ISO 50001 Energy Management System
Case Study

2020 India

Textile Division, Chhindwara

RAYMOND LIMITED with a 45.28 Million Meters in wool & wool-blended fabrics, Raymond commands over 60% market share in worsted suiting in India and ranks amongst the first three fully integrated manufacturers of worsted suiting in the world.

Raymond Limited Textile Division, Chhindwara -100 acres Plant

Case Study Snapshot	
Industry	Textile
Product/Service	Wool based fabric
Location	Chhindwara
Energy management system	ISO 50001
Energy performance improvement period, in years	3 years
Energy Performance Improvement (%) over improvement period	11.00 % reduction during 2nd PAT cycle
Total energy cost savings over improvement period	312274 $USD
Cost to implement EnMS	269872 $USD
Total Energy Savings over improvement period	61710.41 GJ
Total CO_2-e emission reduction over improvement period	4788.69 Metric tons

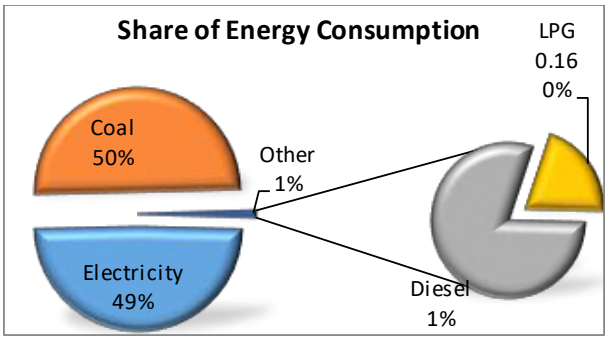
Organization Profile & Business Case

Incorporated in 1925, **Raymond Limited** presently has five divisions comprising of Textiles, Denim, Engineering Files & Tools, Aviation, Designer Wear, and Prophylactics and Toiletries. With a capacity of 45.28 Million Meters in wool & wool-blended fabrics, Raymond commands over 60% market share in worsted suiting in India and ranks amongst the first three fully integrated manufacturers of worsted suiting in the world.

"Saving energy not only saves money but also saves our limited and valuable natural resources used to produce it." – Mr. Surendra Tiwari – Plant Head

The Chhindwara Unit is one of the three production units of the Textile Division. The installed capacity of Chhindwara unit is 116 looms and 33528 spindles as against the license capacity of 1500 looms and 50000 spindles. The unit has a work force of more than 2900. The plant is located on a 100 acre plot with a built-up area of 140,000 sq meters and a green belt area of 65%. The plant is well equipped with the most modern machinery, ensuring high efficiency and productivity. The work force is adequately skilled, well trained and competent. This unit became operational in the year 1991. A well-equipped in-house laboratory is maintained for carrying out the various quality tests of in-coming, in-process and the final products.

The Raymond Chhindwara plant received many awards for energy conservation from the Govt. of India under the banner "National Energy Conservation Awards". The attention of the management on energy, its conservation and its preservation have always been high, it can be noted thorough our various energy conservation measures since 1999 resulting in getting various energy conservation awards.



Share of various Energy Inputs for production

Raymond Chhindwara is also identified a Designated Consumer (DC) as per the norms laid down by the Ministry of Power under the Perform Achieve Trade (PAT) scheme and hence compliance to this scheme was made a mandatory requirement. Under this scheme the plant was given the target to reduced its consumption by 6% by employing energy saving / conservation measures in its 2st cycle i.e. during April, 2016-, March-2019.

To boost facility energy efficiency, the plant resolved to install more efficient equipment and implement an ISO 50001-compliant EnMS. The EnMS has proven extremely useful in managing the plant's energy resources. Managing energy resources ultimately helps to reduce plant costs. Raymond being a leader in Indian textile industry, achieving ISO 50001 was a matter of great pride and reputation.

Business Benefits

The implementation of the EnMS emerged from the need of reducing operating costs, facing the continuous increase of electricity and fuel rates. Then, two energy objectives have been set:

- Improve systematically the energy performance of the plant.
- Raise staff awareness of energy efficiency.

