduced accordingly.

Legal Compliance improvement :

Hazardous waste Management : A mechanism to complete recycling of spent lubrication oils and used transformer oil, blending with furnace oil for consumption in boiler house has been implemented. The lead acid batteries are returned to the suppliers with the replacement of new one. These have helped in achieving legal compliance on spent oil and lead acid batteries management.

Afforestation and community development :

Plantation : A large scale afforestation has been carried out along the plant boundaries with about 80,000 trees, covering an area of 60 acres. Various species of plants are planted, in an effort to restore the ecology cycle. Different species of birds are seen returning to this area that had disappeared due to uncontrolled deforestation. Neighboring hostile community were involved in the afforestation program, through village development committees, that has ensured a survival rate of > 85%.

Safety

Safety is of prime concern in all activities at Belgaum works .Safety performance is reviewed every week by our V.P.Works in HOD's meetings. Utmost importance is given to identification and correction of unsafe acts' unsafe conditions. At the same time usage of personal protective equipment is given due importance to ensure that severity of the accidents is minimum. Belgaum plant has well established safety management systems to prevent accidents. To give some examples we have SOP's for most of activities, equipment clearance procedures, Hazard identification and risk analysis for most of the activities, 3 tier system for hazard identification, work-place environment standards, schedules for use of PPE's surveys, etc. We also have multy discipline safety committees for communication and involvement of shop floor employees in all the safety activities. To coordinate review and monitor all the safety activities Belgaum plant has a full-time qualified safety officer. We have well-equipped Occupational Health Center managed by a full time medical officer who is also trained for carrying out industrial hygiene studies. Who takes care of health & hygiene of the employees. Work place studies on heat stress, noise, dust, etc. are carried out at an interval by CMO in coordination of safety officer and HOD's. Based on the studies, corrective measures are taken to improve the work area environment. The result of all these proactive measure is that our plant has remained ACCIDENT FREE FOR 824 DAYS till 30/09/04 (4.88 Mio. Accident free man-hours.) .Last lost time accident at Belgaum plant was on 29/06/2002. We are certified for ISO-9000 (2000) Version, ISO -14001 and OHSAS18001.