ISO 50001 Energy Management System – Case Study

2022 ARGENTINA

L´Oréal Argentina

Site: Distribution Center

Case Study Snapshot	
Industry	Beauty & Cosmetics
Product/Service	Cosmetics and Hair products
Location	Buenos Aires, Argentina
Energy performance improvement percentage (over the improvement period)	11 % improvement over 1 year
Total energy cost savings (over the improvement period)	USD 11264
Cost to implement Energy Management System (EnMS)	USD 82920
Total energy savings (over the improvement period)	369 GJ
Total CO_2-e emission reduction (over the improvement period)	144 Metric Tons

Organization Profile / Business Case

L'Oréal Argentina Distribution Centre's main activities involve reception, storage, preparation, and dispatch of cosmetic products. These activities were carried out from 2003 at Garín, Buenos Aires Province, Argentina. In 2019 it was moved to the new site at Benavidez built under LEED requirements and wicht obtained the **Platinum Certificate** in 2021.

In 2021, the site obtained the ISO 14.001, ISO 45.001 and **ISO 50.001 Certifications**.

in a context of growing environmental and social challenges, in 2020 we launched the "L'Oréal for the Future" program with ambitions for 2030 in sustainability focused on business transformation. This program materializes the two complementary dimensions of what corporate responsibility means for L'Oréal: transforming the company towards an increasingly sustainable business model and contributing to solving the challenges that faces the world.

Regarding CO2 emissions, a 2030 group objective is defined, in the Loreal for the Future Program. This program established a goal in which all sites must be Carbon Neutral in their energy consumption. Other goal is to achieve -40% to 2030 vs 2019. The implementation of the ISO 50.001 is a key factor to achieve this objective. Due to being a group objective, the management is always ready to allow and apply the energy performance measures that are required to improve our performance.

L´Oréal Group is committed with environment care through the L'Oréal For the Future Program. The Iso 50001 is a tool we consider achieving improvements in our environmental development.

This certificate demonstrates the commitment of all levels of the organization in the management and efficient use of energy. Considering this aspect from the purchase, design, use and management of energy. The work carried out within the framework of this certification allows us to search for improvements and improve the results of our activity in terms of environment care.

Business Benefits

The company is committed to proper energy management true the following actions:

- Leed building Platinum.
- BMS (business management system).
- ISO 50.001 and management system (14001 and 45001).
- Sustainability consulting.
- Monthly KPI´s.
- Purchase renewable energy and I-Recs for the 100% of the energy consumption.

These actions lead us to achieve the follow benefits:

- Reduction of the environmental impact of our activities and energy costs.
- Any non-energy or other benefits:
  - ❖ 100% clean energy supply through purchase contracts with Pampa Energía. Positive impact in our team and social context and stakeholders.
- Energy performance improvements achieved, energy and energy cost savings, and reduction in emissions (CO_2 or equivalent units):
  - ❖ 11% improvement on energy performance:
    - Actual Energy Consumption= 806016 kWh/year.
    - Expected= 908416kWh/year.
    - Annual Energy Savings= 102400 kWh
    - Improvement= 11 %
  - ❖ 144 Metrics Tons CO2-e emission reduction.
  - ❖ 11264 USD Energy cost savings.
- Costs (and estimated staff time) and energy cost savings associated with implementing the EnMS.

Cost to implement	Cost to implement ($USD)
Internal Staff time to develop and implement the EnMS	46080
Internal staff time to prepare for external audit	3840
Additional monitoring and metering equipment installed to meet EnMS requirements	10000
Third party audit costs	5000
Technical assistance (e.g. hired consultants to assist with EnMS implementation)	11000
Other (e.g. internal communications)	7000
Total	**82920**

Plan

Loreal group is committed with the environmental care and stablished sustainability programs since 2013. These programs stablished objectives and goals to achieve this that are monthly reported and follow in a global way.

