

ZINC SMELTER VISAKHAPATNAM - HINDUSTAN ZINC LIMITED

Zinc Smelter, Visakhapatnam (Andhra Pradesh)

Unit Profile

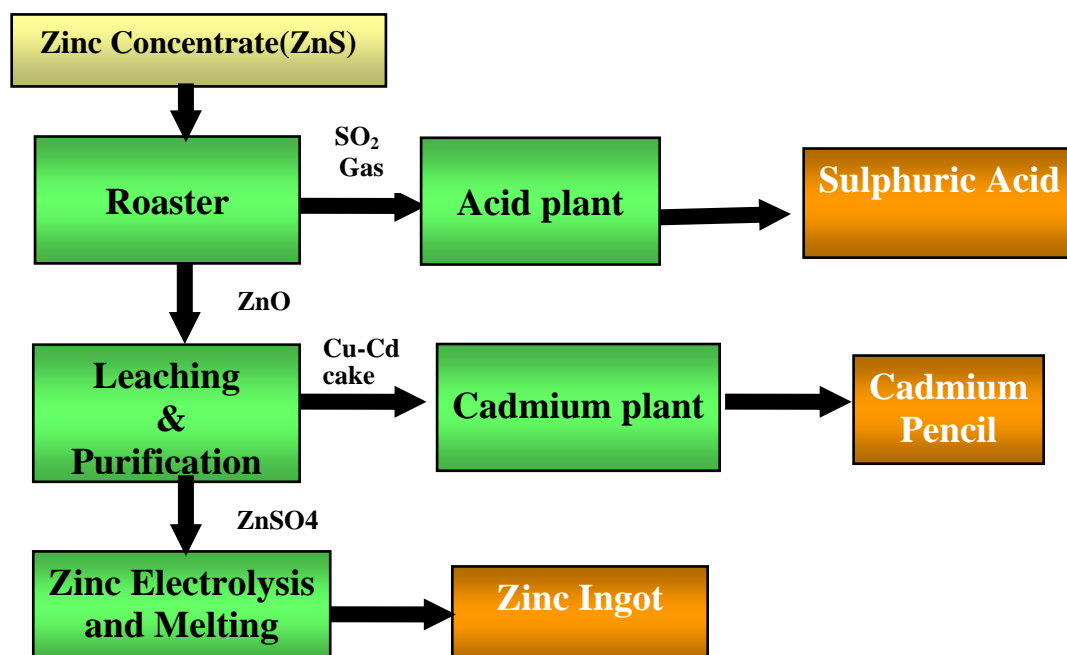
Zinc Smelter Visakhapatnam, a unit of Hindustan Zinc Limited, is engaged in manufacturing of Zinc, Cadmium and Sulphuric Acid. In order to bridge the gap between country's demand and production, unit was commissioned in 1977 with installed capacities of 30,000 MTPA Zinc, 115 MTPA Cadmium and 60,000 MTPA. Performance improvement projects and debottlenecking exercises were undertaken in phases to enhance the production capacity. The present capacities of the unit are 56,000 MTPA Zinc, 138 MTPA Cadmium and 91000 MTPA Sulphuric Acid.

Zinc metal is extracted through hydro-metallurgical route using Roast-Leach-Electro-winning process. Sulphuric Acid and Cadmium metals are produced as by-products. Raw materials required for the plant is sourced from the captive mines located at Rajasthan.

Due to hydro-metallurgical route, manufacturing of zinc is power intensive. Keeping this in view, Unit has adopted state-of-the-art technology to conserve the power.

The plant operates round the clock in three shifts of 8 hours duration each. Unit is managed by a team of dedicated professionals, committed to the management of Safety, Health, Environment, and Quality (SHEQ). Unit has implemented Best⁴ Management Systems (ISO-9001, ISO-14001, OHSAS-18001 and SA-8000) and certified to Best⁴ Management System certification. Unit is the recipient of **Best Management Award 2005** from State Government for maintenance of excellent Production, Productivity & Industrial Relation and "**Excellence in All Round Performance Award**" from the Federation of Andhra Pradesh Chamber of Commerce & Industry.

