Case-study: EnMS implementation on JSC “Revda non-ferrous metal processing works”

JSC “Revda non-ferrous metal processing works” – is the leading enterprise in Russia in manufacturing of tubes, rods, wire, solid or hollow profiles, casting blanks, which made of copper, brass, copper-nickel alloys, bronze. The main products of the plant are thin-walled, medium and small diameter tubes for general purpose, tubes for heat exchange devices, tubes for pressure gages, waveguides, and thin-walled capillary copper tubes for refrigeration and instrument-making industry, air-conditioning, flat-oval and round radiator tubes, tubes antifriction alloys and others.

The products are supplied to both domestic market and for export.

Actions of Revda plant towards energy savings prior to cooperation with UNIDO

Prior to EnMS implementation within UNIDO programme, the enterprise had already been carrying out consecutive measures aimed at energy efficiency. In 1996, Revda plant implemented management system of ISO 9001:1994 series, in 2006 – ISO 14001:2004.

The work towards improving energy efficiency is based on development and implementation of 3-year long energy programmes. Such programme includes target indicators in physical terms for each energy resource, indicators by specific norms by the types of produce, as well as list of energy saving measures and consumption analysis for three preceding years.

Energy management system implementation by UNIDO methodology

Revda plant was engaged in UNIDO project from September 2014 till March 2016. Within the framework of the programme, UNIDO national expert along with a Working Group of the enterprise followed UNIDO methodology and requirements to implement activities throughout the four stages of EnMS implementation: Commitment, Planning, Implementation and Checking.

Thereby, within EnMS implementation by UNIDO methodology the following measures and processes were implemented on the enterprise:

1. Motivation and awareness of personnel on all levels of organization regarding rational energy use have increased.
2. Strong support from the management was attained for further implementation of EnMS.
3. Active and motivated working group was created to implement and then maintain EnMS on the enterprise.
4. A set of internal documents developed that provide for energy consumption management on the basis of system approach, as well provide for incentives for personnel to save energy.
5. Energy users were sytematized by improtance, the most significant energy users (SEUs) were identified, Working group focused on these SEUs at the first stage of EnMS implementation.
6. Variables affecting energy consuption were defined, as well as variables affecting the consumption of SEUs. The planning was organized on the basis of these variables. Activities were implemented to organize the system of variables’ aggregation in different structural subdivisions and to use data in regression models of energy consumption.

7. Regression models for energy consumption were developed for the whole organization, and for each SEU, with high determination coefficient - R^2. Models are actualized and analyzed on a monthly basis. It became possible to estimate current level of energy efficiency and observe energy consumption dynamics.
8. In line of UNIDO project, specialists of Revda plant were trained to implement and maintain energy management system.

Results of EnMS implementation on Revda plant

Decrease in energy resource consumption is explained by constant work of the plant towards improving energy efficiency and energy saving programme implementation. Within the framework of EnMS implementation in 2015, Revda Non-Ferrous Metal Processing Works achieved the following results:

1. Operational low-cost technical measures were implemented:

Activities with highest effect achieved in 2015 to lower natural gas consumption:

- daily control, planning and correction of gas equipment operation, starting from steam boilers;
- eliminating the excessive warm-up time in operation of heating furnaces for presses;
- full shut-down of steam users on weekends and public holidays.

Activities with highest effect achieved in 2015 to lower electricity consumption:

- eliminating the excessive warm-up time in operation of heating furnaces for presses 1,3,4;
- transfer heating or complete shutdown of smelting furnaces of the 1st shop in absence of charge. Full shut-down was done in January and May. Since September, shut-down of equipment not involved in production is done on a monthly basis.

2. Achieved savings (based on regression analysis data):

- Natural gas savings: 2 681 000 m^3;
- Electricity savings: 3 450 000 kWh;
- These savings in monetary terms: 17 769 000 RUB[1] ≈ 296 000 USD (with total investments of 123 000 RUB ≈ 2050 USD).

