

ISO 50001 Energy Management System Case Study

2021

CHILE

AZA Acero Sostenible

Recycled Steel.



Aceros AZA, Colina Plant

Organization Profile & Business Case

AZA Acero Sostenible, the biggest steel recycler of Chile can produce up to 520 thousand tons per year considering Colina and Renca plants, processing more than 500 thousand tons of discarded metal scrap through all the country every year.



Figure 1. Metal scrap reception in AZA plant.

Case Study Snapshot

Industry	Steel
Product/Service	Recycled Steel Bars
Location	Santiago, Chile
Energy management system	ISO 50001
Energy performance improvement period, in years	2.6
Energy Performance Improvement (%) over improvement period	2.47%
Total energy cost savings over improvement period	\$USD 1,350,488
Cost to implement EnMS	\$USD 77,631
Total Energy Savings over improvement period	501,568(GJ)
Total CO₂-e emission reduction over improvement period	10,144 (Metric tons)

Our business is based on a circular economy model, identifying all the environmental impacts through all the life cycle of our products, therefore in AZA we take advantage of our wastes and use them to create other products at the end of their useful life.

Energy is the second main cost after the purchasing cost of metal scrap and has the main impact in the company's carbon footprint.

For more than 20 years AZA has implemented strategies and plans to reduce the energy consumption.



Figure 2. Recycled steel bar produced by AZA

The company’s business strategy has 4 pillars, where Energy Management is under two of them: Operational Excellence and Innovation & Sustainability. There are defined three strategic objectives that give rise to the need of an Energy Management System (EnMS),

Specifically: targeting cost improvement, management improvement and being a referent on the sustainability. Under this objectives, strategic projects are risen, the EnMS is part of the project “Sustainable Value Creation”, specifically part of the action plan of the subproject “Energy and Carbon Neutrality”. The next figure shows the other subprojects developed under the strategy.

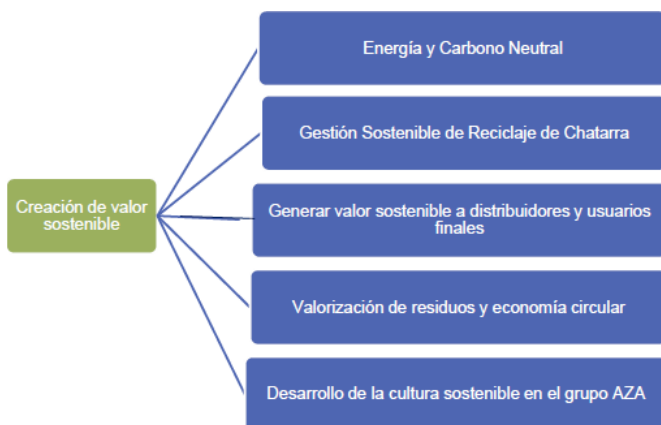


Figure 3. Sustainable Value Creation strategic project

Other actions and goals of the subproject are the continuous evaluation of energy efficiency initiatives, definition of key performance indicators for energy (EnPI) and CO₂ emissions, and constantly decrease our carbon footprint, accomplishing important goals in electromobility purchasing the first Electric Vehicle (EV) and installing electric chargers in each plant (Colina and Renca). AZA has received the “Silver Energy Excellence Seal” in 2020 and “Gold Energy Excellence Seal” in 2021 from the Ministry of Energy.

“2020 was a period of consolidation of AZA’s energy pathway, publishing the Energy Policy for the energy performance improvement and obtaining the ISO50001 certificate for our EnMS.”

—Hermann von Mühlenbrock, CEO



Figure 4. Metal scrap processing

Business Benefits

Electricity and natural gas are very relevant in steel cost production for AZA. The EnMS objective is focused on the energy consumption globally (two plants) and on every Significant Energy Use (SEU), improving the energy performance by 5% on 2025, with a baseline developed whit 2017 and 2018 data.

