ISO 50001 Energy Management System
Case Study

2021 Mexico

TRANE MONTERREY

World Class Energy Efficiency

Trane Monterrey Site 2021

Case Study Snapshot	
Industry	Manufacturing
Product/Service	AC Equipment and HVAC Units.
Location	Monterrey, Mexico
Energy management system	ISO 50001 & SEP
Energy performance improvement period, in years	3 years (2018 - 2020)
Energy Performance Improvement (%) over improvement period	12.5%
Total energy cost savings over improvement period	569k $USD
Cost to implement EnMS	74k $USD
Total Energy Savings over improvement period	22,743 (GJ)
Total CO_2-e emission reduction over improvement period	3,181 (Metric tons)

Organization Profile & Business Case

Born in 1991, Trane Monterrey as a branch of Trane Technologies Manufacturing is a leader in bringing sustainable climate innovations around the world through a broad portfolio of energy-efficient heating, ventilating and air conditioning systems for homes and commercial buildings.

We are a team of 700+ people with the focus to grow through client-centered innovations that improve our worlds quality of life and environment. We are driven by our companies' Sustainability Commitment created by our esteemed CEO Dave Regnery that consists of one ultimate goal: The Gigaton Challenge. We're reducing one gigaton – one billion metric tons – of carbon emissions (CO2e) from our products and manufacturing processes by the year 2030.

"The management system is not achieved by documentation but by the people."

—Rigoberto Mena, Maintenance Manager

Aligned to our important corporate strategy we (Trane Monterrey) began working on several initiatives towards a more sustainable tomorrow. The scope of this initiatives encompasses all strategic and operative areas

of the company. Our largest impact on environmental footprint relies on the manufacturing processes of our products and thus began our 5-year long journey of transformation.

Our first step was the creation of our Energy Committee in 2016 formed by an incredible group of people dedicated to deploying the 2030 Sustainability Commitment strategies and leadership principles. Searching for a standard that ensured our company would have a healthy energy management system, cost reduction, environmental impact and an increase in productivity we decided to certify ourselves in ISO 50001 and Superior Energy Performance in 2018. This way we demonstrate to our customers, employees and stake holders that efficient use of energy is prioritized in our organization and that energy is managed systematically.

The implementation has helped us achieved stability and control in our energy management processes. This has allowed us to start pursuing a new level of development resulting in the implementation of 77 projects that get us closer and closer to our net zero waste and carbon neutral objective.

To sustain and encourage the certification required actions and motivation to search for **bold solutions** we've generated an alignment between our company values/leadership principles and energy efficiency. One of our main objectives being to lead by example. Besides the Energy Management Committee an Internal Energy Committee (CIEn) was created to involve leaders of all areas and make sure our monthly reports, weekly topics and energy knowledge campaigns are cascaded to all employees.

This coalition has allowed us to capture the compromise of the personnel across the site allowing programs like the "Energy Suggestions Mailbox" where anyone in the plant can be allowed to propose, participate and implement energy improvement projects (Figure 1). During our Energy Performance Improvement Period we received and worked on 150+ suggestions.

The team created an Energy Showcase Display in both Plant 1 and 3 that exhibits real time information and graphics about energy, water and natural gas consumption. We've also added our Energy Policy, Sustainability values and information in the badges of all the personnel.

Figure 1. Energy Suggestion Mailbox participation #78

We're challenging others in our industry and communities to join us with several social responsibility programs that embody sustainability. These past years we've made several reforestation campaigns not only on our site but on our city. In 2020 in one of these instances a total of 50 trees were planted on site and 200 others were given to different participants to plant all over the city. Each year the reforestation participation is increasing confirming our commitment to a more sustainable tomorrow (Figure 2).

Figure 2. Reforestation Activity 2020 Trane Monterrey

We are advancing towards new technologies and clean energy generation. Our new star project is the installation of photovoltaic systems in the roof of our 3 different plants. We are expecting to generate 70% of our actual consumption just with the solar modules. This project will be finished mid-2022. We're also leveraging on Industry 4.0 projects such as the use and implementation of Trane Tracer SC (Application used to control and monitor the use of HVAC systems) all across the 3 sites allowing a remote control that helps in the reduction of our air conditioning systems which is our main significative energy use.

"An increase in employee engagement and knowledge in sustainability and energy efficiency subjects is one of many benefits from the ISO 50001 implementation."

