

Raymond Limited, Khadki



An ISO 50001:2018 certified company.

Case Study Snapshot	
Industry	TEXTILE
Product/Service	All wool, polyester wool and polyester viscose blended fabrics.
Location	Vapi, Gujarat.
Energy performance improvement percentage (over the improvement period)	0.55 % improvement over 1 years (2021-22)
Total energy cost savings (over the improvement period)	USD 40381
Cost to implement Energy Management System (EnMS)	USD 33908
Total energy savings (over the improvement period)	2850 GJ
Total CO ₂ -e emission reduction (over the improvement period)	380 Metric Tons

Organization Profile / Business Case

RAYMOND LIMITED, Khadki, is one of the three suiting production division of Raymond organization. The installed capacity of the unit is 154 looms and 21840 spindles. The unit has a work force of more than 1900 people.

The plant is located on a 100 acre plot with a built-up area of 1,40,000 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 2006.

Being energy intense manufacturer of fabric, Raymond goal is to improve energy efficiency and reduce energy consumption cost and promote the long term environmental and economic sustainability of our operation by implementing an Energy Management system (EnMS). Also, Raymond plan is to utilize 30% of its total energy consumption through renewable sources by 2025.

The Top management of Raymond is always committed in improving the Energy management system, and it is shown as Raymond has upgraded its energy management system by implementing ISO 50001:2018, which was released in Aug-2018. They have created an environment which allows all members in the unit to share their initiative and ideas. They periodically review documents, targets and objectives pertaining to energy management. They created a system to spread awareness about energy efficiency and conservation across organization and communicate its objective to all. They encourage all to procure more energy efficient products and services and design new energy projects in an energy efficient manner.

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Raymond limited, khadki plant has received many accolades such as **National Energy Conservation Award**, Certificate of Merit, 2019, **Gujarat Green Award** for Sustainability 2019, “PLATINIUM AWARD” under **Apex India**

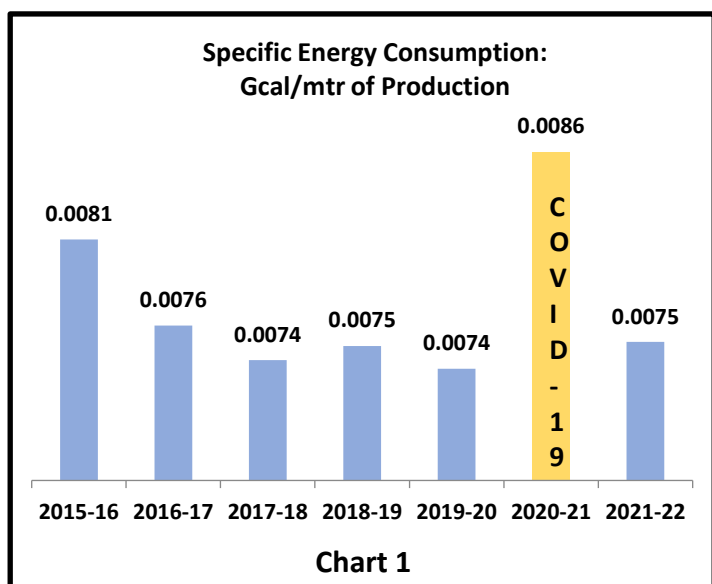
“Energy conservation is the foundation of Energy independence, and ISO 50001 is helping us to attain energy independence.”

— Harish Chatterjee (VP Manufacturing)

Green Leaf Award 2021 for energy efficiency, **CEM (Clean Energy Ministerial)** Insight Award for Energy Management 2018 and “GOLD AWARD” under **Apex India Green Leaf Award 2019** for energy efficiency.

