

ISO 50001 Energy Management System Case Study

Sultanate of Oman

Areej Vegetable Oils & Derivatives S.A.O.C (AVOD)

First organization in Oman to implement an ISO 50001 energy management system (EnMS)



Fig (1): Areej Vegetable Oils and Derivatives production line

Organization Profile & Business Case

Areej is one of the leading fast-moving consumer goods (FMCG) companies in Oman, founded in 1980. We are an integrated manufacturer of a wide range of products such as: cooking oils, vegetable ghee, margarine, specialty fats, butter, mayonnaise, salad dressings and ketchup. Our products serve the local market as well as over 30 Countries around the globe. We are also partnered with many of the major brands to fulfill their production requirements in the region such as: Unilever, Emborg, Heinz, Hellmann's, Knorr. Our plant capacity is 240,000 tonnes of oil per year and our staff strength is 750 employees.

“Through ISO 50001 implementation, we are able to maintain our competitiveness in the market and deliver to our customers the most cost-effective and high-quality products”

—Eng. Salem Al Bortmany, CEO

Case Study Snapshot

Industry	Food Processing
Product/Service	Processing, manufacturing and warehousing of cooking oils, vegetable ghee, butter, margarine, specialty fats, blended butter, mayonnaise, ketchup, and salad dressing.
Location	Rusayl, Muscat, Oman
Energy management system	ISO 50001
Energy performance improvement period	1 Year (Jan 2018 - Dec 2018)
Energy Performance Improvement (%) over improvement period	Electricity: 11% Natural Gas: 23%
Total energy cost savings over improvement period	USD \$779,000
Cost to implement EnMS	USD \$138,520
Total Energy Savings over improvement period	43,763 GJ
Total CO₂-e emission reduction over improvement period	11,382 metric tons CO ₂ -e

Motivation

In January 2017, the Omani government introduced a Cost Reflective Tariff (CRT) for all large electricity consumers with greater than 150 MWhr of electricity consumption per year. For many years previously, Oman electricity tariffs were flat and very low. The CRT tariffs introduced a time-of-use tariff scheme to Oman with high electricity rates in peak times during the summer months, which resulted in a large 62% increase in Areej's 2017 electricity bill compared to 2016 (while maintaining a consistent production output). This was the key motivation for Areej to take the initiative to correct the situation and bring our operational expenses back in control, while reducing also our GHG footprint (in line with the direction of the Omani government and the global sustainable development goals).

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After some research, ISO 50001 was found to be the global best practice for energy management and energy cost reductions of industrial organizations. Since the ISO 50001 approach focuses on staff behavior and operational controls to drive energy performance improvements, it was found to be in line with management's high-level business strategy of empowering its staff to improve performance through continuous education and cultural changes.

Areej launched its EnMS program in September 2017, working with an external consultant to provide coaching, mentoring, and training throughout the one-year EnMS implementation timeline (see Figure 2 below). The Areej EnMS concentrates on practical measures to improve energy performance, with a focus on operational controls, staff behavior, and the minimization of unnecessary documentation. We also installed more energy meters and upgraded our equipment for improved energy efficiency by installing energy efficient motors, variable frequency drives (VFDs), pumps, and insulation. Implementing the guidelines of the standard played a crucial role in bringing our energy expenditures back under control and helped in achieving our energy and financial targets for the year. It also enabled us to maintain our competitiveness in the market by bringing down our production costs.

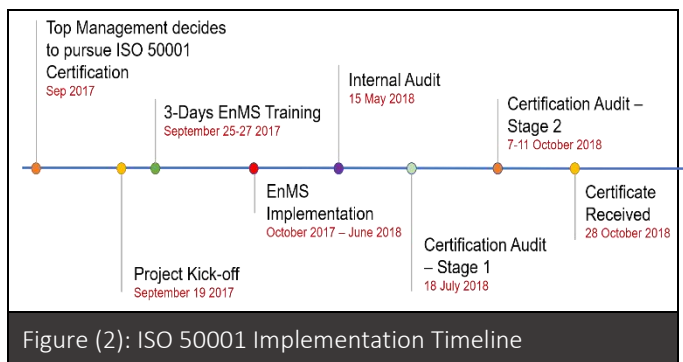


Figure (2): ISO 50001 Implementation Timeline

Business Benefits

With the focus to reduce energy expenditures and CO₂ footprint, our company implemented an ISO 50001 EnMS as a part of an overall medium-term change management strategy that aimed towards achieving the

highest level of efficiency and resource utilization. Being the first company in Oman to adopt an ISO 50001 EnMS and one of the few in the region, EnMS helped us get back on track towards our goal of mitigating the impact of the CRT completely in 2 years while reducing our GHG emissions.

