

Global Energy Management System Implementation: Case Study

Russia

Zhilkomservice

Russian first residential managing company to implement EnMS and get certified by ISO 50001



Figure 1. Naberezhnye Chelny city.

Business Case for Energy Management

Zhilkomservice serves 334 residential apartment buildings, or 1.6 mln. m² of housing stock. Serving more than 100 000 residents makes it the second biggest residential managing company in Russia. Along with management of apartment buildings, the company maintains housing stock, maintains and repairs constructions and engineering networks of buildings, and conducts sanitary maintenance. Its staff consists of 613 employees. Among the main priorities of the company are constant improvement of the comfort of living and residents' satisfaction levels. In the period of 2015 – 2016, Zhilkomservice attended the UNIDO EnMS programme alongside 10 other industrial companies of Naberezhnye Chelny city.

Drivers and energy reduction approach

In 2009, Russia passed a law requiring companies to ensure energy savings and energy efficiency in apartment buildings. To comply with this legislation, Zhilkomservice launched an Energy Efficiency 1.0 program in 2010, which resulted in installation of heat, electric energy and cold-water meters in all apartments by 2015. Central heat points have been eliminated and water heaters with temperature regulators have been

installed in all apartment buildings to optimize hot water supply system. The heat supply system was modernized, and individual heat points with weather regulation were installed. In 2013-2015, Zhilkomservice implemented Lean Manufacturing System and the ISO 9001 quality management system. Both programs have positively impacted the company's organizational and technical efficiency. However, it hasn't yet exhausted potential for energy efficiency increase. Thus, energy management became a new tool for further energy efficiency improving. In 2015, the Energy Efficiency 2.0 - EnMS program was launched.

Case Study Snapshot	
Industry	Housing and communal utilities
Product/Service	Management and maintenance of housing stock
Location	Naberezhnye Chelny city, Russian Federation
Energy Management System	ISO 50001
Energy Performance Improvement Period	2 years
Energy Performance Improvement (%) over improvement period	19%
Total energy cost savings over improvement period	USD 1 163 000
Cost to implement EnMS	USD 73 000
Payback period (years) on EnMS implementation	0.06
Total Energy Savings over improvement period	195 000 GJ
Total CO₂-e emission reduction over improvement period	32 400 tons

The company joined UNIDO project and started to implement EnMS by UNIDO methodology.

Business Benefits Achieved

EnMS implementation not only helped to reduce energy consumption, but also positively impacted many aspects of the company's operations:

- ✓ Total heat energy savings amounted to 79 000 GJ in 2016, and 116 000 GJ in 2017.
- ✓ Utilities payments of residents decreased by 15%.
- ✓ Residents' satisfaction index increased from 75% prior to EnMS to 95% today, partially due to raised awareness of residents about the company's work on energy saving and its positive environmental impact in the city (total CO2 emissions reduction of 32 400 tons).
- ✓ Software developed and implemented for monitoring of heat consumption for each house allowed to quickly identify failures in the heating system.
- ✓ Time needed to localize emergency situations was reduced by 60%. This led to a decrease in labor costs of line employees and made it possible to redistribute the staff working hours more efficiently, resulting in more than USD 200 000 savings in wages.
- ✓ Service life of engineering systems with energy-saving technologies and life cycle of equipment operation increased by 17%. Labor productivity increased by 5%.
- ✓ Residential costs for housing and communal services decreased by 8%
- ✓ Number of poor quality service complaints from residents reduced by 22%.

“EnMS means for us interconnection of People, Data and Technologies.”

— Olga Tarnaeva, Director General

EnMS Development and Implementation

TECHNOLOGY - the goal is to ensure operation of equipment at the most efficient mode on a daily basis.

DATA - a tool for monitoring the performance of equipment. The task is to organize daily monitoring and

data analysis for prompt response to deviations in energy consumption.

PEOPLE are the main factor. Both technology and data depend on how people operate them.

Organizational aspects

PEOPLE or COMMITMENT is the first key factor in UNIDO's methodology, as well as the key to success and the most challenging part of energy management. First of all, the company focused on the search for and implementation of organizational potential in energy saving related to the daily behavior of people.

The process of constant improvement requires constant changes. Changing the established work routine is the most difficult aspect of EnMS implementation. Zhilkomservice faced an even bigger challenge in this area, as the energy efficiency of apartment buildings depends equally on companies' actions, as well as residents of the buildings. Therefore, commitment is a part of energy management program that needs to be dealt with constantly. Commitment has two components – management commitment and employees' involvement.