Electrical Energy

On Regular basis since 2016, the energy performance is being monthly monitored, comparing Energy Performance Indicators (EnPI) and the Energy Baselines (EnB). This enables to quantify directly the savings achieved and also to detect early deviations in consumption levels. From the time when the EnPI started to be measured, the recorded accumulative saving rises over 8437.99 GJ, only electrical energy, which is equivalent to a reduction of 2789.22 ton CO2.

Sr. No.	**Project** implemented during PAT Cycle -2
1	Replacement of standard ceiling fan with high efficiency BLDC fan
2	Installation of VFD's in various Machines in place of Star/Delta and DOL Starters.
3	Installation of humidity controller on AWT pump motors.
4	Replacement of standard motor by IE3 and IE4 motors.
5	Replacement of Sodium Flood Lights by LED flood light.
6	Replacement of fluorescent tube light by LED.
7	Replacement of inefficient Fan with Text-Air high efficient Axial flow fan in Humidification plant.
8	Installation of LED solar street light.
9	Modification of chilled water line of Stenter & stoppage of Calendar m/c's chiller
10	Installation of Noricool day lighting system at various Departments.
11	Replacement of old equipment's/machines with new efficient equipment's/ Machines.

Thermal Energy

Thermal Quantified Energy Saving in 3 energy efficiency projects associated with the use of process steam allowed a reduction of Coal of 1817.7 MT which is equivalent to 53272 GJ and reduction in the CO2e of 1999.47 tons.

Sr. No.	**Project** implemented during PAT Cycle -2
1	Heat recovery from Screw Compressor.
2	Use of fuel additive in coal.
3	Replacement of old Boiler by Efficient boiler

The overall impact on the SEC during Pat Cycle -2 is as follows:-

- Baseline Year : 7.11 TOE / MT

- Assessment Year : 6.29 TOE / MT

- Baseline Year Production : 5068.7 MT

- Net Reduction in Energy : 4105 TOE

- Net Reduction in Energy with EE projects:

Power Saving: 1691062 kWh (495 TOE)

(@ 2927.65 kCal/kWh normalized weighted average heat rate in assessment year)

Coal saving: 1818 t of coal (653 TOE) (@ 3589.66 kCal/kg)

Total energy Saved: 1148 TOE

The SEC has declined from 7.11 TOE per MT production to 6.29 TOE per MT of production.

ES Certs issued during the assessment year: (+) 1870

Implementation Costs

Cost of implementation process was composed by Internal Staff time to develop and implement the EnMS (4200 $USD),Internal staff time to prepare for external audit(2100 $USD), monitoring and metering equipment installed to meet EnMS requirements(7000 $USD),Third party audit costs(2807 $USD),Fee for hired consultants to assist with EnMS implementation) (2100 $USD), internal communications) (1403 $USD,)Total cost(19610 $USD).

Plan

With a well-organized process of data collection and measurement, consumption details of various departments were readily available which lead to a systematic approach to understand the energy use. This data availability enabled us to study the past trend of our consumption and finally a baseline was reached i.e. financial year 2016-2019.

Analysis of the present details leads us to the fact that majority energy consumption in our unit is in the form of electricity. Hence, monthly electricity consumption for all departments was made separately and their annual total was determined. Based on this fact, the significant energy use (SEU) areas were determined considering a threshold of 5% electric use of the total consumption. Furthermore, for each department their EnPI's were realized considering their unit of production and consumption and a ratio of energy per unit of production was discussed and found suitable to be an EnPI.

To have a well-defined and functional energy management system, the members of the organization are to develop a sense of consciousness about energy consumption, conservation and wastage, awareness about the significance of our energy sources needs to be given to the people of the organization.

We at Raymond Ltd Chhindwara. Identified and made a list of the training levels to be imparted to the personnel's according to their job profiles. The key role for EnMS implementation was to be played by the MR and the EMT, hence specialized trainings from BEE certified external experts was arranged on EnMS implementation and internal auditor training. These members were then responsible to again train the other staff members in their respective department. A

number of trainings were arranged on awareness for ground level workers working in the SEU area, their role in energy conservation and preservation was the most because they were the 1st in line to work on the machines.