Process Flow Chart

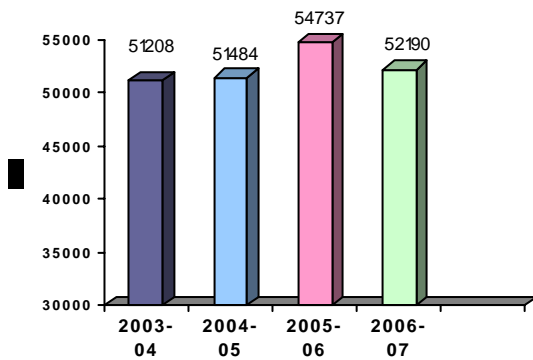


Energy Consumption

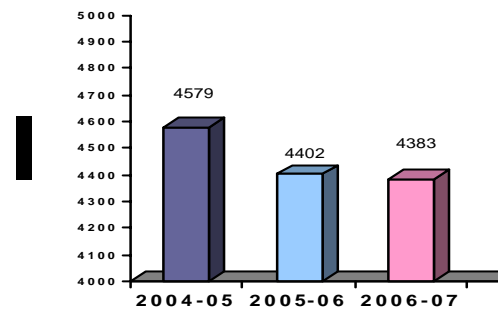
By implementing various energy saving projects there has been consistent decrease in the specific Electrical and Thermal Energy Consumption.

Description	Unit	2004-05	2005-06	2006-07
Zinc Metal Production	MT	51484	54737	52190
Total electrical energy consumption	Lakhs KWH	2357.45	2409.52	2287.49
Specific energy consumption - Electrical	KWH/MT	4579	4402	4383
Total Thermal (Fuel) Consumption	MKCals	30038.86	15859.90	8453.79
Specific energy consumption – Thermal (Fuel)	MKCals/MT	0.58	0.29	0.16
Energy cost as % of manufacturing cost	%	52 %	48 %	44 %

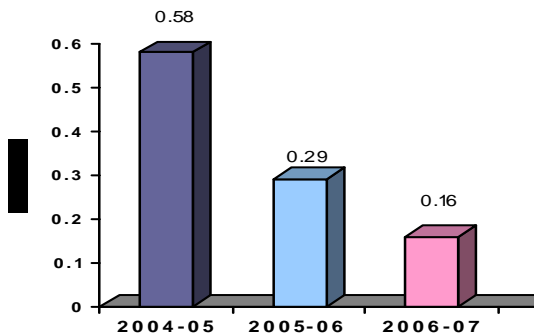
Zinc Ingot Production Trend



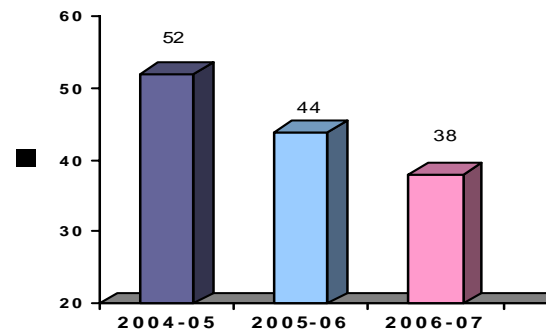
Power Consumption Trend



Thermal energy consumption Trend



Energy cost as % of Manufacturing Cost



Energy Conservation Commitment, Policy and Set Up

Zinc Smelter Visakhapatnam (ZSV) considers Energy Saving as a **key value driver** and hence emphasis is given at all levels to conserve the energy for enhancing the productivity. Energy conservation week is celebrated every year in order to renew our commitments towards conservation of energy for sustainable development. To give further fillip to our energy saving efforts, company has launched the **Six Sigma approach** and good number of projects have been undertaken through this approach in order to save the specific energy consumption. Company has also formulated Energy Management Policy and same has been displayed at all locations.

Energy Conservation Cell has been constituted and AGM(Electrical) has been made Energy Manager to make a focused approach towards energy conservation.

