

# Global Energy Management System Implementation: Case Study

Republic of Macedonia

## AD Makstil

*Makstil achieves energy savings and CO<sub>2</sub>-e reduction using EnMS*



Steel shop – SEU for electricity

### Business Case for Energy Management

Makstil is a significant and very important producer of hot rolled heavy plates in the Balkan region consisted of two plants and three administrative buildings. It was established in 1997 upon privatization and reconstruction of the former Mines and Iron Steelworks –Skopje (founded in 1967) as an integrated producer of flat rolled products.

First plant is steel making plant also known as Steel shop, where slabs are made from scrap metal, by electric arc furnace and ladle furnace.

The second plant is Heavy plate mill, where slabs are made into plates by reheating, rolling, cutting and final customization.

Makstil is on the electricity market since 2014 and the variation in prices for Electricity, natural gas and oxygen which are the most used energy in the production process, directly affects the final price of the product. Energy use and consumptions is monitored in real time, documented and reported. Main driver for optimizing

energy consumption is lowering the cost for production, improving the energy performance and efficiency.

By energy management, AD Makstil is contributing to sustainable environment, since Skopje has been associated with being the most polluted city in Republic of Macedonia.

### Case Study Snapshot

<b>Industry</b>	Heavy metallurgy
<b>Product/Service</b>	Heavy Plates, slabs
<b>Location</b>	Skopje, R.Macedonia
<b>Energy Management System</b>	ISO 50001
<b>Energy Performance Improvement Period</b>	2 years
<b>Energy Performance Improvement (%) over improvement period</b>	7.54%
<b>Total energy cost savings over improvement period</b>	200 000\$
<b>Cost to implement EnMS</b>	30 000 \$ + investments
<b>Payback period (years) on EnMS implementation</b>	0.3 y
<b>Total Energy Savings over improvement period</b>	11 724 GJ
<b>Total CO<sub>2</sub>-e emission reduction over improvement period</b>	2 424 tCO <sub>2</sub> eq

Our goal is to optimize the process and equipment by rational usage and investments accordingly, and is set by the General Manager and Energy Management team when making company strategy for the forthcoming period, which reflects top management commitment to these activities.

With the help of UNIDO and GEF program, employees were trained to implement ISO 50001 standard and establish, implement and improve EnMS.

Main drivers for implementing ISO 50001 were first of all, documenting the whole process, developing policy, setting objectives and targets and actually see the results that lead to continual improvement of energy performance.



Figure 1\_CUMSUM analysis for electricity

Our team had to overcome wide range of barriers starting from changing the mindset of employees by promoting energy efficiency materials, encouraging the personnel to contribute to the improvement of the system, variation in consumption analysis, up to altering the budget to the needs of EnMS. The energy management team could not foresee the end of energy management project, so we decided ...

*“We make EnMS process, not project.”*

—Katerina Dimovski, energy manager

### Business Benefits Achieved

Makstil has been managing energy since 2014, and started documenting the process in 2015 finalizing with the certificate in 2018. Business benefits were seen even in the beginning which was the reason we continued with certification.

Since we already had real-time monitoring system for electricity and oxygen, most of the data was easy

accessible for further calculations and we could focus on bringing systematic approach to energy saving.

First sign was improvement in energy performance of SEUs that came out of regression analysis with operational control only. We started working in three shifts to improve production, and started to plan the production process accordingly electricity market price, so the final price for energy is acceptable.

Most important was the financial benefit, given the variable prices of energy. Aside from that, Makstil benefits with better use of existing energy consuming assets by good energy management behaviors set in the Energy Policy.

Last, but not the least important was the reduction in Greenhouse Gases emission by 2 424 tCO<sub>2</sub>eq calculated from saved energy.

*“ISO 50001 optimized the cost for production and made Makstil more competent.”*

—Dragan Mijalkovski, Management Representative

### EnMS Development and Implementation

**Organizational:** since Makstil has been managing energy uses, it was clear to establish the scope and boundaries under which we will establish, document, implement and maintain EnMS. Top management was fully committed to support EnMS during all internal meetings about energy policy, communicating the importance of EnMS and full support to the EnMS team. They are always considering the energy objectives and targets in the making of production and maintenance plan and long term plans as well.