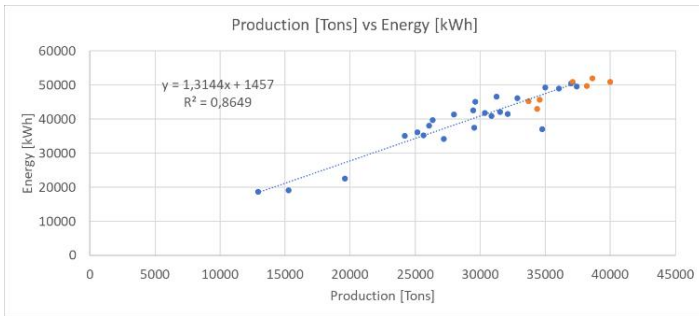


Figure 5. Linear regression used for AZA’s energy baseline.

The accumulated savings in the 2019-2021 are estimated comparing our real consumption with the one calculated with the linear regression (2017-2018). AZA has achieved a reduction of the total energy consumption of 501568 GJ equivalent to 2,47%. We have saved USD \$1350488 in energy costs and 10144 tons of CO₂e.

Year	Energy Savings [kWh]	Energy Savings [GJ]	Savings %	Cost reduction	GHG Emissions Reduction [tonCO ₂ e]
2019	21.364.612	76.913	3,90%	\$ 858.857	6.451
2020	2.177.964	7.841	0,47%	\$ 87.554	658
2021 (to july)	10.051.644	36.186	2,89%	\$ 404.076	3.035
TOTAL	33.594.220	120.939	0	1.350.488	10.144

Figure 6. Energy Savings 2019-2021 period

One of the most relevant energy efficiency improvement measures developed, is the change in the operational control of the Electric Arc Furnace, which is the principal energy consumer. This measure reduces the energy consumption in 4,5%.

Additionally, there are other non-energy benefits related with the operational optimization in the production and the processes standardization. In the EnMS implementation were reviewed many operational and maintenance procedures, simplifying, improving and including new topics about quality, environment and safety.

Plan

Integrated Management System

AZA has an integrated management system certified ISO 9001, ISO 14001, OHSAS 18001. The EnMS ISO 50001 was added to the system where the CEO shows his

commitment to the company. The integrated management system is aligned with the AZA business strategy and traduce the organizational objectives in action plans.

Management Commitment

The top decision makers of the company have shown their high commitment since the beginning of the EnMS, establishing a Energy Strategic Committee conformed by the senior managers in charge of incorporate the Energy Policy through all the company, communicate it to every people, give needed resources and other responsibilities.

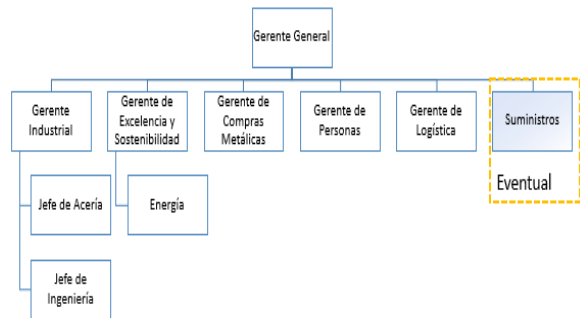


Figure 7. Energy Strategic Committee.

Also establishing the EnMS Team in charge of activities to achieve the objectives of the system. The next figure shows how the EnMS team was communicated to the organization.

Figure 8. EnMS team communication to the organization.

Energy Reviewing & Data

All the data regarding energy consumption (electricity, natural gas and others) and production can be monitored by the Manufacturing Execution System (MES), which allows to see different variables on real time of both production plants.

