ISO 50001 Energy Management System
Case Study

2021 Brazil

HGP - Pirajussara General Hospital

(Pirajussara General Hospital)

Third Brazilian public hospital certified to ISO 50001

Pirajussara General Hospital

Organization Profile & Business Case

SPDM – Paulista Association for Medicine Development was founded in 1933 by a group of physicians united to create a School of Medicine and a Teaching Hospital in São Paulo. From this union, the Paulista Medicine School, the embryo of UNIFESP (Federal University of São Paulo), was born in the same year, and from this school, the Hospital São Paulo was born 7 years later, as the largest university hospital in Brazil, owned by SPDM.

Pirajussara General Hospital (HGP) provides services to the Unified Health System (SUS). With its highly complex installations, it's a reference for around 500 thousand people in the municipalities of Embu das Artes and Taboão da Serra and for 2.7 million lives in 15 surrounding municipalities (Vargem Grande Paulista, Osasco, Juquitiba, São Lourenço da Serra, Barueri and Cotia, among others).

The strategic focus is specialized clinical and surgical care, in line with social demand, in line with the company's mission, vision, and values. HGP continually seeks excellence and quality in executive, tactical, and care management, with a patient-centered focus.

The institution is already excellence certified by HSO Accreditation Canada QMENTUM Diamante, IQG Health Service, and SBHCI (Brazilian Society of Hemodynamics and Interventional Cardiology) Certification by distinction in invasive cardiology service.

Case Study Snapshot	
Industry	Healthcare
Product/Service	Public Heath
Location	Taboão da Serra/SP
Energy management system	ISO 50001:2018
Energy performance improvement period, in years	3
Energy Performance Improvement (%) over improvement period	14.9%
Total energy cost savings over improvement period	US$ 45,314.16
Cost to implement EnMS	US$ 28,995.80
Total Energy Savings over improvement period	2,221.2 GJ
Total CO_2-e emission reduction over improvement period	85 metric tons

The HGP has in its profile: Administrative and support activities in general and activities related to hospital medical care with regard to surgeries in general, Hospital Infection Control Commission (HICC), central sterile services department (CSSD), blood bank, Intensive Care Units (ICU), clinical care (outpatient clinic) and emergency, clinical analysis laboratory.

HGP keeps the Environmental Management Center, whose main objective is to reduce the environmental impacts arising from HGP's hospital processes. Environmental impacts mitigation is a priority for the organization since it is part of strategic planning. The continuous search for improvement has made HGP assume commitments to sustainability in a broader way locally, with participation in the Global Green and Healthy Hospitals, Health Care Climate Challenge, Energy Challenge, Waste Challenge, also seeking the quality certifications such as ISO 9001, ISO 14001, ISO 45001, ISO 50001, Green Kitchen, ONA III, and QMentum International.

It was implemented the ISO 50001:2011 energy management system (EnMS) in 2019.

" Energy management enables better allocation of public resources in health, generating added value to the patient "
JOELCIO MARCELO VILARINHO, HOSPITAL MAINTENANCE ENGINEERING MANAGER.

Business Benefits

The hospital's energy policy is integrated with the quality, environmental, occupational health, and safety systems, and is, therefore, an IMS policy. With the implementation of ISO 50001:2011, the institution improved its management system, becoming more efficient, establishing guidelines and targets to achieve established goals regarding its service provision, with a business sustainable vision in order to satisfy the user's expectations and other interested parties.

Energy management was identified as a solution that aims to overcome difficulties and improve efficient energy, bringing economic and environmental benefits with energy consumption savings within the organization without affecting the quality and provision of healthcare services.

The implementation of the Energy Management System also provided to the maintenance engineering a possibility of revision and improvement in the energy management system already existing at the HGP, resulting in a reduction in total energy consumption and, consequently, its costs. Another important point is the polluting gas emissions reductions.

