Energy Management System Implementation

JK Lakshmi Cement Ltd. – Sirohi (Rajasthan) Plant

– Mr. P. L. Mehta, Sr. Vice President (Works)& Unit Head, JK Lakshmi Cement Ltd. – Sirohi (Rajasthan)

Introducing the Plant

JK Lakshmi Cement Limited, located in district Sirohi (Rajasthan) and established in 1982, is a member of JK Organization, which is one of the largest industrial groups in India. JK Lakshmi Cement was one of the first Indian cement companies to acquire ISO 9000 in June, 1994 for its quality assurance system. At present, JK Lakshmi Cement is ISO 9001, ISO 14001, ISO 50001 and OHSAS 18001 certified, and its testing laboratory is also accredited by NABL. JK Lakshmi Cement is one of the most modern dry process cement plants in India, and adheres to all applicable statutory regulations.

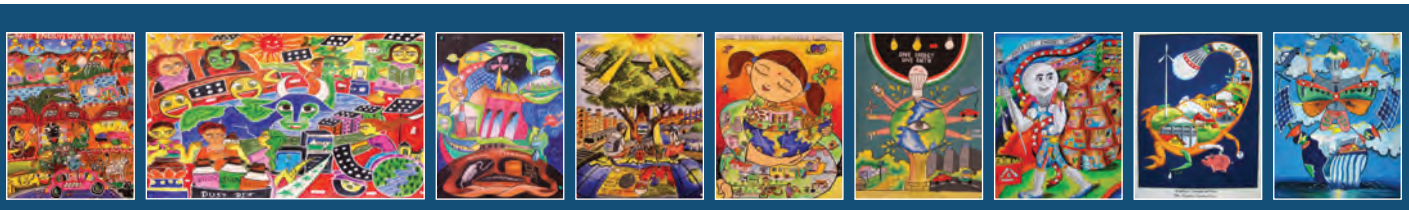
Development strategies adopted for implementing ISO 50001, Energy Management System

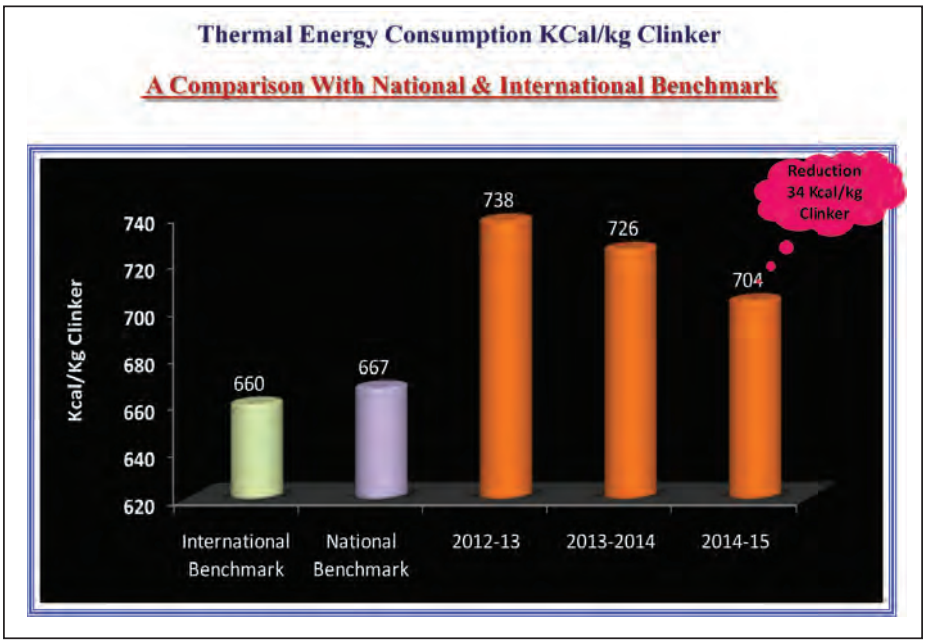
Development phase:

- JKLC established, documented, implemented and maintained an EnMS and is committed to improving its effectiveness in accordance with the requirements of ISO 50001:2011. It aims to lead reductions in greenhouse gases emissions, and also reduce other environmental impacts and energy costs through a systematic management of energy.
- **Top Management:** Senior Vice President (Works),the Unit-Head is the Top Management in the organization and committed to the EnMS and improving its effectiveness. The Unit Head enunciated an energy policy which is required to be followed by everyone in the organization.
- **EnMS Team Leader/Management Representative:** The Unit Head had appointed a Management Representative, the EnMS team leader for the energy management systems; he is responsible for and has the authority to ensure that the EnMS is established, implemented, maintained and continually improved in accordance with ISO 50001:2011.
- **Energy Planning – general:** An energy plan consistent with the energy policy had been drawn up and documented. This emphasized activities that continually improve energy performance and therefore involved a review of all activities within the organization with the potential to affect energy performance.
- **Energy Review:** A procedure to record and maintain an energy review via periodic audits was established: the procedure defined the methodology and criteria for the review.
- **Review, Analysis and Planning – Energy Baseline:** Based on the output of the initial energy review, and taking into account data for the last two years, an energy baseline was arrived at. Changes in energy performance were to be measured against this baseline.
- **Energy Performance Indicators (EnPIs):** Appropriate energy performance indicators (EnPIs) were identified and were linked to operational performance parameters such as energy used/ton of finished product. These are reviewed regularly compared and updated,each month, to the energy baseline.
- **Energy Objectives, Energy Targets and Energy Management Action Plans:** Documented energy objectives and targets were established for relevant functions, levels, processes and facilities. While establishing and reviewing objectives and targets, legal and other requirements were taken into account as were significant energy uses and opportunities to improve energy performance.
- **Financing:** Consideration was also given to other factors such as financial, operational and business conditions, technological options and the views of stakeholders. Documented Energy Management Action Plans (EnMPs) were established, implemented and maintained with updates at defined intervals. The plans included designation of responsibility, stating how and when individual targets were to be achieved, a statement of the methods by which improvements in energy performance would be verified, and a statement of the methods to be used for verifying the results.
- **Duration:** It was estimated that establishing the EnMS would take 18 months while the actual time taken was 17 months.

Use of Professional Expertise

- **Competence, training and Awareness:** All personnel working in areas that were part of the EnMS were trained for the purpose – needs were identified and training on operation of the EnMS was provided. Associated records, such as those evaluating the effectiveness of actions, are maintained.
- **Communication:** The senior management established processes for communicating information about energy performance and the EnMS. Internal communications were carried





out through formal meetings, internal circulars, letters, notice/display boards, the internal mail system, training programs (including those for Energy Policy), the internal magazine (Lakshmi Darpan), open forum meetings, daily, weekly meetings, safety committee meetings, cross functional teams, and quality circles. Any person working for, or on JKLC's behalf could comment upon or suggest improvements to the EnMS. Suggestions/comments received from internal personnel were documented, reviewed and action taken.

- **Employee Engagement:** Employees at different levels and from different functions were encouraged to participate in the EnMS activities through a suggestion scheme, a forum of quality circles, and cross-functional teams belonging to different sections of the plant. Such employees were nominated for internal and external training programs, and were deputed to visit other cement plants to see best practices implemented there.
- **Professional Expertise:** Energy professionals and experts were called in from agencies such as the NCCBM, CII, and also from BEE-accredited energy auditors/BEE empanelled energy audit firms to engage the personnel in EnMS activities.

Steps taken to improve energy performance and optimize operational control

Approach used to determine the energy performance improvement and verify the results:

Monitoring, Measurement and Analysis: A system for monitoring, measuring, recording and analyzing the key characteristics determining energy performance at specified intervals was established.

These key characteristics included:

- Significant energy use and other outputs of energy review;
- Relevant variables related to significant energy use;
- Energy Performance Indicators (EnPIs);
- Effectiveness of the action plans in achieving objectives and targets;
- Evaluation of actual versus expected energy consumption.

An energy measurement plan was defined and implemented, which included utility meters, monitoring and measurement systems connected to the energy measurement software system.

Internal Audit of the EnMS: Internal audits are conducted once in six months to ensure conformance to the ISO 50001:2011 requirements, and that the EnMS is effectively implemented, maintained and is improving energy performance.