Communication set up was very lucid, as each and every detail / update on EnMS was circulated to all the concerned personnel's through e-mail and all the latest documents, records and data was put up on the internet and was accessible to all the staff members. Workers were intimated for any progress by putting up notices on the notice board. In the due process a proper control was maintained throughout by password protecting all the relevant documents on the internet, though accessible to all but editable by none.

Besides this, all the workers were adequately trained about the process flow of machines. They were also given proper instructions about the steps to operate the machine they were working on. For this purpose the instructions were noted down on a paper and placed near the machine to exercise a good operational control.

"Energy conservation should not only be practiced at organizational level but should also be exercised at a personal level" – Mr. Jayant Joshi, General Manager (Engg.)

Do, Check, Act

Energy Policy

The energy policy is a cornerstone for implementing and improving an organization's EnMS and energy performance within its scope and boundaries. The policy provides a statement of the high-level overview of management's intent that members of the organization should apply to their work activities. This policy shall be communicated effectively to all persons working for and on behalf of the organization to ensure its understanding, implementation within the organization. This policy will be made available to relevant interested parties. This Policy is periodically reviewed and updated as necessary to ensure its continued suitability.


Raymond

Energy Policy

Energy Planning

Identification of energy sources used:
At present the following energy sources are used for its activities at Raymond.
Primary Energy Sources: Electricity, Coal, LPG and Diesel.
Secondary Energy Sources: Compressed Air and Steam.

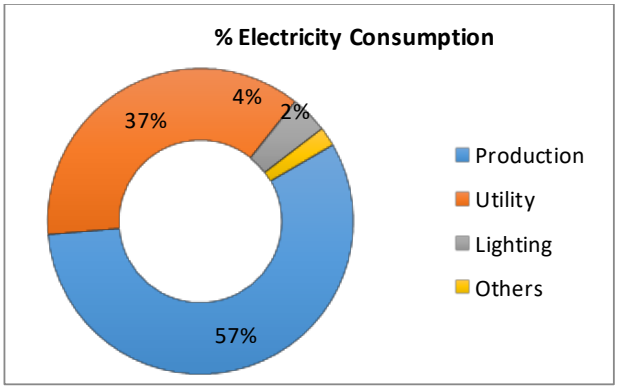
Legal and other requirements

There are many requirements to be met in an EnMS. Some of them are legal requirements (i.e. laws that apply to our energy use, energy consumption and energy efficiency), and there are also non-legally binding requirements often set by corporate management or perhaps customer requirements
Information on legal requirements and other requirements are obtained from a variety of sources. The EHS department has subscribed to EHS Legal requirements software - SheelLegal 2.0 (updated quarterly) from which legal requirements can be accessed. Furthermore, websites of Central Electrical Authority, Ministry of Power, Bureau of Energy Efficiency, MoEF, MP State Electricity Board, can be the source of information. The MR has the responsibility for identification of legal and other requirements that relate to energy use, consumption and efficiency.

Energy review

To improve our energy performance, it is necessary to understand how and why we currently consume energy,

and to identify where opportunities to improve exist. The energy review helps us to establish our current quantities of energy consumption of each of our energy sources, consumption trends, energy performance, and to identify opportunities to improve performance.
It is not unlike a traditional energy audit. This reviews our use of energy and identifies opportunities to improve and gives insights into usage patterns,
An energy review is a live document or process rather than a document concerning a fixed moment in time.
Following steps shall be followed to carry out the energy review for each energy source and the criteria to be used in making decisions during the review is also given along with it. Electricity use and consumption data, Coal use and consumption data, Diesel use and consumption data, Compressed air - Use and consumption data, LPG, Steam - Use and consumption data, Identifying SEUs based on energy use and consumption data.