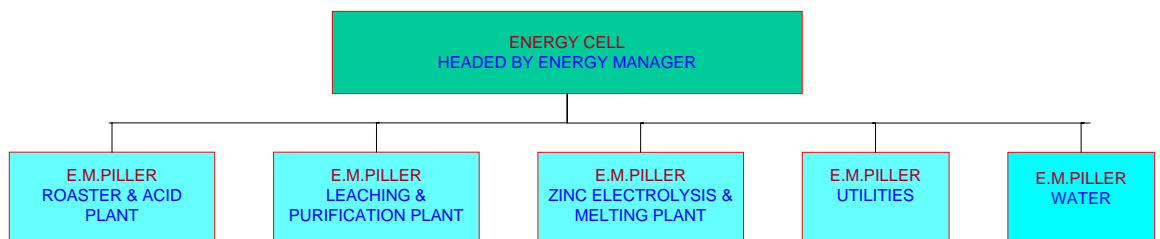
ENERGY MANAGEMENT POLICY

We, at Zinc Smelter Visakhapatnam, are committed to optimally utilize the various forms of energy in all our activities and products so as to become the lowest specific energy consumer in the industry segment and to make it environmentally sustainable for future generations.

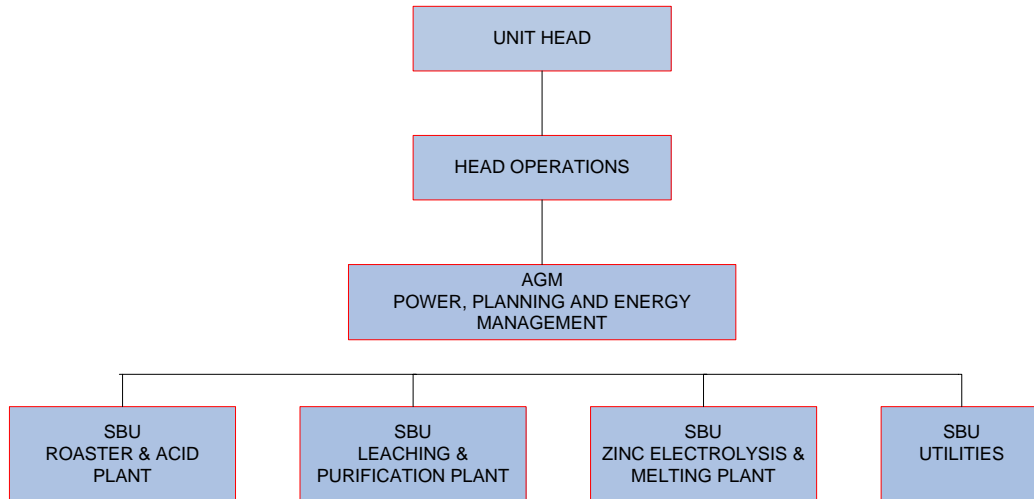
To accomplish this, we will :

- Comply with energy conservation Act-2001 and other statutory requirements.
- Involve & train all the employees to make energy conservation a way of life in and outside the plant.
- Conduct regular internal and external audits to identify areas for improvements.
- Replace energy inefficient equipment with energy efficient equipment .
- Adopt energy efficient operations and energy efficient technologies/equipment.
- Recognize energy conservation initiatives by our employees
- Reduce the cost continuously by adopting energy management system & six sigma approach.

ENERGY MANAGEMENT CELL



ENERGY CONSERVATION CELL STRUCTURE



Energy Conservation Achievements

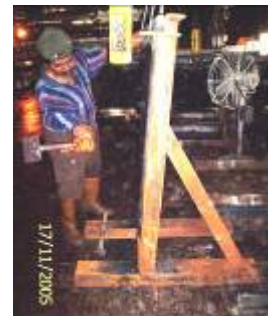
During the period 2003-2006, ZSV has implemented number of initiatives through internal & external audits, adopting six sigma tools, brainstorming sessions involving all employees, regular monitoring. This has resulted in savings of Rs. 540 Lacs during last 3 years with most of the projects having recurring benefits.