EnMS implementation begins with project management. First of all, Energy policy was developed, as a document where the Top management formulates its commitment to support and ensure EnMS with necessary resources. It is highly important from the perspective of employees' trust.

A Working Group on corporate energy management was formed and an Energy Manager was appointed.



Figure 2. Director General and Energy Manager conduct EnMS training for employees.

They have undergone training on EnMS themselves and then ensured the training process and involvement in EnMS for other employees. A model was developed that included Roles and Responsibilities for not only those in the Working Group, but for all employees. Newly hired staff study this document at the stage of signing the employment contract. Top management, namely the general director of the company, is actively involved and personally participates in the energy saving process, encouraging staff and providing financial support to the activities.

The company conducted ISO 50001 certification in October 2015 and was re-certified in December 2017.

Energy review and planning

Energy analysis begins with identification of EnMS scope and boundaries, building annual consumption trends and identification of Significant Energy Users (SEU).

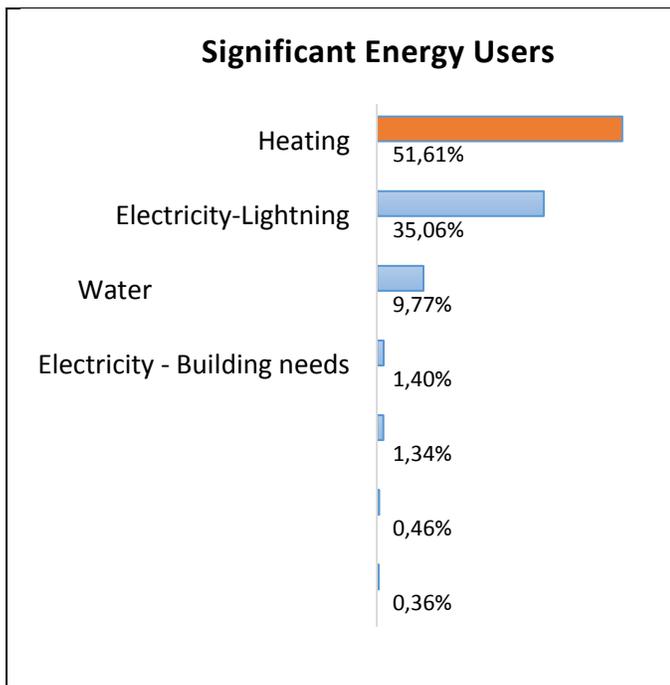


Figure 3. SEUs. Identification of SEUs allows to define areas of focus for EnMS.

SEUs – is the second key factor in UNIDO methodology. In the residential housing sector heat and electricity consumption is significant. Due to the fact that electricity and water are consumed mainly by residents and the

company has no technical ability to influence this consumption, electricity and water were excluded from EnMS scope in the first year of implementation. At present, involvement of tenants in energy saving activities made it possible to include electricity in EnMS scope.

ENERGY ANALYSIS is the third key factor in UNIDO methodology. To analyze heat energy consumption, multifactor regression analysis was applied. The goal was to organize daily analysis for all 334 houses. Doing it manually is very cost- and time-consuming. Therefore, the company decided to automate this process, which became the first stage of Energy Efficiency 2.0 program.

The company hired a programmer, purchased necessary equipment and developed program software to conduct on-line heat consumption monitoring for each house. Total costs of energy analysis process automation paid off in 4 months. Energy analysis automation within Energy Efficiency 2.0 program required 3 months.

Energy Efficiency 2.0 program consists from three parts: energy data collection and monitoring, energy performance analysis and automatic remote control of critical operating parameters.

Energy data monitoring system provides a real-time data collection of heat energy, electricity and water consumption of each building.

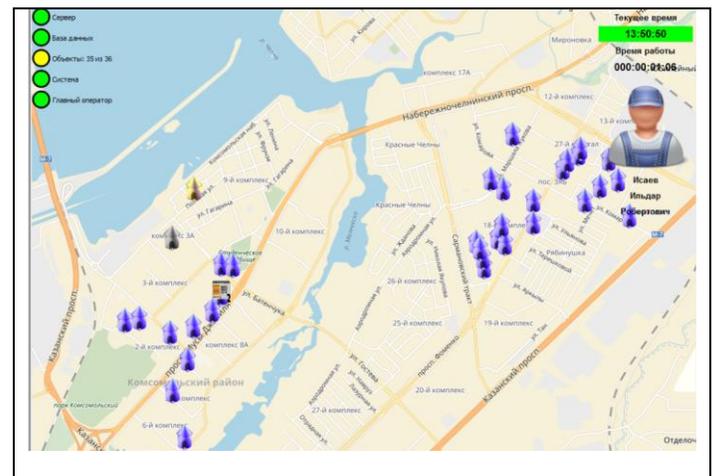


Figure 4. Energy data collection and monitoring system.