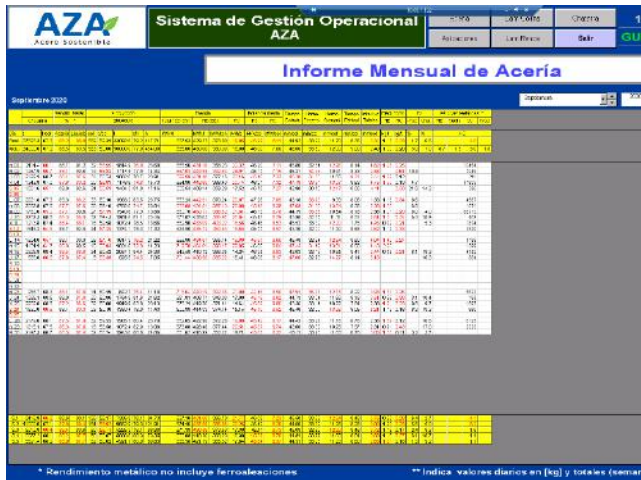


Figure 9. Manufacturing Execution System monthly report.

The energy performance is monthly report to export all the data and be able to analyze and determine energy performance and projections. Thanks to the system we can easily identify our energy consumption and the independent variables.

The following figure shows the energy consumption of the energy uses.

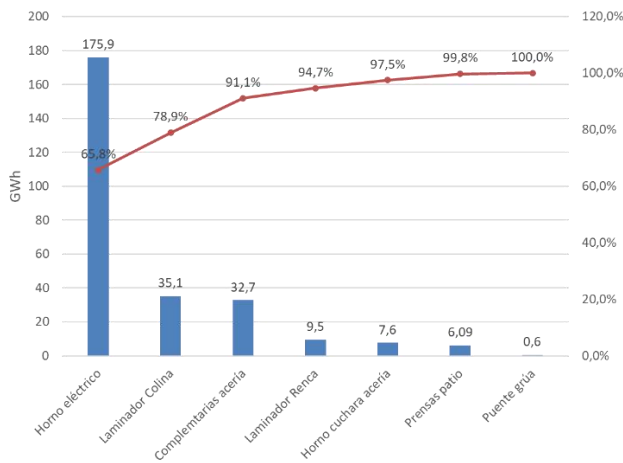


Figure 10. Energy consumption of main energy uses.

The first energy review was focused in the organization of the data and monthly analysis made to understand the energy production costs.

To improve the execution of the energy review, two members of the EnMS team was trained by the Sustainable Energy Agency and certified as Industrial Energy Manager.

Because of this, for a consisting energetic planning, ISO 50001 requires updating the energy review once a year, so we can compare and check our improvements through the EnPIs and the baseline established. For this, we have developed a monthly monitoring worksheet to help us see and understand our improvements.

“ISO 50001 implementation allows Aceros AZA to be recognized with the Gold Seal in Energy Excellence.”

—Paola Grandela, Sustainability Manager



Figure 11. Recycled steel billet production.

Energy Policy

The EnMS supports the strategy of the organization, being in complete alignment with the energy policy of our company, in search of improving energy performance through responsible use of energy sources

and assuring future availability of resources, following the next principles:

- Promoting efficiency on the use of energetic resources, optimizing the design of installations and processes with an intensive energy use.
- Promote acquisition of products, services and raw materials that incorporate energy efficiency on their life cycle.
- Encourage a high-level energy performance through continuous improvement and implementing objectives and goals to all processes impacting the EnMS, compliance of legal and voluntary requirements of energy efficiency.

Energy Objectives and Targets

Energy objectives and targets were defined for the company and each SEUs as a 5% of energy performance improvement over the base line developed with 2018 data as a linear regression (in some cases with main operational changes, the energy baseline was updated). The next table shows the baselines for each SEU.

