

ISO 50001 Energy Management System Case Study

2021

Russian Federation

PJSC Magnitogorsk Iron & Steel Works (PJSC “MMK”)

MMK's energy management system have saved more than \$ 57 million over 5 years.



PJSC Magnitogorsk Iron & Steel Works

Organization Profile & Business Case

PJSC Magnitogorsk Iron & Steel Works (PJSC «MMK») is the largest supplier of galvanized steel products in Russia. The company's assets in Russia represent a large metallurgical complex with a full production cycle. The volume of steel smelting in 2020 amounted to 11.6 million tons, cast iron 9.3 million tons and 10.8 million tons of commercial metal products.

The role of EnMS in MMK's strategy: EnMS is aimed at improving the company's financial performance by directly saving all types of energy resources, reducing costs, and increasing financial transparency, developing a corporate culture of people in the field of energy efficiency. EnMS helps to improve the manageability of the company, maintain the image and reputation of the company, as well as the effectiveness of environmental management.

“MMK strives to consume fewer resources and reduce the environmental burden. Our strategic commitments are created in accordance with the UN sustainable development goals, and we are creating everything necessary to support and implement them”

— Pavel Shilyaev, General Director

Case Study Snapshot	
Industry	Metallurgy
Product/Service	Iron & Steel
Location	Magnitogorsk, Russian Federation
Energy management system	ISO 50001:2018
Energy performance improvement period, in years	6
Energy Performance Improvement (%) over improvement period	22.7%
Total energy cost savings over improvement period	\$ 57 896 000
Cost to implement EnMS	\$ 4 304 879
Total Energy Savings over improvement period	(GJ) 8 117 000
Total CO ₂ -e emission reduction over improvement period	2 098 186

Business Benefits

MMK is a city-forming enterprise, so monitoring energy efficiency and environmental safety is the most important strategic goal of the company.

Since 2018, the Ministry of Natural Resources and Ecology of the Russian Federation has excluded Magnitogorsk from the list of cities with the highest level of atmospheric air pollution in the Russian Federation. PJSC «MMK» updated its development strategy in 2020. Now we are committed to countering climate change by reducing the carbon footprint of our products.

In 2020, the construction of a new coke oven battery and a new blast furnace began, the complex of which includes a recycling steam-blowing power plant (RSBPP). The complex will include a new workshop for capturing chemical products and a biochemical installation of water treatment. Through the launch, it will be expected to reduce emissions into the atmosphere of 11.35 thousand tons per year. The modernization of blast furnace No. 2 and the equipping of its foundry yards with an aspiration unit was completed in 2020. Because of its launch, it was possible to reduce emissions of pollutants into the atmosphere by 250 tons. In 2020, work has begun on the reconstruction of gas purification plants in the Oxygen Converter Shop (OCS) and Electric Steelmaking Shop (ESS), the purpose of which is to increase their productivity and prevent unorganized emissions through more efficient collection and cleaning of flue gases. As a result, it will be expected to decrease by 800 tons per year.

EnMS works closely with ISO 14001, taking over some of the functions to reduce CO₂ emissions in accordance with ISO 14064.

These are key projects equipped with energy-efficient equipment that will allow decommissioning outdated equipment, which will reduce the environmental impact, as well as reduce CO₂ emissions.



“MMK is a responsible organization. Our goal is to reduce CO₂ emissions by 2.2 million tons by 2025”

