Sukholozhsky Casting and Mechanical Plant

Sukholozhsky plant specializes in steel and iron casting, and mechanical processing for UMMC enterprises and other customers. Throughout a long period of its existence, the plant has undergone a number of renovations, which contributed to it becoming the largest enterprise in Russia for processing of scrap and non-ferrous metals waste and production of aluminum, zinc and copper alloys.

Plant's actions towards energy saving prior to joining the UNIDO project

Despite a lack of automated system for energy and water technical accounting, Sukholozhsky Plant continuously works to improve its energy efficiency by ding of organizational and technical measures. The latter refer to production modernization and replacement of old equipment with modern and energy efficient models.

The management shows strong interest and awareness in terms of energy saving and EE increase, and works to systematize these processes.

To perform energy saving activities on a constant basis, a working group was established within the department of Chief Power Engineer; its responsibilities include development of Energy Saving Programme and control over its implementation, correction of specific fuel and energy consumption rates.

EnMS implementation on the enterprise

When implementing EnMS, along with ISO 5001 requirements, the plant applied UNIDO methodology in the following areas:

1. Application of regression analysis method to forecast energy consumption and to evaluate the impact of each of the production variables.
2. Inventory of energy users and identification of the most significant ones (SEUs).
3. Elaboration of Opportunity lists in relation to SEUs.

In terms EnMS project implementation, the plant's specialists carried out the following activities:

1. Developed energy policy, defined energy saving goals, distributed roles and responsibilities of involved personnel.
2. Defined scope and boundaries of energy management system by the types of energy resources: the plant consumes electricity and natural gas; both were included in EnMS scope.
3. Defined the energy consumption base line, against which it is possible to measure and analyze the effects from energy efficicency increase.

4. Upon the results of electricty consumption analysis of the plant's equipment, significant energy users were identified: electric arc furnaces (25% of total electricity consumption), induction furnaces (21% of total electricity consumption), gas infrared radiators (53% of total gas consumption), boiler house (21% of total gas consumption). Then the variables and production factors affecting energy consumption were identified. For each SEU the regression models were developed.
5. In addition to existing system of energy consumption planning, a system of energy use forecasting is organized, with the use of developed regression models; the models are updated and analyzed on a weekly basis. It became possible to estimate current energy efficiency level and to see consumption dynamics.
6. Meetins with the management on energy efficiency and analysis of energy performance indicators started to be orgnized on a regular basis.

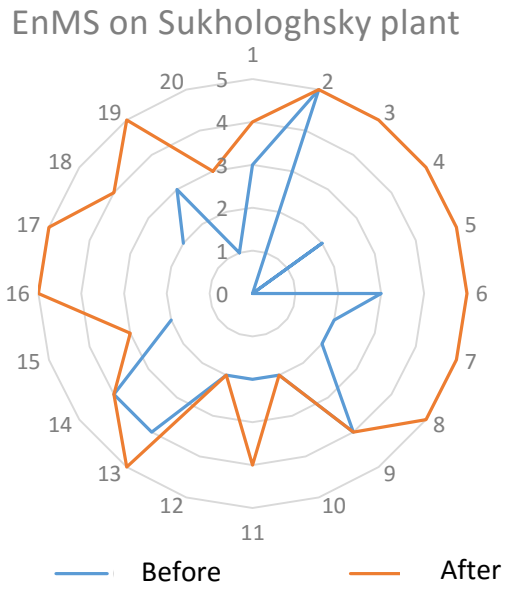
In addition to above listed actions, in February 2015, international and Russian UNIDO experts conducted a GAP-analysis on Sukholozhsky plant. Such analysis examines management and technical aspects of the enterprise and defines areas, where the plant has performed well in terms of energy management, and the areas with room for improvement. It helps the energy management system to develop in a right direction.

Upon completing the analysis, the experts concluded that the EnMS is developing well on the enterprise, and identified technical and organizational opportunities for improvement, such as:

- more attention to low-cost ideas on energy saving;
- taking life cycle cost into account when considering energy saving projects;
- identification and repair of spots with compressed air leaks;
- check-up pressure and flow requirements of cooling towers to optimize operation of pumps;
- use of data aggregation system on hot water to boiler to collect data as well on electricity and other types of energy;
- synchronization of air compressors and pressure optimization.

The diagram below indicates main changes in energy management before and after the UNIDO programme. Expert evaluation was conducted by 20 criteria, in a scoring system from 0 to 5:

1. Management commitment
2. Awareness of low- and no-cost saving opportunities
3. Energy policy
4. SEUs identified
5. Roles and responsibilities are known
6. Energy variables are known and understood
7. Baseline for energy performance exists
8. Energy performance indicators exist
9. Energy objectives and targets exist
10. Energy action plan
11. Training for staff
12. Energy saving awareness communication
13. Maintenance plan
14. Critical operating parameters for SEUs
15. Life Cycle Cost analysis for energy applied in procurement and investment decisions
16. The company had implemented at least three no-cost or low-cost (<10,000 USD) energy efficiency projects in the last 3 years
17. The company had implemented medium- or high-cost EE projects in the last 3 years
18. The company monitors implemented EE projects on monthly basis



19. Ongoing monitoring and periodic measurements and analysis of its energy performance and related key drivers and operating factors/parameters
20. Management pays attention to energy performance

Results of Sukholozhsky Plant's actions toward energy saving and energy efficiency increase in 2015:

Throughout EnMS implementation the enterprise has achieved the following results:

1. Technological measures were implemented:
   - Started using a charging basket on electric arc furnaces. This contributes to a more rational loading of metal, which in its turn, increases productivity and reduces energy use.
   - Reversable and cold water pumps were replaced. The use of energy efficient pumps significantly reduces energy consumption, especially with their long operation time and large installed capacity.
   - Melting time was reduced due to increased accuracy of chemical composition of the metal. Shorter melting time leads to lower electricity consumption by electric arc and induction furnaces, resulting in substantial financial savings.
   - Compressors' operating scheme was changed (outside air intake). This leads to higher efficiency of compressors and reduces energy consumption.
2. Achieved savings (calculated with the use of regression analysis):
   - Electricity savings: 2 418 000 kWh;
   - Natural gas savings: 378 000 m^3.
   - These savings in monetary terms: 7 874 000 RUB[1] ≈ USD 131 230 (with total investments of 2 882 000 RUB ≈ USD 48 000);
   - GHG emissions were reduced by 3 600 tons CO_2.
3. Saff, inculding operating personnell, became more involved in energy savings.
4. Number of proposed energy saving measures has grown (especially those with short payback period), their implementation perion has shortened.
5. The use of preventative methods for equipment diagnostics has started.
6. The enterprise began to use more broadly evaluation of projects from energy efficiency perspective on early stages of design.
7. The variables affecting energy consumption were identified, their monthly control and analysis is organized.
8. New significant energy users were identified.
9. Production and technological processed have improved: production waste was reduced, consumption of raw materials was reduced.

Conclusions

EnMS implemented during UNIDO project enabled the systematic approach to energy resource management. A stable working group has formed, which constantly implements measures in the framework of EnMS. Overall, Sukholozhsky plant built a stable system, aimed at continual energy efficiency increase.

[1] By 2015 tariffs