

Global Energy Management System Implementation: Case Study

India

Vedanta Limited, Smelter Plant-1

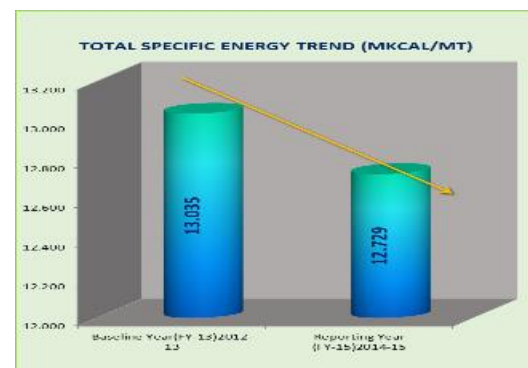


1. Vedanta, Aluminium smelter has received “Excellence Energy Efficient unit” award from CII for three consecutive years i.e. 2013, 2014 & 2015 and national energy conservation award from Govt. of India for last two consecutive years, GMEA award for three years in 2013,2014,2015. Also we are internationally recognized by the Russian Govt. for energy efficiency project implementation.
2. We are the 1st Aluminium Smelter in Asia to receive ISO:50001 certificate for Energy Management System since 2013.
3. A dedicated energy cell is there to have focused approach on energy conservation activities.
4. VL has a well defined sustainability framework having 8 policies, 14 management standards and 22 technical standards in place. This also includes a dedicated policy for Energy & Carbon for the group.
5. VL has successfully completed carbon foot print study by First Climate.
6. People involvement in internal audit and sharing best practices between internal and external units.

7. VL has adopted Business Excellence models such as Six Sigma, QC, Kaizen, SGAs etc. to carry out energy conservation projects.
8. We follow internal & external benchmarking and energy auditing.
9. Involvement of stakeholders, suppliers and contract partners.

Business Benefits Achieved

Our unit has taken many initiatives to save energy compared to the baseline year (2012-13) after Energy management system (EnMS) was implemented. The methodological PDCA approach of EnMS has shown us the way to plan, carry out energy review, make action plan and put the efforts on list of opportunities to maximize the gain with less investment. Use of techniques like auditing, benchmarking & analyzing have given us a lot of opportunities for improvement. In the year 2014-15, around 39 numbers of energy saving projects implemented. The details of energy saving are given below in table-1.1.1:



Year	CO2 emission (MT)
2012-13	16330474
2014-15	8673537

PROJECT DETAILS			
TOTAL ENERGY SAVING		COST SAVING (Rs. Lakhs)	INVESTMENT (Rs. Lakhs)
ELECTRICAL (In Lakh KWH)	FUEL (In KL)		
428.72	1737	1634.66	224.105

Major Energy saving Projects:-

S.No.	Title of the Project	Energy Savings (Million units/Annum)
1	Improvement of conversion efficiency from 98.16% to 98.26%	23.3
2	FTP ID fan process optimization	4.4
3	Cathode Voltage Drop (CVD) Reduction in Electrolytic pots	4.3
4	Specific Energy consumption reduction in Homogenizing furnace	3.6
5	Specific Energy consumption reduction in Rodding furnaces	1.7
6	Reduction in HFO consumption in anode baking furnace	1266 (MT/Annum)

EPI:-

$$EPI \% = \frac{\text{Baseline Period Energy Consumption} - \text{Reporting Period Energy Consumption}}{\text{Baseline Period Energy Consumption}}$$

$$EPI\text{-Electrical Energy \%} = \frac{14751 - 14478}{14751} = 1.42\%$$

$$EPI\text{-Thermal Energy \%} = \frac{0.350 - 0.278}{0.350} = 20.48\%$$

$$EPI\text{-Total Energy \%} = \frac{13.035 - 12.729}{13.035} = 2.35\%$$

“Until one is committed, there is hesitancy, the chance to draw back, always ineffectiveness. That’s why we have a dedicated Energy cell to have focused approach on Energy conservation activities.”

