

Global Energy Management System Implementation: Case Study

Brazil

Baxter

Baxter Healthcare is the first pharmaceutical company in Brazil to be ISO 50001 certified and has improved energy performance by 30.3 % through the Lean Energy Program since 2011.



Save and Sustain Lives is our Mission .

Photo: Baxter Brazil Utilities area

Business Case for Energy Management

Corporate responsibility is a core element of Baxter's vision to achieve top quartile in quality and patient safety, industry-leading performance and to be a best place to work. The company's corporate responsibility initiatives support its mission to apply innovative science to develop hospital and renal products that save and sustain patients' lives.

Baxter's Corporate Responsibility Council, composed of executives and subject matter experts from across the company, oversees Baxter's strategy and leads its efforts to integrate corporate responsibility into the business. The council's role is to:

- Set and adjust the company's corporate responsibility strategy as needed based on assessment of global challenges, opportunities and emerging issues;
- Establish and implement the company's corporate responsibility priorities and goals, track progress, drive organizational accountability and recognize individual and team accomplishments;

- Provide annual updates on Baxter's corporate responsibility programs to the Public Policy Committee of the company's Board of Directors;

Case Study Snapshot

Industry	Manufacturing Industry
Product/Service	Peritoneal Dialysis and Intravenous Solutions
Location	São Paulo , Brazil
Energy Management System	ISO 50001
Energy Performance Improvement Period	5
Energy Performance Improvement (%) over improvement period	30.3%
Total energy cost savings over improvement period	US\$ 2,459,322
Cost to implement EnMS	US\$ 1,182,000
Payback period on EnMS implementation (years)	0.48 year (5.8 months)
Total Energy Savings over improvement period	120,383 GJ
Total CO₂-e emission reduction over improvement period	1,194,103 Metric tons

Baxter Healthcare global main achievements:
 1977 - Established the Company first formal Environmental program ;
 1998- Published the first Sustainability Report;
 1999-Recognized on the Dow Jones Sustainability Index;
 2014- Recognized as one of the only 15 companies included on the Dow Jones Sustainability Index since its created .

Since 2005 Baxter has enhanced its environmental performance by: GHG operations 40% indexed to revenue; 24% Baxter Energy use for operations was from renewable sources ; Decreased water use by 33% indexed revenue ;Recycling 71% of waste generated from operations ; In 2015 Baxter reduced greenhouse gas emissions from product transportation by 22%.

Baxter Brazil main achievements :

1994- Environmental formal program established
 1999-Formal Energy Program established
 2000- ISO 14001 certification
 2006- Sao Paulo Industry Federation Water Consumption Reduction Recognition
 2008 – São Paulo Industry Federation Environmental Honor Mention
 2015- São Paulo Industry Federation Environmental Award

Baxter Brazil has implemented more than 180 projects for Energy consumption reduction since the formal Energy program establishment in 1999, which was the key factor to achieve 68% energy consumption reduction and 80% water consumption reduction.

Baxter established 2020 goals to reduce environmental footprint through increased efficiency and resource conservation:

- Reduce total energy and water use and total waste generation by 15% indexed to revenue;
- Reduce absolute GHG emissions by 10%;
- Pursue zero waste-to-landfill by achieving a landfill diversion rate of 95% or higher at all manufacturing sites;

“We continue to believe that our ultimate statement of corporate responsibility is embedded in our mission to save and sustain lives.”

— José (Joe) Almeida, Chairman and Chief Executive Officer



Figure 1. Solar Water Heating System and Skylights

Business Benefits Achieved

Since the establishment of the Energy program, Baxter Brazil has been able to minimize its footprint impact due to the entire Plant energy usage . That approach took in consideration not only the Main energy users impact analysis (which included the steam system , compressed air system, cooling system , water treatment system , HVAC system) but the entire manufacturing Energy usage diagnosis (cleaning and sanitization procedures , sterilization process , etc.) and employee awareness program which also helped them to save energy at their homes .

Considering 2011 as baseline , Baxter Brazil has enhanced its environmental performance by:

- 100% power source comes from renewable sources;
- Decreased water use by 24% indexed revenue;
- Recycling 82% of waste generated from operations ;
- Decreased energy use by 30.3 % indexed revenue;
- Baxter reduced greenhouse gas emissions from product transportation by 31%;
- 1,194,103 Metric Ton CO2 emissions reduction ;
- Totalizing savings due to the Energy Management System implementation of US\$ 2,459,322.

EnMS Development and Implementation

Baxter Brazil is ISO 9001, 14001, 50001 and OSHA 18001 certified and initiated the Energy program on 1999. The Lean Energy Program committee which is aligned with the corporate energy program has the Brazil Management representative as part of the Global Energy Steering Committee.

The local team works aligned with the Baxter Strategy which is divided in four pillars: Portfolio and Innovation management, Operational excellence, Financial Strength and High-performance organization which is cascaded to all countries.



