

UNIT PROFILE:

The Pig Iron Plant at Amona has two Mini blast furnaces with working volume of 173 M³ each. The first Blast furnace was commissioned in March 1992 and the second in July 1994.

The basic function of a blast furnace is to remove the oxygen from the iron oxide (ore) and bring the temperature of the reduced iron to well above its melting point. This process is carried out by the countercurrent reaction between descending raw materials from top & ascending reducing gases from bottom

The raw materials namely iron ore and fluxes (limestone and dolomite) along with coke (reducing agent & fuel) are charged into the blast furnace from top.

The hot air is introduced through the openings called tuyeres located above hearth & this heated air burns coke charged from the furnace top to produce the heat required by the process and also generates reducing gases that preheat raw material and remove oxygen from the ore descending through the stack.

The molten metal and slag thus collected in hearth are tapped time to time. The liquid metal is collected in a refractory lined ladle and cast into small blocks called pigs in Pig Casting Machines. The different grades of pig iron are produced depending upon customers' requirements. The slag, a by-product generated during smelting of iron ore, is granulated & sold to cement manufacturers.

173 M³ Blast furnace



The company has been certified for Quality System ISO 9001(2000), Environment System ISO14001 (2004) and Occupational health and Safety system OHSAS 18001:1999

The company has its own Captive Power plant of 3 MW Capacity run on steam produced from waste heat boiler using blast Furnace Gas.

The total blast furnace gas (BFG) available from two blast furnaces, after self consumption (used for air preheating) can produce around 8 MW of power with heat rate of 3300 Kcal/ kwh.

Existing 3 Mw power plant which was installed in 1991 is of inefficient design by current standards and takes around 4700 Kcal/kwh. As a energy conservation measure company

decided to scrap the existing power plant and go for efficient design higher capacity plant which can also make use of additional BFG available.

Accordingly a 30 Mw power plant has been installed by a third party who is using BFG as fuel along with coke oven waste heat produced from coke oven plant of Sesa-the parent company.

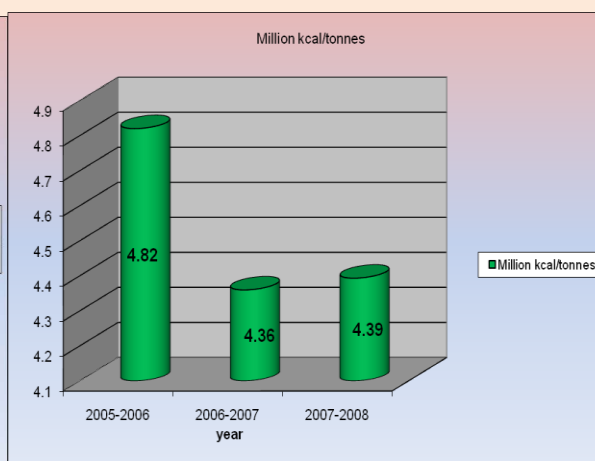
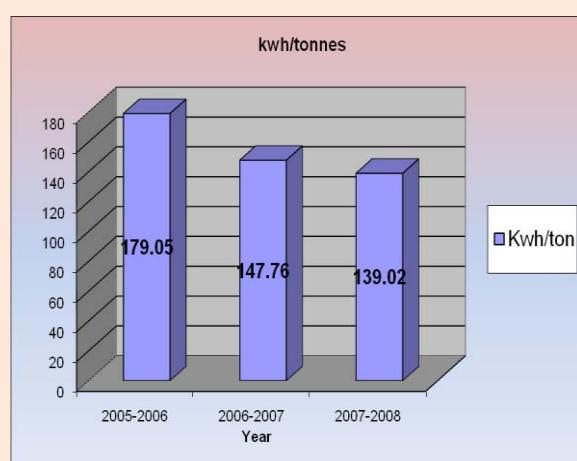
The Company also receives Grid supply from Govt. of Goa at 33KV. During non availability of grid supply and power plant, DG sets are operated. However from June 2007, power from GEPL plant is made available to Sesa as such grid and DG power is not required/ is used only during emergency. However due to the inability of GEPL to utilize full quantity of BFG available with us, due to technical constraints like under sizing of pipe line and fan, considerable quantity of BFG was being flared to atmosphere. To save on valuable resources, Company decided to run its 3 MW Power Plant and accordingly it was run till May-08.