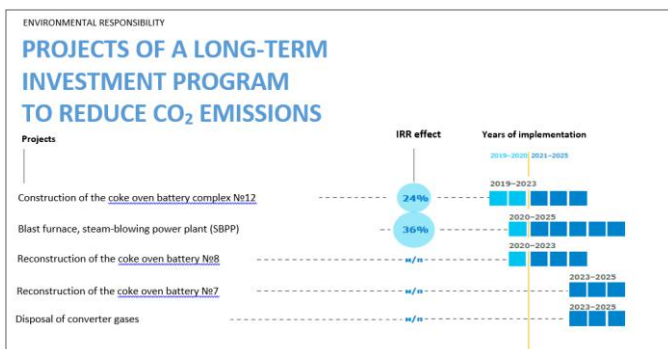
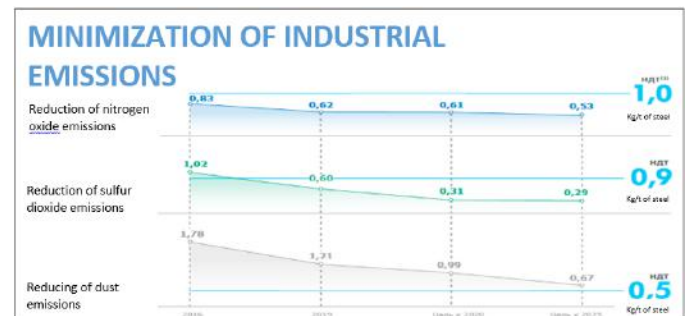
– Pavel Shilyaev, General Director

PJSC «MMK» and the Fortum Energy Concern signed a Memorandum of cooperation in the field of renewable energy.



“MMK’s investments in the environment in 2020 exceeded \$ 90 million”

– Viktor Rashnikov, Chairman of the Board of Directors of PJSC «MMK»



In accordance with the energy saving program, measures to reduce the cost of production were developed and implemented in all production and functional divisions of the company.

The main directions of cost reduction:

- implementation of organizational and technical measures;
- implementation of low-budget high-performance investment projects (Baby Capex);
- inventions and innovations;
- implementation of energy saving measures.

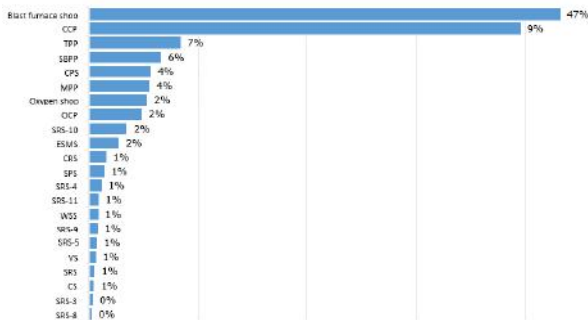
The share of costs for purchased energy resources in the cost of products sold decreased by 1.3% compared to 2016. The energy management system at PJSC «MMK» has saved more than \$ 55 million over 5 years.

Plan

In order to prepare for the recertification of the energy management system in accordance with the requirements of the international standard ISO 50001:2018, MMK carried out the following activities:

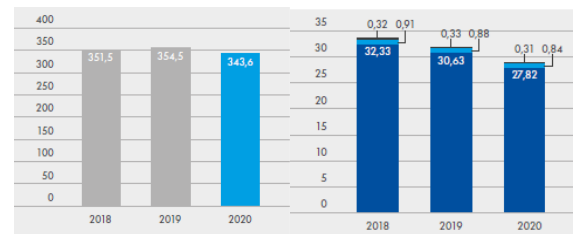
1) Developed a management approach based on monitoring energy resources, collecting data from an automated system recognized as an effective management system in the field of energy conservation by the Ministry of Energy of the Russian Federation. Areas of significant energy consumption are identified and the largest consumers are found.

Structure of consumers energy resources of MMK in 2020, million GJ



The company not only purchases energy resources, but also produces its own. The result of energy resources

management in 2020 – the total energy consumption for the Group MMK amounted to 343.6 million GJ, which is 3% less than the same indicator in 2019. In 2020, total fuel consumption decreased by 2.6% compared to 2019. In 2020, the volume of purchased heat and electric energy decreased by 9% compared to 2019 and amounted to 28.97 million GJ. At the same time, the share of purchased electricity consumption from the total energy consumption in 2020 is equal to 8.1% (in 2019 – 8.6%).

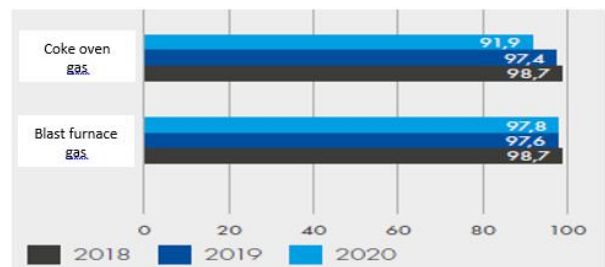


The share of secondary gas utilization at power plants in relation to its output has been increased in comparison with 2019: coke oven gas – up to 33.2%, blast furnace gas – up to 56.2%, the share of natural gas consumed by power plants in the total fuel balance of PJSC «MMK» is 39.5%.