Figure 2. Boiler Burner Efficiency Improvement Team

Annually Baxter Brazil holds the Plant strategic meeting based on the Stakeholders SWOT analysis inputs and the local top management creates the plant strategy for the following year, which Energy is one of the key aspects for the plant and business sustainability .

Strategic A3 (Lean Management Tool) are created for each area: Portfolio and Innovation Management, Operational Excellence, Financial Strength and High – Performance Organization (this category will cover all sustainability goals where energy is one of them).

At the 2015 strategic meeting ,the ISO 50001 certification was included based on the Stakeholders input and the local team was assigned to ISO 50001 training on a partnership with SENAI – National Learning Industry Service, ELETROBRAS – Brazil and ProCobre – Copper Industry Association.

Energy Business plan is part of the local review and it is tied to the Corporate Lean Energy Program which supports Baxter Sustainability program.

The local team is responsible for all EnMS initiatives: Business Plan, Indicators, People development, Communication, Strategy plan, regulatory monitoring, Energy acquisition and address any issues related to the EnMS.

Cost-Benefit Analysis

The summary for the EnMS Cost-benefit analysis can be detailed in the next chart .

Year	Investment	Cost- \$	Savings-\$
2012	Submetering Projects	150,000	252,430
		100,000	
2013	Projects	100,000	267,479
2014	Scada System Projects	150,000	411,199
		100,000	
2015	Projects	170,000	721,856
2016	Scada System Certification 50001 Staff & Projects	50,000	806,358
		12,000	
		250,000	
Total		1,182,000	2,459,322
Simple ROI		0.48 years	5.77 months

Figure 3 . Cost benefits analysis Chart

The tool utilized to measure the EnMS is the Utilities Indicator on which a series of detailed performance indicators are utilized , the baseline is the Overall Energy utilization in BTU per EPU (equivalent production unit in liters equivalent) , where year by year performance is compared to demonstrate the program advance. Other sub-indicators are also utilized for the main energy users, such as: Boilers, compressed air , cooling system .

Each energy project is analyzed using a prioritization matrix methodology which includes the finance viability (ROI & IRR) and the energy consumption reduction impact to achieve the corporate goals (BTU). The prioritization matrix is reviewed every quarter by the plant management to guarantee the corporate goals and projects execution .

The monitoring system check is part of the preventive maintenance system and the calibration system to

assure the readings accuracy and the indicators reliability.

Annually the internal audit is performed and the corporate audit is done every three years for the entire EnMS and EHS indicators by Baxter headquarter and an external auditor.

The EnMS procedures were created to standardize the Energy Program. The EnMS Manual was created based on the corporate guidelines and ISO 50001. Other procedures for project viability analysis and the Energy & equipment acquisition were created to guarantee the day by day operation alignment with the EnMS .

The Energy team participants job description had the Energy Management responsibility included on that and the Isostrain (training system software) had the job curriculum modified to include all EnMS trainings for each level in the organization . Onboard training and annual refresh trainings were created to maintain the people skills related to the EnMS.

EnMS indicators review is done by the top management on a monthly basis and any action plan for deviations are addressed by the team using the Non-conformance SOP (Standard Operation Procedure).

Brazil Energy Team is a multifunctional area responsibility, where: Operations, Engineering, EHS, Maintenance, Utilities, Sterilization and Purchase have roles facilitating the compliance with to ISO 50001.



Figure 4. Energy Team on ISO 50001 qualification at SENAI

The team reviews the monthly indicators , shares best practices on energy use , tracks projects

implementation , review Strategic A3 ,monitors regulations , manage the Energy Business plan , promotes internal Energy trainings during the Lean Boot Camp and the Technical Boot Camp every year to mention some of the energy team activities .



Figure 5 . Energy Team ISO 50001 Structure

The Team member responsible for Utilities area holds on a daily basis the Tier 1 meeting with the operators and maintenance staff to review key Energy indicators which are cascaded to plant management on the other Tier meetings.

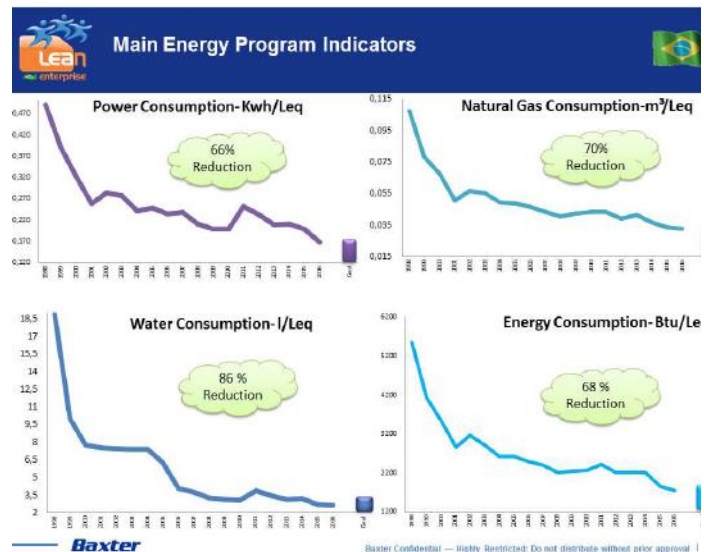


Figure 6. Main Energy Program Indicators

Employees are the key part of the Lean Energy Program and of all Energy Management System.