3. GHG emissions were reduced by 16 800 tons of CO_2.

4. Measures undertaken within EnMS increased awareness of personnel in terms of energy saving.

5. Investments in energy efficient projects began to be evaluated with consideration of their life cycle cost.

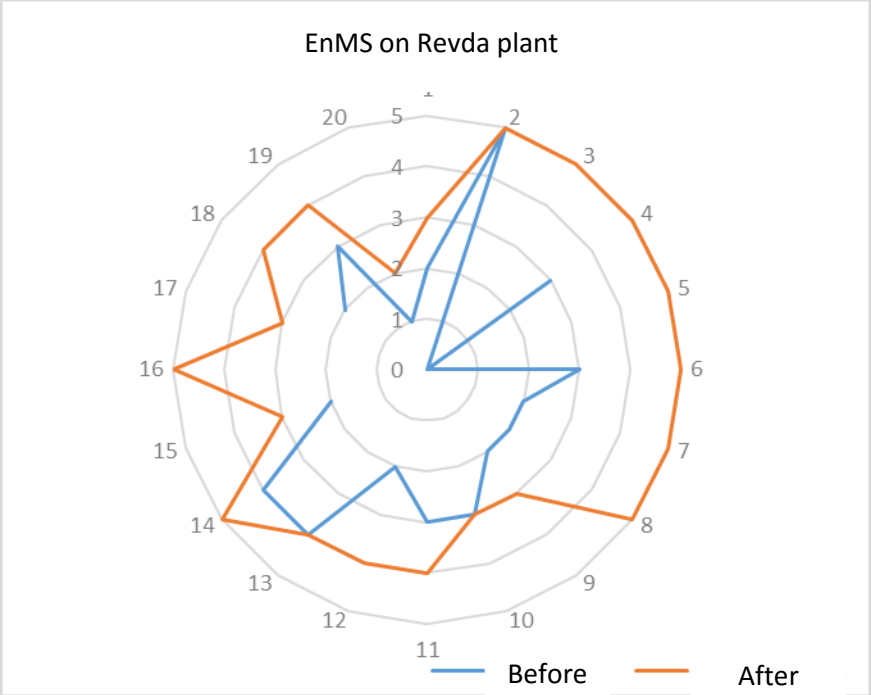
Noteworthy, upon completion of EnMS project in July 2015, UNIDO national and international experts conducted Gap-analysis to identify areas of improvement and areas, where the enterprise has succeeded. Such analysis is done in the area of management and production site and helps to ensure the right process of EnMS implementation.

Management area was defined in accordance with provisions of ISO 50001 and UNIDO EnMS methodology. Taking into account that the work on EnMS implementation has already been underway, experts have assessed corresponding EnMS areas on the enterprise.

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

[1] By 2015 tariffs.

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 a 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

Within technological part of analysis, the experts found a number of technical opportunities for improvements, among which are:
- The use of thermal energy for heating rooms or for an air curtain through a heat exchanger;
- Improving the insulation of hot pipes and fittings;
- Installation of a water heat exchanger over an open surface of melt, etc.

These and other identified saving opportunities were approved and put into implementation on the enterprise.

Additional benefits gained from implementing EnMS

Along with building a system for energy resource management based on system approach and energy efficiency increase, the enterprise gained the following non-energy benefits:

- Reduction of maintenance and repair costs. Due to accurately built system of carrying out maintenance of certain SEUs not only by repair schedule, but also on the basis of developed maintenance criteria, Revda plant was able to eliminate unplanned shut-down of equipment and financial and energy losses related to it. When developing maintenance criteria, recommendations of equipment producers and SEUs operators were considered.
- Production growth (volume and pace) due to shortening of unplanned shut-down times and increased control over energy system and higher competence of operating personnel, of technical maintenance, etc.
- Improvements in labor protection and personnel safety. Quality preparatory work prior to start-up of furnaces, as well as preventative maintenance lower the chance of accidents, which positively impacts safety of the personnel.
- Increase in quality of manufactured produce, smaller numbers of defective produce. Stronger control over critical operating parameters, preventative maintenance for certain

SEUs, as well as change in production schemes and schedules provided for quality increase in manufacturing and reduction of defective goods.

- General increase of production and competitiveness.

Conclusions

Lowering energy costs, more rational use of energy, implementation of new production schemes, increase in production quality, and motivation towards continual improvement of energy efficiency on the basis of system approach to energy management helped Revda plant to become more competitive and more efficient.