Energy Conservation Measures Undertaken During 2006-07

1. Improvement in Cell House Rating :

In the Zinc Manufacturing Process, Zinc is extracted in Cell House through Zinc Electro winning process, which is a power intensive Plant. Efficiency of Cell House is known as 'Rating', which is measured as Zn Cathode Produced in MT per day/ Power consumed in AC MW per day. The improvement in the power rating was obtained by adopting Six Sigma tools and continuous monitoring as given below:

- Short circuiting of Anode & Cathode. Action taken to eliminate the short-circuiting are :
 - a) Use of Anode straightening stand.
 - b) Regular counseling of Strippers
 - c)
 - 1) Removing bends during buffing of cathode bends
 - 2) Increase in buffing cycle
 - 3) Installation of cathode stand at shut-down cascade



- d) Providing of permanent anode header spacers to avoid short circuit between cathode and anode.

Anode
Header
Spacers



- e) Ensuring availability of Anode Spacers
f) Maintaining cell cleaning cycle between 50-55 Days
- High impurities in Neutral Solution. Actions taken are :
 - a. To raise alarm at low belt load indicating less Zinc dust feed than required
 - b. Calibration of Zinc dust feeder in every shift
 - c. Flow meter for PAT addition
 - d. Isolation of individual launders during final stage Filter Press cleaning.
 - e. Inspection of filter clothes while washing
 - High Zinc and Acidity ratio of Cell Feed. Actions taken are :
 - a) Increasing the Leaching & Purification plant capacity
 - b) Storage of min 400 NM3 Neutral Solution in Cell House
 - c) Decreasing load to min 6KA during Neutral Solution shortage
 - Variation of Stripper's Performance. Action taken to reduce the variation are :
 - a. Improving the environment of Cell House plant by providing natural air ventilation (Turbo Ventilators).
 - b. Regular training and development of strippers in view of manual stripping of the metal.
 - Solid overflow into Neutral Overflow / low N/Dorr clarity
 - a. Dilution tank filling is to be done at 60% instead of 40%
 - b. Dosing pump for flocculant is to be installed
 - c. Flocculant tank low level alarm
 - Loss of Power at Busbar joints. Actions taken are :
 - a) Voltage drop at all bus bar joints is to be measured every month and tighten necessary joints at the time of cascade isolation
 - b) The spent line discharge tapping end points were shifted to top portion of the Reaction Tanks in Leaching plant.

The rating of the Cell House got increased from 7.11 MT/MW of 2004-05 to 7.19MT/MW. This resulted in savings as given below:

- **Total Investment** : **Marginal**
- **Annual Savings in Units** : **22.54 Lac Units**
- **Annual Cash Savings** : **Rs. 67.60 Lacs**

2. Reduction in Leaching Power Consumption :

The following initiatives were taken to reduce Power Consumption of Leaching Plant.

- i) Level controllers installed for all the pumps to eliminate idle running



- ii) Double pumping stopped in Purification by the conversion of SS pipes into CPVC.
- iii) High HP pit pumps and agitator drives were replaced with suitable motors. In RTP, Star delta conversion made in selected motors

Power saving due to Reduction in Motor size					
SNO	EQUIPMENT	Motor Rating in HP		Running Hours	Power Saving in kWh per day
		Before	After		
01	Water pit pump below HBF	15	10	24	96
02	Purification pumps (First stage)	40	30	24	120
03	Star delta conversion in RTP motors	0	0	0	24
04	JT-2 Agitator	30	20	24	24
05	SAL 10 Agitator	30	20	24	24
	Total				288

- iv) Running hours of HT motors optimized by training the operators

Power saved due to Running hrs reduction						
SNO	Equipment	Motor rating in HP	Running Hours			Power Saving in kWh per day
			Before	After	Reduction	
01	Water pit pump below HBF	10	24	12	12	48 KWH
02	06 Pit pump	15	12	8	4	32 KWH
03	HBF 2 nd pump (repulper)	20	24	12	12	180 KWH
04	Purification pumps (First stage)	30	6	0	6	120 KWH
05	Purification pumps (Final stage)	40	6	0	6	160 KWH
06	03 pump, Dorr pit pump	15	10	4	6	60 KWH
	Total					600KWH

- **Total Investment** : Nil
- **Annual Savings in Units** : 4.72 Lac Units
- **Annual Cash Savings** : Rs. 14.16 Lacs

