ISO 50001 Energy Management System – Case Study

2023 Argentina

YPF S.A

Refinería Luján de Cuyo

Case Study Snapshot	
Industry	YPF S.A.
Product/Service	Refinement
Location	Argentina
Energy performance improvement percentage (over the improvement period)	2,5 % improvement over 1 year
Total energy cost savings (over the improvement period)	USD 198,229,863.70
Cost to implement Energy Management System (EnMS)	USD 20,000
Total energy savings (over the improvement period)	55,518,602 GJ
Total CO_2-e emission reduction (over the improvement period)	2.197.157 $TnCO_{2\ eq}$

Organization Profile / Business Case

YPF is the main energy company in Argentina, with a leadership position in the entire oil and gas value chain in the country (production, refining and sale of fuels). It also has a growing business in electricity generation and renewables, as well as a company focused on innovation and new energies.

YPF is committed to climate action and the efficient use of resources because it knows the great challenge they represent for the sustainable development of economic activity. It is a phenomenon on a global scale and most countries in the world committed their mitigation, adaptation and resilience efforts in the Paris Agreement.

The company wants to be part of the solution in a proactive way, through a diversified production and commercialization of energy, products and services, more energy efficient and with lower emissions. It promotes the use of energy in a responsible and efficient manner in all the activities it carries out and throughout the entire value chain. Climate change not only has environmental impacts, but also affects economic, financial and social aspects.

Through three industrial complexes located in La Plata, Luján de Cuyo and Plaza Huincul, YPF generates fuels, petrochemical products and lubricants, providing a comprehensive product offering, with a strong commercial presence in retail, agriculture, industry and LPG.

CILC: Complejo Industrial Luján de Cuyo – Refinería Luján de Cuyo

The Luján de Cuyo Refinery began operating in 1940, processing 500m3/day of crude. Currently, it has a processing capacity of 18,700 m3/day and dispatches 9 types of fuel through the Poliducto. The Refinery mainly supplies thecentral-north zone of the country and part of the eastern zone.

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Figure 1 – Refinery Luján de Cuyo

"The Luján de Cuyo refinery has certified the ISO 50001:2018 standard for Energy Management Systems based on two fundamental pillars; a mature system and the high degree of competence of the operational staff; a mature system and the high degree of competence of the operational staff."

—Jorge Toledo, CILC Quality Manager

Business Benefits

For years, the company has implemented actions in order to improve its energy performance. It is reflected in the main indicator at the Organizational Level.

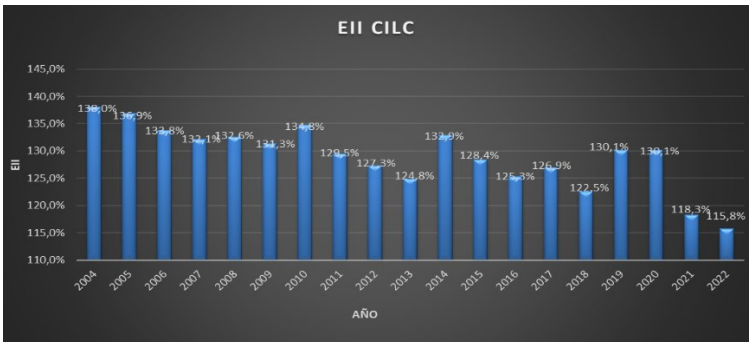
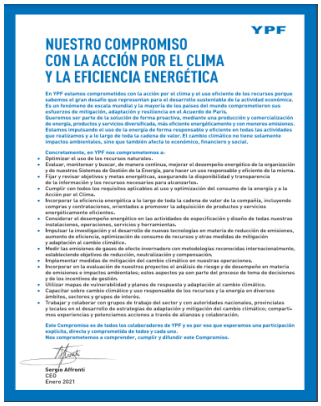


Figure 2 - EII CILC

In 2015 YPF issued the Commitment to Action for Climate and Energy Efficiency and in 2021, the CEO of the company reaffirmed it.