Energy Consumption:

| Description | Unit | 2005-2006 | 2006-2007 | 2007-2008 |
|--|------------------|-----------|-----------|-----------|
| Annual Pig Iron Production | MT | 207224 | 243337 | 271492 |
| Total electrical energy consumption/annum | Lakhs KWH | 371.04 | 359.5 | 377.4 |
| Specific energy consumption-electrical | KWH/MT | 179.05 | 147.76 | 139.02 |
| Total thermal energy consumption/annum | Million Kcal | 998683 | 1060839 | 1192703 |
| Specific energy consumption-thermal | Million Kcal./MT | 4.82 | 4.36 | 4.39 |
| Total energy cost | Rs In Lakhs | 15678 | 14864 | 22075 |
| Manufacturing cost | Rs In Lakhs | 25496 | 31234 | 39853 |
| Total energy cost as % of manufacturing cost | % | 61.49% | 47.59% | 55.4% |

Electrical Energy Consumption

Thermal Energy Consumption



Note: In the financial year 2007-08 the specific thermal energy consumption was on higher side as one of the furnace (Bf-2) was running towards end of its campaign life (falling of refractory causing absence/less insulation between furnace hot charge & cold shell resulting in higher thermal energy)

Energy Conservation Commitment, Policy and Set Up:



SESA INDUSTRIES LIMITED
PANJIM - GOA

DEPARTMENTAL COMMUNICATION

To : All Employees:

Date :

ENERGY MANAGEMENT

We have formed an 'ENERGY CONSERVATION CELL' (ENCON CELL), at our Pig Iron Plant, Amona Goa.

Its objective is to promote industrial energy efficiency, and thereby help company achieve energy savings. By means of an interactive approach, Energy Conservation Cell initiates a comprehensive energy-saving programme, which will eventually become part of the organisation's way of functioning and thinking. Energy management involves bringing all pertinent energy data from all over the plant into a central location and providing this information to users to make informed energy decisions. The aim of energy management is to achieve organisational objectives at minimum energy consumption and cost

Three key principles of energy management are:

- Purchase/ generate energy at the lowest possible price
- manage energy consumption at peak efficiency
- utilize the most appropriate technology

Energy management will save the organization money towards energy requirement and reduce its impact on the environment at the same time.

Energy Management is all about:

- Make the best use of our present and future energy sources in order to avoid crisis, both economic and environmental.
- It is a professional occupation that has impact on the economy, people's security and comfort, their jobs, and the environment.
- It is not just concerned with saving energy, but also with increasing productivity, improving standards of living and saving money.

The first aim of energy management should be to gain control of consumption and costs by assessing current use, and by taking steps to incorporate energy efficiency into the corporate culture. This often involves:

- Identifying, and quantifying, our organization's major users of energy
- Reviewing energy purchasing strategies
- Assessing operating practices
- Motivating and training on energy awareness

I am sure you all will provide your active support to ENCON team so as to achieve or organizational goals towards energy conservation as per the guide lines given in Energy policy.


H. P. U. K. NAIR
OCCUPIER

ENERGY POLICY
(SESA INDUSTRIES LTD)

Sesa Industries is committed to implement Energy Conservation measures judiciously in all its activities, ventures, products across the organization; in an eco-friendly manner.

We believe in continually striving to be the lowest specific energy consumer in our type of industry, without affecting quality & productivity.

This shall be achieved through;

