

ISO 50001 Energy Management System Case Study

2021

Brazil

Diadema's State Hospital - DSH

(Diadema's State Hospital - Governor Orestes Quéricia)

Second Brazilian public hospital certified to ISO 50001



(Diadema's State Hospital - Governor Orestes Quericia)

Organization Profile & Business Case

Inaugurated on October 26, 2000, the Diadema State Hospital is the reference in healthcare for about 2.5 million people in the ABCD Region, which comprises seven municipalities: Santo André, São Bernardo do Campo, São Caetano do Sul, Diadema, Mauá, Ribeirão Pires and Rio Grande da Serra.

The partnership between the State Department of Health and OSS-SPDM – Paulista Association for

Case Study Snapshot

| | |
|---|------------------------------|
| Industry | Hospital/Healthcare |
| Product/Service | Public health |
| Location | Diadema / São Paulo / Brazil |
| Energy management system | ISO 50001:2018 |
| Energy performance improvement period, in years | 2 |
| Energy Performance Improvement (%) over improvement period | 7 |
| Total energy cost savings over improvement period | \$USD 44,102.01 |
| Cost to implement EnMS | \$USD 167,984.30 |
| Total Energy Savings over improvement period | 1,559.45 GJ |
| Total CO ₂ -e emission reduction over improvement period | 69.43 metric tons |

Medicine Development aims to speed up administrative processes, with a budget based on quantitative and qualitative targets with strict control by the State.

In 2018, DSH awarded ISO 9001:2015, ISO 14001:2015, OHSAS 18001:2007, and ISO 50001:2011 certifications in order to add greater reliability to the services provided and ensure Compliance.

The DSH profile comprehends administrative and support activities in general and activities related to hospital medical care with regard to general surgeries, includes also 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.

Engaged in continual improvement and increase the quality of its care, DSH works based on international excellence accreditation standards and successfully obtained its first certified recognition in 2003.

DSH keeps the Environmental Management Center since October/2010, whose main objective is to reduce the environmental impacts arising from DSH 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 DSH 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.

The Diadema's State Hospital was awarded in 2009, 2010, 2011, 2012, 2013 and 2016 with the environmentally friendly award. With ISO 5001 implemented, there was recognition in 2018 and 2019 for the participation of the State Hospital of Diadema in the Global campaigns of "Waste Challenges" and "Climate Health Challenge".

Since 2014, the DSH has been recognized for its commitment to the Global Green and Healthy Hospitals.

All awards obtained by the Diadema's State Hospital are directly linked to ISO 50001, because from them we acquire awareness for the maintenance of certification.

In addition to these recognitions, DSH currently holds the following certifications:



Business Benefits

The EnMS implementation in the institution brought numerous benefits to the hospital, in relation to:

- 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;
- 13% reduction in natural gas consumption generating annual savings of USD 9,473.95; 16% reduction in electric energy consumption generating annual savings of USD 27,703.98;
- 61% reduction in diesel fuel consumption, generating annual savings of USD 6,924.08.

In this case study, it's being considered 2019 for the Energy Baseline (EnB), when the DSH was ISO 50001:2018 certified. SPDM's Greenhouse Gas Inventories are carried out using the Intersectorial tool of the Brazilian GHG Protocol Program and the data considered are related to Scope 1 (direct emissions), Scope 2 (emissions with energy purchase) and Scope 3 emissions (partial – only the spreadsheet “Solid Waste from Operation”).

The Diadema unit's GHG report shows a significant reduction in the 3 scopes, when we compare the results of 2019, 2020 (prepared in the advanced module)

- *GHG emissions (tCO₂e) - Total reduction: 17.1%.*

The reductions were made possible through works whose objective was to exchange 40% of the air conditioning equipment for more energy-efficient models, which have less offensive refrigerant gas uses; a continuous sustainability education program for all hierarchical levels; the kitchen steam caldron replacement by the electric heating system; S500 by S10 diesel replacement, gasoline by ethanol replacement in flex vehicles, nitrous oxide partial replacement of by anesthetic gas 50% less pollutant in the humanized birth center (Kalinox), visual communication improvement aiming conscious consumption, waste evaluation sent for recycling, reverse logistics programs for chemical packaging.

Plan

This planning project has as purpose to present the Energy Management System at the DSH, considering 2019.

To analyze the use and consumption of energy at Diadema's State Hospital, a mapping of the equipment used and their respective consumption was carried out by Hospital Engineering, Clinical Engineering and Information Technology. In the absence of specific meters to verify the consumption of equipment, an estimate was made based on technical data of the equipment, taken by consulting manuals or

manufacturers, considering the installed power of the equipment multiplied by the time of monthly use.

With this, it was possible to verify the possible factors and variables that interfere with the SEU and the hospital's energy performance.

