# Global Energy Management System Implementation: Case Study

**India**

**-A leading pioneer in the Indian Textile Industry.**


*Raymond Limited, Vapi- 100 acres plot with a 65%*

## Business Case for Energy Management

The need to save energy is the need of the hour. Being one of the most recognized brands of the country, Raymond Limited takes immense pride in taking initiatives in order to achieve the goals of sustainable development.

The Vapi Unit is one of the three production divisions of the Textile Division. 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 2006.

The plant has successfully implemented an energy management system (EnMS) that meets all the requirements of ISO 50001.

Raymond Limited, Vapi has received **National Energy Conservation Award** from Ministry of Power, Govt. of India in the year 2010 and 2013. Also, the plant has been the recipient of **Steamtech Award- Best Boiler User Industry** in 2016.

| Case Study Snapshot | |
|---|---|
| **Industry** | Textile |
| **Product/Service** | Worsted Fabric |
| **Location** | Vapi |
| **Energy Management System** | ISO 50001 |
| **Energy Performance Improvement Period** | 1 Years |
| **Energy Performance Improvement (%)** over improvement period | 14.7 % |
| **Total energy cost savings** over improvement period | $ 671142.4 USD |
| **Cost to implement EnMS** | $ 327472.2 USD |
| **Payback period (years)** on EnMS implementation | 0.48 |
| **Total Energy Savings** over improvement period | 52363 GJ |
| **Total $CO_2$-e emission reduction** over improvement period | 4136.97 Ton of $CO_2$ |

After the successful implementation of ISO 50001, Raymond Vapi unit showed an improvement of energy performance of 14.7% over a period of 1 year. Energy saving of 52363 GJ was achieved with a reduction of 4136.97 Ton of $CO_2$ emission. The energy cost savings was around $ 671142.4 USD

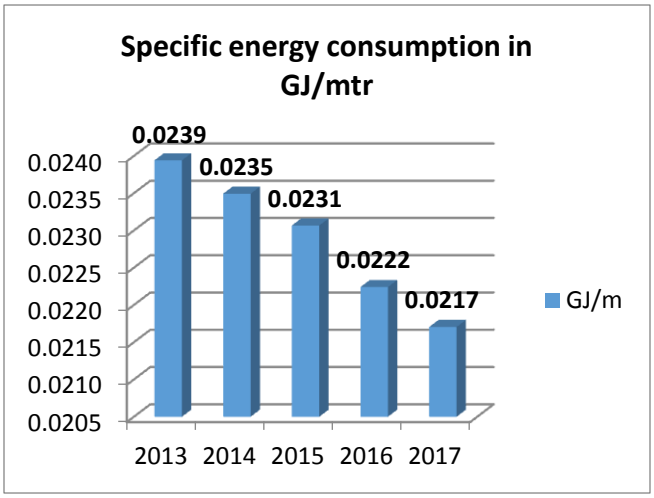
***"Energy Management has helped us understand the importance of Energy Saving and the need to attain sustainable development."***

—Harish K. Chatterjee, Vice President, Manufacturing.

## Business Benefits Achieved

Raymond Limited, Vapi plant is a Designated Consumer (DC) as per the norms laid down by the Ministry of Power under the Perform Achieve Trade (PAT) Scheme. Under this scheme, the organization has been allotted the target to reduce its energy consumption by 6% in the 3rd PAT cycle i.e. April-2016 to March-2019 through implementation of energy conservation initiatives.

Proper planning and execution of energy saving initiatives has led to an improvement in energy performance by 14.7%. The first year saw the plant implement a lot of energy saving projects. A gradual reduction in Specific energy consumption has been observed over the years.




The major projects that have been implemented for energy conservation are given below:

| Sl No | Project Title | Annual Savings in $USD |
|---|---|---|
| 1 | Use of Fuel additive in coal in boiler and thermic fluid heaters | **113,696.70** |
| 2 | Power saving in compressor by less use of inefficient old compressor | **19,600.19** |
| 3 | Power saving in Air Washer Towers in monitoring and controlling | **59,222.24** |
| 4 | Thermal insulation repairing work | **12,775.26** |
| 5 | Chiller load balancing | **70,326.41** |
| 6 | Condensate Recovery of Steaming m/c in Spinning | **6,122.13** |
| 7 | Changeover of Electrical Heater to Steam Heater in RF Dryer of Dyeing | **19,709.51** |
| 8 | Main Steam line Trap condensate collection | **4,310.48** |
| 9 | Saving due to Improvement in ETP aeration system | **23,488.99** |
| 10 | Replacement of 36 watt fluorescent tube rod by LED 16W/18W/15W tube in plant lighting.(Total 11500 No's)and street light replacement 150 W by 45 W LED(total 45 no's) | **112,590.97** |

A textile plant is an extremely power driven unit. In Raymond Ltd, Vapi, the energy costs comprises around 40% of the total production cost. As a result it has become extremely important to implement a proper energy management system in the plant to promote sustainable and economically feasible business development. ISO 50001 has enabled us to not only meet the targets of the PAT scheme, but also helped us lead the way to a better future of the plant.