Business Benefits

Raymond limited, Khadki unit has understood the importance of energy management system and implemented the system in the year 2016. After successfully implementation of ISO 50001:2011 in the year 2016, the unit has shown tremendous improvement in energy performance. In the subsequent years, the unit energy performance has only got better as can be seen in **Chart 1**. After reaping the benefits of Energy management system, the management got to know about the up gradation of ISO 50001. In 2019, this was also the recertification year; the management decided to upgrade its EMS system and got recertified with Upgraded ISO 50001:2018.



Raymond limited, khadki unit is a designated consumer (DC) as per the norms laid down by the Ministry of Power under Perform, Achieve and Trade (PAT) Scheme. The unit was given the target of reducing its energy consumption by 6% in PAT Cycle III (Apr-16 to Mar-20) by implementation of various energy saving initiatives. At the end of the cycle period, i.e. after Mar-20, the unit has accomplished a saving of 11.6% against the given target of 6%. The unit has done M&V (Mandatory MONITORING and VERIFICATION) through BEE (Bureau of Energy Efficiency) accredited External Energy Auditing Agency and had submitted the related document to BEE.

The saving of 11.6% (2720.8 TOE) which the unit has gained is mainly by proper planning and execution of

Energy Saving initiatives through ISO 50001 Energy Management System.

The unit got Recertified by ISO accredited Agency DNV-GL in the year 2019. The emergence COVID-19 in the FY 2020-21 had impacted nearly all business. The unit was also severely impacted and can be seen in **Chart 1**, but in FY 2021-22, the unit got back to its feet, by undertaking energy saving initiatives. For energy performance measurement of FY 2021-22, we have considered FY 2019-20 as baseline period. The various energy saving projects with capital investment are shown in **Table 1**.

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Table 1

Sr. No.	Project description (2021-22)	Energy Saving in kWh	Energy Saving in MT	Savings in \$USD	tCO2 Reduction
1	Installation of 1000 CFM Low Pressure Compressor	244875	70	33696	315
2	Installation of free float traps in ETP Sludge Drier	0	29	3393	47
3	Installation of PNLD in Weaving Compressor No.2	4375	0	455	4
4	AC Drive installation in 1 Nos. CT fan motor of Weaving Chiller (11 KW)*	422	0	958	0.4
5	Replacement of Old Motor by high efficient IE3 Motors (1 No.) in ETP Return Water Pump (5.5 kW)	639	0	76	0.5
6	AC Drive installation on Sanjay-04 machine circulation pump motor (11 KW)	14556	0	1547	12
7	AC Drive installation on Sampling FM Machine Suction motor(5.5 KW)	2451	0	255	2

*** Motor running for 8 months.**

The Total energy performance improvement = ((Total energy saving in FY 2021-22)/(Baseline FY 2019-20 energy consumption))*100, this is equal to 0.55% over the baseline period. Also unit has mitigated 380 tCO2 in the FY 2021-22.

Implementing EnMS has enabled the unit to create positive attitude toward energy use in each and every person in the company, thus encourages confidence in their personal lives of utilizing energy saving products such as solar panels, LED lights etc.

Raymond has efficient commercial teams which always look out for energy efficient products and services at a reasonable cost. They had created vendor which provides material or services as per our norm of energy efficiency product/services which are stated in the Purchase orders.

Plan

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 team which formed the core of the energy management system of the plant.

The salient features of Raymond EnMS system include:

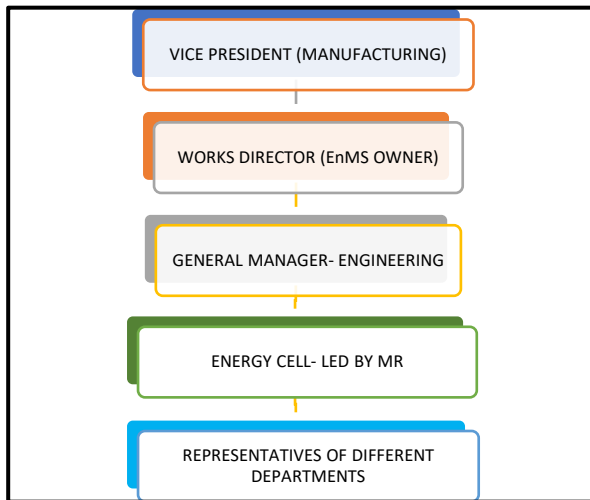
- A proper hierarchy based structured energy cell.
- An energy policy that reflects the image of the organization towards energy conservation.

