

ISO 50001 Energy Management System

Turn On/Shut Off Painting Process On-Demand Scheme for Energy Consumption Efficiency

2020

Ecuador

General Motors OBB del Ecuador

14% in Energy Consumption Reduction (1,7K CO2 Metric Tons avoidance) over a period of 1 year (2018 to 2019) mainly explained by the implementation of an on-demand equipment/line/ovens turn-on/shut-off plan according to the current production needs.



Organization Profile & Business Case

At a global scale, General Motors Company revealed its vision to create a world with zero crashes, zero emissions and zero congestion. Since the declaration of such vision, every business decision is driven by the commitment and desire to reshape our future by saving lives, creating a cleaner environment and ending traffic jams.

As a strategic pillar of the global GM's vision, Sustainability, Footprint reduction and Environmental Impact avoidance take a decisive role. In order to achieve those challenges, every GM site is working on the implementation of day-to-day initiatives from small suggestions to huge projects that aim to reduce energy consumption and/or replace current energy forms for renewable and cleaner energy sources.

GM-OBB Ecuador is totally aligned with the corporation's global strategy as the local leadership is

putting a lot of effort in developing, implementing and improving a robust energy program management. The journey to our energetic and environmental goals is already well underway.

First of all, GM-OBB of Ecuador has established and distributed an Energetic Policy among all its employees, service and goods contractors, dealers and all the actors in its business value chain in order to promote the conscious usage and consumption of energy in all business-related activities and to assure the fulfillment of all ISO 50001 requirements and legal duties.

As supporting building blocks of our Energy Management System, we follow a well-structured annual agenda full of activities and events that encourage the culture of energy usage continuous improvement by making several channels available to employees so that they can speak-up. To mention a few, these so-called channels and activities are: Suggestions Mailbox, Monthly Deployment and Implementation of Energy Saving Initiatives (contest), The Energy Week (advertisement, culture, innovations), and of course a strong and integral energy management process based on KPIs, for all our sites, that ultimately trigger corrective and strategic actions aligned with our goals.

Inside our culture there is an important chapter that is the application of a Continuous Improvement GM's Corporative Methodology called OpEx (Operational Excellence) that we use to attack and solve complex business issues. That is the case of one of our recent major project on energy consumption efficiency titled: *Turn On/Shut Off Painting Process On-Demand Scheme for Energy Consumption Efficiency* which is a flagship initiative implemented last year that brought determinant savings in terms of MWH consumption as well as savings in money and of course several thousands of tons of CO2 avoided. This implementation was recognized and congratulated in our recent ISO50001 follow up of last January, 2020.

“Our commitment is the continuous improvement in the energy performance with focus on the incorporation of energy efficient equipment and services”

—Julio Aguirre, Manufacturing Engineering Manager

Business Benefits

Our organization was certified ISO50001, for the first time, in 2014. Since then, the culture of energy efficiency plays a main role at all levels of the organization and in all business decisions.

Over the latest 5 years the energy consumption has decreased significantly as a result of the strategy addressed above in the previous topic. In a past opportunity we already participated on a CEM event and we won a recognition on the Vienna Forum “Sustainable Energy for the Future” where we showed all our benefits from the Energy Management in place at that moment.

In this current opportunity, the improvement in energy consumption efficiency that we would like to present is the one perceived during the period 2018 – 2019 that was up to 14,3% in Energy Performance, reduction in energy usage (3.774 MWH reduced from year to year)

Of course, such reduction brought financial benefits for the organization as GM OBB Ecuador expenses in energy were 302.839 USD less than the previous comparable period.

Gains in Environment Impact, resulting from the significant reduction in energy consumption, are of 1.698 CO2 Metric Tons avoided to be spread into the environment.

All the results showed above have been achieved with an investment of zero dollars in equipment. The only investment done to accomplish such result is the effort, consciousness, discipline and determination that each member of the GM-OBB Ecuador family put in their day to day activities. Re-training our staff was indeed

needed, but this is not considered as an expense since trainers are GM expert and competent people.