YPF

NUESTRO COMPROMISO
CON LA ACCIÓN POR EL CLIMA
Y LA EFICIENCIA ENERGÉTICA

Figure 3 - Compromiso por la Acción por el Clima y la Eficiencia Energética

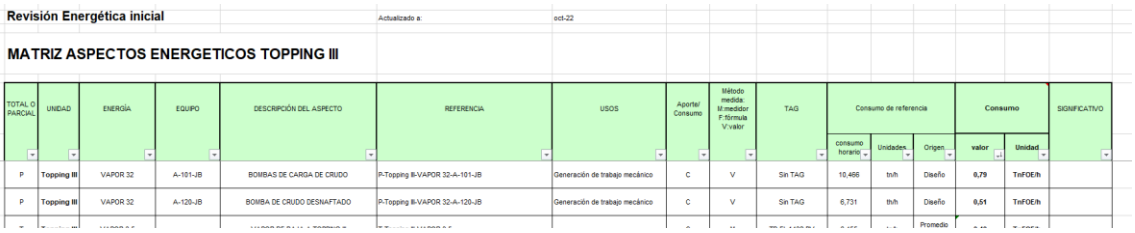
In 2021, when the implementation was proposed, different benefits of implementing the ISO 50,001 standard were identified by Energy Management System, such as:

- Identify areas where energy consumption can be reduced.
- Reduction of greenhouse gas emissions
- Reduction of energy costs.
- Contributes to a more efficient use of available energy sources.
- Integrate energy saving into the company's culture.

Plan

At the end of 2021, the implementation process of the ISO 50.001 standard began and by 2022 the Complex set its certification objective. In the Management Review, the Certification Program was included as output. To develop the EnMS according to ISO 50001, a multidisciplinary work team dedicated to implementing and certifying the standard was formed. In addition, a training course was carried out on the requirements of the standard, for all levels of the organization.

The implementation process began with the completion of the Energy Review. To this end, the Energy Management team, together with Processes, surveyed the use and consumption of 1,168 pieces of equipment present in the Refinery, establishing the Matrix of Energy Aspects for each of the processes:



Revisión Energética inicial — Actualizado a: oct-22

MATRIZ ASPECTOS ENERGETICOS TOPPING III

TOTAL O PARCIAL	UNIDAD	ENERGÍA	EQUIPO	DESCRIPCIÓN DEL ASPECTO	REFERENCIA	USOS	Aporte/ Consumo	Método medida M:medidor F:fórmula V:valor	TAG	Consumo de referencia			Consumo		SIGNIFICATIVO
										consumo horario	Unidades	Origen	valor	Unidad	
P	Topping III	VAPOR 32	A-101-JB	BOMBAS DE CARGA DE CRUDO	P-Topping B-VAPOR 32-A-101-JB	Generación de trabajo mecánico	C	V	Sin TAG	10,466	tn/h	Diseño	0,79	TnFOE/h	
P	Topping III	VAPOR 32	A-120-JB	BOMBA DE CRUDO DESNAFTADO	P-Topping B-VAPOR 32-A-120-JB	Generación de trabajo mecánico	C	V	Sin TAG	6,731	tn/h	Diseño	0,51	TnFOE/h	

Figure 4 – Matriz de Aspectos Energéticos

To compare the consumption of the different types of energy, the unit of measurement TnFOE/h (ton of Fuel Oil equivalent per hour) was used.

In order to determine the equipment with significant consumption, the Pareto 80-20 was established as the criterion of significance from which the 20% of the equipment that consumes 80% of the Refinery's energy were identified.