— Sambit Senapati, Operation Engineer

Company or Country Specific Branding Here

Case Study Snapshot

Industry	Aluminium
Location	Jharsuguda, India
Energy Management System	ISO 50001
Product/Service	Manufacturing of Aluminium hot metal, ingots, billets and wire rods
Energy Performance Improvement (%)	2.35%
Annual energy cost savings	1634.66 Lakhs INR
Cost to implement	224 Lakhs INR
Payback period	2 months

Company Profile

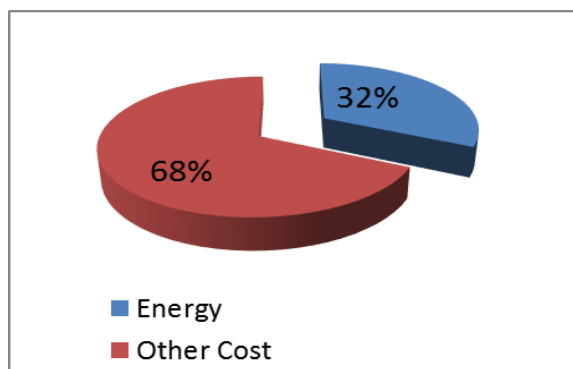
Vedanta Ltd. Jharsuguda is an associate company of the London Stock Exchange listed, FTSE 100 diversified resources group Vedanta Resources Plc. Originally incorporated in 2001. We are a leading producer of metallurgical grade alumina and other aluminium products, which cater to a wide spectrum of industries. Aluminium smelting unit of 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 1215 MW Captive Power Plant supported by highly modern infrastructure at Jharsuguda, Odisha.

In our quest to meet high quality standards and best of Health, Safety and Environment systems, we have implemented integrated management system (IMS) & are certified for ISO 9001, ISO 14001 and OHSAS 18001 & ISO 50001.

Business Case for Energy Management

Drivers/Business Case:

Aluminium smelting is power sensitive and power intensive process as well. The energy cost is 32% of total cost of production. So energy usage, consumption and efficiency play a vital role in sustainable business performance of the plant. ISO: 50001 implementation has helped us to reduce our cost of production, reduce our carbon foot print and in addition has enabled us to meet Energy Consumption reduction target set by Govt. of India under PAT scheme.



The Legal and other requirements include:-

- Achieving of Specific Energy consumption target notified to us in PAT scheme.
- Energy conservation Act 2010.
- Fulfilling of Corporate sustainability requirements as per technical standard TS-11 clause no-4.7.
- Creating a brand image in Indian Aluminium Industry and corporate sector.

EnMS has facilitated to meet above requirement in a structured manner.

Keys to Success

- Formation of Energy cell consisting of people at different levels.
- Appointment of energy manager.
- Training and Developing of internal auditors.
- Periodical review by top management.
- Availability of advanced tools like IT enablement, EMS SCADA, online reporting etc.
- Availability of business excellence drivers like six sigma, Asset optimization, Quality circle, IMS etc. in place.
- Active participation in national level energy management programs being undertaken by govt. of India.
- Technical support from reputed associate partners like Siemens, Hencon for integrated plant maintenance (IPM).
- Young work force always eager to implement new out of the box ideas and quick to learn.

“Dream Big, Start small, Act now. With this attitude we are the 1st Aluminium smelter unit in Asia to be certified with ISO: 50001 for Energy Management System since 2013.”

— R.C. Patro, Maintenance Engineer

EnMS Development and Implementation

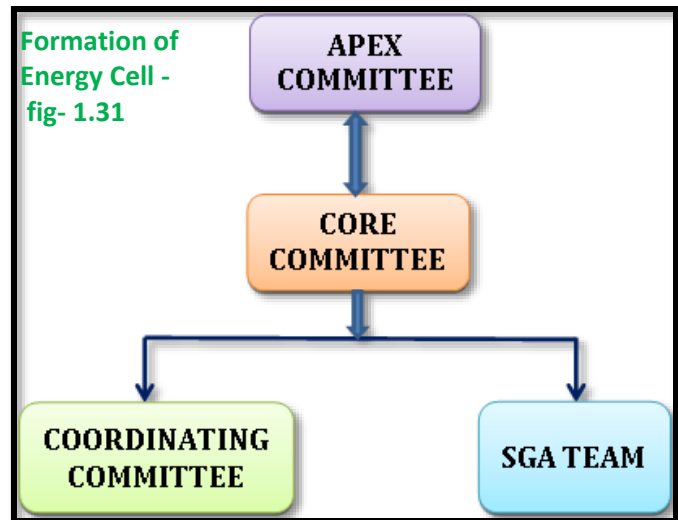
Organizational:

At Vedanta, we believe that teams are always better than individuals and systematic tools are more fruitful than solitary ideas. So as a part of our culture we follow Business Excellence models like Six Sigma, Quality Circles, Asset optimization (AO), Kaizen, 5S, SGAs etc.

