ISO 50001 Energy Management System – Case Study

2022 BRAZIL

GENERAL MOTORS DO BRAZIL
SÃO JOSÉ DOS CAMPOS COMPLEX

EnMS-Team

general motors

Case Study Snapshot	
Industry	Manufacturing
Product/Service	Automobile company
Location	São Paulo, Brazil
Energy performance improvement percentage (over the improvement period)	19,78 % improvement over 3 years (2019-2022)
Total energy cost savings (over the improvement period)	USD 95,346.90
Cost to implement Energy Management System (EnMS)	USD 31,051.61
Total energy savings (over the improvement period)	5,374.8 GJ
Total CO_2-e emission reduction (over the improvement period)	144.67 Metric Tons

Organization Profile / Business Case

The São José dos Campos Complex develops the activities of manufacturing motor vehicles, whose direct activities include Vehicle Assembly, Sheet Cutting, Stamping, Assembly of Sub-assemblies by Sheet Metal Welding Process, Painting of Bodywork, Injection and Painting of Plastics, Engine, Transmission and Heads Factory, extending to other indirect structural activities associated with the Plant's activities.

The General Motors, through the establishment of objectives and targets that enable the continuous improvement of its environmental and energy performance, determinated a global target of 35% reduction in the MWh/Vehicle metric until the year 2035. We expect to meet this objective through the availability of resources, information, and support for the acquisition of environmentally and energy efficient products and services, aimed at reducing waste and managing the risks and opportunities of environmental aspects, compliance with laws, regulations and other environmental and energy requirements, as well as the prevention of pollution and good communication with all stakeholders.

The Complex implemented the “Energy Treasure Hunt” program, which focus on identifying energy reduction initiatives without costs or low investments, and recently the GMB São José dos Campos was recognized by the U.S. Environmental Protection Agency in recognition of their commitment to protecting the environment through improving energy efficiency by conducting an ENERGY STAR® Treasure Hunt and identifying 21,875,242 kBtu in potential annual energy savings.

"As more energy is managed more energy is saved ".
—Paulo Eduardo A. Souza, Manufacturing Operations Manager

Business Benefits

The implementation of ISO 50001 certification provided the complex with a greater engagement of employees in the energy efficiency. This engagement was strengthened by the creation of a committee made up of representatives from all areas that debate, through a monthly agenda, the viability of implementing energy efficiency initiatives, waste elimination, as well as the compilation of information for the correct monitoring of area energy performance. The initiatives taken after the implementation of the certification allowed an accumulated reduction of USD 95,346.90 in the structural cost of the Complex (Figure 1).
Between the years 2019-2022 our EnMS actions helped to reduce the consumption in around 5,374.8 GJ (144.67 Metric Tons) and the performance indicator increased 19,78 % (MWh)/vehicle).
The costs per year to implement the EnMS was around USD 31,051.61 with certification process and manpower to manage the informations about consumptions, forecast and budget.
One important action that the EnMS implemented was the preventive maintenance to identify compressed air leaking. This action eliminated approximately 300 leakings until now.

Figure 1 Recognition of Environmental Protection Agency

Plan

In 2020 we presented the benefits of ISO 50001 certification to senior management that were:
Establishing metrics, continuous improvement, creating a culture of eliminating waste and reducing structural cost.
As a result of this presentation the senior management approved the implementation of ISO 50001 certification and the expenses to implement was planned in the budget for 2021.
We developed a Daily Report (Figure 2) with the energy consumptions of areas to be presented at meeting daily.
After this the senior management started to be involved in energy management and the respective root causes of deviations from the target.

The EnMS created a review monthly with senior management for disclosing the initiatives and actions of the energy management committee, in this meeting the initiatives with payback lower than one year normally are approved and overtime to implement initiatives with low cost are approved too.
The EnMS monitore the energy consumption and establish targets for non-production period; production period and shutdown periods (Sunday and holydays) and daily the consumptions achieved off target are informed to area representative to evaluate the cause possible.
We periodically measure the energy consumed by compressed air leaks in the areas, that help to identify which areas have the highest number of leaks and the costs involved, justifying the prioritization of actions to eliminate leaks and reducing energy waste.

