

# Energy Management System Implementation

## Vedanta Limited, Smelter Plant 1

– Mr. Bijneswar Mohanty (AVP, Head Cast house & Energy Management),  
Mr. Ramesh Chandra Patro (Associate Manager, Coordinator Energy Cell)

### Introducing the Plant

Vedanta Ltd. (VL), Jharsuguda, is an associate company of the FTSE 100 diversified resources group Vedanta Resources Plc, listed on the London Stock Exchange. Originally incorporated in 2001, Vedanta is a leading producer of metallurgical grade alumina and other aluminium products, catering to a wide spectrum of industries. The aluminium smelting unit at Jharsuguda has carved out a niche for itself in the aluminium industry with its superior product quality based on energy efficient state-of-the-art technology. The firm operates a 0.5 MTPA aluminium smelter and a 1215 MW captive power plant supported by highly modern infrastructure at this location in Odisha.

In the quest to meet high quality standards and the best of Health, Safety and Environment systems, the company has put into place an integrated management system (IMS) and is certified for: ISO 9001, ISO 14001, and OHSAS 18001 and ISO 50001.

### Development strategies adopted for implementing ISO 50001, Energy Management System

#### Development Strategies:

At Vedanta, we believe that teams are always better than individuals and systematic tools are more fruitful than solitary ideas. Cross-functional team involvement in Focused Improvement Projects to improve energy performance by optimizing processes, innovating, implementing new ideas, and also using the latest technology, have all helped

achieve significant reductions in energy consumed.

The top management's role in implementing and maintaining such a system is vital and includes,

- Formation of an Energy Cell (Fig 1.) comprising a three-layer structure: an apex committee, core committee, coordinating committee and Small Group Activities (SGA) team. (refer to attached Annexures 1 and 2, for details of the Energy Cell and Energy Management Team's roles and responsibilities).
- Defining an energy policy taking into account all organizational and legal requirements.
- Appointing a management representative (MR) and Energy Manager to drive the system.
- Defining the roles and responsibilities of the MR and Energy Manager.
- Establishing energy objectives and targets according to energy policy and providing necessary resources for achieving them. (necessary resources include approvals for CAPEX (capital expenditure) and OPEX (operational expenditure) proposals aimed at implementing energy saving projects, computerization of all energy reports, energy-efficient procurement, design, etc., and training human resources).
- Training all plant personnel in energy conservation awareness.
- Reviewing the energy

performance of the plant periodically.

Our team is actively involved in spreading awareness about energy conservation in the community and in industry: we also conduct workshops at national level. Vedanta organized the first aluminum sector KEP (Knowledge Exchange Platform) workshop involving all players in the aluminium industry, research institutes, and the Bureau of Energy Efficiency, Government of India.

### Energy review and planning

The energy review is the heart of this management system. All aspects of the EnMS depend on it so proper energy plans and reviews are a must for successful implementation of EnMS. An energy review exercise is conducted every year. The energy planning process includes:

- a. Identification of different energy streams used in our plant.
- b. Analysis of energy use and consumption.
- c. Determination of areas of significant

Figure 1: Formation of Energy Cell





energy use and consumption (by Pareto method).

- d. Analysis of past and present energy consumption, so as to determine the baseline for each area.
- e. Analysis of relevant variables impacting significant energy use.
- f. Identifying opportunities for improvement.
- g. Setting out objectives and targets.

The energy review exercise involved the Energy Cell team: the energy consumption of motors, lights, different parts of the process, furnaces, etc., were measured using a power analyzer and recorded for analysis. This procedure was followed for all types of energy streams.

To monitor energy performance, energy performance indicators (EnPI) were defined for each area, and, based on past and present energy consumption, baselines were set for each EnPI taking the average energy consumption over a year.

A list of opportunities was drawn up using audits, brainstorming sessions, sharing best practices, etc., and then priorities set, based on conditions such as payback, feasibility, process impact.

## Use of Professional Expertise

During the implementation stage an energy consultant guided our team in developing energy review formats, trained the internal auditor, provided information about best practices in other industries, all of which helped us develop a robust system not only for complying with all the requirements of an EnMS but also for achieving national benchmarking figures of energy consumption.

Human resources are the key to success in any organization, hence it is of utmost importance to train them and develop skills. To enable focusing on this, our policy mandates every department to conduct training sessions on energy conservation. The HR department conducts training programmes and monitors their effectiveness.

### 1. Training by external agencies

Agencies from outside the organization were called in to train the Energy Cell team in techniques of energy auditing, energy management and energy saving in different kinds of equipment.

Training on the following topics was carried out by external agencies mentioned alongside:

- Energy auditing techniques: CII
- Energy saving in utilities: FICCI
- Energy management training: CII
- Internal auditor training: GRK enterprises
- Lead auditor training program: SGS



We are also encouraging our engineers to go through the BEE-certified Energy Auditor's course and we now have eight government-certified energy auditors and managers.

### 2. Training by faculty within the organization

As per the internal training calendar, in-house specialists provide refresher training for internal auditors, and EnMS, as also in areas such as:

- Energy savings in pump and motors
- Energy efficiency in pot cells.
- Energy efficient lighting, etc.