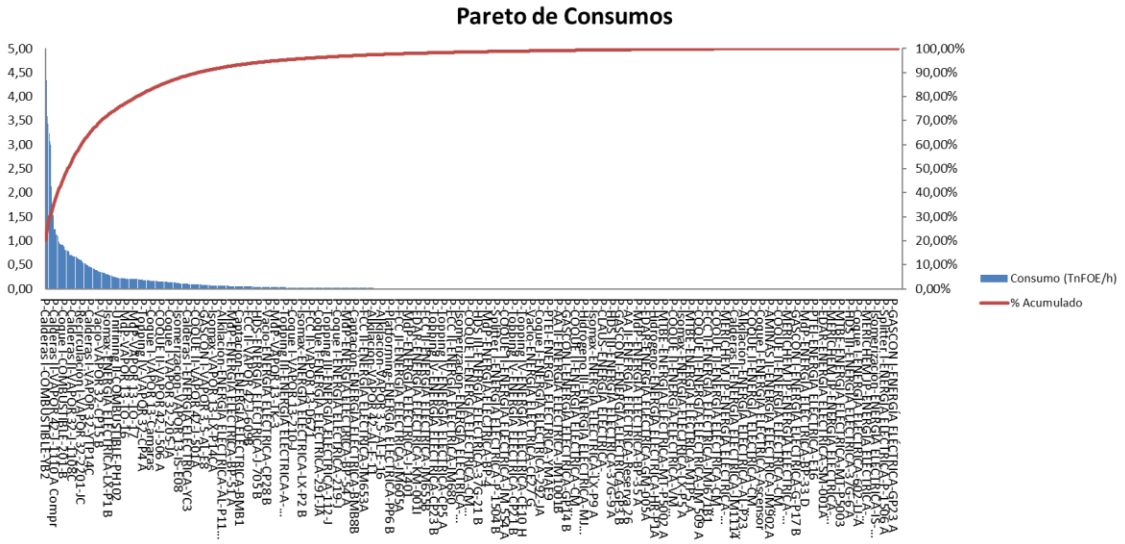


Figure 5 – Pareto de Consumos CILC

In accordance with the established criteria, 129 devices with significant consumption were identified. For these equipments, the relevant variables that affect their energy performance, their limit values and objectives were identified. In addition, for its operational control, monitoring screens were implemented:

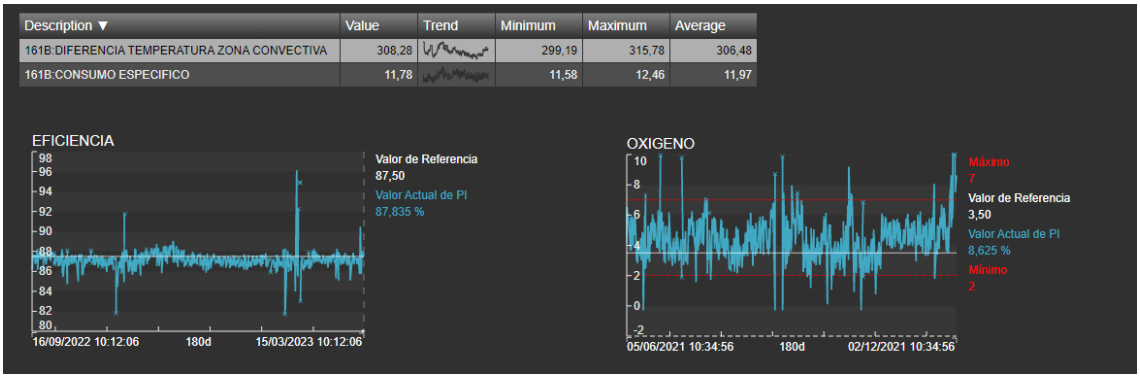


Figure 6 – Operational control

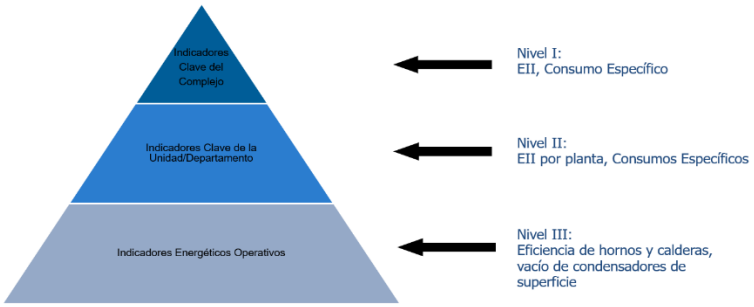


Figure 7 – Indicators of performance

After the energy review, indicators of three levels were defined in order to be able to evaluate energy performance.

- Level I (Organizational): IBD and specific consumption.

- Level II (System): EII per plant and specific consumption per plant

- Level III (Equipment): Equipment efficiency.

Being:

- EII: It is the primary indicator used by Solomon to assess energy performance. It is a number equivalent to the net energy consumption divided by the standard energy. Lower rates correspond to more efficient energy uses.

- Specific consumption: It is the relationship between the energy consumed and the raw material processed.

To evaluate the improvement in the energy performance of the complex, the baseline was established after the last major modification in the Refinery. For this, a period of 12 months (year 2018) was taken and the value of the energy indicators in that year was quantified.

Once the energy review was carried out, the significant uses of energy were identified and the opportunities for improvement were taken into account, an energy optimization, saving and reduction plan (POARE) was defined. It contained objectives, goals and action plans to achieve them.