Process	Energía E (kWh)	Producción P (t)	Base line	Reference period (year)
Electric Furnace	Electricity	Billets	$E \text{ (kWh)} = 422,4 * P(t) + 207200$	Jul-2019 a Jun-2020 (operational changes were made)
Electric Furnace	Natural Gas	Billets	$E \text{ (kWh)} = 5,1382 * P(t) + 18549$	2018
Complementary energy meltshop	Electricity	Billets	$E \text{ (kWh)} = 68,6 * P(t) + 497220$	Ago-19 a Jul-20 (operational changes were made)
Rolling mill Colina	Electricity	Final products	$E \text{ (kWh)} = 95,208 * P(t) + 358665$	2018
Rolling mill Colina	Natural Gas	Final products	$E \text{ (kWh)} = 26,41 * t + 136916 / t$	2018
Rolling mill Renca	Electricity	Final products	$E \text{ (kWh)} = 81,811 * P(t) + 209557$	2018
Rolling mill Renca	Natural Gas	Final products	$E \text{ (kWh)} = 34,595 * P(t) + 35338t$	2018

Figure 12. AZA's SEU baselines.

Do, Check, Act

Implementation Process

Energy Management activities are made for more than ten years, focused in cost reductions. In December 2019, AZA and the Chilean Sustainable Energy Agency, signed a memorandum to support the ISO 50001:2018 implementation and certification, hiring the consultancy

company WSP. The implementation was developed in 2020 fully supported by the top management.

The COVID-19 situation changed some activities schedule, but the EnMS was fully implemented by the end of 2020 and certified by Lloyd's Register in December of these year.

Energy Performance Evaluation

The energy performance of each SEU is presented monthly to the top management committee, showing the improvements and difficulties.

The energy performance is monthly report to export all the data and be able to analyze and determine energy performance and projections. The monthly energy performance is determined comparing the energy consumption with the energy calculated by the lineal regression used as baseline.

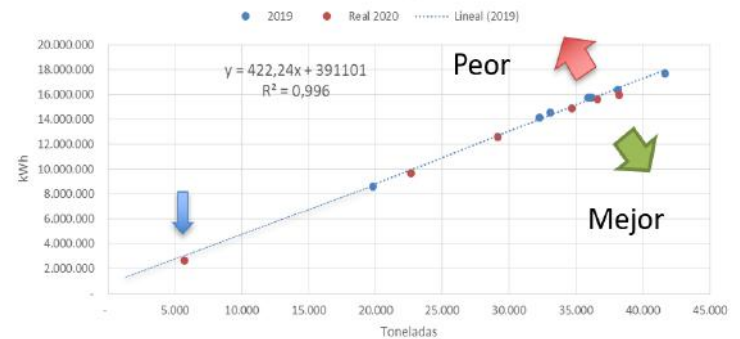


Figure 13. Monthly evaluation of energy performance.

Operational Control

The main energy performance improvements come from operational control initiatives. For the EnMS implementation the team review about 200 existing operational procedures to determine the documents that contains or can contain the energy criteria for the processes, including the effective operation and maintenance. The operational improvement opportunities were analyzed with the processes operators and the procedures were updated.



Figure 14. Recycled steel production process.

Action plans follow up

The action plans are reviewed in monthly meetings developed in each area with SEUs. In these meeting the team check the status of the initiatives and document new ideas that can be analyzed as new energy performance improvement opportunities.

Training

The EnMS implementation included training activities:

- Introduction to EnMS ISO 50001
- ISO 50001 for top management
- Internal Audit ISO 50001
- AZAs Energy Management System
- Awareness about AZA’s EnMS

Transparency

The Energy Policy is available to all the interested parties. The energy performance is communicated to the Ministry of Energy of Chile and published in our annual sustainability report.

What We Would Have Done Differently

ISO 50001 implementation was planned in 2019 and executed in 2020, with many restrictions caused by COVID-19. Many activities must be changed, but the commitment of the top management and EnMS team was the key for a successful ISO 50001 certification.

Some things that we would have done differently are:

- Early participation of operation and maintenance personnel in the EnMS design.
- Improve the communication of the EnMS benefits at the beginning of the implementation to all the organization.
- Develop more trainings related to energy efficiency customized for the different areas of the company.



Figure 15. AZA's operation personnel.

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.

