Energy Management System Implementation

Shree Cement Limited

– Mr. P. N. Chhangani,President (Works); Mr. R. Bhargava, Joint Vice President; Mr. Sanjay Singh, Manager (Energy Management Cell); Mr. Umang Gupta, Senior Engineering (Energy Management Cell)

Introducing the Plant

Shree Cement Limited (SCL) is a leading Indian cement company and its approach in transforming risks into opportunities has given it a notable presence in the national cement industry. It is India's third largest cement company with a cement production capacity of 25.6 million tonnes per annum. SCL commenced operations in 1986 with a production capacity of just 0.6 million tonnes per annum. With changing times and needs, SCL diversified its business portfolio and entered the power sector with a commercial power plant, Shree Mega Power,whose generating capacity was 300 MW. If 201 MW of captive power is included, the total power generation capacity becomes 501 MW. The capacity of this plant is augmented by 111 MW from the waste heat recovery plants (WHR),making a total of 612 MW. The capacity of SCL'sWHR power plant is, worldwide, second only to similar plants in China. WHR-based power plants are located in Beawar, Rasand Raipur.

Development strategies adopted for implementing ISO 50001, Energy Management System

Identification of Energy Aspects and Prioritization

- All members of the core team, comprising personnel from concerned departments such as Process, Mechanical, Electrical, the power plant,together with a Management Representative,conduct an energy review (aspect identification and evaluation) initially. While identifying and evaluating energy aspects, the following are considered.
- Analysis of energy use and consumption based on measurements and identification of current energy sources. Past and present energy use and consumption are also evaluated.
- Based on the analysis of energy use and consumption, areas of significant energy use are identified as are also facilities, equipment, systems, processes and personnel working for, or on behalf of, the organization that significantly affect energy use and consumption. Other relevant variables affecting significant energy uses are identified. Current energy performance of facilities, equipment, systems and processes related to significant energy uses are identified and future energy use estimated.

Determining Criteria for Potential Savings and Feasibility

Once the energy aspects are identified, their significance is reviewed; the two significance criteria include, "Potential Savings" and "Feasibility". Both these, Savings Potential and Feasibility, are added to determine which energy aspects are significant: aspects totaling to more than 10 are considered significant. The table below illustrates how the significant criteria are determined.

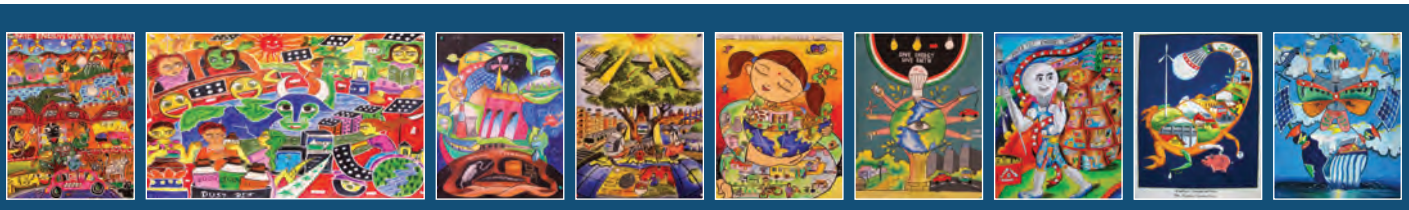
Note:

Give 1 mark bonus if Efficiency of equipment is 90 % or more

Give 2 marks bonus if Efficiency of equipment is between 89-75 %

Give 3 marks bonus if Efficiency of equipment is between 74-60 %

Criteria for rating energy aspect											
Saving Potential Rating A		Technological Rating B		Efficiency Rating C					Possibility for Usage of Renewable Energy Rating D	Possibility for Usage of alternative/ waste Energy Rating E
				Efficiency 90% or more	Efficiency between 89.99-75%	Efficiency between 74.99-60%	Efficiency between 59.99-50%	Efficiency between 50%		
Less than Rs 10,000/ annum	0	Easy to implement well established technology/ method, very simple changes are required	10	1	2	3	4	5	2	1
Less than Rs 1,00,000/ annum	3	Minor changes are required	7							
Less than Rs 10,00,000/ per annum	7	Major interventions/ changes are required	3							
More than Rs 10,00,000/ per annum	10	Technology not available or not a proven technology	0							



