ISO 50001 Energy Management System
Case Study

The Republic of SERBIA

BAMBI

Serbian leader in confectionary industry achieves great savings using the ISO 50001

1 Everybody is important: Energy team with leadership

Organization Profile & Business Case

Nothing tells a better story about BAMBI than its brands, consumer loyalty and numerous awards. This applies to the most recognizable Plazma, i.e. Lane in Western Europe and USA, which today has grown into the entire family of the products designed for various ways of consumption, but also to other Bambi brands like Wellness integral biscuits, Zlatni Pek, Bambi biscuits, Josh! salty snacks and Bambi wafers.

Bambi has grown its energy program from the responsibility of the corporate manager to a thriving program with dedicated plant-based personal. This new energy team has provided a competitive advantage for Bambi and continues to grow rapidly.

Bambi was the participant of the Pilot project that was, with the support of UNIDO, organized in Serbia in 2016, referring to the application of UNIDO methodology in the implementation of Energy Management System.

How did the program grow so fast? The short answer is results. Expanding on this question offers many interesting insights into starting a successful energy program. When strong leadership interacts with the right people (in our consulting company EnPI Center, to whom we own a great thank You), a focused process, and innovative technology, extraordinary results occur.

Our goal is to continually reduce the company's environmental footprint. Therefore, we seek to minimize the use of natural resources and energy, to decrease the waste quantity we produce, to reduce the emissions as much as possible. Also, we seek to continuously improve the efficiency and effectiveness of our processes and energy use through constant training, by having higher requirements as regards the knowledge and raising awareness of our employees.

As a result of our efforts and commitment, we certified the energy management system according to the requirements of ISO 50001:2011 in June 2018.

"We want to constantly improve the energy performance and to reduce CO_2 emissions."

—Dragan Stajković, General Manager

Case Study Snapshot	
Industry	Food production
Product/Service	Confectionary
Location	Pozarevac, Serbia
Energy Management System	ISO 50001
Energy performance improvement period	< 2 years
Energy Performance Improvement (%) over improvement period	4.51%
Total energy cost savings over improvement period	110,000 $USD
The cost to implement EnMS	29,200 $USD
Total Energy Savings over improvement period	8050 (GJ)
Total CO_2-e emission reduction over improvement period	1,325.66 (Metric tons)

Table: Case Study Snapshot

Business Benefits

Energy Management System has enabled us to address this issue structurally and systematically. Besides the reduction of energy consumption, Energy Management System helped us to increase the efficiency of our processes.

Our Energy Team Leader, Saša Milovanović, likes to joke: "For a single energy manager without plant-based engineers, pushing new energy practices on the plant is like pushing a rope uphill. Some will gain traction, but many will not". If only one person is responsible for reducing energy in tens of processes, progress will be slow.

Bambi, until recently, hired no new energy engineers. Instead, priorities for an engineer at each process were realigned. The program targeted people who excelled as drivers of change, innovators and technical leaders. In fact, most of the engineering personal had a very little insight in energy efficiency and environmental awareness. Bambi in association with EnPI Center, financed a strong training program along with the standardized tools that allowed our engineers to deliver savings quickly.

"EnMS helped us to become more efficient, to eliminate the time we spent on discussions without any results and to focus on the main objective - how to preserve energy."

—Saša Milovanović, Energy Team Leader

Thanks to the results of the Pilot project, top management showed full commitment to Energy Management from the moment implementation started. The decision on implementation was made at the beginning of 2017. Within the period lasting less than two years from the beginning of implementation, saving (comparing to 2016 as the reference year) of 4 % annually as regards the consumption of CNG, i.e. close to 1,269.687 kWh, was achieved. Of which, in 2017, the reduction was 3.92% i.e. 630 kWh (3.92%), and in 2018 it was 640 kWh (4.04%). At the same time, this saving means the reduction of CO_2 emissions by approximately 280 metric tons. Finally, if we talk about money, saving is approximately 59,000 $USD.

Regarding the electricity, saving, if compared to the consumption in 2016, is 5.28% annually, i.e. 843 kWh in total. Of which, in 2017, the reduction was 306 kWh (4.56%), and in 2018 it was 536 kWh (6.70%). Bearing in mind that coal power plants have the share of 70% in electricity production in Serbia, reduction in electricity consumption, which was achieved by us, is equivalent to a total reduction in CO_2 emissions by approximately 930 metric tons. This saving resulted in a financial saving of approximately 47,000 $USD.