—Rigoberto Mena, Maintenance Manager

Business Benefits

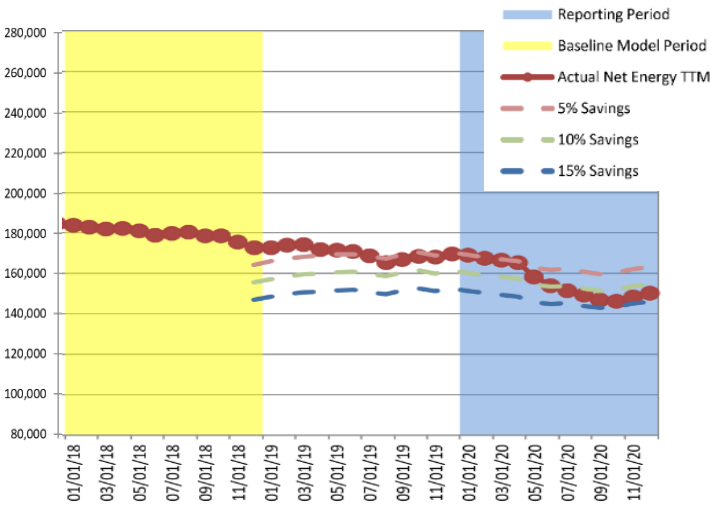

Figure 3. Reduction in Actual Net Energy Use TTM (MMBtu) (2018-2020) GT EnPI Tool v3.16.10

Since the implementation of ISO 50001 we have achieved a reduction of energetic costs of $569,000 dollars, energy savings de 22,743 GJ and CO2e emission reduction of 3,181 tons all adding to our energy performance improvement of 12.5% (Figure 3). After achieving our firsts results, we started paving the way to support the Sustainability Commitment not only holding up to our corporate goals but also making an impact on the world. We soon established ourselves in the top sites that contribute to this objective.

One company can change an industry and one industry can change the world: The most important benefit for us was the impact on our planet. We were able to manage energy consumption savings equivalent to 200 houses or a footprint reduction that saved 26,830 trees.

Other types of benefits were the improvement in environmental consciousness that our personnel developed not only understanding the impact for our company but also in our community and our world. The majority of the established projects during the energy performance improvement period needed their help and discipline; ideal results require ideal behaviors.

We believe the key to achieving these goals was the correct deployment and teachings not only to the personnel in the corporation but to our teams. Georgia Tech trainings and benchmark with several companies to really learn what is the correct way to implement ISO 50001, do the audits and reviews of information. We leverage on historical data to make decisions; we use Trane Tracer SC as the platform to storage and consult this data. We plan the strategic projects using this information during our Hoshin Kanri event.

Plan

Once a year the energy committee gets together in an exercise called "Hoshin Kanri", a methodology for setting and prioritizing annual targets that align with mid- to long-term plans (Figure 4). In this activity all levels of the organization are taken into account to make sure the true north of the company is prioritized. We expose the potential interactions with the other departments to make sure we have a successful coalition.

We focus on creating problem solving strategies and action plans leveraging on the Deming circle and the historical data created the previous years. During the 2020 Hoshin Kanri the goal of re-certification in 2021

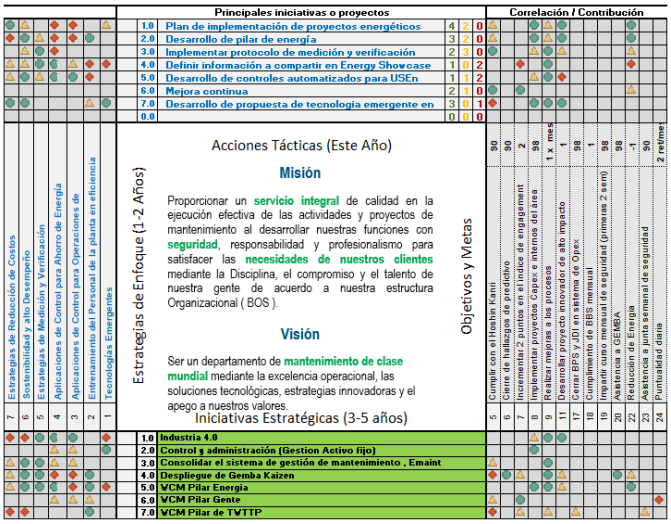

Figure 4. Hoshin Kanri X Matrix

was established, and we focused on identifying and eradicating the weaknesses of our EMS.

In our plan our main objectives were maintaining the pillars of the Energy Management System at its best. This task was simple, because the main benefit of implementing Hoshin Kanri method involves achieving a sustained high performance and ensures that members take initiative.