Operational Control:

It was ensured that operations and maintenance activities related to significant energy use and consistent with the energy policy, objectives, targets and action plans, are identified. Conformance with specified conditions was ensured by:

- Establishing and setting criteria for effective operation and maintenance of areas of significant energy use, where deviations could affect energy performance significantly;
- Operating and maintaining facilities, processes, systems and equipment, in accordance with operational criteria;
- Appropriate communication of the operational controls to personnel working for, or on behalf of, the organization.
- Making available/displaying written work-instructions for a specific process or procedure.

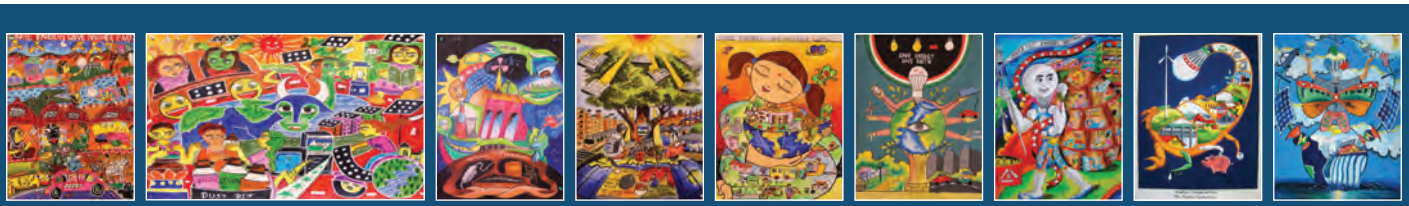
Energy performance shall be included in determining how JKLC will procure equipment and also react to contingencies, emergencies or disasters.

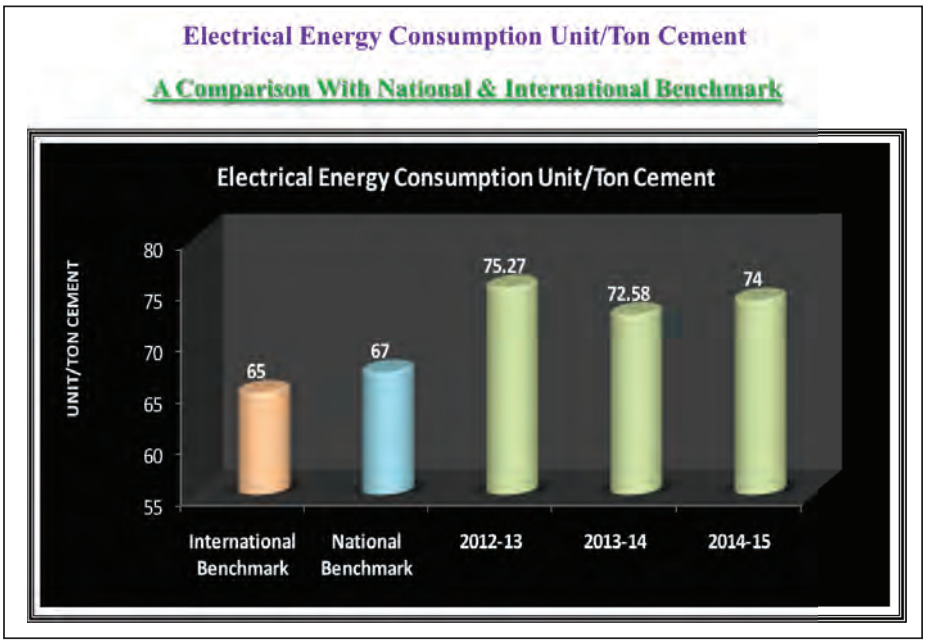
Cost Benefit Analysis

The implementation of various energy saving measures achieved a total energy cost saving of Rs 903 million, with an investment of Rs 2832 million and an average payback period of 38 months.

Challenges

As all the employees were well versed with the other management systems already in place (ISO 9001, ISO 14001 and OHSAS 18001) the implementation of ISO 50001 was smooth. However, the involvement and education of bottom





line workmen was a challenge which was met by regular and effective training by internal and external resource persons.