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- 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.



Plan for 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 an energy conservation project. We present a cost-benefit analysis of each project to the management, which enable the management to provide financial commitment and resources, based on the below criteria.

The criteria for electrical and thermal 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)	> \$6447	\$3868 to \$6447	\$1289 to \$3868	<\$1289
Payback months	> 36 Months	36 Months	24 Months	12 Months

Prioritization Criteria (Thermal)				
Parameters	1	2	3	4
Annual energy savings MT	<1 MT	1 TO 10 MT	10 TO 50 MT	>50 MT
Implementation cost (\$USD)	> \$6447	\$3868 to \$6447	\$1289 to \$3868	<\$1289
Payback months	> 36 Months	36 Months	24 Months	12 Months

A score of 32 and higher enables the project to be taken into consideration as significant. Also, **Zero investment opportunities** are also considered as significant projects. The above matrix helps to decide the management where to focus resources and prioritizing actions.

The following cost benefits and energy benefits were achieved during 2021-22.

- **Total Electrical Savings: 267317.98 kWh**
- **Total Coal Savings: 98.82 MT**
- **Total energy cost savings: \$ 40380.76 USD**
- **Cost to implement EnMS: \$ 33908.21 USD**
- **Payback period (years): 0.84**

Plan 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 2021-22) is selected to evaluate historic energy consumption and identify trends. The period selected is a

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representative of the variation in organizational operations (e.g. production, CDD, count, PPM etc.). Wherever appropriate, energy use and consumption information have been analysed making **use of linear regression**.

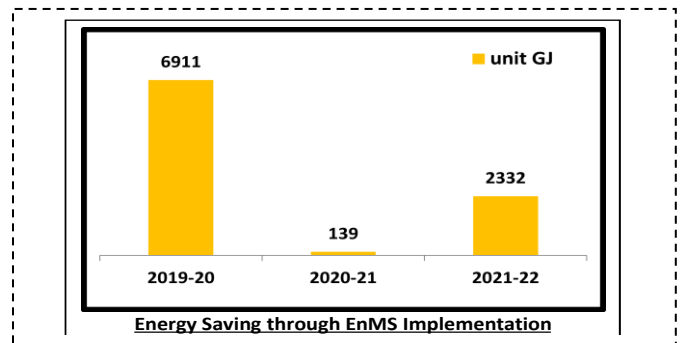
Linear regression is a useful tool in analysing and predicting the future trends of energy consumption.

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

- Identification and classification of all energy units in our plant i.e. ENERGY REVIEW. (A picture of Energy Review for FY 2021-22 and related SEUs, which contributes to 88.13% of total energy consumption of plant, is shown below).
- 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.

**“Save Energy Equate to save Money.
Energy and business go hand in hand.
EnMS is the best tool to achieve Energy
conservation.”**

— Mr. A. A. Bambardekar, Works Director



In 2019, Raymond got recertified with ISO 50001:2018 from ISO 50001:2011, as our certificate was getting expired. The scope of work remain the same, the process of implementation of ISO remain the same.

Do, Check, and Act



Raymond's Energy Policy

The management, MR and EnMS team were involved in the implementing the EnMS System in the Plant/Unit. First an energy policy (shown below) is created showcasing Raymond commitment towards improvement in energy performance. The management appoints MR to lead the EnMS team and implement the system effectively. EnMS team is creating by the top management with consulting MR. A member from each department of the unit constituted the team. The member is responsible for addressing the energy performance of his/her department as a system, process and equipment with the Department HOD.