This policy was instituted in 2019 through SPDM's corporate management, providing a basis for establishing the objectives and goals of the management system, and, for now, it has met all the institution's objectives.

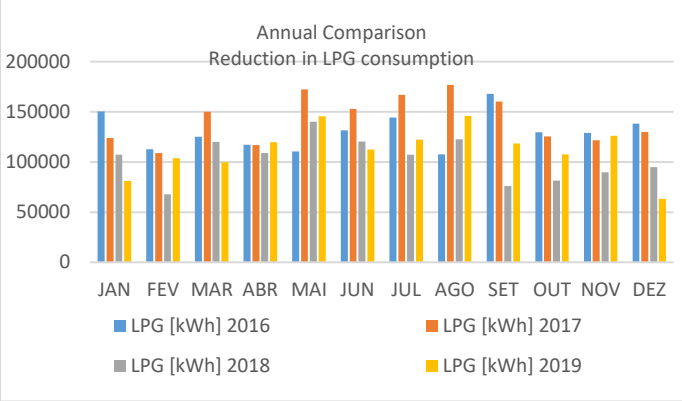
The policy was instituted at all levels of the hospital, including service providers, which enabled the purchasing policy improvement and development where materials, services, and equipment acquisition processes are more rigorously evaluated at efficient energy terms. The awareness culture of processes involving energy use was another significant change among sectors and employees, where everyone's involvement was the main tool for obtaining results.

Other benefits that HGP obtained with the implementation of the EnMS were:

- Purchasing Processes acquiring better energy performance equipment.
- rational energy use through new electrical loads planning.
- Online electric energy consumption monitoring through software (Smartenergy), which can faster predict electricity consumption deviations, providing data for instantaneous actions.
- Greater visibility on volumetry related to the energy matrix.

• Clear identification in equipment with the highest energy consumption, enabling assertive actions to seek the most rational energy use.

• Between 2017 and 2019, there was a 14.4% reduction in LPG consumption based on the medians of the years (from 139,903 kWh to 119,848 kWh), and 20.5% based on the sum of the consolidated data (1,453,774 kWh for 1,156,611.12 kWh). There was also an 80% reduction in diesel oil consumption.



The Pirajussara General Hospital aims for energy performance improvement through energy management by applying techniques in project development to increase energy efficiency and also by supporting energy-efficient products and services acquisition. To this end, it was proposed replacement for all climatization equipment by more efficient models, which use less offensive refrigerant gas and technology that consume less energy, while around 30% of the existing equipment in the HGP's facilities has already been replaced.

The energy management system points to a rational administration existence, which contributes to a society with Environmental awareness, as the employees who participate in the processes take these experiences to their social circles and directly help in society's understanding and engagement.

Plan

Pirajussara General Hospital established a 5% reduction as a goal for global energy consumption between the consolidated annual consumption in the periods of 2017 and 2018, agreed in a strategic objective.

Global energy consumption is the sum of energy vectors (electricity, gas (LPG), and diesel oil), that were evaluated in the historical data since 2016.

It was decided, in the consensus of senior management, to stipulate the year 2017 as the Energy Baseline (EnB), as it is the most similar structural and production scenario to the year of implementation.

To obtain for each equipment individual consumption in the HGP's technological park, a task force was carried out, with the Maintenance Engineering, Clinical Engineering, Information Technology, Food and Nutrition Unit, Hospital Hospitality and Environmental Management teams working with the processes mapping and machinery and equipment inventory, recording their respective consumption power.

With a telemetry system (Smartenergy) already installed, instantaneous data acquisition is read on the platform to obtain relevant data on energy consumption. This system was acquired to support the Energy Management System in analyzing consumption and defining improvement strategies.

For locations that do not have telemetry, the equipment power was obtained by consulting technical manuals and consumption was estimated taking into account the installed equipment power multiplied by the monthly use time.