Energy performance analysis system provides monitoring, measuring and analysis of heat energy consumption each of the 334 houses separately.

“Energy management issues are very important for our city in a time of growing consumption of energy resources.”

— Nail Magdeev, Mayor of Naberezhnye Chelny city

Investigating OPPORTUNITIES FOR SAVINGS is the forth key factor of UNIDO methodology. Zhilkomservice provided an environment that enabled all the employees and residents of apartment buildings to submit ideas on energy saving. More than 300 suggestions have been submitted since the beginning of 2017. Each idea is carefully reviewed. One way to gather ideas is through setting up a mailbox where top management can get proposals to improve not only energy efficiency, but also employee involvement. Another way is to have personal discussions with each employee individually. The members of the working group try to interview individuals and get recommendations from personnel during meetings, trainings and daily work. Based on the database of ideas submitted, planning is carried out with a focus on no-cost and low-cost measures.

Cost-benefit analysis

In 2016, the company achieved savings of USD 690 000, out of which 75% (USD 515 000) were achieved by no-cost operational measures of energy management, with a payback period of 0.3 years. During the same period, savings from investment measures (installation of automated individual heat points) amounted to 175 000 USD, or 25%, with a payback period of 3.8 years.

Approach used to determine if energy performance has improved

Energy performance monitoring, measuring and analysis is carried out for each of the 334 houses separately by UNIDO methodology and with a use of multifactor regression analysis.

The main relevant variable for Heating is heating degree-days (HDD). To visualize the results of energy analysis, graphs are used that represent the planned (red line) and

actual (blue line) savings by the cumulative sum (CUSUM).



Figure 5. Monitoring of heat energy consumption.

Energy analysis is carried out by heating periods from early October to end of April. Preceding heating period serves as a baseline. Before the heating period starts, for each of the houses its own EnPI model is built.

The CUSUM graph indicates if the energy performance is improving (Down) or if one should undertake corrective measures (Up).

As a result of EnMS implementation, heat energy savings in the 2015-2016 heating period amounted to 6%, 2016 - 2017 – to 8% and in 2017-2018 – to 7%. Thus, in relation to the heating season 2014-2015, the company achieved an energy consumption decrease of 19%.

Approach used to validate the results

Zhilkomservice assesses its energy performance by two parameters.

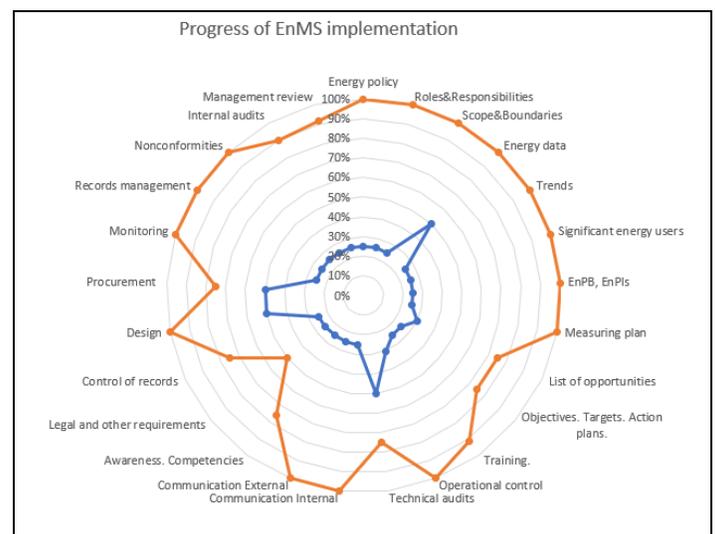


Figure 6. Monitoring of EnMS implementation

The first is, most importantly, achieved target energy savings (goal for energy consumption decrease). EnPIs models are used for monitoring this indicator.

The second indicator – is the percentage of EnMS implementation. By the end of 2016, this indicator was at 86%. With continual improvement by the company, this number rose to 92% by the end of 2017

Such a system ensures the process of continual improvement.

Steps taken to maintain operational control and sustain energy performance improvement

OPERATIONAL CONTROL is the fifth key factor of UNIDO methodology. Upon automation of the energy analysis process, the company aimed at automation of operational control, including by identified critical operational parameters.