Prior to implementing our EnMS, Areej was very immature in energy management, due to the very low electricity and natural gas prices in Oman prior to the introduction of the CRT. Since the implementation start in September 2017, Areej has proven that with a tailored EnMS dedicated to empowering its staff with training and providing them the platform and the tools to take ownership of their operations, it's possible to achieve outstanding savings with simple daily measures. This is the beauty of ISO 50001 compared to other investment intensive initiatives such as retrofitting and renewable energy. The achieved benefits include both energy and non-energy and can be summarized as follows:

- ✓ Impressive savings in both electricity and natural gas by 11% and 23% respectively in 2018, for a combined energy savings of 43,763 GJ for the same period. Approximately 74% of these savings come directly from operational savings alone.
- ✓ Water savings of 15% or 26,487 m³ in 2018 (while not an energy source, water management was also included in the EnMS)
- ✓ Utilities cost reduced by 22%
- ✓ Reduced CO₂ emissions by 18%
- ✓ An 18% improvement in the conversion factor for our raw material to finished goods
- ✓ Monitoring our energy consumption on a daily basis helps in better understanding of our energy users allowing us to challenge the operating parameters while strengthening the operational controls.
- ✓ Increasing the awareness level among the workforce enables them to take more control towards achieving the energy efficiency targets. Areej staff contributed 100 improvement opportunities in 2018 alone.

- ✓ Improved energy monitoring by installing smart energy meters and gas flow meters in the most critical areas.

EnMS Costs

Implementation of the EnMS is estimated to have cost \$138,520—including internal staff time spent to develop and implement the EnMS. This cost estimate takes into consideration the following elements:

- Internal staff time devoted to develop, implement and maintain the EnMS. Internal staff included 1 energy manager and a variety of supporting cross-functional staff, with total staff time estimated to be 3.7 FTE over the 1-year implementation period (3.7 person-years).
- Third-party certification audit
- External technical assistance (consultants)
- Communications and internal printing such as printed posters, banners, etc.

“ISO 50001 is a tool that helped us to better understand our consumption trends and systematically control it”

—Eng. Imam Ergawi, Energy Manager

Plan

In May 2017, Areej staff attended a seminar conducted by the Oman Authority for Electricity Regulation in order to help large electricity consumers organizations in Oman to better adjust to the new electricity CRT using strategies like ISO 50001. After learning about many case studies showing the benefits of ISO 50001, Areej leadership was convinced that this proven strategic approach would be the right tool for the organization to better manage its energy consumption and energy costs.

The culture of continuous improvement requires frequent human driven changes to energy consuming systems and practices. This necessitates a high-level commitment and continuous support from the top management to adopt and support the initiative. Such understanding was the cornerstone in providing the

work frame and resources that enabled individuals to carry out such changes. As such, EnMS implementation started with Areej operations staff first developing the project charter and business case, which was presented to top management along with energy cost trends. Once it became clear of the specific potential benefits that could result from low-cost savings measures, leadership increased their support and provided full resources to support ISO 50001 adoption. The scope and boundaries statement and Areej Energy Policy was developed shortly thereafter to codify top management’s commitment.

We then conducted a simple energy audit to better understand our consumption patterns. And we developed an energy balance to better identify the significant energy uses (SEUs), which was the basis for identifying our energy saving opportunities (Figure 3).

Following the energy audit and development of the energy balance, we began to work on the targets and goals for the energy saving for the year. Since we did not have any previous data or experience to refer to, our top management took the lead and suggested targets to align with their objective of mitigating the impact of the CRT in a total period of 2 years. These targets were then re-evaluated every quarter by the energy team and the top management based on our achievements and revised if needed. These meetings were key to ensure continuous support and leadership towards achieving the set targets.