To implement the system successfully the top management arranges training related to EnMS to all the members of the EnMS team, which enhance the skills required to implement the EnMS system effectively. Various other activities such as celebrating Energy Conservation day on 14th Dec each year help to spread awareness, support and motivation among each and every employee towards energy use, energy conservation and various energy saving opportunities.

As said in the plan, the process of the unit is divided into system, processes and equipment. The systems comprise 88.13% of the total energy consumption of the unit and are tags as SEUs (significant Energy uses). Analysis of the

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system are done on monthly basis through regression technique and is recorded accordingly in the excel format. An example of energy performance analysis done on the system SEU Weaving Department is shown below. **Table 2** and **Table 3** provide the data of weaving department consumption for the FY 2019-20 and FY 2021-22.

Table 2					
Actual Weaving department production and kWh consumption of FY 2019-20					
Month	Actual consumption in kWh	Production Quantity	PPM	AW Production	PV Production
Apr-19	430585	459660	2664	35457	343348
May-19	463546	490796	2550	15694	435823
Jun-19	430870	396608	2640	16673	421737
Jul-19	437972	375353	2757	92803	340419
Aug-19	414503	338102	2754	77857	341395
Sep-19	428536	662602	2674	23151	127962
Oct-19	378116	524678	2774	13196	133464
Nov-19	401497	667238	2811	15761	40930
Dec-19	449701	739327	2744	14605	76131
Jan-20	421484	497507	2882	86830	159122
Feb-20	400169	450477	2930	84614	160897
Mar-20	304022	424856	2767	20986	105837
Total	4961002	6027203	2745	497627	2687063

Table 3					
Actual Weaving department production and kWh consumption of FY 2021-22					
Month	Actual consumption in kWh	Production Quantity	PPM	AW Production	PV Production
Apr-21	394445	466519	2687	53108	227438
May-21	351182	245425	2643	142064	295296
Jun-21	219325	180426	2913	18771	129647
Jul-21	406620	382448	2929	65010	267989
Aug-21	391576	384909	3026	51304	229562
Sep-21	393023	459355	2924	40830	195879
Oct-21	404330	474586	2908	76411	154871
Nov-21	333978	287808	3034	83450	181016
Dec-21	380018	471321	2858	81302	99474
Jan-22	373007	439625	2880	44607	150259
Feb-22	362293	404529	2985	110388	95686
Mar-22	370678	487809	2999	74595.91	64865.20
Total	4380475	4684760	2899	841839	2091980

As shown in the above table, in weaving energy consumption is basically affected by Production, PPM, AW Production and PV production, so taken them as variable for analysis the energy performance. Based on the data above we done regression analysis and predicted the outcomes for FY 2021-22. The outcomes of regression analysis are below in Table 4.

Table 4		
Base line 2019-20 Regression analysis output		
Multiple R	0.993271584	
R Square	0.986588439	
Adjusted R Square	0.97892469	
Standard Error	6010.815647	
	<i>Coefficients</i>	<i>P-value</i>
Intercept	-355406.3951	0.053850736
Production Quantity	0.503534353	3.42447E-07
PPM	140.3291563	0.029798383
AW Production	0.533174181	0.002138647
PV Production	0.484681983	5.60261E-06

Based on the outcomes we predicted the expected energy should consume given the variable affecting (i.e. production, PPM, AW Production, PV Production) its energy performance. After getting the expected energy

consumption we check the variation in expected and actual consumption of the department, so that profit or loss in the energy performance can be accessed.

(Formulae for predicting expected energy

$$y = m_1x_1 + m_2x_2 + m_3x_3 + \dots + m_nx_n + c$$

Below is the variation table of weaving department for FY 2021-22 with baseline of FY 2019-20 (Table 5).