### 3. Tool Box talks cover energy conservation awareness for shop floor personnel

Tool box talks are organized each fortnight for shop floor technicians and operators, on energy savings, deviation reporting and control, to communicate of the energy policy, objectives and targets, etc.

Online e-tests are being organized to evaluate the competence of all employees who are significantly impacting energy. We also invite vendors to participate in workshops and demonstrate energy efficient products and educate our Energy Cell team members by exposing them to national international symposiums.

### Tools and resources

The Jharsuguda plant of Vedanta has a value-driven culture with strong business drivers such as Six Sigma, Quality Circles,



**Figure 2: SCADA based energy monitoring system**



Annual energy cost savings	1634.66 lakhs INR
Cost to implement	224 lakhs INR
Payback period	2 months

**Lessons Learned**

- Team work at all levels of Energy Cell needed for successful implementation.
- Software tools such as Minitab, Ampla, etc., used for energy monitoring and data analysis.
- Robust auditing techniques of EnMS necessary.
- Best practices sharing between business unit and sub-business unit level.
- Internal and external benchmarking to set high standards.
- Error-free data management and documentation system development.
- Effective use of resources.

**Improvements after EnMS (ISO 50001) implementation**

- Cohesive Energy Management team and Energy Cell developed.
- Small Group Activities (SGA) given more importance. Employees from all levels are involved and suggestions received from all levels for listing of opportunities (LOOP) to improve energy performance.
- Top management awareness, involvement and commitment increased.
- Policy developed and acted upon.
- Objectives established for all departments and targets assigned. Around 15 objectives and 25 management programs finalized and communicated to all to achieve the energy targets.
- Energy saving opportunities identified and prioritized.
- Energy Baseline study conducted in scientific manner.
- Performance monitoring through EnPIs (Energy Performance Indicators).

Kaizen, asset optimization, sustainability, IMS, and 5S in place. It is also equipped with advanced IT-based applications such as MES online report generation, SAP-based energy efficient product procurement, and e-based document management systems.

A SCADA-based energy monitoring system in which all energy meters are connected to one server, generates reports. Portable flow meters and power meters are used to analyze deviations at a particular load.

**Steps taken to maintain operational control and sustain energy performance improvement.**

While the EnMS was being implemented, we reviewed all work instructions (WI) and modified them so as to meet the requirements of ISO 50001. The impact of energy performance of each item of equipment in the process was analyzed. The operating / control limits of each process were redefined so as to optimize energy consumption. A list of significantly impacting activities was made by analyzing the WI and communicated to workers on the shop floor to ensure control.

All WIs are communicated to shop floor technician in training programmes held periodically, with tests conducted

before and after the training. To increase awareness, posters and dashboards are displayed on the shop floor.

**Approach to determine energy performance improvement and validate results**

Before implementing the energy saving projects, the SGA team of our Energy Cell measured energy consumption and other process parameters such as pressure, flow, temperature, and recorded them in a specified format. All these parameters, including energy, current, voltage, etc., were again measured (after implementation) to enable a comparison. The results were verified by an internal auditor/central EnMS coordinator.

Details of the modifications along with photographs and other data are recorded in a specified format for reference and the final result verified by the Energy Manager.

**Cost-benefit analysis**

Cost-benefit is calculated on the basis of costs of the project, maintenance, operations, and finally comparing this with savings due to reduced energy consumption.



- Energy efficient procurement analysis for all products by commercial team.
- Measurement and monitoring system strengthened.
- Management review for performance improvement.
- EnMS Tool Box talk being conducted.
- Inclusion of EnMS topics in induction training of new employees.
- Energy linkage to Standard Operating Procedures (SOP) and Standard Maintenance Procedures(SMP) of Integrated Management System(IMS) and accordingly field operation followed.
- Energy Dashboards maintained in all sections and departments.

## Team of Innovators

The team behind the successful implementation of the project were Mr. Bijneswar Mohanty (AVP, Head Cast house & Energy Management), Mr. Mangu Srinivas (AGM, Rectifier), Mr. A Krishna Perumal (Associate Manager, Bake Oven), Mr. Harish Yadu (Manager, Cast House), Mr. Sridhar Nayak (Associate Manager, Utility) and Ms Rashmiprabha Maharana (Associate, Rectifier).



**Mr. Dayanidhi Behera**

*Sr. Vice President & Head Aluminium Operation, Vedanta Ltd., Jharsuguda, Odisha, Aluminium & Power Business*

Vedanta Limited, Aluminium & Power Business at Jharsuguda, is an early adopter of ISO 50001 system and has been an ardent practitioner of Energy Management System (EnMS) over the years. We drive EnMS as a culture and we inculcate the same in all our employees and associate partners as well. ISO 50001 has helped us to have a structured approach to formulate policy, set objectives & targets and to improve our energy performance continually involving people at all level. I believe our team is motivated and inspired enough to see enormous drives towards energy efficiency and energy conservation measures to have a sustainable growth with low carbon footprint.