Top management role is vital in implementing and maintaining the system successfully which includes

- Formation of Energy cell (Refer Fig-1.31) which comprises of three layer structure consisting Apex committee, core committee, Coordinating committee and SGA team. (Refer attached annexure-1 and 2 for Energy cell and energy management team's roles and responsibility).
- Defining an energy policy by taking care all the organizational and legal requirements. (Energy policy is attached as Annexure-3 for your reference).
- Appointed a management representative (MR) and Energy manager to drive the system successfully. (MR appointment letter is attached as annexure-4 for reference.)
- Defining the roles and responsibility of MR and Energy manager.
- Establishment of energy objectives and targets according to energy policy and providing all necessary resources to achieve the same.
- The necessary resources include CAPEX (capital expenditure) and OPEX (operational expenditure) proposal approval for energy saving project implementation, IT enablement of all energy reports, energy efficient procurement, design etc. and human resources.
- Providing necessary training to all plant personnel regarding energy awareness.

- Reviewing periodically the energy performance of the plant.



Our team is actively involved in spreading energy conservation awareness drive in the community and in industry. We conduct workshops at national level as well. Vedanta has organized first aluminum sector KEP (knowledge exchange platform) involving all players of aluminium industry, research institute and Bureau of Energy Efficiency, Govt. of India.

“We are what we repeatedly do. Excellence, then, is not an act, but a habit. We won “Excellence Energy Efficient unit” award from CII for three consecutive years i.e. 2013, 2014 & 2015.”

—Mangu Srinivas, AGM

Energy review and planning:

Energy review is the heart of this management system. All the aspects of EnMS depends on Energy Review, so a proper energy planning and review is must for successful implementation of EnMS. We are conducting the energy review exercise once in a year. Energy planning process includes;

- a. Identification of different type of energy streams used in our plant.
- b. Analysis of energy use and consumption.
- c. Finding out of significant energy use and consumption (by Pareto method).
- d. Analysis of past and present energy consumption, thereby finding the baseline for each area.
- e. Analysis of relevant variables impacting significant energy use.
- f. Identifying opportunities for improvement.
- g. Accordingly setting objective and targets.

Moreover during energy review the total team of energy cell is getting involved in the whole exercise where in energy consumption in each load like motors, lights, process, furnaces etc. are measured in power analyzer and recorded for analysis purpose and this method is followed for all types of energy streams.



To monitor the energy performance, energy performance indicators (EnPI) has been found out for each area and on the basis of past and present energy consumption, baseline is found out for each EnPI by taking one year average energy consumption.

List of opportunities are found out through different methods like audit, brainstorming, best practice sharing etc and then prioritized based on some conditions like payback, feasibility, process impact, etc

“Potential unexpressed turns to pain. That’s why we believe in People involvement and sharing best practices between internal and external units.”

—Bijneswar Mohanty, GM

Development and use of professional expertise, training, and communications:

During the implementation stage we have taken the support of Energy consultant who guided in developing energy review formats, internal auditor training, provided information regarding best practices followed in other industries which helped us to develop a robust system with not only complying all the requirements of EnMS but also achieving national benchmarking figures of Energy consumption.

Human resources are the key to any organizational success, hence their training and skill development are of utmost importance. To have focus on this our policy mandates every department to have training on energy conservation awareness. HR department conducts training programme and monitors the effectiveness. Following trainings are organized by unit.

1. Training by external agency.

Training has been organized from external faculties on energy audit techniques, Energy management and energy saving in equipment etc. for all the energy cell team.

- Details of external training:-
- Energy auditing techniques-CII
- Energy saving in utilities –FICCI
- Energy management training by CII

- Internal auditor training program by GRK enterprises
- Lead auditor training program – by SGS

We are also encouraging BEE certified Energy auditor course for our engineer, by this process we have developed around 8 nos. govt. certified energy auditors and managers.

2. Training by internal faculties:-

As per internal training calendar, internal faculties are providing training program on their specialized area which includes ;

- Energy saving in pump and motors
- Energy efficiency in pots.
- Internal auditor refresher training.
- EnMS induction training
- Training on Energy efficient lighting etc.