"The ISO 50001 provide benefits like continuous improvement, cost reduction, best energy control, and decreasing of energy consumption ".
—Silvio Fernandez, Energy efficiency engineer

COMPLEX							
		1-jun	2-jun	3-jun	4-jun	5-jun	6-jun
EE	Target	**339**	**339**	**339**	**164**	**80**	**339**
	Achieve	320	328	323	148	75	322
NG	Target	**250**	**250**	**250**	**44**	**36**	**250**
	Achieve	209	207	224	40	26	225

Figure 2 - Daily report

Do, Check, and Act

First, we created a energy committee with representatives of all areas and the site utilities representative managed this team.
After all representatives of the energy committee were trained in the ISO 50001 requirements interpretation and another group received the training to be auditors.
We also developed a visual management to monitor ISO 50001 requirements implementation status and we had a meeting monthly to evaluate the implementation.
Senior management produced a video that was shown on restaurants and areas TVs, where he called employees attention to the benefits of obtaining ISO 50001 certification and reinforcing actions to avoid wasting energy.
The main activities implemented in the ISO 50001 certification process were:
1) MAPPING - MAIN ENERGY SOURCES
2) MAPPING - SIGNIFICANT CONSUMPTION EQUIPMENT
3) MAINTENANCE & MONITORING
4) SHUTDOWN CONTROL
5) ENERGY EFFICIENCY INITIATIVES
6) RESULTS MONITORING
7) TRAINING AND WORKSHOPS
8) ADDITIONAL CONVERSATIONS
9) CALIBRABLE INSTRUMENTS
10) COMPRESSED AIR LEAK TAG SYSTEM

General Motors do Brasil de São José dos Campos defined that the baseline reference will be the year prior to the current year, obtaining as a information and analysis, the history from January 2020.
Our current indicator is MWh/vehicle, we converted the electrical energy and natural gas energy in MW.
There is a supervisory system that monitors consumption and demand in the areas online, which allows us to identify deviations from targets and compare the consumptions before and after the implementation of improvements.
Daily energy consumption graphs of the areas are published and action plans are established for deviations from the target

We have measurements of energy consumption in all production areas of the complex, which allows us to establish targets for the energy consumed per vehicle produced (MWh/Vehicle), that permit to identify if the actions are improved the metrics.
There is a monitoring of external temperature because the variation temperature influences at energy consumption, mainly of natural gas (figure 5), however there isn't equation yet to determine the consumption with the variation temperature, it will be necessary online measure to create this equation.
We weekly audit the shutdown (Figure 6) level of all the productive areas in non-productive periods, identifying waste and prioritizing actions to improve the shutdown level.
The metrics established in 2021 was achieved at Assembly (Figure 3), month by month the target was decreased (acceleration ramp), all the initiatives helped to reach the target at the end of the year.
Annually the energy committee realize a critical analyze of indicators, we compare the indicators achieved with the target (figures 3 and 4), that permit to define actions to improve the indicators performance.
EnMS sets the energy forecast and budget based on historical consumption, summer season, winter season, production volume and working days.
The current base load is around 2900 MWh (during non-productive period), the bigger consumption is in the air compressed generation, for this case small air compressor was installed to attend critical process and some valves were installed to turn off air compressed at the entrance of building. Another action is monitoring of shutdown demand to identify lighting, fans or air conditioners that weren't turned off.