Key team members are the management representative and the energy manager that are communicating on daily basis about the achievements in energy performances, whether they are following the framework of objectives and targets set at the beginning of the year. Management representative is

included in purchasing of energy efficient products and services and Energy manager coordinates the activities within the EnMS:

- is following the usage of energy in real time and alarms if unusual values appears,
- does the competence and awareness training in the SEU staff and every employee (800 employees)
- makes daily nomination of electricity coordinating the production process
- does the energy analysis and EnPI on monthly basis and updates the targets and action plans
- documents all the steps in EnMS , control the document revisions, status and ensures that relevant versions are available at point of use
- Establishes energy criteria for SEU for effective production maintenance and operation
- Deals with nonconformities and corrective actions
- Schedules management review meetings
- Gathers ideas for upgrading EnMS and list them by importance

**Energy review and planning:** Energy review and regression analysis in the beginning (2014 and 2015) were made monthly, but no accurate data was given because of the production dynamics. So we made Methodology and criteria for developing energy review stating that analysis should be made by batch production considering the weight of batch, temperature of tapping and yield of each.

With this methodology we established baseline and evaluated past and present energy use and consumption for each source separately.

Accommodating the budget was one of the challenges we had to face, because we set the parts of SEU that needed replacement, and we are investing in efficient lightning and equipment month by month.



Figure 2\_ EnPI over the years

One big investment was the reconstruction of electric arc furnace in 2015 that led to 22% improvement in energy performances, but as base year we set the period after the reconstruction because we can not do reconstructions often. Even after the reconstruction improvement is made by efficient operation by 5% that is saving in total price of electricity by 2% (because price of electricity market, this investment could be paid back in a day with right nomination and imbalance).

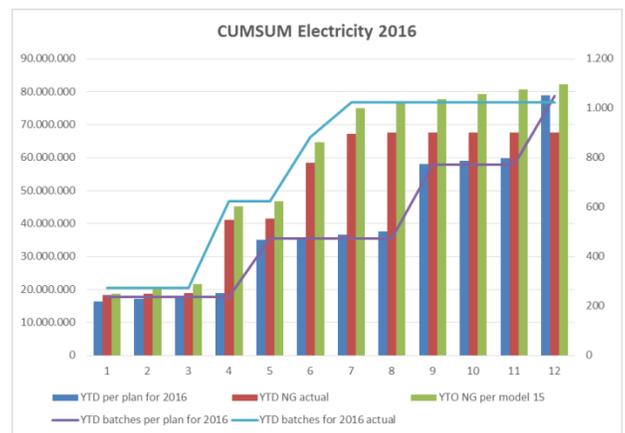


Figure 3\_ CUMSUM for electricity for 2016

*“We have better production and maintenance thanks to ISO 50001”*

—Ivan Banovski, general manager

**Tools and resources:** Makstil started implementing ISO 50001 by UNIDO Energy management system tool, and as we progressed with the analysis, we started to build separate regression models in Excel for each batch following the guidance form ISO 50004:2014 Guidance

for the implementation, maintenance and improvement of an energy management system, ISO 50006:2014 Measuring energy performance using energy baselines and energy performance indicators and ISO 50015:2014 Measurement and verification of energy performance of organizations. The additional standards provided detailed directions in the implementation process that lead the way of calculating energy savings.

For monitoring of energy usage, we have real time monitoring system for all energy used in the production process that help us for systematic tracking, analysis and planning of energy use. EnMS is integrated to the existing management system so production factors are connected to energy use.

With EnMS, Makstil managed to have better control of energy cost and take advantage of open market price drops, establish energy management team that showed leadership, diversity, knowledge, commitment and support throughout the implementing process and reduced consumption and future risks associated with carbon emission taxes.