3. Tool Box Talks cover energy conservation awareness for shop floor people:-

Fortnightly basis tool box talks organized for shop floor technicians and operators on energy saving, deviation reporting and control, communication of Energy policy, Objectives and target etc.



To test the competency level, online e-test is being organized and evaluated the competency level of all the persons who are significantly impacting energy accordingly retraining processes has also been ensured. We are also inviting vendors to demonstrate energy efficient products at our location and sending our Energy cell team members to various national level energy forums like CII (confederation of Indian industry), BEE (Bureau of energy efficiency) workshops.

“Small daily improvements over a time lead to stunning results. We have started Tool Box Talks on energy conservation on a daily basis giving wonderful results”

—Rashmiprabha Maharana , AO

Tools & resources:

Vedanta limited, Jharsuguda plant has a value driven culture where we have very strong business drivers like six sigma, quality circle, Kaizen, asset optimization, sustainability, IMS, 5S are in place. Further to add, as mentioned earlier also, we have been equipped with advanced IT based tools like MES online report generation, SAP based Energy efficient product procurement, E-based document management system.

SCADA based energy monitoring system is there where in all the energy meters are connected to one server and reports are generated automatically. Apart from this portable Flow meter and power meters are there to analyze a particular load for any deviation.



SCADA BASED ENERGY MONITORING SYSTEM (4.6.1) Steps taken to maintain operational control (ISO 50001:2011 Section 4.5.5& A.5.5) and sustain energy performance improvement:

During the implementation of EnMS we have reviewed all work instructions (WI) and modified them as per ISO 50001 requirement. Impact of Energy performance each equipment & process are analyzed. The operating / control limits of each process are redefined in order to optimize energy consumption. Moreover a list of significantly impacting activities are separately made by filtering out points from the WI and communicated in shop floor for proper control of same.

All the WIs are communicated to shop floor technician by periodical trainings. Pre and post-tests of the trainings are conducted. To increase awareness posters and dash boards are in shop floor.



“Criticism is the price of ambition. We criticize energy misuse at every step.”

—Harish Yadu, Manager

Approach used to 1) determine whether energy performance improved and 2) to validate results:

Before starting the implementation of energy saving projects, the SGA (small group activity team of our energy cell) are taking measurement of energy consumption and other process parameters like pressure, flow, temperature etc. and recording it in a specified format (Format attached as annexure-5 for reference). Then after completion of the project again all the data like energy, current, voltage etc. are taken to compare the performance. The results are verified through an internal auditor/central EnMS coordinator.

Details of the modification along with necessary photos and other data are recorded in a specified format (sample format attached for reference as annexure-6) for final result verification through energy manager.

Cost-benefit analysis:

Cost benefit calculation is done based on number of units saved at present power cost on per annum basis by taking into account all costs like project cost, maintenance cost, operational cost and finally comparing with energy cost saving. After calculating all the financial benefits, the saving is being verified by our finance department for confirming the savings.

“All change is hard at first, messy in the middle and gorgeous at the end. With implementation of more than 100nos. energy saving projects, we became the benchmarking aluminium smelter in india.”

—Arun Rathi, Manager

Lessons Learned

- Team work in all levels of energy cell for successful implementation.
- Utilization of software tools like Minitab, Ampla, Etc. for energy monitoring and analysis.
- Auditing techniques of EnMS.
- Best practices sharing between business unit and sub- business unit level.
- Techniques of internal and external benchmarking.
- Error free data management and documentation system development.
- Utilization of resources.
- **Improvements after EnMS (ISO 50001) implementation:-**
 - 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 department and targets assigned. Around 15 objectives and 25 nos. management programs have been finalized and communicated to all to achieve the energy targets.
 - Energy saving Opportunity for improvement identified and prioritized.

- Energy Baseline study conducted in scientific manner.
- Performance monitoring through EnPIs (Energy Performance Indicators).
- Energy Efficient procurement analysis for all products by Commercial team.
- Measurement & monitoring system strengthening.
- Management review for performance improvement.
- EnMS Tool box talk being conducted.
- Inclusion of EnMS topic in induction training of new employees.
- Energy linkage to SOP and SMP of IMS and accordingly field operation.
- Energy Dash Boards maintained in all sections and departments.

“Where victims see adversity, extreme achievers see opportunity. We snatched the opportunity and created national benchmark”