Give 4 marks bonus if Efficiency of equipment is between 59-50 %

Give 5 marks bonus if Efficiency of equipment is below 50 %

Give 2 marks bonus if there is Possibility for usage of renewable energy

Give 1 mark bonus if there is Possibility for usage of alternative / waste energy

The significant aspects are further examined to determine energy factors, opportunities for savings and required investment. Details are recorded in the register of opportunities (ROP).The above criteria are used to prioritize among the opportunities available based on payback period and use of renewable energy. An action plan for tackling the significant aspects based on priority is drawn up and recorded in the register of opportunities (ROP). The action plan could be in terms of an EnMP or check sheet or work instructions, or a combination of all these. The delegation of responsibilities for the action plan is also mentioned in the ROP. All members of the core team, comprising personnel from the concerned departments shall establish an energy baseline using the information in the initial energy review, considering a data period suitable to the organization's energy use and consumption. Changes in energy performance shall be measured against the energy baseline. Adjustments to the baseline shall be made in the case of one or more of the following:

1. The Energy Performance Indicators (EnPI) no longer reflect organizational energy use and consumption,
2. There have been major changes to the process, operational patterns, or energy systems, or,
3. According to a predetermined method.

Use of Professional Expertise

The plant regularly provides three kinds of training to their personnel: organizational needs, functional needs and individual needs. In FY 2014-15, 1,153 internal and external training programs were conducted across all SCL units, totaling 77,179.56 training man hours –a key highlight of our People Development Agenda. We are attempting to customize the training programs based on the individual learning style of employees in the coming year. In addition to classroom training, we also incorporate innovative and interactive modes of training such as role plays, theatre, workshops, movies and case studies to ensure that the sessions have a higher recall value.

Cross-functional training is an important aspect of our training sessions wherein employees are encouraged to work across departments, learn new skills and aspire for all-round development. This is aimed at building a team of people that comprehends the views of other teams and is able to address cross-sectorial challenges.

Steps taken to improve energy performance and optimize operational control

- Operational control procedures for general electrical maintenance
- Operational control procedures for conservation of energy by optimizing the use of office lights and air conditioners
- Operational control procedures for safe operation of lifts
- Operational control procedures for energy conservation
- Work instructions for shift in charge
- Work instructions for section in charge
- Work instructions for predictive maintenance of load center
- Work instructions for preventive maintenance work instruction of motor, LRS, GRR
- Work instructions for safe and efficient operation of lifts.
- Conservation of energy associated with office lighting and air conditioning
- Conservation of energy associated with control panel
- Work instructions for CCR operators during changeover of shift
- Work instructions for CCR operators from CCR control
- To control dust during operation of ESP
- To control hot material from kiln I/L and O/L during pressurization and normal operation
- To minimize dust generation while cleaning during shutdown.
- To minimize dust generation while cleaning cyclone.
- To control dust generation while pressurizing raw mill circuit
- To control dust generation while operating bag filter.
- To minimize power consumption of various drives during operation.
- To control heat losses during kiln operation.
- Optimum utilization of resources when overhauling hydraulic system.
- Optimum use of power and ensuring safety during operation.
- To reduce consumption of energy associated with office/site lighting and air conditioning.
- To conserve energy while operating the compressor.

Cost-benefit analysis

Implementation of ISO 50001 has benefitted Shree Cement - cost benefits for the FY 14-15 are as follows:

- Annual energy cost savings: Rs 40.84 crores
- Cost to implement: Rs 128 crores
- Payback period: 3 years

Keys to Success

Objective of implementing ISO 50001 was to achieve higher levels of energy efficiency ultimately leading to operational efficiencies. To align the efforts with NAPCC under the umbrella of PAT, the plant implemented the following projects:

- Installation of waste heat recovery boiler for generation of electricity by utilizing waste heat from kilns: highest in India.