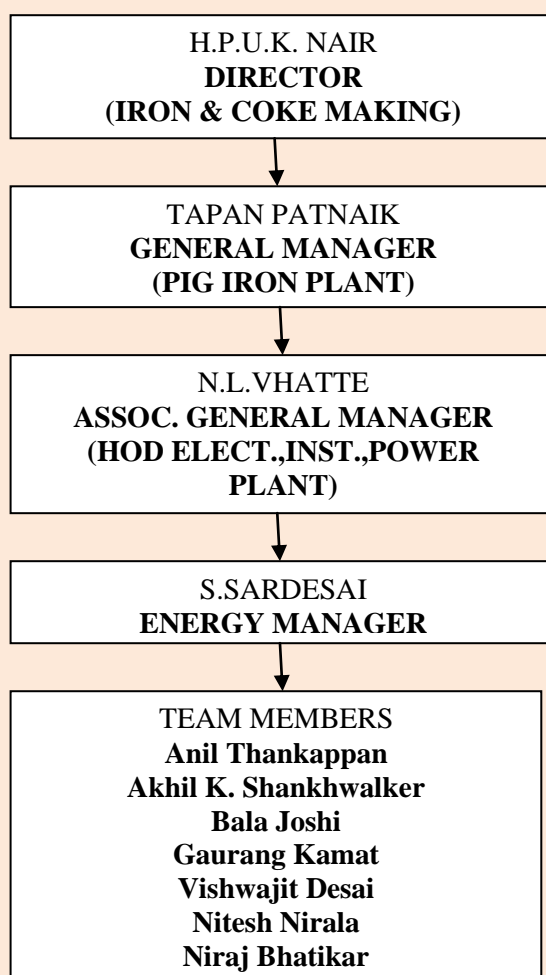
- 1) Establishing, monitoring and tracking of energy consumption data regularly with an aim, to reduce specific energy consumption.
- 2) Adopting and enforcing energy efficient technology /processes for all projects.
- 3) Providing training & enhancing awareness to our employees and suppliers in the areas of energy conservation.
- 4) Complying with all applicable Energy regulations enforced from time to time.
- 5) Replacing/redesigning old energy inefficient technology/equipment with the latest energy efficient technology/equipment with a view to improve efficiency and economics of the operation.
- 6) Carrying out regular Energy audits to identify and reduce energy wastage in all areas.

The management of SIL is committed to provide the resources and support required to ensure successful achievement of above policy.

Date: 22/03/2007


OCCUPIER

ENERGY CONSERVATION CELL:



ENERGY CONSERVATION ACHIEVEMENTS:

| Year | Products | Kwh/tonnes | % Reduction over 05-06 | Mkcal/Ton | % Reduction over 05-06 |
|---------|----------|------------|------------------------|-----------|------------------------|
| 2005-06 | Pig Iron | 179.05 | - | 4.82 | - |
| 2006-07 | Pig Iron | 147.76 | 17.4% (Decrease) | 4.36 | 9.5% (Decrease) |
| 2007-08 | Pig Iron | 139.02 | 22.35% (Decrease) | 4.39 | 8.9% (Decrease) |

Note: In the financial year 05-06 the specific energy consumption has increased & production was lower due to furnace (Bf-2) relining. In the financial year 2006-07 also there was relining of the other furnace (Bf-1) and specific consumption would have been the same as 2005-06 but for the energy conservation measures like introduction of Hot Blast stove, VFDs, etc.

Major projects implemented for Energy conservation during 2007-08

1) Variable Frequency Drives for Air compressors



The company has Installed VFD for their existing screw type air compressors, which were earlier run on soft starters. Average Power consumed by compressors after installation of VFD has reduced by approx 12%.

Total investments = Rs 8.5 lakhs
Total Savings in KWh = 1.46 lakhs/annum
Total Savings in Rs = 4.38 lakhs/annum

2) Downsizing of Slag granulation pumps:



The company has downsized their slag granulation pumps from the existing CPK 200-500 to CPK 200-400 pump & further trimming of impeller diameter from 404 mm to 365 mm to suit the exact flow/head requirement, in both the Blast furnaces.

Total investments = Rs 4.0 lakhs
Total Savings in KWh = 1.575 lakhs/annum
Total Savings in Rs = 4.72 lakhs/annum

3) Air preheater for Hot Blast stoves in Blast furnace 1



The company has installed air preheater in Blast Furnace # 1, to utilize the sensible heat from the waste gases to preheat the combustion air & increase the combustion efficiency. This has resulted in metallurgical coke savings.

Total investments = Rs 30.5 lakhs

Total Savings in coke = 278 tonnes/annum

Total Savings in Rs = 35 lakhs/annum

4) VFD & Auto start/stop control for Cooling Tower fans:



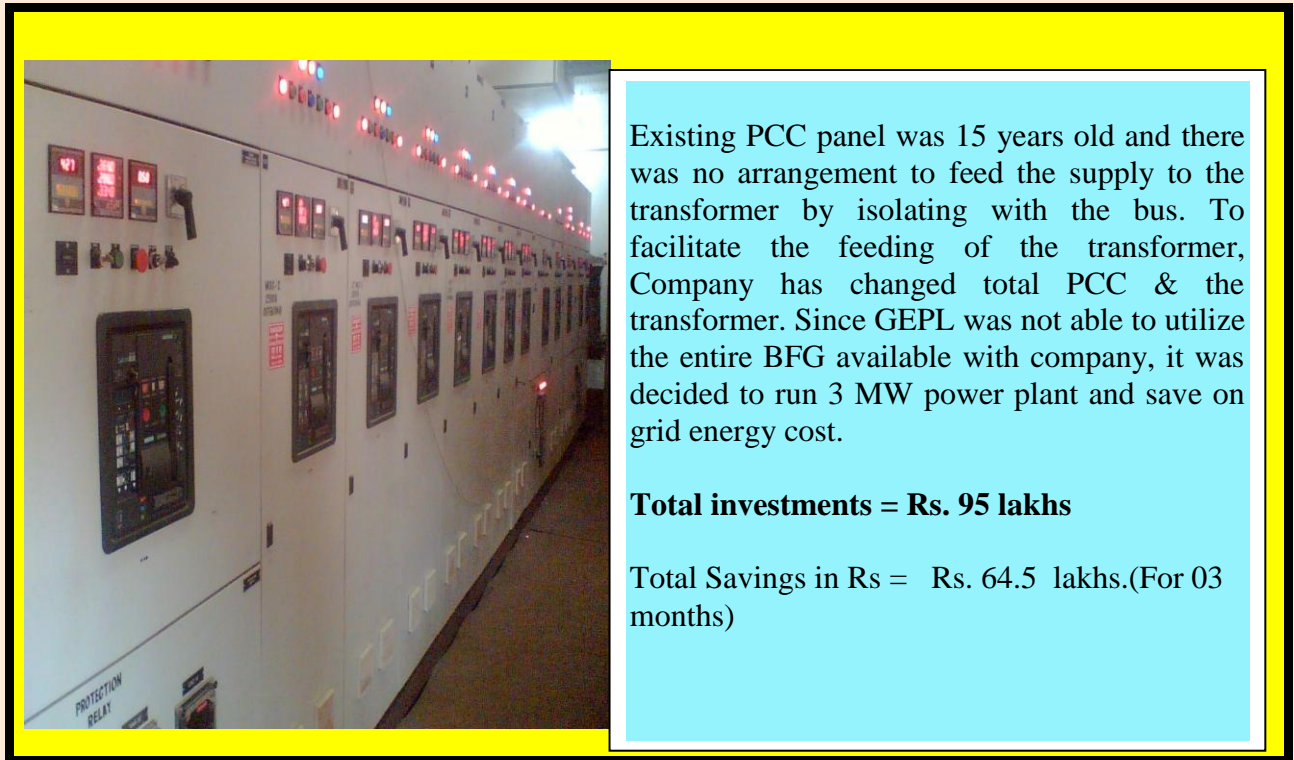
Existing cooling tower installed in 2006, has 03 cells, out of which 02 are in operation and one is standby. One of the three cooling tower fans is fitted with a VFD with temperature feedback & operated in PID control mode. Based on actual temperature of water fan speed is corrected by VFD. The other fan which is provided with an auto start/stop control comes IN/OUT of circuit only when temperature control is out of VFD range. This allows the fan to remain off for almost 10 to 12 hrs in a day based on ambient temperature.

Total investments = Rs 1.5 lakhs

Total Savings in KWh = 1.64 lakhs/annum

Total Savings in Rs = 4.91 lakhs/annum

5) Installation of Power control centre(PCC) & 2000 KVA transformer:



Other Major initiatives taken for energy conservation during the year 2007-08.

- Running of charging system conveyers (CB5) in star mode during 'No Load 'operation.
- Switching of excess lights by checking lux levels in Hot Blast stoves, street lighting, Dg House etc.
- Replacement of Poly V belts in place of V Belts.
- Downsizing of Dilution air blower in Slag drier plant.
- Replacing Jetty pump with a lower capacity pump.
- Installation of lighting voltage transformers.
- Installation & commissioning of Venturi pump VFD.
- Reduction in Hot Blast stoves changeover cycles.