3. Reduction in power consumption of pumps in Cell House :

Due to constraint of layout, spent & neutral solution after cooling are pumped to main-feed launder where it is mixed and the resulting cell feed solution is sent to individual cells in Cell House. Pumping of spent & neutral solution involves 142 KWH/MT of zinc metal. In order to save the power consumption on these pumps, a six sigma project was initiated wherein following actions were implemented :

S.No.	Problem	Action Taken	Result
1	Neutral solution received in 91 tank is supplied to the coolers through the route 64B, seeding tank and 65A/B	Gravity line was provided from 91 tank to seeding tank and avoided pumping through 64B pump.	One 40 HP motor running was avoided.
2	The spent coming to the 96 tank is excess for one pump and less for two pumps causing running of two pumps	One nozzle was provided at the bottom of the feed launder to 96 tank and connected it to existing pump's delivery line and isolated the pump to facilitate gravity flow to 93/94 tank.	Feed solution to 96 tank has reduced and running hours of second pump reduced
3	Higher capacity motors in 70 series pumps and coolers	1. One 75 HP Motor was replaced with 60 HP Motor in pump no.75 with 25 HP 2. 3 nos 30 HP motors were replaced by 25 HP motors in coolers	Power factor improvement observed
4	Improper setting of blade angle of fans in atmospheric coolers	Blades angle checked (for all Cooler fans)	Fan are running with optimum blade angle
5	Lighting during daytime at various places due to no marking on the DB pillar wise	Marking done on DB pillar wise so that only the required lights are switched on.	Lighting is being used at required places only.
6	Continuous starvation of 65A and B pumps	Impeller size was optimized in one pump to avoid starvation	Starvation of the pump and Power consumption reduced
7	Main feed launder overflow solution is going to 80 series pits through 94/95 tanks, 70 series pumps and coolers	The overflow solution line was diverted from 94/95 tanks and extended to 80 series pits to avoid pumping through 70 series pumps and coolers.	Found effective.
8	Idle running of pit pumps and man coolers	1. Auto relays were provided for 2 pit pumps 2. Individual starters were provided near the man-coolers	Pit pumps running hours reduced. Idle running of man coolers reduced
9	No fixed cleaning schedules for 70 series pumps and deviation in schedules of 80 series pumps	Schedules were made for 70 series pumps and strict adherence to the schedules is being maintained for 80 series pumps	Reduced additional running of pumps on part load operation.
10	Pumping the spent to 97/98 tanks and drawing back to supply spent to leaching	Study was done to supply spent to leaching by gravity from 97/98 tank.	As the supply points are in higher elevation, this could not be done
11	Running of 2 pumps (47 and 49) for supply of spent to leaching	Delivery line of 47 was changed to CPVC from HDPE to increase the flow	Running hours of 49 reduced to 50%

- **Total Investment** : **Marginal**
- **Annual Savings in Units** : **4.45 Lac Units**
- **Annual Cash Savings** : **Rs. 13.36 Lacs** (on account of power)

4. Reduction in power consumption in water pumping system :

Need was felt to optimize the power consumption in water pumping system. A six sigma project was launched with the objective to reduce power consumption from 71.4 kWh/MT of gross Zn ingot to 66 kWh/MT of gross Zn ingot resulting a saving of Rs 9.01 Lacs per annum. Following actions were implemented:

S No	Area	Problem	Action taken	Running Hours			Power Reduction	Power Saving per month
				Eqpt	Before	After		
1	Drinking water	Maintaining drinking water requirement with 50HP pump instead of 25HP pump	Connected the High pressure line to Low pressure line of main tank of Colony to avoid running of 50HP pump	25 HP pump	14 to 16	24	Running load of 50HP = 27KW (previous) Running load of 25HP = 16KW (present)	11 kW x 8 Hrs x 30 Days = 2640 kWh
				50 HP pump	8 to 10	Nil or spare		
2	Clarified water pumping	Maintaining clarified water requirement with 75 HP pump instead of 30HP pump	Replaced the 75 HP pump to energy efficient pump and replaced motor with 40HP	75HP pump	6 to 8	Nil	Running load of 75HP = 41KW (previous) Running load of 40HP = 18KW (present)	23 kW x 8 Hrs x 30 Days = 5520 kWh
				40HP pump	Nil	6 to 8		
3	Rectifier pumps	Rectifier return water is leaking at rectifier and pump discharge pressure is being maintained high	Four nos valves replaced at Rectifier Transformer room and discharge pressure reduced by 0.5Kg/Cm ²	50HP pump	24	24	Reduction pump load by 2 Amps (52.5A to 50.5A)	0.96 kW x 24 Hrs x 30 Days = 691 kWh
4	Lighting	At pump house only two switches are controlling all the light fittings. If switches are separated only required lights will be kept on.	Lighting distributed properly for operation. Separate switches are provided area wise					0.28 kW x 6 Hrs x 30 Days = 50 kWh
Total power saving per Month								8901 kWh

- **Total Investment** : **Marginal**
- **Annual Savings in Units** : **1.07 Lac Units**
- **Annual Cash Savings** : **Rs. 3.21 Lacs** (on account of power)

Energy Conservation Plans & Targets

A number of energy conservation measures planned during 2007-2009. These are :

SI No.	Energy Center	Actionable project	Potential Savings kWh/MT	Estimated Investment in Rs Lacs	Time frame
1	All plants	Adoption of flat belt in place of v belts for all coolers	0.61	2.00	31.03.08
2	Central Services	AC of Roaster control room and Pnuematic conveying compressor cooling water return line to be routed to cooling tower sump directly	0.31	0.10	30.09.07
3	Central Services	Pumping compressor house pit pump water directly to consumption points instead of sending to water treatment plant	2.36	0.50	31.10.07
4	ETP	Replacement of Jarosite pumps with energy efficient pump at jarosite pond	1.57	0.40	31.10.07
5	L&P	Jarosite neutralisation treatment at ETP in place of SFT	6.28	2.00	31.12.07
6	L&P	100% NOF transfer to surge tank by gravity utilising available gradient	3.14	0.15	30.06.07
7	Roaster	1000 MT stock of calcine in silo is to be maintained to reduce the running hours of pneumatic conveying	2.36	0.00	31.07.07
8	ZEM	Avoiding double pumping of spent from 96 to 94/93 and then to L&P	2.62	0.10	30.09.07
9	ZEM	Reduction of idle running of pumps near 96 tank and 66 tanks	0.29	0.05	30.06.07
10	ZEM, L&P	Providing level controllers in Jarosite Nuetralization tanks, C/H bottom Pit pump, Ball Mill Tank of L&P,	0.52	0.50	31.07.07
11	All Plants	Different Energy saving Projects after CII Audit	40	50.00	31.03.08
12	Roaster	Installation of Back pressure Turbo Generator for recovering heat energy of high pressure stream from waste heat boiler of Roaster plant.	115.2	200	31.10.08
13	Cell House	Motivation to low performance strippers to improve the rating at least by 0.05	25		Continuous
14	Central Services	Replacement of KG Khosla compressor with screw compressor	5	13	31.03.08
15	L&P	Use of sun n planetary gear box for agitators of purification tanks	1.57	10	31.03.08
16	L&P	Use of turbine blades in place of pitched blades for purification agitators	3.14	10	31.03.08
17	L&P	Optimisation of Sizing/capacity of underflow pumps and piping of dorr 6, 7, 8 9	1.57	5	
18	ZEM	Spent cooler 7 & 8 outlet to cascades (9 to 16) directly instead of taking through 80 series pumping	7.85	12	31.03.08
19	ZEM	Improvement in Cell house power Rating	32	0.00	31.3.08

20	L&P	Reduction in power consumption in L&P including pneumatic conveying	4	0.00	31.3.08
Total savings in kWh/MT of Gross Zinc ingot			255	305.80	

By adopting the above energy conservation measures, ZSV will be able to achieve the set target of 4150 KWH/MT of Zinc metal produced by the end of 2009. Financial savings projected is Rs. 369 lacs.