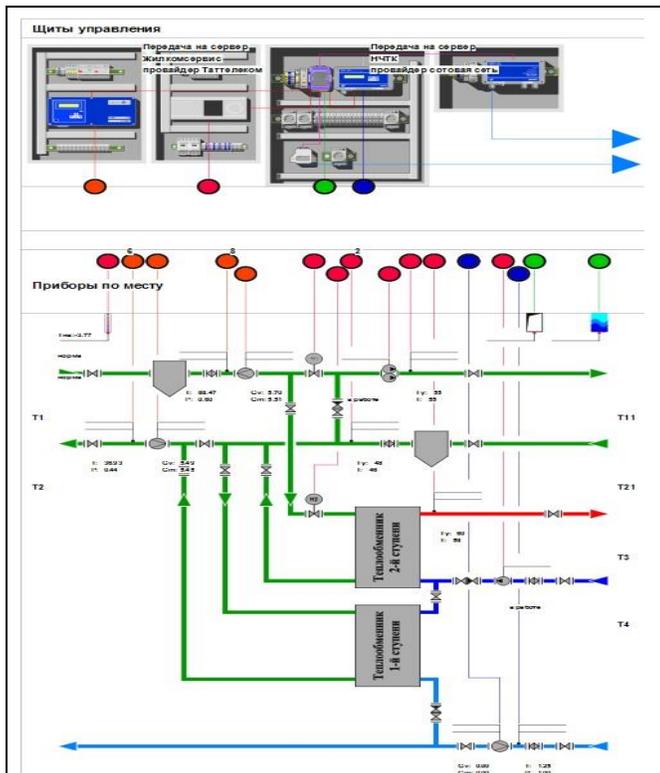


Figure 7. Automatic remote control of critical operating parameters

Remote control of the technological equipment operation allows changing microclimate parameters in

the premises. The program enables the user to change parameters of the heating system coolant, turn off the heating system in case of warming, to control the parameters of the hot water supply system coolant, to turn off the hot water supply system at night (transfer of the hot water supply from circulating system to deadlock), and to remotely change the parameters of circulation pumps in hot water supply and the heating systems.

In addition, the developed software allows the dispatcher to monitor the operation of equipment by 70 parameters for rapid detection of abnormal situations (accidents).

In case of abnormal situation (accident) the dispatcher receives a signal, and the program lists possible causes of abnormal situations, as well as options of necessary corrective actions to undertake.

Development and use of professional expertise, training, and communication

EnMS success stems from involving all employees in the process, increasing their competencies and awareness, as well as enabling all staff to directly participate in EnMS. To date, the company was able to involve 74% of its staff in EnMS activities.

Specific features of Zhilkomservice stipulates the need for training of not only company employees, but also apartment residents.



Figure 8. Regular training for residents

Along with in-house EnMS training, 50 employees have undergone vocational training in college. The salary depends on competencies: for example, knowledge of energy management is among skill level criteria for line employees, and depending on the skill level, wages can vary from 250 USD to 700 USD.

Training on energy saving for interested residents was organized. More than 300 apartment residents attended this training in 2017. The company equipped a special study class for this activity.

Company has developed an educational program for children and conducted trainings on energy savings in schools.

CONTINUOUS IMPROVEMENT is the sixth key factor of UNIDO methodology.

Improvement of energy performance is not only a target of EnMS, it is also an indicator that your EnMS works properly.

Tools & resources

Implementation of measures within ISO 9001 quality management system and Lean Manufacturing program in the earlier periods has greatly contributed to successful EnMS implementation.

Currently, the company applies an integrated management system.

Top management provides EnMS with all the necessary resources, including USD 10 000 funding for training class equipment, and USD 15 000 for additional training for staff.

The Keys to Success are formulated in '5 Cs':

- Commitment
- Coherent data analysis
- Consistent operational control
- Continuous training
- Continuous improvement

Lessons Learned

EnMS is a system that ensures involvement of all employees in the process of continuous energy efficiency improvement.

It is very important to build commitment at all levels of the organization.

EnMS will not work without direct involvement of the top management.

All EnMS activities are lining up into an interconnected logical chain right after the beginning of correct analyzing and understanding of your energy performance on a daily basis.

The potential of energy saving is the potential of knowledge and experience of your employees.

EnMS provides new business incentives to the company, builds up the team, motivates and creates new stimulus for employees.

EnMS is not a one-time project. This process never ends.

Through the Energy Management Working Group (EMWG), government officials worldwide share best practices and leverage their collective knowledge and experience to create high-impact national programs that accelerate the use of energy management systems in industry and commercial buildings. The EMWG was launched in 2010 by the Clean Energy Ministerial (CEM) and International Partnership for Energy Efficiency Cooperation (IPEEC).

For more information, please visit www.cleanenergyministerial.org/energymanagement.