After surveying the consumption of all Hospital equipment and its representativeness as a whole, all equipment whose energy consumption (Electric, Natural Gas or Diesel Oil) is equal to or greater than 2% in relation to global consumption, due to their representation within the Hospital's global consumption and, consequently, in the energy performance of the DSH, the SEU listed must be involved in actions to reduce consumption, as well as awareness of the people involved (e.g. training of people related to maintenance, awareness of employees regarding the use of SEU).

The Energy Baseline (EnB) of the State Hospital of Diadema was established in order to allow the monitoring of the Hospital's energy performance and definition of corrective actions or improvements in this performance. The Energy Baseline 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 the inclusion of new technologies, inclusion of new processes or structural changes in the building of the Hospital.

In addition, not only presenting the evolution of the DSH EnMS, which was certified according to the ISOs 50001:2011 requirements in 2018, but also the changes and other relevant points related to the certification migration following the ISOs 50001:2018 requirements, certified by an official external audit body, BRTUV, for the migration from ISO 50001:2011 to ISO 50001:2018, whose changings the standard fully meeting the requirements were recommended.

The Energy Management Team and Senior Management contributed to this accreditation by making resources available in time and ensuring everyone's engagement in the objective of keeping the EnMS assured, investing in

new technologies, implementing quality management software and electrical loads monitoring.

The EnMS is constantly checking its results.

Do, Check, Act

In 2018, the institution's Senior Management decided to adjust DSH processes and certify its Energy Management System, to bring positive contributions to the institution. In that same year, DSH obtained the international certification seal of ISO 50001:2011 and in 2019, adapted its processes in accordance with the new version (2018), becoming certified in the current standard of ISO 50001.

The certification in this standard had a positive impact on the institution and it provided excellent results, not limited to those listed below:

- Exchange of 3,500 conventional light bulbs for LED light bulbs;
- Refurbishment of diesel power generators;
- Update of electrical protection technology in the power substation;
- Online monitoring installation in significant energy use (SEU) equipments;

These actions provided 97,038 kWh of savings in one (01) year since implementation.

• Contextualization

HED obtained international recognition for its Energy Management System, and its processes compose a systematic summarized 05 (five) steps:

1 – Commitment: KPI's insertion (energy performance indicator, EnPI), data collection, and analysis related to the Energy Management System in the Institution's Strategic Planning.

2 – Expertise: Hiring a specialized and certified consultancy in matters related to the Energy Management System.

3 – Adequacy: Collection of energy consumption data; survey of energy generator equipment; adequacy and reformulation of hospital processes to the energy efficiency.

4 – Recognition: Hiring a certified, specialized, and recognized external body to assess the Energy Management System based on ISOs 50001 normative requirements.

5 – Excellence: Recognition and certification of Energy Management System obtained through ISO 50001 analysis of adherence.

• Commitment

The institution's expectation is to ensure the best energy performance in its operations.

After analyzing the energy review of the Diadema's State Hospital, we verified possibilities for improvement in the energy system, mostly the use of renewable energy resources, or other energy sources, initially we chose to change the lighting technology, replacing fluorescent lamps with LED technology, we replaced the Cooling Plant with conventional compressor technology, by another plant with INVERTER compressor technology, we carried out a general overhaul of the primary cabin system and generators, which gave us more reliability in the energy system, which immediately demonstrated an immediate improvement in the energy system, we also prioritize awareness actions for all employees. So, we consider these our actions.

Keep employees committed, active, and aware of their environmental and corporate responsibility regarding rational energy use.

Improve energy performance by applying practices, projects and supporting the acquisition of products and services in order to improve energy efficiency.

• Detailing

The survey considered the data related to each source of energy used (Electricity, Natural Gas and Diesel Oil),

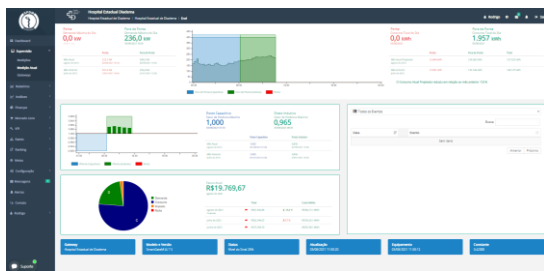
consolidating the Hospital's global energy consumption given by the equation:

$$\text{Global consumption} = (\sum \text{Electric cons.} + \sum \text{Natural Gas cons.} + \sum \text{Diesel oil cons.}) \text{ kWh}$$

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

• Energy Use and Consumption Analysis

We currently use a demand analyzer software, Smartenergy.