In addition, reduction energy consumption through Kaizens, Suggestion Scheme and Quality Circles are planned during 2007-2009.

Environment & Safety

Safety

ZSV has a commitment to provide a safe and healthy workplace for its employees and contractors. We believe that we can minimize risks and train our employees and contractors to recognise this and act accordingly. Our safety and health initiatives focus on the following elements:

- Leadership – ensuring that senior management and operational heads provide leadership in, and are committed to, health and safety;
- Management systems – we have adopted OHSAS18001 certified management systems. Safety committees operate at various levels to ensure that employees are involved in decisions affecting their health and safety;
- Training – safety flows from safe behaviours and attitudes. Regular training is provided to all employees and contractors to increase their awareness and to improve their behaviours and attitudes towards safe working practices; and
- Risk management – risk assessments are carried out, particularly for hazardous operations, and significant risks are minimised by the application of engineering measures and the adoption of new technology and safe working practices.
- Hazard reporting system – we have implemented hazard reporting system by all employees through hazard reporting boxes located at various places in the plant. Immediate actions are taken to eliminate the hazards.
- Safety steward system - we have implemented Safety steward system on an experimental basis to improve standards. This has yielded excellent results and, importantly, is motivating individuals and teams to integrate HSE actions into their routine activities and thinking.
- Audits - Many internal and external audits were undertaken through specialists, as well as relevant agencies, to look at the operations and identify risks and hazards, whilst also recommending preventive measures. These audits provide valuable input and feedback to the operating teams in reducing safety risks.
- Safety promotion – every year we celebrate safety week and various competitions are conducted such as Safety Slogan/ Poster/ Suggestion/ Playlet/Essay. In addition, we recognize best safety conscious employees and best housekeeping plants.
- Occupational Health –We have got full-fledged Occupational Health Centre which conducts regular occupational health surveillance of all employees and contractors. This

includes specific examinations such as audiometry, lung-function test, blood cadmium, vision tests, chest x-rays and pulmonary function tests.

Our commitments and initiatives have enabled us to bag the prestigious **Greentech Safety Platinum Award 2006** instituted by Greentech Foundation, New Delhi.

Environment

ZSV is fully conscious of its responsibility towards environment protection and sustainable development. Top Management has demonstrated its commitments through formulation & implementation of **Environment Policy** with the objective to achieve sustainable development through compliance of legal & other requirements, continual improvement in environmental performance through reduction in pollution, recycling/re-use of wastes, conservation of resources and adoption of eco-friendly technology.

Company has implemented ISO 14001 Environmental Management system & improved the environmental performance by identification of significant aspects and taking measures (environment management programmes / standard operating procedures) to prevent/reduce the effects of significant aspects.

All pollution control measures were incorporated in the design stages itself with respect to all environmental attributes. However, additional facilities have been created in the vital areas to prevent pollution. These include onsite **Secure Land Fill** for effective management of solid wastes, **Tail Gas Treatment Plant** for reduction in SO₂ emission from 500 ppm to less than 250 ppm, **Effluent Treatment Plant** for proper treatment of effluents, **Residue Treatment Plant** for recovery of metals from the residues, **Mercury removal plant** to recover mercury from the gases, etc.

Besides the facilities available for environmental protection, we have been following environment friendly practices such as regular monitoring of air quality (ambient & workzone), water (effluent, groundwater), soil, solid wastes by engaging internal & external agencies, developing greenbelt through plantation of 5000 saplings every year, improving the housekeeping, organizing a number of **training & awareness programme** on environment among the surrounding **villagers, children, employees** and their **family members, customers and suppliers**.

Various requirements relating to EHS legislations were duly complied by the company. In addition, company also complied voluntary requirements relating to Corporate Responsibility for Environment Protection applicable for zinc industries.

Company has been rewarded by various bodies for the environmental improvement initiatives. These include :

- i) **Best Solid Waste Management Award from State Pollution Control Board.**
- ii) **Greentech Environment Excellence Gold Award in Metal Sector for 2006 from Greentech Foundation, New Delhi.**
- iii) **Golden Peacock Environment Management Award from the World Environment Foundation, UK.**