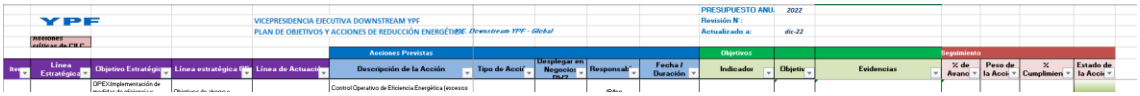


Figure 8 – POARE

The action plan considers six strategic lines:

- Implementation ISO 50.001

- Medium-term strategic actions

- Training and communication

- Good practices

- Savings goals and follow-up

- Optimization of objectives and energy performance improvements

> **"This norm will allow us to systematize the processes and improvements that are being implemented, to continue optimizing energy performance and be increasingly efficient, making responsible use of resources."**
> —Miguel Assad, CILC Manager

Do, Check, and Act

Within the CILC, different projects and actions have been implemented in pursuit of energy improvement. One of the most important projects was the Revamping of the Delayed Coker Unit I furnaces, which are among the largest energy-consuming equipment in the Complex.

REVAMPING OF FURNACES OF UNIT COKER I

CILC's DCU I unit was originally designed to operate with two charge furnaces (late 1950s). Later a third module was added to increase the capacity of the unit.

Figure 9 – Coker I Furnaces

The original design of the kilns provided for the asphalt to reach them at a temperature of 349°C. With the construction of Crude and Vacuum, the recovery temperature of the DCU I furnaces was lowered. The inlet temperature to the DCU I furnaces dropped and Duty increased by 20%. This had an impact on the need to decoke the furnaces more frequently. With the construction of DCU II, the third module was not necessary, leaving a reserve module (a furnace and two chambers). At the end of the 1990s, this reserve furnace was assigned to operate as a reboiler, providing the main furnaces (which operated with the DCU modules) with part of the duty that had been taken from them (20%).

The original design of the furnaces provided for a thermal efficiency of 64.5%. In the late 1990's, a type heat recovery system was designed and installed. This system operated for a very short time, because the preheating of the air results in more usable energy in the convective zone, but since the area in this zone had not increased, the heat transfer in the radiant zone ended up increasing and consequently the temperature of metals in this area, generating operational problems and forcing it to be taken out of service.

The main objective of the revamping of the DCU I furnaces was to reduce energy consumption. Other objectives were the reduction in CO2 emissions, increasing the safety of people by raising the discharge point of the furnace gases and improving the atmospheric dispersion of the gases due to the greater height of the chimney.

The project contemplated:

• Increase in the exchange area of the convective zone by increasing the number of tubes and replacing smooth tubes with tubes with an extended surface.

• Replacement of the existing air preheater with a static recuperative type.

• Replacement of the FD fan and ID fan.

• Replacement of all existing burners with low NOX burners.

• Update of the Interlocking System

To evaluate the improvement in the energy performance of each of the furnaces, the performance during the year 2021 was established as a baseline. The target value set for each of them was an efficiency of 75%.

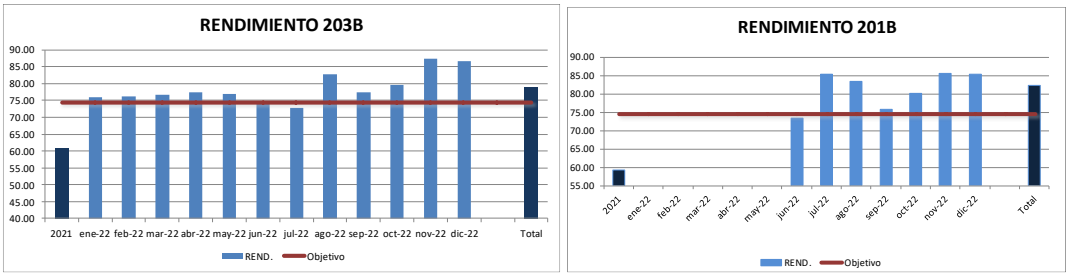


Figure 10 – Eficiency of furnaces of Coke I

Transparency

Every year, the Company generates a sustainability report, following the international standards of the Global Reporting Initiative (GRI), in order to communicate the environmental, social and financial performance. The information posted is veracious, contrastable, adequate and faithful. It includes energy performance and the Company commitment to sustainability. These reports are published in the website of the Company: https://sustentabilidad.ypf.com/

The certification of the standard has been formally informed by mail to our main clients by the certifying organization Bureau Veritas. In turn, the organization published the news through the official Workplace channel.

What We Can Do Differently

The implementation of the ISO 50.001 standard to our Energy Management System has benefited us in many aspects. Due to CILC's management system is mature, implementation could have started earlier. As a recommendation to other companies, we fully support its implementation

Our company is committed to promoting continuous improvement in all aspects of our operations. Climate change is one of the greatest challenges facing the world today. As a company, we recognize our responsibility to take action to reduce our carbon footprint and contribute to a more sustainable future. That is why we have committed to implementing a range of energy efficiency initiatives across all our operations.