ENERGY CONSERVATION PLANS & TARGETS:

| Sr. No | Energy Conservation Measures(planned) | Approx. Investment (Rs.Lakhs) | Project Commencement & Completion Year |
|--------|---|-------------------------------|--|
| 1 | Up gradation of blowing system. (To save on specific Power consumption) | 60.0 | April 2009 |
| 2 | Auto starting of DG Blower incase of Power supply. | 10.0 | May 2008 |
| 3 | Poly V belts instead of V Belts. | 0.5 | Under Implementation |
| 4 | Install VFD for Slag drier ID Fan | 2.0 | October 2008 |
| 5 | Increase capacity utilization of Slag drier | 0.70 | October 2008 |
| 6 | Installation of Jetty water pumps to be procured under CAPEX | 5.0 | October 2008 |
| 7 | Replacing GCS pump with a lower capacity pump | 2.0 | October 2008 |
| 8 | Replacing existing CA Fans of HBS with energy efficient fans. | 8.0 | November 2008 |
| 9 | Replacing existing ID Fan of Blast furnace HBS with energy efficient fans. | 7.0 | February 2009 |
| 10 | Replacement of Electromagnetic ballast with electronic ballast & CFLs in place of incandescent lamps. | 0.30 | Under Implementation |
| 11 | Procurement & installation of Blast Furnace software for process automation | 225 | January 2009 |
| 12 | Installation of Air pre heater for BF-2 HBS | 60 | Completed |
| 13 | Introduction of cooling plates in Blast furnace # 2 | 200 | Completed |

Sesa-Waste Heat Recovery Based Power Generation

Under the project activity, Sesa Industries Ltd is supplying excess blast furnace gas (BFG), not utilized in the process of pig iron manufacturing, from the Blast Furnace along with waste heat from Sesa's coke oven plant (Sesa Goa Ltd.) is given to 30 MW power plant which is set up by Goa Energy Private Limited (GEPL- A company promoted by Videocon group) on a Build, Own and Operate (BOO) basis. 33% heat input is from BFG and 66% heat input is from hot flue gas from Coke oven plant. Under the agreement, GEPL will supply 38 million units per annum of to Sesa Group (@3 paisa/ kwh) at Amona/ Navelim and sell the balance power to Power Trading Corporation of India Limited (PTCIL). Sesa will also get Rs 0.37/kwh for the power sold to grid by GEPL as gas charges.



30 MW Waste heat recovery Power Plant (Registered CDM Activity)

With the commissioning of the Power Plant from 01.06.2007, around 18 MW of Power is fed in to the Western Regional grid. It implies indirect CO₂ emission reductions from fossil fuel combustion corresponding to an equivalent amount of grid electricity that the Power Plant has replaced.

Besides above, this Power plant activity is registered as CDM activity and so far **43130 TCO₂e, CERs** are accrued to Sesa's account for the year 2007-2008, amounting to around Rs **470 lacs.** (Approx).

Note: 1 CER = 18 Euros.

Environment Management System (EMS)

Enlightened organizations are actively achieving and demonstrating sound environmental performance by controlling the impacts of their activities, products or services on the environment, consistent with their environmental policy and objectives. This is necessary for sustainable development apart from meeting the requirement of increasingly stringent legislation, the development of economic policies and other measures to foster environmental protection, and increased concern expressed by interested parties about environmental matters.

At Sesa Industries as a matter of policy all those operations that are associated with significant environmental aspects consistent with our environmental policy, objectives and targets, are identified in order to ensure that they are carried out under specified conditions by establishing, implementing and maintaining documented procedure(s) to control situations where their absence could lead to deviation from the environmental policy, objectives and targets.

The organization identifies training needs associated with its environmental aspects and its environmental management system & provides training to meet these needs.

Environment:

Sesa Industries Ltd.- Pig Iron Plant division is adopting resource conservation practices and pollution reduction technologies. SIL is committed to comply with all the applicable legal &

other statutory requirements. All the required consents & authorisations are obtained & renewed periodically.

Air:

Ambient air quality is monitored at three ambient air stations, for SPM,, SO₂, NO_x, twice in a week and readings are displayed on the electronic board at factory main gate. Similarly Boiler Stack emission is monitored once in a month. Also the monthly ambient air quality and stack emission report are submitted to Goa State Pollution Control Board.

To reduce the fugitive dust emissions we have installed dust suppression system at raw material handling area.

Water:

Sesa Industries Ltd. - Pig Iron Plant appreciates the value of water and takes every possible effort to save & conserve this precious resource.