Monitoring and measurement: The scope of monitoring and measurement covers monitoring, measurement and analysis of key characteristics of operations that include: a) Significant energy uses – energy consumption quantity and trend; b) The relevant variables related to significant energy uses; c) EnPIs; d) The effectiveness of the action plans in achieving objectives and targets; e) Evaluation of actual versus expected energy consumption. The purpose of monitoring, measurement and analysis is to obtain and analyse data in order to determine whether energy performance is improving, by how much and whether operational control is being maintained. This is applied to SEUs, relevant variables affecting the SEUs, EnPIs, and action plans. The MR is responsible for preparing energy measurement plan that defines the requirements for monitoring, measurement and analysis. This measurement plan is an output of the energy planning process. The Deputy MR and EnMT communicate the energy measurement plan to all concerned.

Energy Performance Indicators (EnPIs)

The only reliable energy measurement equipment for electrical consumption, coal consumption, steam consumption and LPG, were installed. Therefore, the EnPIs defined were the total consumption of above, as measured in the bills or invoices.

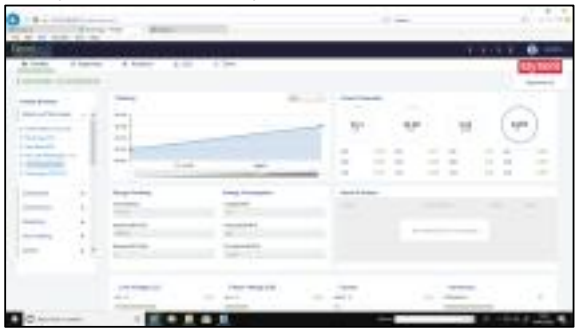
Energy Baselines (EnB)

The baseline period was established as 12 months. The same criteria were used to establish the reporting period for the EnPIs and deadlines for the objectives and targets. The relevant variables identified were: Production quantity, Dew Point / CDD, Coal consumed, Count, Picks per Meter (PPM) etc. Afterwards, to create the EnBs a regression analysis was made, comparing real energy consumption with the relevant variables for both electricity and coal; Microsoft Excel data analysis tool was used.
Measurement equipment: Load Manager an energy analyser and calibrated energy meters were used to measure the improvement in energy consumption. This equipment has its own specific applications, and its accuracy is tested periodically to ensure results by competent agencies.

Transparency

At Raymond Ltd, Chhindwara use Digital Energy Management system which makes our energy consumption and costs more transparent – for all departmental sites. No matter where you are or how widely spread our sites may be – our web-based tool provides us 24/7 real-time overview and detailed insight into our energy consumption and production.

Comparing historical values, observing correlations and checking average versus extreme values is easy. Our Software allows us to identify, understand and avoid peak loads by taking systematic steps to optimize costs. Its transparency and seamless presentation of historical data will enhance our energy consumptions of plant. Departments can easily excess their consumptions to verify production Data.



Lessons Learned

. It was indeed a big task to implement the energy management system, but the willingness and dedication of the organization made it happen. Many lessons were learned in the due course.

- Team work, sharing of responsibilities, accountability, time management were the key things that played their role for EnMS implementation.
- The first step to become more efficient, eliminate energy waste and bad habits that affect energy consumption, is to keep everything under control. It's mean you have to measure and monitor.
- Communicate at any level, People Engagement at any level.

Keys to Success

- A well suited system / method for timely data collection and measurements of energy consumption inside the plant boundary.
- Energy awareness amongst the people working in the plant is must because no system/process/method can be brought into practice without knowing the actual significance and need for it.
- ISO implementation guides, ISO 50002, 50003, 50004 & 50006 provided a more clear idea about the interpretation and meaning of the EnMS standard and its requirement.
- A well-documented EnMS manual with all the necessary procedures and action plans makes it a lot easier to manage and implement the energy management system and also to share the responsibilities accordingly.

Energy Conservation day Dec.2019

Through the Energy Management Working Group (EMWG), government officials worldwide share best practices and leverage their collective knowledge and experience to create high-impact national programs that accelerate the use of energy management systems in industry and commercial buildings. The EMWG was launched in 2010 by the Clean Energy Ministerial (CEM) and International Partnership for Energy Efficiency Cooperation (IPEEC).

For more information, please visit www.cleanenergyministerial.org/energymanagement.

CLEAN ENERGY MINISTERIAL
Advancing Clean Energy Together

ipeec