Electricity generation by MMK's electric power stations in 2020 increased by 6.5 MW compared to 2019 and amounted to 545 MW. The provision of PJSC «MMK» with its own electric energy (the share of its own electricity in the balance sheet of PJSC «MMK») increased to 64.1% compared to 2019.

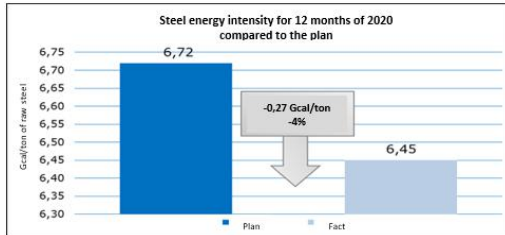
Energy losses were reduced in comparison with 2019:

- losses of drinking water - by 13 % (0.33 million m³);
- compressed air – by 11% (7.8 million m³).



One of the most important indicators of energy efficiency is the energy intensity of production – the ratio of energy equivalent of the total amount of energy

consumed to the volume of steel production. The reduction in the specific energy intensity of steel in comparison with the plan by 0.27 Gcal/t (or 4%) was 6.45 Gcal/t raw steel.



The effectiveness of the organization of the technological process depends on the organization of the production process at the enterprise and workshop level, as well as directly on the actions of the operator.

The evaluation method is based on fixing the volume of purchased resources and comparing them with the target indicators.

The calculation of the target indicators is carried out using a multivariate regression model.

$$q = -0.1954 - 2.465 \cdot 10^{-6} \cdot \text{steel} + 4.131 \cdot 10^{-3} \cdot \text{cast iron} + 2.373 \cdot 10^{-2} \cdot K_3 + 7.248 \cdot 10^{-3} \cdot \text{coke}$$

The methodology based on regression analysis when using the STADIA software product (IT product) is used to determine ways to improve energy efficiency. The software allows you to analyze several dozen incoming parameters:

- the structure of product orders;
- the grade of steel planned for smelting;
- execution of technological chain orders calculated in ERP-modules;
- composition of charge materials and physical properties of coking coal;
- load factor of power plant generators.

The accuracy of the approximation is 97-99%.

2) Distributed the energy saving policy among employees, the following activities were carried out:

- The standard of the enterprise «The procedure for managing energy-efficient projects» was introduced by the order of MMK;

- Implemented a methodology for motivating staff to design an energy-efficient project;
- An additional training program for personnel has been developed in order to achieve maximum results in the system management of consumed energy resources in accordance with MS ISO 50001:2018;
- Implementation of a mechanism for monitoring and controlling the reduction of production costs and improvement of energy efficiency of production based on the order of the General Director of MMK;
- Holding regular meetings with the main specialists in the areas, in the workshops with employees of the departments.



“In 2020, PJSC «MMK» successfully passed the certification of the EnMS in accordance with the new requirements of the international standard ISO 50001:2018 and received the certificate TÜV Thüringen e.V. (Germany), confirming that the company uses an energy management system that meets the requirements of the ISO 50001:2018 standard”

– Ilona Yaprlyntseva, Head of the Center of Energy Saving Technologies PJSC «MMK»

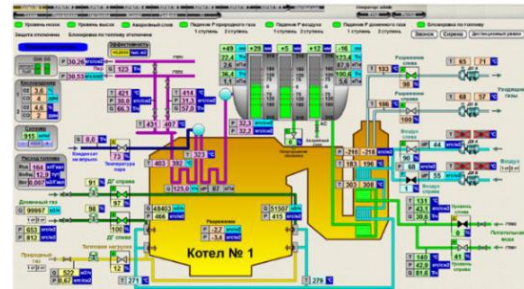
The certification process, starting with the preparation, included the following:

1. A new Energy policy was introduced in 2020 in accordance with the sustainable development goals;
2. A special group, based on the Center of Energy Saving Technologies, has been created and is functioning to coordinate and organize the activities of the energy management system between the workshops and divisions of the plant;

3. A new business process "Energy saving and improving the energy efficiency of production" has been developed;
4. A new business process for risk management has been developed and integrated into all existing business processes of production;
5. Changes were made for job descriptions and regulations for workshops;
6. Trainings have been organized for all categories of employees in EnMS, including subsidiaries;
7. A new system of motivation of the staff of the workshops has been developed. Due to the fact that power plants in the structure of energy consumption account for more than half of all energy consumption;
8. An economic case was demonstrated to ensure the commitment of the company's top managers and effective management support.