Table 5			
Month	Actual consumption in kWh	Expected Consumption	% Variance
Apr-21	394445	395125	-0.17
May-21	351182	357994	-1.90
Jun-21	219325	217066	1.04
Jul-21	406620	412769	-1.49
Aug-21	391576	401632	-2.50
Sep-21	393023	402925	-2.46
Oct-21	404330	407415	-0.76
Nov-21	333978	347491	-3.89
Dec-21	380018	374542	1.46
Jan-22	373007	366682	1.73
Feb-22	362293	372421	-2.72
Mar-22	370678	382256	-3.03
Total	4380475	4438318	-1.30

So from the above table it can be seen that in weaving department, the overall saving of 1.3% (57843 kWh) occurred in FY 2021-22, on comparing with baseline FY 2019-20.

The above method is adopted of each SEUs and determine their energy performance for FY 2021-22. Any major deviation is identified and reasons for the deviation are recorded for each month.

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 through MRM on 6 month basis. Through MRM management ensure the EnMS support the strategy and target of the organization and gives valuable feedback on improvement required to achieve targets.

Total energy saving action taken in the FY 2021-22 was 24 Nos. Total energy saving expected through these actions was 377004 kWh and 881.17 MT of Coal. The actual saving achieved in FY 2021-22 are 267318 kWh and 99 MT of Coal.

ISO 50001 has also motivated Raymond towards sustainability. Raymond, from the starting, has always supported the utilization of renewable energy. In 2017, we first installed 640 kW Solar Roof Top Power plant. In 2019, we procured 2.2MW Renewable Wind Energy through a bilateral agreement. In 2021, we extended the bilateral agreement of 0.84MW to purchase Renewable Wind energy. In 2022, we now started purchasing 3MW Hybrid energy (wind + Solar) through bilateral Agreement. Below is the annual renewable power procurement through wind generator.

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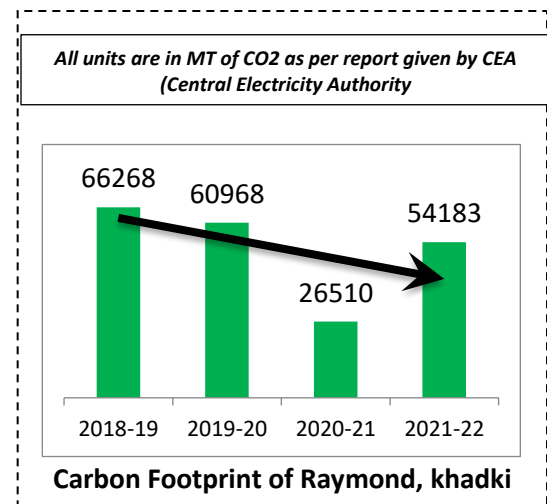
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Financial Year	Annual kWh (lac)
2019-20	56.40
2020-21	29.46
2021-22	81.93

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. Additional benefit of implementing the EnMS system is it not only improve Raymond insight toward energy performance but also it has given a tremendous boost toward reducing our GHG emissions as can be in the graph.



Transparency

Raymond limited, is one of the leading pioneer industry in the global textile industry. Having ISO certification helps the consumers/customers understand Raymond commitment toward Quality, safety, Environment and Energy.

Publically, displaying the ISO 50001 certification, not only improve the Raymond Brand value but also encourage the sales of the company, thus lead to greater revenue.

We are providing the certificate to “Office of textile commissioner” which is a government entity. Also, to obtain export order, the customer often enquires regarding ISO certification. For getting Institutional orders, we provide detail of our ISO certification in the tender.

What We Can Do Differently

If, Raymond limited, were to implement ISO 50001, all over again, we would be more focused at an equipment/machine level which consumes more energy, at an initial level of implementation. We would be interested in each and every machine consumption, so would have procured energy meters, air meters and other required meters for each and every machine/equipment’s. This would have not only help in achieving saving in energy but also would have make the implementation of EnMS system thoroughly.

After implementing the upgraded ISO 50001:2018 in the year 2019, the next step is to maintain the system and look for more energy saving opportunities.

The future plan for Raymond regarding the EnMS system is to make a virtual platform where we can get data/report of all energy for each and every machine.

Thank you.