The commitment from the top decision makers in our organization was gained through a company decision in line with the LÓréal For the Future standards.

The resources were destined for the design and construction (2018) of the new distribution center of 24,000 m2 covered considering important tools necessary for a future sustainable site. Natural lighting, presence and movement sensors, Business Management System, low consumption equipment (LED, inverter battery chargers). All this required a significant investment for the company. The financial resources were obtained with the approval and commitment of the Group.

From the beginning of the construction work, the Operational Director, the EHS manager and the project manager were involved.

Within this goals the ISO 50001, ISO 14001 and 45001 certifications were included so, the compromise and resources were available for achieved this activities in all the organizational levels in the company.

The EHS department is the coordination team of the management system.

The implementation of the EnMS came in two phases, it coincided with the move to the new site, and the certification of other two ISO norms, the ISO 14.001, and the ISO 45.001. the certification was postponed in 2020 due to the COVID-19 Pandemic, so the process of getting the certification was finished in 2021.

Data from the system's energy meters are extracted through the BMS system. These integrate the main systems of the distribution center. An energy matrix is created, based on annual consumption, the average daily consumption is calculated and the USEs are determined.

From the study of the matrix, we determined that the main USEs is the office HVAC system and distribution center ventilation. Our main measures to improve are focused on optimizing the use of these systems. To do this, we determine which variables affect the system, in both cases the outside temperature, the quantity of products dispatched.

As part of the review of the management system itself, after the BMS measurement system start-up test period, we reviewed the matrix and were able to determine the values of the USEs with greater accuracy. In addition, we conclude the seasonal behavior of the variables. This information allows us to carry out moving average studies with n=12 to determine our main KPI, which is: Energy expenditure per unit [kWh/Unit]. See **Error! Reference source not found.**