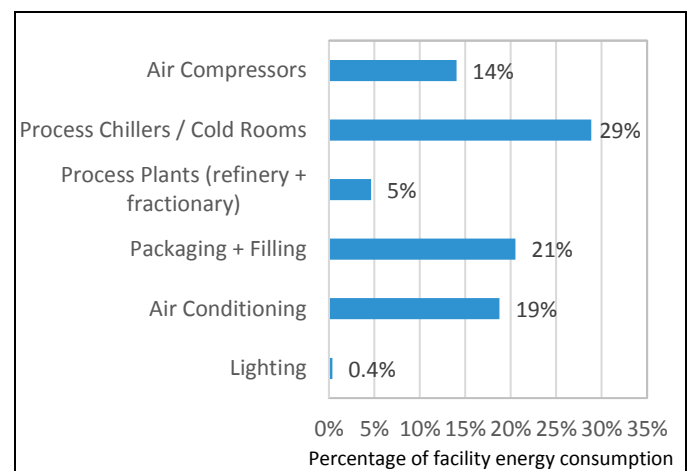


Figure (3): Electricity significant energy uses (SEUs). Identification of SEUs helped us prioritize saving efforts.

“Our Employees are more capable of energy management on a daily basis thanks to the continuous training and coaching driven by our ISO 50001 initial gap assessment”

—Mohamed Yaqoob – HRD

Do, Check, Act

A cross-functional energy team was established, with members carefully selected to represent different parts of the organization. This team led the planning and implementation of the EnMS. An energy manager and management representative were appointed.

The team determined to meet regularly to check on the implementation status, review and coordinate work between departments, analyze consumption trends, and evaluate new saving opportunities identified by any Areej staff. Top Management (the CEO) is actively involved and personally attends energy team meetings to motivate the team, ensure smooth operations, and provide the necessary support as soon as it is needed.

In Areej we understand the importance of defined roles and clear targets for everyone, and with this project, it was no exception. That is why, a *Roles and Responsibilities matrix* was developed for all the major stake holders throughout the implementation stages. This was very important to essentially build the culture that energy management should be seen as an integral part of the daily routine for everyone across the company, and not just the responsibility of the energy team or a single department.

A project timeline and a tasks table were both created to facilitate the implementation and ensure progress. This was based on the requirements of the standards as well as any other Areej’s identified requirements.

Historical energy data was used to develop the baseline for electricity, natural gas, and water. Data collection and record keeping was improved to facilitate the process of energy data collection, feeding into dynamic regression models developed specifically to analyze and monitor the facility’s energy performance. Energy data was

normalized to take into account all relevant variables including production shifts and mix, oil processing and refining quantities, bottle and cans making, and weather (HDD/CDD) to give an accurate picture of the energy expectations vs. actuals. Using this Model, energy savings were determined by comparing modeled 2018 energy consumption to the 2017 baseline period, representing the consumption in each energy source under its present condition. This method enabled us to closely monitor and understand our performance trends on a daily basis and gave us the ability to quickly react in case a deviation was detected in a focused manner. The graph shown in Figure (4) below shows our normalized energy performance improvement.

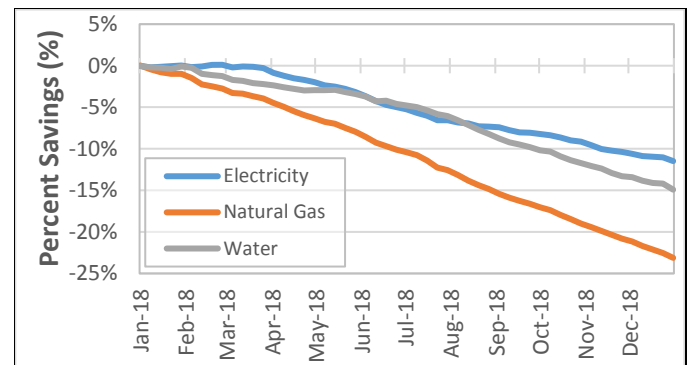


Figure (4): Normalized energy performance improvement for electricity, natural gas, and water in 2018 based on weekly data points that take into account factors including production and weather.

The key EnMS tool used to collect and evaluate identified saving opportunities by Areej staff is a live energy savings opportunities (ESO) spreadsheet that serves as the centralized location to detail all plant energy savings opportunities and action plans. Each ESO includes details including:

- Identification date and who identified it
- Description of opportunity
- Estimate of potential energy and water savings and any relevant project implementation risks
- Implementation status (Idea, In-Progress, Rejected, On-Hold, Complete)
- Responsible staff
- Target/actual completion dates
- Measurement & verification details

Each ESO idea is studied by the energy team based on the savings/cost ratio and agreed upon ideas are assigned to individuals responsible for implementation and verification of the savings. Following implementation, the savings from each idea was validated/verified using an appropriate method (e.g., measurements, calculations, etc.), with methodology described in the ESO spreadsheet. This approach promotes a more systematic approach to energy management and ensures continuous employee engagement.