For the energy use and consumption analysis, the HGP sought to establish an indicator relating to the relevant variables, identifying the three energy vectors uses, defining all areas of the Hospital as frontiers, and carrying out a consumption history survey for each energy vector, which are: electricity, LPG, and diesel oil.

Aiming at constant efficient energy improvements, management practices were developed, either through continuous actions, such as the preventive inspection routines creation for equipment and systems or with one-take actions, such as 100% of hospital's lamps replacement by LED lamps, which mostly were fluorescing and the replacement process brought economy and durability, the same for more efficient engines purchase.

" THE APPLICATION OF THE ISO-50001:2018 STANDARDIZATION ENABLED THE HOSPITAL'S MAINTENANCE ENGINEERING LEADERSHIP A TECHNICAL DEVELOPMENT IN MANAGEMENT SYSTEMS."

JOELCIO MARCELO VILARINHO, HOSPITAL MAINTENANCE ENGINEERING MANAGER.

Do, Check, Act

To achieve the proposed objectives and goals, it was necessary to do more than just think about SUSTAINABILITY, it was necessary to ACT, DO, CHECK. The key to obtaining the results achieved is directly related to the involvement of all areas with the support of all the people and the support of the Senior Management.

DO

• Financial resources: There was a need for significant financial investments made available by Senior Management, all organized in meetings with the Energy Management System committee, planning the actions to be taken and provisioning such financial resources to improve energy efficiency, to meet legal requirements needs and to reduce significant environmental impacts.

• The replacement of several pieces of equipment and the acquisition of many others, all to meet strategic goals of the EnMS, allowed the project good results. Air conditioners, cooking boilers, lamps, capacitor bank, combined ovens, pass-through, autoclaves, refrigerators, and freezers were replaced

• Purchasing: Senior Management, in its strategic planning, defined that one of the requirements for machinery and equipment purchasing is the presentation of better energy performance. A procedure was developed containing the methodology for the products and services acquisition and guidelines for the selection, evaluation, and reassessment of suppliers.

• The use of a specific form in the products or services purchase that are critical to the EnMS was implemented, with criteria for evaluating product energy performance to be purchased.

CHECK

• In order to maintain the results obtained with the implementation of the EnMS, it is necessary to have continuous monitoring for the entire process already implemented, where the energy consumption monitoring must be carried out daily, which is done in the HGP through the Smartenergy software in the total energy consumption and through individualized meters installed in equipment considered as SEU (SIGNIFICANT ENERGY USE) or even those that at a certain time was considered as a potential SEU, such as the autoclave in the CSSD and the Surgical Center Chiller, where the records are made by the electricians in a specific spreadsheet and the data are transferred to an Excel spreadsheet by the maintenance administrative sector.

• In addition to telemetry, there is a monthly collection of electricity consumption, LPG, and diesel oil data, recorded in a control spreadsheet after receiving the monthly bills issued by the concessionaires and suppliers, with also the LPG consumption recording at the steam boilers entrance, enabling greater consumption monitoring, where a spreadsheet is filled in by the boiler operators and the information is transferred to an Excel spreadsheet by the maintenance administrative sector, where it is observed the Hospital's energy performance behavior.

• Monthly meetings with the EnMS committee: results analysis and action plan definition when deviations are observed.

• Internal and external audits: annual, to monitor IMS (Integrated Management System) performance.

• Annual critical analysis of Senior Management: discussion of EnMS and IMS results, with objectives and goals definition for the next cycle (year), the financial resources allocation definition, with ongoing actions monitoring, and need to change analysis in the EnB (Energy Baseline in 12 months period) in case of occurring changes in the institution that impact the EnMS.

ACT

• The need to comply with requirements and meet standards in relation to energy consumption and employees' greater alignment with organizational objectives requires that actions such as meetings with the EnMS committee and critical analysis take place annually. The managers part of the EnMS committee, analyze the performance of the EnMS and, in deviation cases that may negatively impact the stipulated goals, help in the critical analysis and in dealing with the deviation. The committee and Senior Management are also responsible for developing actions to improve the EnMS, after perceiving opportunities in the Integrated Management System (IMS).