The key activities for seeking the recertification are:

- Maintaining the current Energy Management System.
- The Energy Committee received 60+ hours in training and diplomas for ISO 50001 2018.
- Training for internal audits.
- The generation of new registry, processes and systems that are required to qualify.
- Development and training for Audit Leaders.

"Continuous improvement of our Energy Management System is the key for success in ISO 50001."

—Rigoberto Mena, Maintenance Manager

During the first implementation, since the process was completely new to the company, there was uncertainty in regard to the process, energy savings and cost reductions. After the certification, recollection and analysis of historical data, the potential rewards expected surpassed actual results leaning our annual objectives towards a more advanced and innovative energy management system.

Do, Check, Act

As previously mentioned on this ISO 50001 recertification we focused our efforts on identifying the weakness of our system and we adapted new documentation to make it even more robust. We worked on a cultural strategy to raise awareness that the system is being maintained by them rather than by the documentation.

The team members that are involve in this recertification process comes from different areas and with different skills. We believe that by doing this we will have enriching discussions and innovative ideas that will bring value to the organization. One thing that played on our favor was that top leaders seek this type of initiatives with their groups. We have always received support from them and willingness to engage the rest of departments.

Key activities that helped improve energy performance:

- Hoshin Kanri
- Building Automation System in the 3 plants. (Trane Tracer SC for HVAC control)
- Installation of intelligent measuring gauges (IoT – Connected to Trane Tracer ES)
- DMAIC in HVAC Systems

We are sure these activities have a positive impact on our energy performance because over the past period of time we have seen improvement year by year, and the results of our energy performance indicators helps us bring confidence to know we are on the right path. For our 12.5% of improvement in energy consumption we utilize the Good Methodology with the suggested formula given on the instructions for the application of

this award. We compared reporting period with baseline period energy consumption.

$$\left(\frac{\text{baseline period energy intensity} - \text{reporting period energy intensity}}{\text{baseline period energy intensity}}\right) x\ 100$$

Figure 5. Formula used for determining our energy performance improvement.

For this data we took into account all the different sources of energy that we currently use in our site. (Electricity and Natural Gas).

We leverage on different tools to help us predict the energy consumption behavior for the following year, by doing so we can address specific projects to mitigate any extra consumption predicted. Each project done during the improvement period is corroborated by the recollection and analysis of data, supported by the predictive maintenance team that are the responsible for the installation of the power analyzers in the center charge of the equipment to review. With these data recollections the energy committee obtains the information required for the verification of our before and after improvement. Every project is documented in the Registry of Energetic Improvements Bottom Up.

We recently changed our procurement process of equipment that consumes electrical power. This initiative secures that we procure state of the art products and that what we buy is classified with high electric efficiency. All purchases are validated by the energy committee.

For the external audit we usually prepare to make sure we define the team members that will be involved during the actual audit week. We review extensively all documentation is in place in our organization cloud and Energy Management SharePoint.

Transparency

After obtaining the ISO 50001 certification we received a recognition from the Secretary Board of Sustainable Development of our state (Figure 6). This recognition confirms our efforts in reducing energy consumption and greenhouse gas emissions implementing and leading by example with actions against climate change.

Figure 6. Green House Gas Reduction Recognition by the State of Nuevo León

Other bodies involved in our transparency process:

- Trane Monterrey Site presentation of Case Study during **National Commission for Energy Efficiency Use (CONUEE)** for the 6th annual EMS forum. **(2017)**
- Case Study published on the website for the ***Commission for Environmental Cooperation (2017)***.
- Certification of ISO 50001 and Superior Energy performance by external audit party ***Advanced Waste Management Systems (AWM) (2018).***

What We Would Have Done Differently

Evaluations of performance after finishing a process are inherent to continuous improvement. Several steps were considered after thorough analysis of our actions. We concluded opportunity for development in the subject of new technology and data analysis simulations were missing.

One of our company values states the uplifting of our culture to other communities generating inclusive approaches and we had a lack of benchmarking activities with other certified manufacturing plants across the state. This activity has since been addressed and we've participated with the CLAUT Energy Committee to present our EMS to other 6 certified companies of Nuevo León, Mexico opening our work to feedback providing positive criticism that helps us focus on our areas of opportunity improving not only individual but team performances.

Our commitment to a responsible business affects everything that we do, we're leading our industry in sustainability practices and it's already having a positive effect. Trane Technologies will continue to push the boundaries on climate innovation creatin a plan for long-term growth for us and the planet.