For us at GM-OBB Ecuador the fact to have happy, engaged and committed employees is vital since that is the power that fuel a successful implementation of the activities, initiatives and projects we described above.

Case Study Snapshot

Industry	Manufacturing, Automotive
Product/Service	Vehicles, Production
Location	Quito - Ecuador
Energy management system	ISO 50001
Energy performance improvement period, in years	1
Energy Performance Improvement (%) over improvement period	14,3%
Total energy cost savings over improvement period	302.839 \$USD
Cost to implement EnMS	0 \$USD
Total Energy Savings over improvement period	13.586 (GJ)
Total CO₂-e emission reduction over improvement period	1698 (Metric tons)

Specifically speaking about the project that we implemented in the Paint Shop Process, it accounts for the majority of the results outlined above. This implementation brought with it, not only tangible and quantitative results but also, allowed us to demonstrate the high level of flexibility, adaptability and resilience of our corporation and employees.

Along with the desire to continue to reduce energy consumption, this project aimed to adapt the old painting process scheme to a new one that could work best for the current production needs.

As 2019, GM-OBB production volume suffered a drastic drop, due to several macroeconomic and commercial reasons, so we figured out that the Painting Process capacity was, by far, underutilized; considering the current production volume. Apart from that, we identified some other inefficiencies to be solved such as excessive conveyor's overspeed, low flexibility in our manpower knowledge (opportunity to train operators in more than 1 operation), and painted cars buffer underutilized.

Plan

GM-OBB Ecuador is constantly seeking for opportunities in every aspect of business. One of the most important drivers for us is to have a competitive manufacturing cost, among other GM plants and competitors. As April 2019, we experienced a production volume decline that affected our Cost per Unit metric, leaving us with a gap of 65% to reach the new adjusted costs target.

Several analysis were done to address this gap in our financial figures. A deep-dive into our Utilities account raised a red flag about the cost of energy consumption so we started to brain storm several ideas to address this opportunity. Paint Shop is the main user of electric energy by 5 times more consumption rates compared with the second productive shop in energy usage.

For all of the above, senior leadership was informed and quickly involved in the team to solve the cost gap as two key business metrics were in play: manufacturing cost and energy consumption.

From our Energy Management Reports and KPI tracking system, we rapidly noticed that the energy consumption could not remain at the same level with such low production volume scenario, so we put our hands in action to understand the old process scheme so that we could come up with innovative possibilities for a new

production scheme that would permit us reach our financial and energetic targets.

After completing the first three steps of the *DMAIC (Define, Measure, Analyze, Implement, Control)* process, we applied the solution to our process and then we set the new energy consumption targets to all our reports, tracking boards (Business Plan Deployment) and of course, we declared the new targets to senior leadership so we are all aware of the new challenge that would be tracked in a monthly basis.

For instance, some of our ways to track and control energy consumption are: Real Time Business Intelligence reports showing trends of usage, deviations and locations at where peaks were generated in order to target those processes or locations at the facility.

We also run a monthly meeting, called CICE that stands for Internal Committee of Energy Control. In this meeting, Global Facilities Department, which is the owner of the Energy Management System, presents status of our metrics, corrective action plans, strategic projects and every running or planned energy consumption initiative is tracked and sponsored if needed. Senior leadership is active member of this meeting.

Another way to make our results measurable and visible is our Business Plan Deployment (BPD) which is a public board containing several categories. One of the categories, of course is Environment & Energy in which we show various metrics, being one of them the energy consumption real performance compared against the new target established from the main efficiency project deployed at our painting process.

All these tracking and control tools guarantee that all the implemented efficiency actions are in place, working and performing according to plan; otherwise, if a deviation exists, that is immediately addressed and fixed in order to reach our monthly target that would ultimately support the year-end objective, as well as support our energy policy and vision.