As a result of EnMS implementation, Areej achieved financial savings of USD 779,221 while bringing down its energy consumption in electricity, natural gas, and water by 11%, 23%, and 15% respectively for the reporting period of January to December 2018. The majority of these saving came from low-cost projects such as:

- Condensate recovery for feed water
- Reduction of Compressed Air pressure
- Heat Recovery from hot water
- Air Compressor Centralization project
- Installation of 13 VFDs/VSDs
- Staff energy awareness campaign
- Cold Rooms/Chillers set points optimization

Adherence to operational limits and parameters is key to ensuring the savings are maintained and steadily improved, and that is why it was necessary to strictly control and monitor them. Existing operational controls were carefully studied and challenged. A live document was developed for identifying the improved critical operational controls and parameters to ensure the most energy efficient mode in all operations. The list was made available to all concerned personnel and it was continuously challenged in an effort to maximize the savings. The energy team were responsible for ensuring that these controls are maintained at all times.

As we put efforts in managing performance for the existing equipment, we also believe that is equally important to do so for the newly purchased equipment. For that, we redesigned our procurement process for purchasing new equipment so that all proposals will be assessed and evaluated using a life cycle analysis

methodology by the energy team to ensure that only the most energy efficient equipment are considered.

EnMS success depends on the level of competence of those who are directly or indirectly involved in the implementation process. That is why training and competence management was carefully considered by Areej Management. The core energy team have undergone awareness training on various aspects of the EnMS by the consultants and then ensured the training process and engagement in EnMS for other employees. A training matrix was also developed specifically to identify the competence gap for individuals and was used to organize the necessary training according to the requirements or the level of involvement in the implementation either by the internal energy team or with the aid of the consultants. To date, the company managed to provide the necessary training to 160 employees from all levels. The trainings covered technical and non-technical aspects of EnMS.

EnMS results are checked during the Management Review Meeting set every 6-months. During that time, targets, gaps, implementation status, savings are all reviewed from a top level prospective.

It was also very important to us to make sure that our practices are in adherence to both the ISO 50001 standard's requirements as well as our internal procedures, our consultants assisted in carrying out a second party audit targeted at identifying gaps in the system that needs attention in preparation for the certification audit. Apart from that, we also carry out a periodic internal audit to promote continuous improvement in the system and methods.

The journey of implementation was not always a green road and we faced challenges at some point such as:

- Data collection and data quality, which we improved by introducing new recording systems and training the people on using them
- Availability of Information for estimating the savings for each ESO idea.
- General staff experience with energy management activities



Figure (5): Regular energy team meetings with cross-functional representation from across the organization

Transparency

Being a private company, we do not have any obligations to publicize our energy saving achievements. However, we do so in order to showcase to our customers that we always strive to make our products in the most cost-effective manner. We also aim to lead by example so that other businesses can be motivated to benefit more by saving energy and the environment. In that context, we published our energy management certificate on our website and we also participated in a number of energy efficiency conferences in the region where we presented our case study to entities from both the private and the public sector in order to encourage them to take the initiative in reducing energy consumption and CO₂ footprint in their respective work environments.

Lessons Learned

- Staff competence and knowledge in energy management are critical to achieving targets. Although training is continually provided as needed, identifying more technical training gaps, especially during the early stages of the project, could have helped us achieve even more savings.
- Human resistance to change can be the biggest challenge and should be continuously addressed with awareness building and motivation.
- An employee incentives program with monetary or non-monetary awards for energy savings ideas can help increase workforce engagement and help generate additional energy savings.
- Increased attention to ensuring the streamlining of our data collection process would have helped to save our team time later on in the project.
- Getting in touch with similar organizations that implemented EnMS would have helped us gain more practical experience in improving our system.
- Involvement of all employees, with commitment at all levels, is fundamental to the success of EnMS and ensuring continuous energy improvement.
- Achieving savings doesn't necessary mean large investments in fancy gadgets. It can be done by simply giving the people the tools to change and control their own work environments.
- Continuous guidance and coaching to energy consumption influencers are key to maximize savings.
- Energy management provides various non-energy benefits to the company, for example:
 - Increased staff knowledge on the importance of climate change and CO₂ emissions.
 - Improved the staff motivation thus increased the level of engagement in the work place.
- EnMS is a life-time journey, not a one-time project. Organizations that implement an EnMS should strive to continually improve energy performance and be a leader in energy management.

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.