To keep them engaged in supporting the activities and to have them qualified to leverage the program at the

next level, Baxter Brazil has implemented several Awareness activities such as the One Point Lesson , where each employee create and document trainings for another person about Energy conservation .

On top of the company efforts the Program is also engaged to extend the Energy conservation concepts to the community , teaching employees how to save energy at their homes.

“The ISO 50001 implements a Management System which provides Baxter achieve the Business Sustainability and the lowest Environmental Footprint .”

—Daniel Coelho , Brazil Plant Manager

Baxter Brazil has a metering system chain to support business plan decisions , which includes the Gestal-Power Monitoring System and the Utilities Scada system (iFix software) are used on the strategic meetings and determine ROI projects . On an annual basis, during budget elaboration projects with less than 3 years ROI are included in the investment plan to support the Energy Management goals for the following years .

and create and analyse the main energy users indicators advance.

Gestal-Power demand control monitors on a 24 hour basis the plant consumption and enable to mitigate any over consumption. The system also monitors more than 27 utilities and process equipments to generate the process indicators and understand energy profile or potential opportunities.

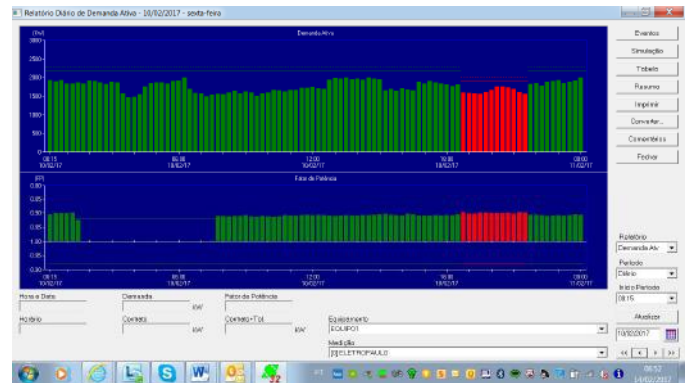


Figure 8. Gestal -Power Demand System control

“An Energy Management System Based on the ISO 50001 is Key to achieve Sustainability Goals and Business Sustainability.”

—Leandro Corral, Engineering Manager



Figure 7. Utilities SCADA System to Monitor Key Process

Main energy users like : Boilers , Air Compressors, Chillers, Cooling System and HVAC (Air conditioning) have their performance monitored by the SCADA System to provide process improvements and it is a key tool the Energy Team to understand the opportunities



Figure 9. Utilities Control Room and Lean Energy Program Mascot Welcoming Visitors

The Baxter Brazil Lean Energy Management System classifies the program maturity level in four levels : Pre-Requsite , Bronze , Silver and Gold .

Every Utilities Process efficiency expected is determined on each level (Boilers , HVAC , Chillers , Compressed Air

, etc.), technology level implementation , awareness program , Energy Team activities just to mention a few items covered in the program.

Baxter Brazil EnMS journey achieved 30.3% energy consumption reduction per EPU (equivalent production unit) , totalizing US\$ 2,459,322 in energy savings , 120,383 GJ in Energy consumption reduction and gases emission reduction of 1,194,103 Ton CO2 as 2011 baseline.

	Energy Reduction - US\$	Energy Reduction- GJ	Energy Reduction - %
2012	252,430	11,182	4,07
2013	267,497	13,609	4,93
2014	411,199	22,015	6,4%
2015	721,856	30,630	7,0%
2016	806,378	42,948	7,9%
Total	2,459,360	120,383	30.3%

Lessons Learned

The Energy Management System is a journey, in which employees will have fun when they see the results and the organization shows respect to their work.

Start with snapshots measurements and simple indicators, using them to guide you in the projects implementation when you start your program.

Learn every day, everyone will learn something more every day. The company will be successful when the

team learns together and works together for a unique - purpose. -

Celebrate, every project implemented, regardless of the - benefit amount, people need to know that their efforts make it that happen. That will motivate them to do - more and more. -

To Plan an annual strategic plan review will guarantee - the next execution period, allowing the Energy Team to - achieve the company goals. -

To implement a reliable measurement system that will support the EnMS team to understand the process and generate projects to feed the program pipeline.

An EnMS with ISO 50001 certification shows to the - entire organization that this is the organization program and not the energy team program.

Keys to Success

- Top Management supporting the EnMS Team providing resources and recognizing all employee efforts.
- Always believe we can do better.
- Engage people in all levels of the organization, everyone is responsible for energy use in the organization.
- Work hard and the results will motivate more people.
- When you work in a very regulated environment like the pharmaceutical business to promote changes in the production process without affecting product quality is key for EnMS success.

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.