In the Pig Iron Plant water is used for Gas Cleaning Process, Furnace shell cooling, slag granulation process, dust suppression and housekeeping and domestic purpose. The water used in gas cleaning and slag granulation is collected and then treated separately in settling tanks and thickener and then reused in the same process. Water for shell cooling is reused after cooling it through cooling towers. No liquid effluent goes outside the factory premises. For monitoring the consumption of water, meters are installed at the inlets. The water for the process is brought from company's old exhausted mine pit 8 Km away where rain water harvesting is being done.

Wastes:

There are no solid or liquid wastes which are allowed to go out of plant. Solid wastes like sludge collected from gas cleaning system is reclaimed and sold to parent company for blending with iron ore. All water used in plant is recycled.

In process of Iron making, slag is generated and granulated using high pressure water jets and sold to Cement Plants as a raw material for producing high quality Cement

Occupational Health, & Safety

The company achieves its goals in an Eco-friendly manner and by maintaining highest possible standards of health & Safety in all its operations. Company has established, maintained and it continually improves the management systems for environment, occupational health & safety. Company adopts programmes for improvement in product quality, conservation of resources, prevention or reduction of pollution and safety risk exposure to company employees & interested parties.

Sesa Industries is the only merchant pig iron producer certified for Quality System ISO 9001:2000, Environment System ISO14001:2004 and Occupational health and Safety system OHSAS 18001:1999

Safety Activities:

In keeping with group philosophy of being the best in its class, Sesa industries actively promotes safe working practices at the work place.

Safety program is implemented through the workplace Safety Committee consisting of management and workmen's representative headed by General Manager of plant.

There are a set of Work Instructions for each department, which forms the guidelines to work safely. Also administrative controls such as providing induction training by the safety department and job specific safety training by the concerned department at regular intervals, is carried out. Safety sign boards at necessary locations with safety slogans in English and local language are displayed at conspicuous locations. Safety suggestion scheme is also implemented to take suggestions, feedback from the employees. Celebrations of National safety Week, National Fire Week, etc are carried out in the factory premises. Finally necessary PPE's are provided to all the personnel, working inside the plant, to take care of residual risks.

The company has the Work Permit System for ensuring safe working conditions. Every tool and tackle including power tools used inside the company premises is certified by authorized company engineers

Regular mock drills are carried out to check the response of employees in identified emergencies & training the employees for the same. Any shortfall during the mock drills is corrected & rectified.

Sesa Industries Ltd. - Pig Iron Plant, has won the Golden Peacock Occupational Health & Safety Award - 2008, Silver Trophy in Green tech Environmental Excellence Award - 2008 and Short listed for CII WR Safety Health and Environment (SHE) Award 2007.

Regular Safety Audits are carried out by third party auditors like Bureau Veritas certification (BVC), National Safety Council (NSC), etc. & the recommendations are complied for continual improvement. Workplace monitoring for noise levels, illumination, temperature, dust (RSPM), is carried out regularly. If any deviation is observed, immediate corrective preventive actions are initiated and non-conformity is eliminated.

A Safety library has been made available on Intranet for the reference of the staff about safety problems & solutions where different national & international standards are available for reference.

Recently company has initiated implementation of 5S program under the guidance of QFCI.

Occupational Health Monitoring:

Pre-employment medical examination of the new recruits is done, to set a base line data for Occupational Health. This Pre-employment tests include Audiometry (to assess hearing capability), Lung function test (to assess respiratory system), eye tests (including vision & color blindness) along with blood tests.

Every 3 years Periodic Medical Examination is carried out for all the employees. For the personnel working in some critical areas Periodical Medical Examination is carried out annually.

In the Factory premises a well equipped Occupational Health Center and an Ambulance along with a Physician and a qualified nurse is available. Medical aid is given to all staff and workmen and their families.

At some places where noise levels are found to be more, access is restricted. People working in plant area are instructed to wear ear plugs when they are exposed to noise.

Also with regards to dust emissions, dust levels are measured at different locations in the plant regularly and corrective actions are taken. Ear plug, dust masks are provided free of cost to all employees including contractor employees. Dust suppression systems are provided at various working areas. Besides this road dust suppression is carried out regularly.

Medical tests for contract workmen also are carried out at plant dispensary whenever required. Company has formulated an alcohol policy. Nobody is allowed to work in the plant premises under the influence of alcohol.

Employees are encouraged to contact any health and safety committee member regarding their concerns in safety and health matters.