***"Save energy equates to save money. Energy and Business go hand in hand. EnMS is the best tool to achieve energy conservation. "***

—A.A. Bambardekar, Works Director, Raymond Vapi

## EnMS Development and Implementation

### Organizational

There are four vital requirements for a successful Energy Management System in an organization.

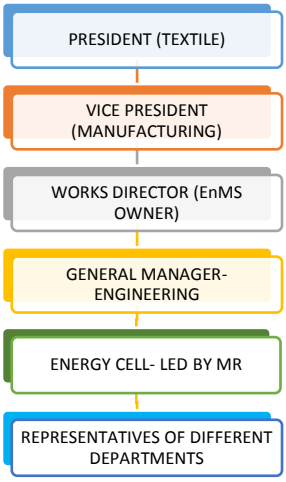
- Top Management Support
- Strategic Planning
- An Effective Monitoring System
- Adequate Technical Ability

The top management of Raymond Limited has always accepted the notion that energy efficiency is best for business. With the support of top management, a very confident Vapi team formed an energy cell which formed the core of the energy management system of the plant.

The salient features of the EnMS system include:

- A proper hierarchy based structured energy cell.
- An energy policy that reflects the image of the organization towards energy conservation.
- Appointment of Management Representative (MR) to lead the team and drive the system effectively.
- Establishment of energy objectives and targets according to energy policy and providing all necessary resources to achieve the same.
- Adequate technical training of all the plant employees to promote energy conservation awareness.
- Periodic evaluation of energy performance of the plant.

**ENERGY CONSERVATION CELL STRUCTURE**




The energy conservation team is actively involved in spreading energy conservation awareness drive in the plant. Important events like World Environment Day (5 June), National Safety Week (4 March to 10 March), Energy Conservation Day (14 December) are celebrated with full zeal and enthusiasm through quiz, poster and slogan writing competitions organized both at staff and workmen level.

Raymond Limited, Vapi is also the first plant under Raymond Group to host a mega event known as **Knowledge Exchange Programme (KEP)** where 50 engineers from 10 different units of Raymond Group shared their views and ideas on energy conservation activities that are already implemented in their respective plants. This event proved to be highly beneficial for all the parties involved.


*KEP EVENT AT RAYMOND LIMITED, VAPI*

Active participation and transparency among the organization's hierarchy has enabled the plant to achieve a lot of its objectives and targets. New ideas are always met with a warm welcome and Raymond Vapi hopes to continue at the same rate in achieving more in the future.

***"With the passing of every year, we are losing more and more non-renewable resources. It's time to wake up and ISO 50001 and PAT gave us the perfect start towards achieving our goals "***

—Surendra Tiwari, General Manager-Works, Raymond Vapi

**Energy Review and Planning**

Developing an understanding of the organization's energy use and consumption is the first step in an energy review. This is accomplished through:

1. Identifying current energy sources; Primary energy sources – Electricity, Coal and Diesel; secondary energy sources are – Compressed air and steam. Water also included for analysis even though it is not an energy source
2. Identifying current energy uses; production processes, utilities and incidental facilities

3. Evaluating energy use and consumption, including past and present trends; use and consumption data of FY 2016-17. For this purpose, inputs taken from utility bills, coal and diesel purchases, main meter and sub-meter readings of energy meters, wherever available.

The resulting information is used to identify Significant Energy Uses (SEUs) and energy performance improvement opportunities.

***"Energy consumption in a plant is a very robust topic. EnMS has helped us understand this topic in various levels- be it at a system level, process level or even an equipment level. "***

—Ajay Baldua, General Manager-Engineering, Raymond Vapi

## Cost-benefit analysis

Energy and costs have a direct relationship. More the energy is saved, more will be the cost benefits. Every step comes at a price, so there is a fine balance between the implementation cost and energy cost savings.

At Raymond Vapi, a simple but effective comparative analysis approach is used to check the feasibility of a energy conservation project.