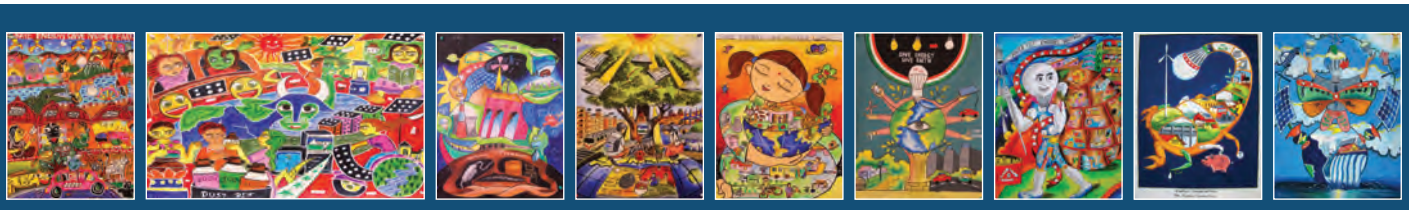
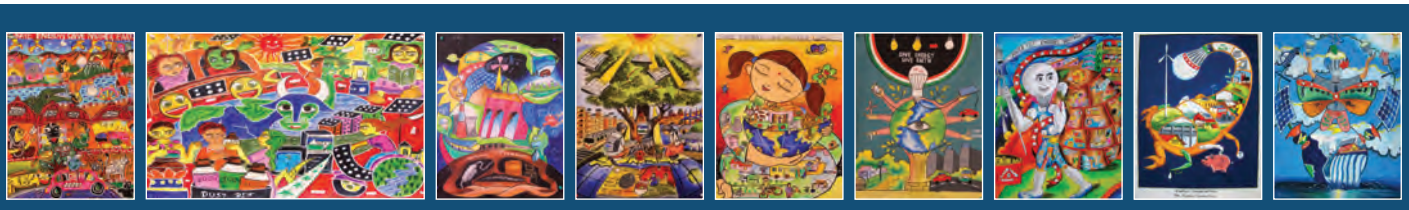


Table 1: Journey towards implementing ISO 50001	
Activity	**Responsibility**
PLANNING	
Prepare Annual Audit Plan covering Shree Management System as a whole.	System Coordinator / MR
Auditors independent of their activities shall be nominated at the time of preparing Annual Audit Plan.	System Coordinator / MR
The audit program / schedule for a specific period shall be prepared and circulated to all concerned, in advance.	System Coordinator/ MR
Unscheduled (extra) audits may also be planned and carried out in case of: • Increased customer complaints • A change of personnel at the level of departmenthead and above. • Increased departmental non-conformance • No progress in Continual Improvement Projects / Objectives • Specific reports from regulatory bodies • Reduced customer satisfaction • External audit reports	System Coordinator/ MR
AUDIT TEAM	
Individual auditor or a team of auditors, as found necessary and sufficient will audit each of the functional areas covered by quality/ environment / energy / OHS system elements. Normally the auditor will be a person from a sister department who has a general knowledge of the functions in that area. In case a team of auditors is assigned for any functional areas, one of them shall be nominated Team Leader with the responsibility for overall management of the audit.	Audit Team
QUALIFICATION AND TRAINING OF AUDITORS	
Executives / engineers / officers who are given auditing assignments should be diploma engineersor graduatesat the minimum. They should also be given requisite training which is an internal auditor course conducted in-house, or the lead assessor's course conducted internally or externally to facilitate quick and efficient auditing.	Mgt. Rep. / System Coordinator
PERFORMING AUDITS	
The auditors carry out audit of departments/activities to check for compliance and effectiveness of the quality system and prepare a report of non-compliance, if any	Concerned Internal Auditor & Auditee
The auditors also verify deficienciesin previous audits and review the effectiveness of the corrective action taken.	Concerned Internal Auditor
The auditor prepares the audit report in 16:01:00:02.based on his findings recorded in the non-conformance report 16:01:00:01. This report is submitted to the system coordinator /concerned department and the auditee compiles the non-conformities observed during the audit.	Concerned Internal Auditor & Auditee
Auditor shall also obtain acceptance on the observations, proposed corrective action and time required to resolve the non-conformities from the head of the auditee department on each non-conformity report.	Concerned Internal Auditor & Auditee
The auditee department shall take the necessary corrective action and inform the auditors for verification of action taken.	Concerned Auditee
The auditor shall keep system coordinator / MR informed in respect of the audit by sending a copy of the audit report at following stages: a) Immediately upon completion of audit b) After verification of corrective action taken by auditee.	Concerned Internal Auditor
Review the progress of completion of audits once in three months.	System Coordinator
Prepare audit summary report and send the same to chairman (IMS-SMS) and MRs for review.	System Coordinator
Consolidation of NCRs is prepared and put up to MRs andchairman (IMS-SMS) for review.	System Coordinator
Consolidated list of corrective and preventive measures to avoid potentialnon-conformance is prepared with the consent of concerned officials and put up for review in MRG meeting.	System Coordinator