The tasks of energy management include:

- use of advanced management methods and approaches to improving energy efficiency;
- optimization of existing power supply schemes, production and technological processes and related processes;



- using the energy efficiency criterion for purchasing equipment, raw materials, technologies, designing and implementing new or modernized facilities;
- introduction of a new personnel motivation system focused on the use of secondary energy resources.

Do, Check, Act

EnMS PJSC «MMK» is aimed at improving the energy efficiency of production and use of energy, in accordance with the adopted energy policy.

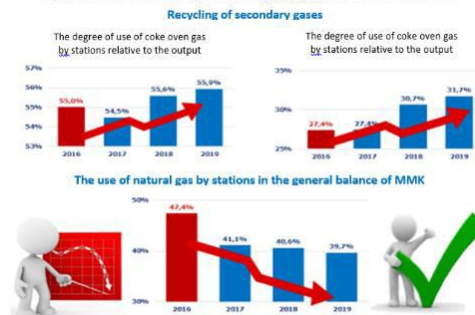
In 2020, in accordance with the order of the General Director, an energy saving program of 116 measures was implemented:

- 28 events on electricity;
- 24 fuel events;
- 30 events on thermal energy;
- 14 events on air conditioning and compressed air;
- 10 events on drinking water;
- 10 events on technical water.

Financial costs for energy saving and energy efficiency improvement:

Year	Activities	Cost, \$
2015-2019	• Certification according to ISO 50001:2011	8 600
	• Staff training	3 100
	• Energy saving projects	175 246
	• Energy audit	418 300
2020	• Recertification according to ISO 50001:2018	9 333
	• Projects, energy saving program	3 699 333

Dynamics of the use of energy resources as a result of the introduction of KPI



An electronic energy management platform (PEM) has been developed which designed to automate energy management processes. The tasks of PEM include:

- Monitoring and analyzing the implementation of energy saving measures and their impact on energy consumption and costs;
- Formation of analytical materials for planning and implementing energy saving measures;
- Accumulation and replication of best practices in the field of energy efficiency improvement.

During the 12 months of 2020, 771 energy efficient ideas were submitted to the PEM of which 188 projects were implemented.

Motivation for the successful implementation of the project is provided. The team of employees receives 2.5% of the achieved effect as a reward.



The energy management system (EnMS) includes personnel management and information about energy use and technologies that can improve energy efficiency.

The operating maps of power equipment are regularly reviewed.

Transparency

We strive for transparency in all our communications. The certificate of compliance of the energy management system with the requirements of the international standard ISO 50001:2018 is available on the corporate website of PJSC «MMK». We publish our indicators in accordance with the GRI and SASB standards. The goals in the field of energy saving are formed in accordance with the UN Sustainable Development Goals. The energy management system makes it possible to create a basis for sustainable development in accordance with the UN goals.

What We Would Have Done Differently

1. The construction of an effective management system is possible on the basis of the integration of fuel and energy accounting systems into all technological processes;
2. MMK has taken the path of developing a system of training and motivation of personnel;

“Energy efficiency in modern industry is achieved today for the most part not through the introduction of new energy-saving technologies, but through changes in management methods”

– Marco Matteini, UNIDO

3. The management is puzzled by the intensification of organizational and technical measures to track the peaks of the electrical load and issue recommendations to the staff;
4. It is necessary to strengthen the use of energy service contract schemes, thanks to which several large projects were implemented;
5. Best practices in the field of energy saving should be disseminated and demonstrated;
6. It is necessary to focus on the development of analytics based on the electronic energy management platform.

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.