“In addition to our renewable energy goal, we are committed to using less energy overall and reducing our carbon emissions globally. Since 2010, we have reduced our carbon intensity by over 20 percent, avoiding 1.5 million tons of carbon emissions — roughly the annual electric use of 260,000 homes.”

—Mary Barra, General Motors Chairman & CEO

Do, Check, Act

One of our corporate values is *One Team* and we at GM-OBB Ecuador practice this mantra in every activity we enroll in. We stimulate the development of projects as a team rather than working in silos. The project that we are using as the main topic of this case study was not the exception and of course it was successfully implemented by a multi-disciplinary team. The implementation team was mainly composed by Paint Shop personnel who are experts in the technical details and supporting areas such as maintenance, and Global Facilities were included too. Even senior leadership, Plant Manager and Assistant Plant Manager signed the project charted so all are committed to get to the finish line in time and with the expected result.

As it was already explained above, this project had several key origins and motivations that aim our corporate goals. The foremost objective was to be more efficient in energy consumption and reach the new cost target established due to our current business context with a lower production volume.

Of all equipment involved in the painting process, ovens located at three process phases (ELPO, Primer & Top Coat) are the main electric energy consumers. In the old process, all three ovens used to remain on during the 8 hours shift as production volume was higher and the process was designed to work in a continuous-linear fashion during the whole shift. After detailed analysis of the new vehicles demand versus the process installed capacity we figured out that we could change the process scheme to one that would work in intermittent shifts

depending on the necessity. So, the project team defined that the most adequate way to work is to keep the ovens on as follows: ELPO oven (4 hours/day), PRIMER oven (3,5 hours/day), TOP COAT oven (4,5 hours/day).

This way of working results in a 50% decrease in the energy consumption of the three ovens without compromising units delivered to the down-stream process.

The new outlined process scheme is sufficient to serve the current vehicles demand while keeping our painted vehicles safety stock (to cover line downtime) in a healthy status as well as delivering vehicles to the following process (General Assembly) in a timely manner.

Other optimizations were done as part of this project. Main gains were observed in productivity metrics as line overspeed and headcount KPIs were benefited. These improvements are so important for the integral manufacturing process but are out of scope of this case study and will not be explored in detail.

Results from this implementation are traced by our energy consumption measurers and reported in a layered manner to all business hierarchies so everybody has information at hand to make tactical and strategic decisions that help to keep the project goals in place.

The savings goal of this project was 245 K USD and it was surpassed by far as we reported a total saving of >300 K USD in the 2019-year end figure.

The outstanding result achieved reflects a detailed technical analysis, a flawless execution and implementation and an effective training to our operations and productive population on the new process that represented new knowledge challenges in order to have a First-Time-Quality results despite the huge turn over in the process scheme.

Transparency

ISO50001 is a very representative certification that we always proudly announce in every interaction with internal and external parties. We regularly receive visits from government, universities and Global GM leadership to learn about our best practices in manufacturing, quality, environment and energy management.

As an important activity to mention, we are involved and committed with social wellbeing and Ecuadorian Industry development. Every year we prepare several training sessions on lean manufacturing, general manufacturing management and energy/environment best practices, aimed to small and medium corporations. All this is performed in compliance with the ISO50001 framework, requirements and procedures.

With the previous background in mind, the biggest lesson learned, for future and similar implementations would be:

- Program a more generous period of time to run more simulations and hands-on training so that we could assess every risk coming from the new process features and challenges, establish a corrective action and avoid defects and reworks in real production.

Lessons Learned

Due to such radical change over in the production scheme that our painting process suffered, at the early stage of the implementation we indeed saw benefits in energy efficiency, cost savings and emissions reduction but still we had issues, mainly related with minor and solvable quality defects that have been eradicated in the previous process scheme as it was at a steady process stage.

Our painting process is totally manual, so we are subject to a certain time of process variability until operators get used to the new line speed and procedures, despite the theoretical and in-situ training and simulations that we ran before the Start of Regular Operations.

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.