**Energy performance improvement:** By doing the regression analysis we determined the baseline by batch production in 2015 and started to report monthly after each production session. In the beginning only production was input to the regression models, but as we went in depth of regression models, we understood that the weight of the batch and the temperature are important factors to normalize data as well .

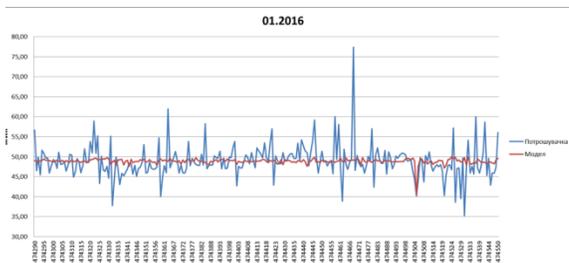


Figure 4\_Regression analysis by batch for January 2016 production

Makstil invested in separate department for energy and trained the staff for implementation of ISO 50001 and generally leading the EnMS. Control monitoring equipment was already installed and integrated in SCADA for electricity, so we added oxygen and we plan

to update the SCADA with all other energy sources in the following years.

With this real time monitoring system it is easy to follow SEU and update EnPI, effectiveness of action plans in achieving objectives and targets and evaluate actual versus expected consumption.

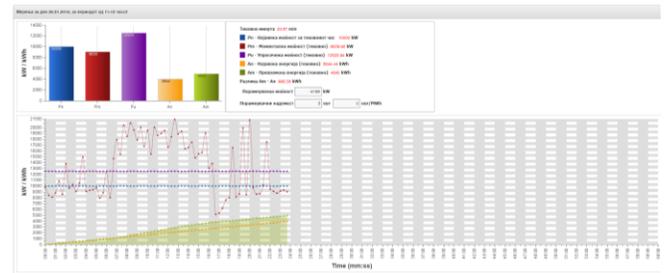


Figure 5\_ SCADA system for real-time monitoring of energy consumption in Makstil

Energy manager does the training part to all new employees and the existing personnel starting from SEU operators. For now, the training is concentrated to promote energy awareness, but in 2018 it is planned to have custom training for each job description, once experiences from other major manufacturing plants are collected.

In our internal informational software we integrated part where every employee can contribute toward improvement of EnMS and report in case there is inconvenience in the system.

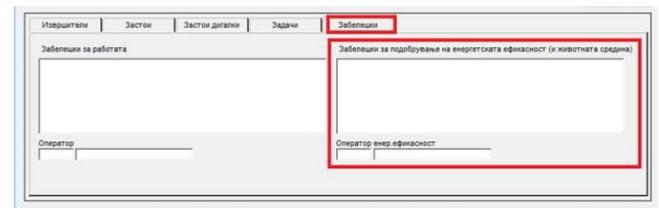


Figure 6\_ Part of internal information system that anyone can contribute to improvement of EnMS on daily basis

Internal audit is scheduled twice a year to ensure that EnMS is running effectively, objectives and targets are met and that are no major nonconformities. Records are maintained and reported to top management.

In the part of operational control, work instructions about energy aspects are distributed to each part of the manufacturing plant. In the instructions, effective operation criteria is set and established following the

existing work procedure and stating how the operators can directly affect energy usage and performance and that with their actions how they directly contribute to better or lower energy performance.

Our advice will be to take things slow and let employees accommodate the new tactics provided in EnMS production and maintenance. Most importantly, never give up, even if you don't see savings in the beginning, they will come eventually with continuous improvement. Then, when you compare with the beginning, you can see the results.

## Keys to Success

---

- Believe you can make a change
- Gather enthusiastic team
- Don't believe it is impossible
- Top management commitment

## Lessons Learned

---

First lesson we learned is that anything is possible if you have motivation and will. Makstil is place with workers of all generations, for the younger is easier to accommodate to the new technologies and instructions and the more experienced workers were challenged by this energy revolution. But in time, everyone become aware that their actions lead to general consequences and started to care about their impact on energy performances. Employees even learned few tricks on energy saving for home improvement.

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](http://www.cleanenergyministerial.org/energymanagement).