Demand Controller

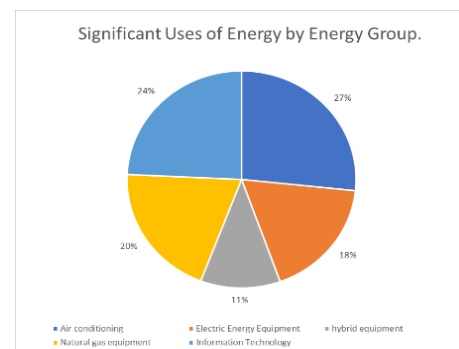
Based on the hospital production data, presented, and on the external ambient temperature data, and having knowledge of the SEUs, a comparison with the energy consumption, Data Analysis and Correlation was prepared.

- Global Consumption History: Comparison of global energy consumption between years;
- Global Energy Control: Presentation of global energy consumption in the current year and a Lower and Upper Confidence Limit Estimate based on the existing standard deviation;
- Electric Power Control: Presentation of electricity consumption in the current year and a Lower and Upper Confidence Limit Estimate based on the existing standard deviation;
- Natural Gas Control: Presentation of natural gas consumption in the current year and a Lower and Upper Confidence Limit Estimate based on the existing standard deviation;

- Diesel Oil Control: Presentation of diesel oil consumption in the current year and a Lower and Upper Confidence Limit Estimate based on the existing standard deviation.

• Determination of Significant Energy Use (SEU)

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, Natural Gas or Diesel Oil) is equal to or greater than 2% in relation to the global consumption of HED.



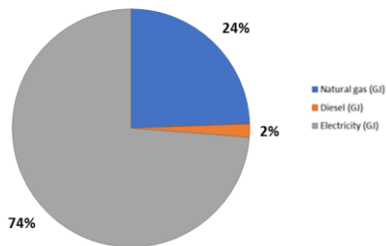
SEU

| | TOTAL | Monthly consumption 30 days (GJ) | Percentage consumption |
|-------------------------------|-------|----------------------------------|------------------------|
| significant energy use | 2871 | 1,084,25 | 67% |
| other significant energy uses | 4041 | 303,38 | 33% |

• Determination of energy baseline (EnB)

The Energy Baseline (EnB) of the State Hospital of Diadema was established in order to allow the monitoring of the Hospital's energy performance and definition of corrective actions or improvements in this performance. The LBE 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 the inclusion of new technologies, inclusion of new processes or structural changes in the building of the Hospital. According to data collected, we chose to place the year 2019 as EnB, as it is the best year in terms of energy consumption.

ENERGY CONSUMPTION- 2019 GJ



Consumption by type of energy

•Determination of energy performance indicator value (EnPI value)

Based on Pearson's correlation, we conclude that the indicators will be: 1) Electricity Consumption (kWh) x External Temperature (°C) - whose correlation in 2019 is -0.79; 2) Natural Gas Consumption (kWh) x External Temperature (°C) - whose correlation in 2019 is -0.70.

• Goals and objectives

The objective of the EnMS of the State Hospital of Diadema is aligned and defined with the goals of the IMS (Integrated Management System), which, in a manner consistent with the IMS Policy, seek to improve its energy performance. For the EnPI (Energy Performance Indicator) Electric Energy Consumption (kWh) x External Temperature (°C) a 10% reduction target was defined in relation to the EnB (2018), while for the indicator Natural Gas Consumption (kWh) x External Temperature (°C) it was the goal of 1% reduction in relation to the EnB was defined (2018). The goals outlined in the planning were achieved, but during the execution of the planning, improvements were made in the actions implemented, thus reaching the goal objective.

Transparency

The ISO 50001 certification of the Diadema State Hospital was internally disclosed through the Intranet and bulletin board. Since 2009, the Diadema State Hospital, participates in the Global Healthy Hospitals network, Energy Challenge project, Health Challenge project. for the Climate, Health Without Mercury, and Health Service. Waste Challenge, carrying out an annual greenhouse gas inventory, which is reported to the Healthy Hospitals Project, with the objective of progressively reducing greenhouse gas emissions.

What We Would Have Done Differently

Actively acting in its EnMS, and after its implementation, we verified that we could have carried out the implementation of the system more easily if the following actions were taken:

- Advance planning for exchange of medical and non-medical equipment technologies;
- Carry out awareness work and greater preparation of the team, so that changes were accepted without prejudice to any department;
- Exchange experiences on the implementation of the EnMS with other organizations in the same segment.

" The ISO 50001 certification was a watershed in the Hospital's energy management. Contributing to a more energetically viable world is our mission".

— Vieira, Mrs. Claudia, Administrative director of HED

The Energy Management Leadership Awards is an international competition that recognizes leading organizations for sharing high-quality, replicable descriptions of their ISO 50001 implementation and certification experiences. The Clean Energy Ministerial (CEM) began offering these Awards in 2016. For more information, please visit www.cleanenergyministerial.org/EMAwards.