Overall benefits achieved

- A structured platform for energy consumption, energy conservation and energy management activities was made available.
- An easy approach to identify and prioritize major energy consuming activities and equipment was put into place
- Close monitoring of high energy consuming processes made possible and also the development of a mechanism for providing information about any change in energy consumption patterns.
- Improvements in operational efficiencies possible; different approach developed towards maintenance and procurement procedures.
- Improvement in the awareness of issues related to energy consumption and conservation among employees as well as other associates.
- Helped to minimize wastage of energy.

Significant Achievements at the end of PAT (Perform, Achieve and Trade) Cycle-1:

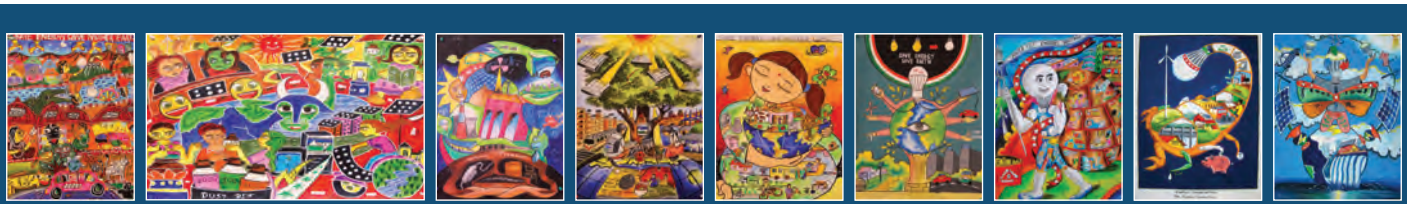
- Overall energy performance improved from 877 kCal/kg of major product to 747 kCal/kg of major product in PAT Cycle1.
- Thermal energy intensity reduced from 759 kCal/kg of clinker to 704 kCal/kg of clinker.
- Overall electrical energy intensity reduced from 81 units/tonne of cement to 74 units/tonne of cement.
- Up to clinkerization, electrical energy intensity reduced from 55 units/tonne of clinker to 49 units/tonne of clinker.

Chinese VRM

Kiln-1 upgradation

Hot-Air Recirculation Duct

IKN Cooler



- Achieved total energy cost saving of Rs 903 million, with an investment of Rs 2832 million and an average payback period of 38 months.
- Achieved CO2 reduction, from 915 kg CO2/tonne of clinker to 891 kg CO2/ tonne of clinker.
- Increased generation of green energy, through WHRS (Waste Heat Recovery System), 7.56 to 90.62 Million units/ annum.
- Reduction in CO2 increased, from 2.6 kg CO2/ton of clinker to 24.56 kg CO2/tonne of clinker, on account of increased generation of green energy, through WHRS.
- Pictures of the projects implemented

Team of Innovators

The team behind the successful implementation of the project were (Front row; Left to right): Mr. Alok Kumar Gupta (Dy. Gen. Manager (Geology)), Mr. Nikesh Mittal (Sr. Manager (Elect)), Mr. Shobha Ram (Sr. Manager (Elect)), Mr. Vivekanand B K (Dy. Gen. Manager (DG-PH)), Mr. N K J Panchal (Dy. Gen. Manager (Elect)), Mr. B B Wadhawan (Vice President (Engg)), Mr. Ajay Sharma -Dy. M. R. (Gen Manager (Process – CM)), Mr. S. K. Gupta (Dy. Gen. Manager (Mech)), Mr. Rajpal Singh Shekhawat (Gen Manager (Process)); (Second Row-Left to Right):Mr.P K Kabra (Sr. Manager (Mech)), Mr. Hemant Shrimali (Manager (DG-PH)), Mr. Umesh Gupta (Manager (Instrumentation)), Mr. R K Mishra (Manager (QC)), Mr. C. P. Taparia (Sr. Manager (Mech)) and Mr. Pankaj Tiwari (Dy. Manager (Process)).

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EnMS-50001 has helped us a lot to achieve PAT (Perform Achieve & Trade) Targets by implementing best practices, involving our team members at all levels, ensuring periodic reviews, identifying opportunities for improvement & executing our action plans as per set timelines.

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