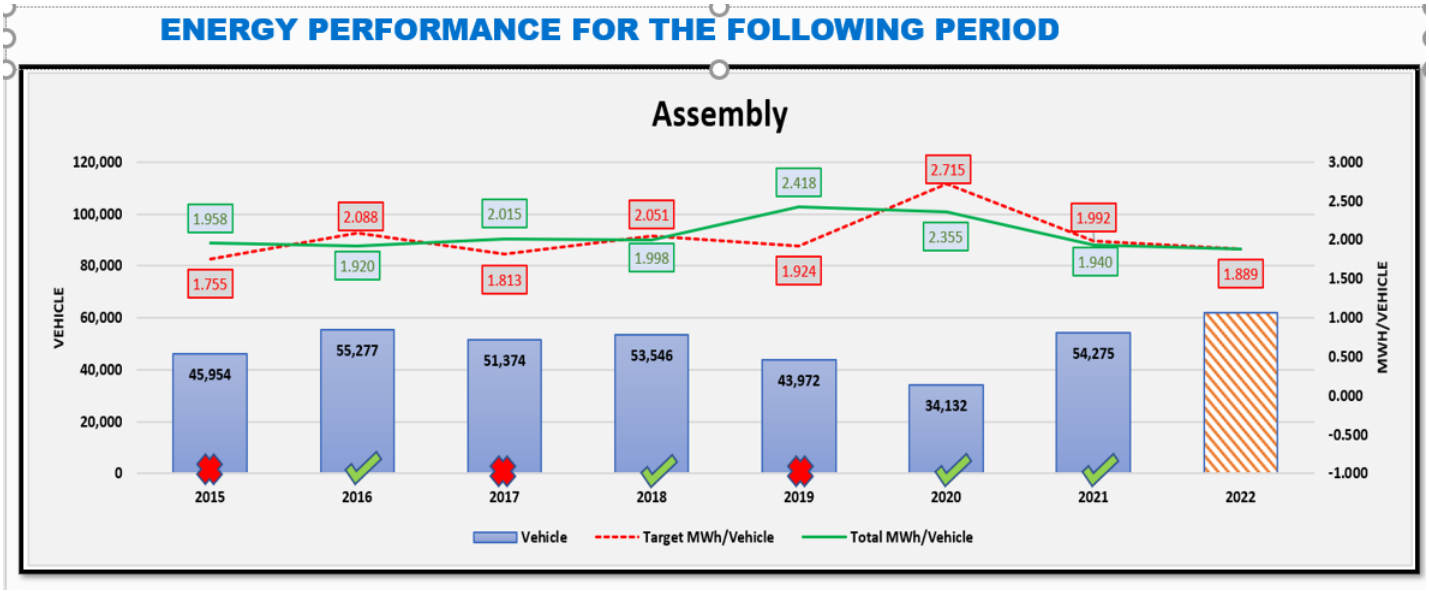


Figure 3 - Energy performance

CRITICAL ANALYSIS OF ENERGY PERFORMANCE AND RESPECTIVE INDICATORS

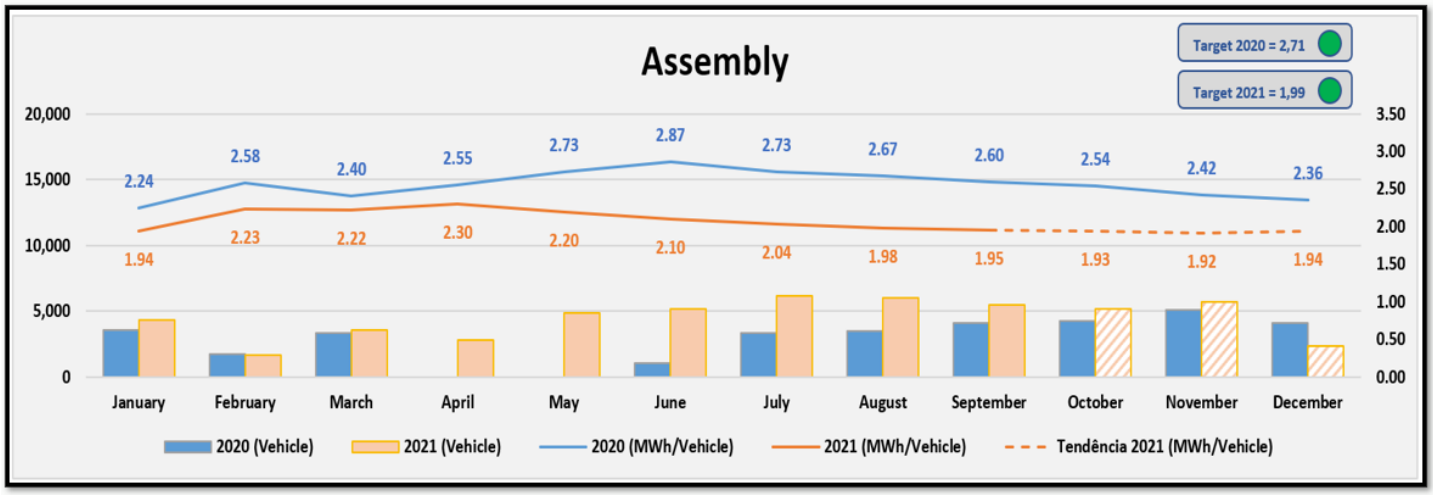
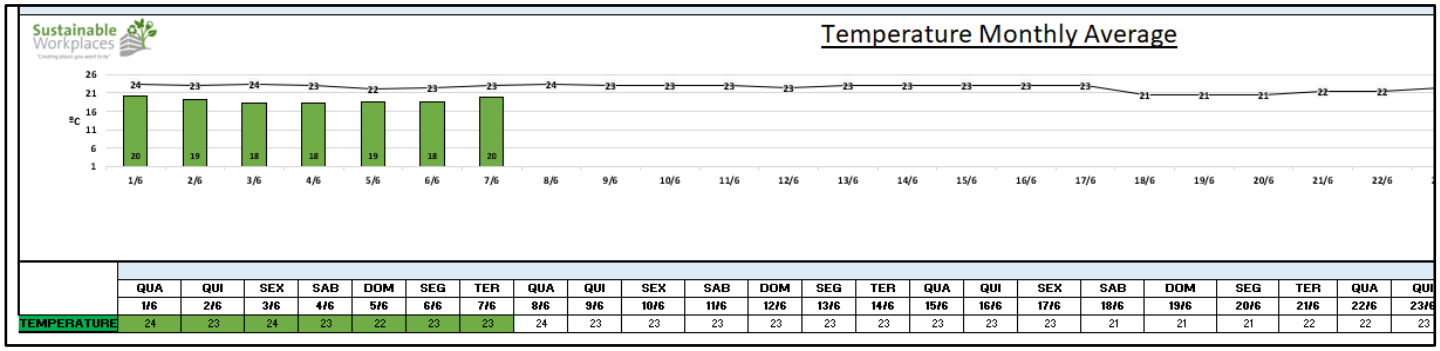


Figure 4 - Critical Analysis of Energy Performance Indicators



	QUA	QUI	SEX	SAB	DOM	SEG	TER	QUA	QUI	SEX	SAB	DOM	SEG	TER	QUA	QUI	SEX	SAB	DOM	SEG	TER	QUA	QUI
	1/6	2/6	3/6	4/6	5/6	6/6	7/6	8/6	9/6	10/6	11/6	12/6	13/6	14/6	15/6	16/6	17/6	18/6	19/6	20/6	21/6	22/6	23/6
TEMPERATURE	24	23	24	23	22	23	23	24	23	23	23	23	23	23	23	23	23	21	21	21	22	22	23

Figure 5 - Temperature Monthly Average

MAY 2022					
Demand	01/05/2022	08/05/2022	15/05/2022	22/05/2022	29/05/2022
Work day	17.916,24	17.836,68	17.396,74	16.638,52	17.179,22
Sunday	3.204,89	3.122,08	3.075,23	3.149,91	3.035,86
Shutdown %	82%	82%	82%	81%	82%

Figure 6 - Shutdown control (kWh)

Transparency

At GMB São José dos Campos there is the Environmental and energy policy at the entrance of production buildings. During the year some conversations about ISO 50001 are divulgated for all employees and during the week energy that happen once a year we present pointers about energy efficiency.

What We Can Do Differently

The internal communication to the employees about certification process could be bigger, with more presentations and campaigns to became clearer all the benefits of ISO 50001 certification

The quantity of internal auditors was small, so the internal audit was slow (there were 10 areas to audit)

Most of the information for the audit was showed by Software Maximo (maintenance management) and we lost some time waiting the information, so for the next audits we can prepare a pre research at the Maximo screen to present the information faster.

The next steps to improve ISO 50001 EnMS are:

- Create KPI (Key Performance Indicator) to measure and establish targets to eliminate air compressed leakings;
- To improve the current measurement system to reach more areas;
- To approve a budget to implement initiatives with payback bigger than one year;
- Air compressors operation automation study to reduce energy at air compressed generation.