- Installation and commissioning of secondary crusher to enhance raw mill's output
- Enlargement of kiln inlet riser duct orifice cross section
- Removal of fan inlet dampers at raw mill and coal mill fans
- Replacement of fuel feeding double screw conveyor by direct chute with a rotary air lock in coal mill circuit • Replacement of conventional fuel firing blowers by high efficiency Delta blowers
- Installation of coalmill rejects recirculation system
- Tipping of raw mill fan impeller to increase fan flow
- Replacement of existing conventional kiln tire cooling fans with high efficiency fans
- Replacement of conventional fuel firing system by rotor scale



- Installation of high efficiency K-turbo blower for jet air in kiln burner
- Installation of high efficiency IE-3 type motors.
- Replacement of conventional lights by LED lights
- Replacement of higher rating less loaded LT motors by low rating high efficiency motors
- Installation of Star-Delta starter
- Installation of VFDs and MVDs for various applications
- Elevator load current versus bag filter fan speed control system at clinker unloading circuit
- Louver damper removed from process fan inlet duct
- Plant compressor operation taken into DCS and interlocked developed in DCs with cement and packing plant operations.

Team of Innovators

The team behind the successful implementation of the project were (left to right) - Mr. Umang Gupta (Sr.Engg. (Energy Management Cell)), Mr Sanjay Singh (Manager (Energy Management Cell)), Mr. Sanjay Gupta (Additional General Manager (Quality Control)), Mr. Anil Sharma (General Manager (E & I)), Mr. Santosh Kumar Kumawat (Additional General Manager (Electrical)), Mr. Sanjay Chaturvedi (Senior Manager (Secretarial)), Mr. Vishal Singh (Assistant Manager (Secretarial)), Mr. Vimal Kumar Jain (Assistant General Manager (Electrical)), Mr. Ankit Nagar (Deputy Manager (Energy Management Cell)), Mr. Jayant Jain (Sr.Engg. (Energy Management Cell), Mr. Mohan Singh Rathore (Assistant General Manager (Mechanical)), Mr. Jagdish Prasad Ameta (General Manager (Process)), Mr. Satish Chandra Maheshwari (Vice President Operations (Management)), Mr. Arvindkumar Patil (General Manager (Development)), Mr. Ramesh Kumar Sharma (Deputy General Manager (Process)), Mr. Abhay Prakash Sharma (Assistant General Manager (Electrical)), Mr. Pawan Kumar Sharma (Senior Manager (Civil)) and Mr. Piyush Singh Brijvasi (Assistant Officer (Environment))

Mr. P. N. Chhangani
President (Works
Shree Cement Limited

Frequent climate change events and rising GHG emissions levels have made it obligatory to take appropriate and pre-emptive actions. Sensing the future prospects of energy mix and supply scenarios, efficient energy management is quintessential.

SCL is the First Indian Cement Company to adopt BS EN 16001:2009 Energy Management System proactively and revised it to ISO 50001 in the year 2011.

Energy efficiency is an ultimate measure to combat climate change as it leads to improved process efficiency, cost-economics and energy conservation which ultimately reduce the GHGs emissions, and this is what SCL has been doing since its inception.

❑❑❑