Actividad	Equipo o instalación involucrado	Tipo de energía consumida	Consumo (estimado, calculado o medido)	Consumo KWh/día	Factor de conversión KgCO2/KWh	Equivalente en Tn de CO2/día	Factores estáticos	Variable que puede afectar el consumo	% sobre el total de los consumos	Uso Significante de Energía (USE)	Personal que puede tener influencia en el USE
Iluminación											
Iluminación general	Nave 1	Eléctrica	Medido	11,69	0,39021	4,56	Dos turnos de trabajo	Horario del día Época del año	0,49%	NS	
	Nave 2	Eléctrica	Medido	441,92	0,39021	172,44	Dos turnos de trabajo	Horario del día Época del año	18,61%	**USE**	Mantenimiento con el control del BMS
	Sala de baterías	Eléctrica	Medido	40,96	0,39021	15,98	Dos turnos de trabajo	Horario del día Época del año	1,72%	NS	
	Cocina	Eléctrica	Medido	35,11	0,39021	13,70	Dos turnos de trabajo	Época del año	1,48%	NS	
	Dock externos	Eléctrica	Medido	143,54	0,39021	56,01	Dos turnos de trabajo	Horario del día Época del año	6,04%	**USE**	
	Taller	Eléctrica	Medido	21,28	0,39021	8,30	Dos turnos de trabajo	Horario del día Época del año	0,90%	NS	
	Vestuarios	Eléctrica	Medido	5,66	0,39021	2,21	Dos turnos de trabajo	Horario operativos Época del año	0,24%	NS	
	Sala de bombas	Eléctrica	Medido	1,26	0,39021	0,49	Dos turnos de trabajo	Horario operativos Época del año	0,05%	NS	
	Oficina PB	Eléctrica	Medido	15,68	0,39021	6,12	Dos turnos de trabajo	Horario del día Época del año	0,66%	NS	
	Oficina PA	Eléctrica	Medido	10,41	0,39021	4,06	Solo turno	Horario del día Época del año	0,44%	NS	
Fuerza											
Tomas y conexiones fijas	Nave 1	Eléctrica	Medido	74,28	0,39021	28,98	Dos turnos de trabajo	Tiempo de preparacion/ Temperatura	3,13%	NS	
	Nave 2	Eléctrica	Medido	81,94	0,39021	31,97	Dos turnos de trabajo	Tiempo de preparacion/ Temperatura	3,45%	NS	
	Sala de baterías	Eléctrica	Medido	80,36	0,39021	31,36	Dos turnos de trabajo	Duración de las baterías/estados/usos	3,38%	NS	
	Cocina	Eléctrica	Medido	209,29	0,39021	81,67	Dos turnos de trabajo	Tipo de comidas según época	8,81%	**USE**	
	Dock externos	Eléctrica	Medido	7,43	0,39021	2,90	Dos turnos de trabajo	Horario del día Época del año	0,31%	NS	
	Taller	Eléctrica	Medido	126,73	0,39021	49,45	Dos turnos de trabajo	Tipos de trabajos	5,34%	**USE**	
	Vestuarios	Eléctrica	Medido	33,31	0,39021	13,00	Dos turnos de trabajo	Horario operativos Época del año	1,40%	NS	
	Sala de bombas	Eléctrica	Medido	12,65	0,39021	4,94	Dos turnos de trabajo	Horario operativos Época del año	0,53%	NS	
	Oficina PB	Eléctrica	Medido	205,71	0,39021	80,27	Dos turnos de trabajo	Ocupacion administrativa	8,66%	**USE**	
	Oficina PA	Eléctrica	Medido	55,14	0,39021	21,52	Solo turno	No tiene	2,32%	NS	
Ventilacion											
Ventilacion	Nave 1	Eléctrica	Medido	30,20	0,39021	11,78	Dos turnos de trabajo	Aumento de inyección de aire en verano	1,27%	NS	Mantenimiento con el control del BMS
	Nave 2	Eléctrica	Medido	21,29	0,39021	8,31	Dos turnos de trabajo	Aumento de inyección de aire en verano	0,90%	NS	Mantenimiento con el control del BMS
	Termomec. Oficinas	Eléctrica	Medido	661,44	0,39021	258,10	Dos turnos de trabajo	Aumento de inyección de aire en verano	27,86%	**USE**	Mantenimiento con el control del BMS
	Termomec. Servicios	Eléctrica	Medido	47,29	0,39021	18,45	Dos turnos de trabajo	Aumento de inyección de aire en verano	1,99%	NS	Mantenimiento con el control del BMS

Energy efficiency advisory services and ISO 50001 internal auditing are contracted. Quarterly reviews of consumption are carried out to update the matrix. In addition, during the year 2021 we carried out an energy audit to detect energy efficiency opportunities in the USEs. Action plans were developed to implement over the next few years to improve energy performance.

