

KUZBASSRAZREZUGOL BRANCH COMPANY – KEDROVSKY SURFACE MINE

In cooperation with UNIDO for energy efficiency increase, UMMC Holding management decided to implement a pilot project on Kedrovsky surface mine – a branch company of one of its affiliated organizations – Kuzbassrazrezugol.



The reason this branch office was chosen is that it includes all types of rock coal mining and conversion concentrated within one enterprise. These activities include surface stripping, mining, conversion and coal washing. Therefore, in case of successful EnMS implementation, acquired experience could be shared with other surface mines (there are six of them along with Kedrovsky within the Holding). Activities within UNIDO programme lasted from September 2014 to March 2016.

The field of Kedrovsky surface mine is located in the central part of Kemerovsky geological-industrial region of Kuznetsky River Basin. The company mines coal of CC energy brand in the average annual amount of 5 thousand tons. Balance reserves are more than 70 million tons. The company uses transport systems of coal excavation, and uncovers coal seam by dispatching overburden rocks and loading automobile and railroad transport. Kemerovsky surface mine comprises of approximately 3.5 thousand employees and its annual energy consumption is over 127 GWh.¹

Achievements of KRU in energy saving prior to joining the UNIDO programme

Upon beginning of partnership with UNIDO for EnMS implementation, Kedrovsky surface mine has already been undertaking consistent measures aimed at energy efficiency improvement: the company developed energy saving programmes for 3 years, which included previous years' analysis, target indicators for each energy resource, indicators for specific norms per production unit, and the list of energy saving activities. However, despite its positive outcomes, this programme had a disadvantage of not considering low-/zero-cost opportunities of operational control.

Energy management system implemented within UNIDO project provided for energy consumption management on the basis of system approach, in other words, analysis of current energy consumption based on a model, built on a last (basis) year's data. Such analysis employs regression model that considers all the factors (variables) affecting energy consumption, and allows to compare current results with the previous ones. Monitoring of results of how indicated targets are being reached is done by comparing the graphs of actual and target energy consumption.

¹ Data for 2015

EnMS implementation by UNIDO methodology

On the initial stage of EnMS implementation by UNIDO methodology, the company's team responsible for this process had to identify EnMS scope, that is, which energy resources would be analyzed within the programme. Production processes of Kedrovsky require electricity, heat, technical water and diesel fuel. The share of heat and technical water is less than 2% and, therefore, insignificant. Share of diesel fuel is relatively high, but it was premature to analyze this energy resource on the first stage of implementation due to existing distribution of functions in KRU subsidiaries.

It is worth mentioning that EnMS team has conducted a large volume of work to gather all the data, whilst lacking necessary measuring tools and information on the factors affecting consumption.

On the next stage of implementation, it is necessary to identify significant energy users (SEUs) in order to analyze their consumption of electricity. One of key features of Kedrovsky surface mine is that all identified SEUs are at the same time three main production sites of the company. Thus, the most significant energy users are mining and conveyor equipment, which account for 64% of all payments for energy resources, hydromechanization equipment (hydraulic stripping) – 22%, and coal preparation factory – 14%.

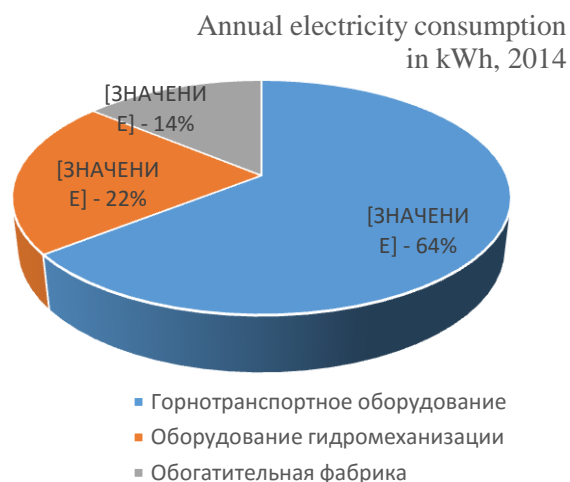
Kedrovsky EnMS team has defined the variables (factors) affecting electricity consumption on each SEU and has built the regression models.

Kedrovsky EnMS team has conducted large amount of work for verification and synchronization of data for analysis. It is noteworthy, that improvements of the models built lasted throughout the whole time of programme implementation. This was due to the fact that data acquired from mining journals had to be analyzed (whether it affects or not the consumption) and synchronized with data on electricity. Together with UNIDO experts, EnMS team had tested approximately 80 models, before selecting only three technically correct ones.

Implemented measures for energy efficiency increase

In result of energy saving activities within the framework of EnMS programme implemented on KRU in 2015, the following results were achieved:

1. Technology-focused measures were implemented on significant energy users (SEUs):
 - optimization of operation of gridners by redistribution of workload between the first and second process streams;
 - daily planning for equipment operations, decrease of non-productive downtime in idle mode;
 - optimization of operating parameters for pumps and hydromechanization equipment;
 - ensuring nominal workload for energy efficient excavators;
 - water pressure optimization at hydrostripping site



In 2015, Kedrovsky surface mine saved 3972 MWh, or more than 9 mln.RUB (USD 155 000) on the hydromechanization site by lowering operating pressure from 30 to 19 atm for water in the pipeline, supplied from pumping station to the hydromonitor. This effective measure was implemented in result of cooperation between the power engineers and engineers for mining operations.



2. Achieved savings (in comparison with forecasted) estimated by regression analysis:

- Energy savings: 20 778 MWh;
 - Savings in monetary terms: 49 936 thous.Rub. ≈USD 860 000, with total investments of 852 thousand Rub. (≈ USD 14 673)
3. Decrease in CO₂ emissions: 12,5 thousand tons.
4. Additional non-energy benefits are achieved, such as improvements in maintenance and growth of personnel awareness in terms of energy savings.

Conclusions

The example of Kedrovsky surface mine – branch company of Kuzbassrazrezugol showcases that substantial economy, exceeding set targets, is achievable without any high capital costs, but solely with low-cost measures of operational control.

One of the main success factors was the efficiency and unity of EnMS implementation team. Together with national UNIDO experts, responsible employees of the company have done a lot of work to gather and analyze the variables; they have tested different regression models before they could get precise energy consumption forecasts and verified results. By doing so, they were able to estimate actual current level of energy efficiency and compare it with the base one, it also became possible to estimate exact results of any implemented energy saving activity.

Additionally, high management involvement and its commitment to energy saving ideas has had a positive impact on programme implementation results. The management gained understanding of the benefits of UNIDO methodology (regression models over specific indicators) and acquired higher motivation and intention to further implement EnMS as an energy efficiency tool.

Direct and additional benefits, such as energy expenses reduction and its more rational use, introduction of new production schemes, quality increase and commitment to continual energy efficiency improvements on the basis of system approach allowed the company to become more competitive and improve its productivity.