• HGP carried out a survey of the consumption history for energy sources used throughout its border. The survey considered the data related to each energy used source (Electricity, LPG, and Diesel Oil), consolidating the Hospital's global energy consumption given by the equation:

• Global consumption = (∑ Electric cons. + ∑ Gas cons. (LPG) + ∑ Diesel Oil cons.) kWh

• To carry out the energy review, it was considered consumption data for the last 3 years and the current one.

• After surveying the consumption of all Hospital equipment and its representativeness as a whole, Significant Energy Use (SEU) was defined as all equipment whose energy consumption (Electric, LPG, or Diesel Oil) is equal to or greater than 5 % in relation to the global consumption of HGP.

• The Energy Baseline (EnB) of HGP was established in order to allow the Hospital's energy performance monitoring and corrective actions definition or improvements in this performance. The EnB was referred to and determined according to the Hospital's consumption history, and its change will only be carried out when there are significant changes in processes or services, such as new technologies inclusions, new processes inclusion, or hospital building structural changes.

When analyzing the global electricity consumption history data all over the years, it was kept the same consumption in 2020 comparing to 2019, taking into account the transient variation of this seasonality consumption (like temperature variation interferences in the air conditioning park equipment consumption).

When related the electricity consumption to the total number of procedures, there was a 44% increase in the median consumption for performing procedures at the Pirajussara General Hospital, from 0.58 kWh per procedure to 0.81 kWh per procedure, considering April, as the point outside the curve.

The study of this point converges to the month with the lowest institutional production, as determined by the State Health Department, to meet a possible need of the population with hospitalization for Coronavirus infection (in April, this hospital was referenced for COVID-19 hospitalizations). The procedures reduction was not enough to reduce energy consumption, which does not reflect use efficiency, only that electrical energy consumption from 100% or 85% operation is similar (Example: the climatization system in the Surgical Center needs to be working 24 hours a day, 7 days a week, independent of the percentage of procedures performed).

LPG consumption

In the following are discriminated equipment that consumes LPG at Pirajussara General Hospital: Industrial Steam Boiler, which supplies steam for heated water delivery, and the steam cooking caldron in the Food and Nutrition Division (FND), in addition to LPG supplied directly to other FND equipment like the stove, combined oven, and gas caldrons.

In the consolidated data between October 2019 and September 2020 (compared to the same period of the previous year), there was a 5.5% reduction in consumption (from 1,315,202 kWh in 2019 to 1,243,473 kWh in 2020).

In October 2019, corrective maintenance was carried out on the hot water distribution system to correct the relief valve, contributing to a reduction in hot water consumption.

Diesel oil consumption at Pirajussara General Hospital for electric generator operation represents less than 1% considering global energy consumption.

Diesel consumption data from October 2019 to September 2020 was similar to data from October 2018 to September 2019, which were lower than the previous period, considering a reduction of about 80% in consumption in kWh. These results are influenced by the stability of the electricity supply system.

Transparency

The ISO 50001 certification of the General Pirajussara Hospital was disclosed on the intranet and on the Hospital's notice boards, for the knowledge of employees, patients, visitors, and third parties.

All employees of the General Pirajussara Hospital, when they are hired, go through an integration day on the first day of work, where they get to know all the hospital's management systems, and at this time they are introduced to the energy management system and receive training to understand how to use the energy vectors that will be made available with awareness and responsibility.

What We Would Have Done Differently

We could have had more preparation time to implement the standardization, as well as more human resources, to carry out situational diagnoses to propose improvements.

Asset management systems replacement from manual to digital monitoring, generating greater data reliability and better improvement efforts allocation.

Updating the technology park could bring better results, despite internal planning, external borders prevent the update at the speed desired.