The criteria for electrical energy saving is shown below:

| **Prioritization Criteria (Electrical)** | | | | |
|---|---|---|---|---|
| **Parameters** | **1** | **2** | **3** | **4** |
| **Annual energy savings kWh** | <1000 kWh | 2000-5000 | 5000-25000 | >50000 |
| **Implementation cost ($USD)** | > $7800 | $4650 to $7800 | $1560 to $4650 | < $1560 |
| **Payback months** | > 36 Months | 36 Months | 24 Months | 12 Months |

A score of 32 and higher enables the project to be taken into consideration. Also, **Zero investment opportunities** are also considered as significant projects.

The following cost benefits and energy benefits were achieved during 2016-17.

- **Total Electrical Savings: 4298498 kWh**
- **Total Coal Savings: 1837 MT**
- **Total energy cost savings: $ 671142.47 USD**
- **Cost to implement EnMS: $ 327472.2 USD**
- **Payback period (years): 0.45**

## Approach to evaluate energy performance

Energy performance is evaluated by preparing energy applicability matrix, fence diagram and process flow diagram linking the energy sources to energy uses. A single energy source can be associated with multiple energy uses.

Once the energy uses are identified, past and present energy use and consumption is evaluated. A suitable of 12 months FY 2016-17 is selected to evaluate historic energy consumption and identify trends. The period selected is a representative of the variation in organizational operations (e.g. production, CDD, count, PPM etc). Wherever appropriate, energy use and consumption information have been analyzed making **use of linear regression**.

Linear regression is a useful tool in analyzing and predicting the future trends of energy consumption.

Based on the analysis of energy use and consumption, the following information are established:

- Identification and classification of all energy units in our plant.
- Trend pattern analysis of these units based on historical data.
- Identification of Significant Energy Users (SEUs) with the help of Pareto method on System, Process and Equipment Level.
- Formation of baseline of these SEUs based on historical data.
- Finding out the impact of relevant variables on the trending pattern of the SEUs
- Identifying the opportunities for improvement and setting up the respective objectives and targets.

## Approach to validate results

All the departments covered under EnMS are audited once a year.

Also Internal audit of EnMS is conducted at least once every six months ensuring all clauses are covered in one-year time.

There is a documentation manual for internal audit (**RAYV-EnMS-P 09)** that defines the responsibilities and requirements for planning and conducting audits, establishing records and reporting results.

MR ensures that the EnMS internal audits are planned and conducted with objectivity and impartiality of the audit process and to assure the top management of the organization that EnMS:

1. conforms to planned arrangements for energy management including the requirements of this International Standard;
2. conforms with the energy objectives and targets established;
3. Is effectively implemented and maintained, and improves energy performance

An audit plan and schedule are developed taking into consideration the status and importance of the processes and areas to be audited as well as the results of previous audits.
Records of the audit results are maintained and reported to top management.

## Steps taken to maintain operational control and sustain energy performance improvement

Operational and maintenance controls bring the SEUs and the energy uses related to the energy objectives, targets and action plans into efficient and sustainable operation. As the management system matures, equipment, processes and systems will be governed by appropriate operational and maintenance controls.
Effective operational control and associated training of relevant personnel often provide considerable energy performance improvement opportunities and typically at low cost.
In Raymond Vapi, the operation and maintenance management team has a well defined system to maintain operational control.
The following records are maintained to maximize operational control and sustain energy performance improvement:

| Sl no | Name of the record | Media | Custodian | Retention Period |
|---|---|---|---|---|
| 1 | Critical Operating Parameters | Soft/Hard Copy | Concerned Dept. | 3 Years |
| 2 | Records as per operational control OCPs established under IMS | Soft/Hard Copy | MR | 1 year |

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

The organization plays a key role in motivating the employees towards the goal of energy management.
Without the right motivation and participation, it is simply not possible for any team to maximize its potential. EnMS related education/training program are planned and provided in-house to the employees as well as workmen by the HR Department. Its deployment is ensured through the active participation of Heads of Departments (HODs).

In FY2016-17, apart from the in-house EnMS training, the company organized a five day training and workshop termed as **KEP (Knowledge Exchange Platform)** (As mentioned earlier).