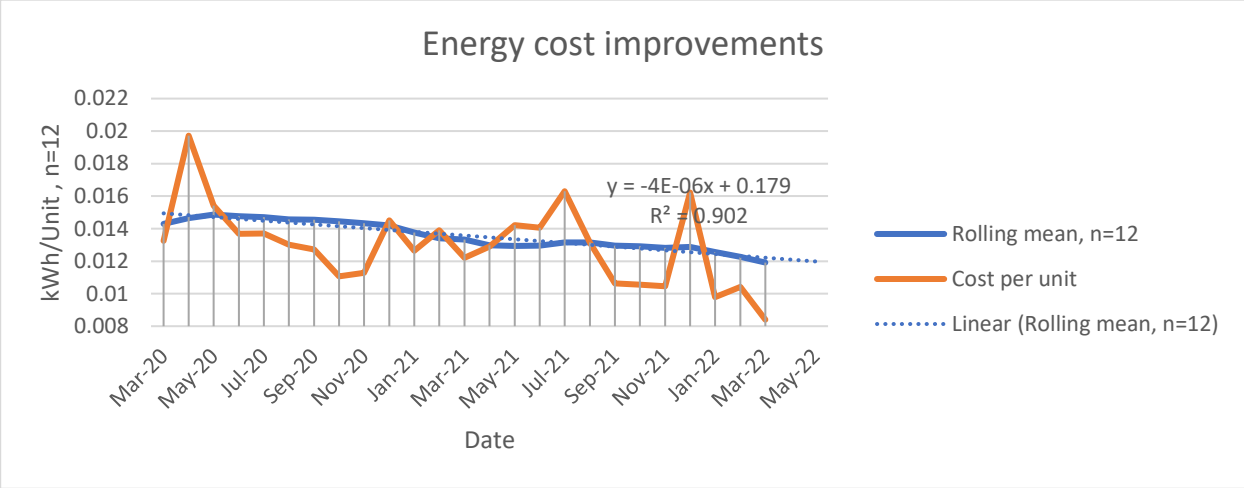


Figure 0-1 Impact of the EnMS on the energy cost per unit.

Do, Check, and Act

We generated an energy committee.

We made internal audits and a monthly review of the consumption of energy and maintenance actions.

Definition of objectives and goals programs of the management system.

External audits

External reports of KPIs

The actions that were implemented during 2021 to improve energy performance are listed below by month. These were executed correctly and had the expected effects. The actions are aimed at controlling the calendar times of the BMS to optimize the operation of the HVAC system, which is a main USE master. The lighting system commands of the main ship are also modified. This allows for better utilization of the lighting system.

2021	
Enero	
Febrero	Se modificó configuración del calendario
Marzo	Se verificó funcionamiento de ciertos circuitos de iluminación en NAVE-2
Abril	Se revisan luminarias // Se reconfiguran parámetros de TC de multimedidores de TGBT
Mayo	Se extiende el pulso de comando de los telerruptores de iluminación a 2 segundos
Junio	Se optimizó funcionamiento de BMS para NAVE-1 y NAVE-2 de luminarias
Julio	Se analiza la posibilidad de agregar comando de ventiladores de extracción
Agosto	Se resetean ciertos controladores B# del TBMS-3 recuperando el control de ilum
Septiembre	Revisión de sistema operativo
Octubre	Se agrega control de ventiladores y dispensers en TS-NAVE 1
Noviembre	Se agrega control de ventiladores y dispensers en TS-NAVE 2
Diciembre	

The baseline was created with the following reasoning: the analyzed data showed that the HVAC system is a determining USEs that has seasonality in both hot and cold periods. This implies high consumption of heating and cooling. A multiple linear regression is performed that considers the units shipped, the HDD and CDD value.
The model is adjusted with the data obtained during the year 2020.

Tabla 1 Training data 2020

	Electricity (kWh)-2020	Production (units)	Cooling Degree Days	Heating Degree Days	Forecast-Baseline
2020	*Y*	*X1*	*X2*	*X3*	
January	82274	4615129	59,3	6,8	88088
February	90524	5045112	53,1	11,2	86458
March	63651	4803540	36	4,5	76728
April	57876	2935057	1,5	80,5	59358
May	59680	3869223	1,3	165,5	67624
June	64900	4745968	0,6	233,5	74323
July	72390	5285565	0,2	304,2	80423
August	72706	5585562	1,2	221,5	76135
September	68671	5398988	0,9	187,1	73128
October	62126	5618068	4,2	122,2	70984
November	63614	5641612	14,2	24,3	69426
December	63988	4408041	43,1	19	80192

$$Y(kWh) = 0.0027701 * Production\ (units) + 503.2293189 * CDD + 67.9839346 * HDD + 45000$$

The significance of F or p value is less than 0.05, therefore we can conclude that the model has statistical significance. In other words, there is variability in the dependent variable versus variation in the independent variables. The statistical summary is as follows:

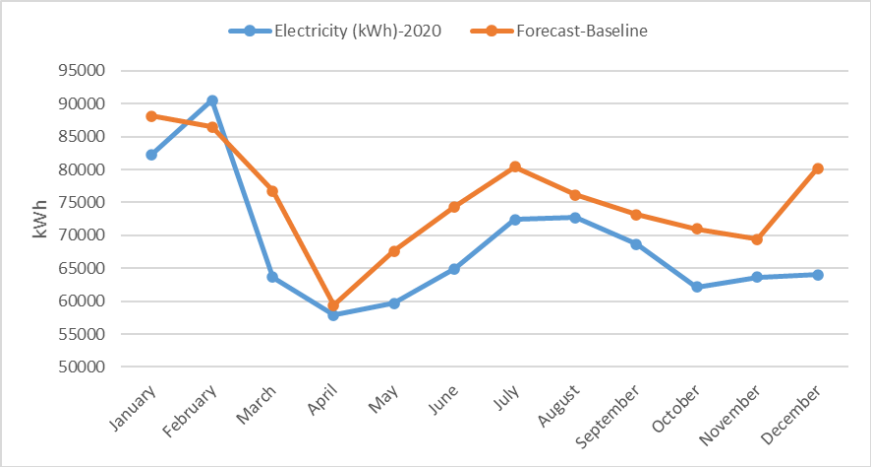
Regression Statistics	
Multiple R	0,836114294
R Square	0,699087113
Adjusted R Square	0,58624478
Standard Error	6192,881973
Observations	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	712797391,7	237599130,6	6,195255772	0,017572804
Residual	8	306814297	38351787,13		
Total	11	1019611689			

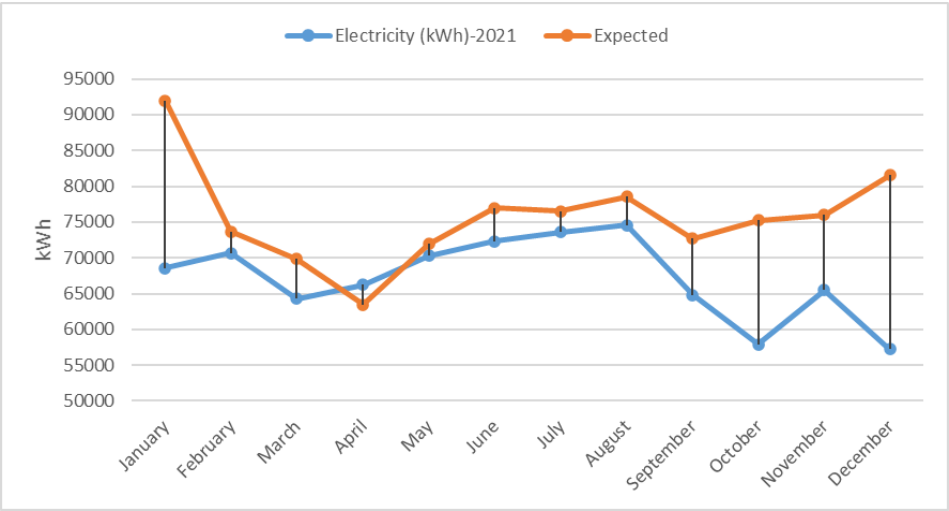
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	38293,86337	11654,05405	3,285883455	0,011089963	11419,56655	65168,16019	11419,56655	65168,16019
X Variable 1	0,002770231	0,002409845	1,149547238	0,283534358	-0,002786882	0,008327343	-0,002786882	0,008327343
X Variable 2	503,227922	133,535349	3,768499695	0,005477373	195,294855	811,1609889	195,294855	811,1609889
X Variable 3	67,98353243	29,78731455	2,282298135	0,051884875	-0,706138094	136,673203	-0,706138094	136,673203

The result of the training is seen in the following figure. The model fits as expected. We are working on detecting other variables that may affect the model in order to review it and further improve the fit.



The data is monitored and updated on a quarterly basis. The data for the calculation of the baseline and the actual measurement of the BMS are completed. The energy matrix is also updated and the variation of the expected values for the USEs is constantly monitored. The results are the following:

	Electricity (kWh)-2021	Production (units)	Cooling Degree Days	Heating Degree Days	Expected	Savings (kWh)	%%
2021	*Y*	*X1*	*X2*	*X3*			
January	68582	5427282	62,6	6,9	92005	-23423	-25,5%
February	70660	5083697	28,2	5,5	73647	-2987	-4,1%
March	64308	5267018	17,6	20,2	69820	-5512	-7,9%
April	66260	5136305	4,4	30,3	63502	2758	4,3%
May	70300	4946382	0,7	189,6	71944	-1644	-2,3%
June	72310	5144486	0	260,4	76954	-4644	-6,0%
July	73570	4511684	0,1	278,6	76488	-2918	-3,8%
August	74577	5676669	1,5	251,2	78557	-3980	-5,1%
September	64826	6095892	0,5	155,5	72709	-7883	-10,8%
October	57920	5483099	16,5	99	75222	-17302	-23,0%
November	65492	6262526	22,1	37	75985	-10493	-13,8%
December	57211	3525509	52,8	3,6	81581	-24370	-29,9%



Although our baseline has an R2 coefficient of 0.69, it correctly adjusts past behavior. Our improvements are impacted, as shown in the previous point, in the reduction of kWh/Unit, demonstrating that the application of the

ISO 50001:2018 energy management system not only has a positive impact on the cost/sales ratio of the center of distribution. Obtaining an acceptable p-value for model fitting, we determined that data normalization for training was not necessary. However, to be sure of the decision, we perform the normalization of the data through the method of maximums and minimums. The results obtained did not have a significant variation.

	Electricity (kWh)-2020	Production (units)	Cooling Degree Days	Heating Degree Days
2020	*Y norm*	*X1 norm*	*X2 norm*	*X3 norm*
January	0,75	0,62	1,00	0,01
February	1,00	0,78	0,90	0,02
March	0,18	0,69	0,61	0,00
April	0,00	0,00	0,02	0,25
May	0,06	0,35	0,02	0,54
June	0,22	0,67	0,01	0,76
July	0,44	0,87	0,00	1,00
August	0,45	0,98	0,02	0,72
September	0,33	0,91	0,01	0,61
October	0,13	0,99	0,07	0,39
November	0,18	1,00	0,24	0,07
December	0,19	0,54	0,73	0,05

The result of the excel data analyzer is attached:

Regression Statistics	
Multiple R	0,83611429
R Square	0,69908711
Adjusted R S	0,58624478
Standard Err	0,18968641
Observation	12

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	0,66873328	0,22291109	6,19525577	0,0175728
Residual	8	0,28784748	0,03598093		
Total	11	0,95658076			

	Coefficients	*tandard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	-0,33829884	0,1942306	-1,74173809	0,11972766	-0,78619541	0,10959773	-0,78619541	0,10959773
X Variable 1	0,22965515	0,19977879	1,14954724	0,28353436	-0,23103556	0,69034587	-0,23103556	0,69034587
X Variable 2	0,91095228	0,2417281	3,7684997	0,00547737	0,35352628	1,46837829	0,35352628	1,46837829
X Variable 3	0,62407084	0,27343966	2,28229813	0,05188487	-0,00648216	1,25462383	-0,00648216	1,25462383

As part of the continuous improvement, we continue to review the energy matrix and monitor the variation in the values of the USEs.

Transparency

We announced the ISO 50001 certification of our organization through internal channels such as billboards, newsletters and posts in Teams channels. Also in newsletters that reach external audiences. Different mentions were made in visits of strategic stakeholders to the Distribution Center, explaining the results and positive impacts that resulted from the implemented actions.

What We Can Do Differently

It could be better to have a extra and more specific technical BMS support at the same time to started to use the BMS system.