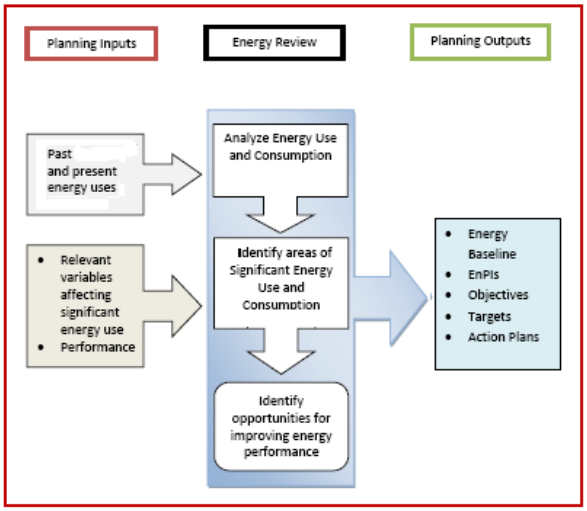
Knowledge Exchange Platform (KEP) has been established by **Bureau of Energy Efficiency (BEE)** in partnership with Institute of **Industrial Productivity (IIP)** to promote transfer and uptake of best practices and technologies in industries covered under the Perform Achieve and Trade (PAT) scheme.

The entire event was supervised by two expert consultants to BEE. With a participation of 50 participants from 10 different units of Raymond Group, the event proved to be a huge success for everyone involved.


*CAPACITY BUILDING TRAINING, KEP EVENT,*

### Tools and resources

Raymond Limited, Vapi has been certified ISO 9001, ISO 14001 and OHSAS 18001 for many years. ISO 50001 was the first international standard to be adopted at a corporate level through a governing code of practice for establishing energy management systems. The PDCA cycle tool has been extensively used in implementing EnMS in Raymond Limited, Vapi.



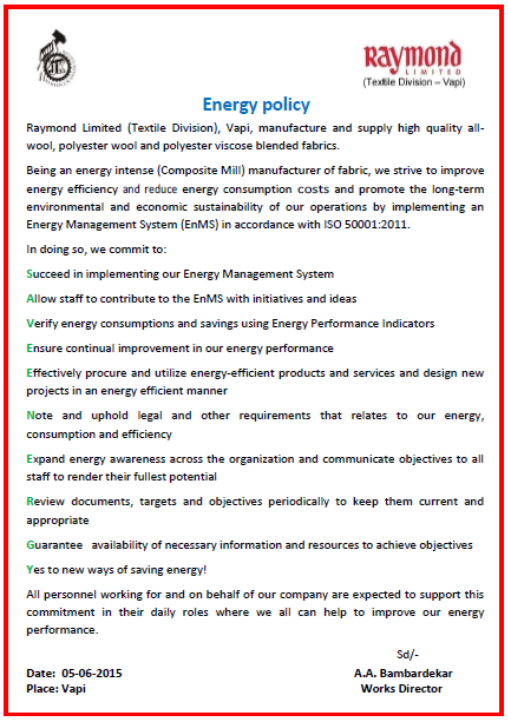

Advanced IT based tools like Online energy monitoring system and report generation, SAP based Energy efficient product procurement, E-based document management system are also utilized to boost the plant's energy performance.

## Lessons learned

Implementation of ISO 50001 has been highly instrumental in driving the energy initiative and moving towards the goal of sustainable development. Raymond Ltd, Vapi, went through a learning experience while implementing the energy management system.

### Keys to success:

- Coordination and knowledge sharing among each and every department should be transparent.
- Roles and responsibilities should be clearly defined.
- Accuracy and authenticity of data is of utmost importance.
- Maximum participation of employees at all levels.
- Reliable metering and monitoring systems.
- Rewards & recognition of energy related achievements.



Raymond (Textile Division – Vapi)

**Energy policy**

Raymond Limited (Textile Division), Vapi, manufacture and supply high quality all-wool, polyester wool and polyester viscose blended fabrics.

Being an energy intense (Composite Mill) manufacturer of fabric, we strive to improve energy efficiency and reduce energy consumption costs and promote the long-term environmental and economic sustainability of our operations by implementing an Energy Management System (EnMS) in accordance with ISO 50001:2011.

In doing so, we commit to:

Succeed in implementing our Energy Management System

Allow staff to contribute to the EnMS with initiatives and ideas

Verify energy consumptions and savings using Energy Performance Indicators

Ensure continual improvement in our energy performance

Effectively procure and utilize energy-efficient products and services and design new projects in an energy efficient manner

Note and uphold legal and other requirements that relates to our energy, consumption and efficiency

Expand energy awareness across the organization and communicate objectives to all staff to render their fullest potential

Review documents, targets and objectives periodically to keep them current and appropriate

Guarantee availability of necessary information and resources to achieve objectives

Yes to new ways of saving energy!

All personnel working for and on behalf of our company are expected to support this commitment in their daily roles where we all can help to improve our energy performance.

Sd/-

**Date: 05-06-2015**
**Place: Vapi**

**A.A. Bambardekar**
**Works Director**

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
Accelerating the Transition to Clean Energy Technologies

ipeec