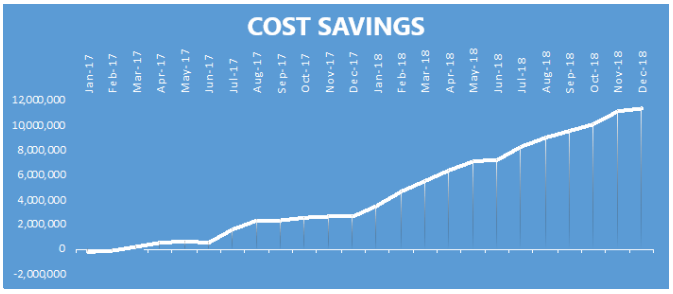
Reduction in heat energy consumption is the most significant if we talk about a percentage, and it is 8.98% annually. Since the heat energy is primarily used for heating of administrative premises and workshops, during 5 - 6 months a year, reduction of heat energy consumption in absolute amounts is approximately 412,000 kWh (thermal). Of which, in 2017, saving was 69.000 kWh (2.93%), and in 2018 was extremely significant 343,000 kWh (15.37%). Equivalent reduction of CO_2 emission is 119 metric tons. If we talk about money, saving amounts to approximately 4,000 $USD.

At factory level, total energy saving is 4.51% comparing to that in 2016. With the reduction of thermal kWh to the third, total saving, in the absolute amount, is 2,236 MWh, i.e. 8050 GJ Reduction of CO_2 emission is over 1,325 metric tons, and energy cost savings are 110,000 $USD.

Bearing in mind EnMS implementation costs, which were less than 30 thousand US dollars, we come to the fact that the implementation cost was returned through the savings in the first year.

"Correct definition of operational parameters has helped us to understand the way the energy is used and to be able to quickly react to the variations."

- Nataša Nikolić, Production Process Manager



2 Cost savings in RSD

The most significant benefits from EnMS

- √ Bearing in mind the investment measures we implemented during previous years as regards the equipment replacement, during less than first two years of EnMS implementation, we reduced energy costs by 110,000 $USD or 4,5% which we consider significant and which has exceeded our expectations.
- √ Reduction of CO_2 emission by 1,325 tons during the same period significantly strengthens our commitment and responsibility towards climate changes;
- √ Reduction of operational costs enables us to be competitive at the market, as regards the prices;
- √ Thanks to the great number of opportunities and achieved saving, today we are able to achieve significant saving without any investments;
- √ Significantly increased commitment and will for further reduction in energy consumption is noticeable in our team;
- √ Focusing on a simple system, which is not complicated for exploitation enabled many members of our company to actively participate in all aspects of EnMS;
- √ Knowledge acquired by application of ISO 50001 enables us to simplify other management systems in our company, too;
- √ We know that the employees are the key element of success. Therefore Energy Management became one of the key subjects in all of our training and all procurements as regards to maintaining and operational processes;
- √ We are ready to improve the internal energy flow measurement system and by that to enable a deeper and detailed understanding of energy flows, and noticing inefficiencies and finding of the room for new savings;
- √ We have developed the practice to use all inconsistencies in order to improve the essence of our system;
- √ We publish our success in many articles and reports, both professional and financial.

Plan

Strong determination of top management for EnMS implementation resulted in forming the energy team and appointing its leader. All necessary support was obtained in time and necessary resources were provided. Also, energy policy defined clear directions for leading personal in the company. All of these have defined the general objectives the company aspires to. Based on this, the practical implementation of the EnMS system started.

Energy review, as the first step in EnMS implementation, helped us to overview and determine SEU (Significant Energy Use).

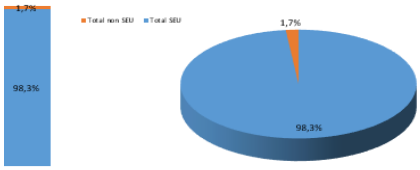
Three main energy resources being used in our organization, have been identified: CNG (Compressed Natural Gas), Electricity and Heat energy, obtained from the district heating system of the city of Požarevac.

CNG flow measurements inside the factory helped in treating every production line as individual SEU within the part of CNG consumption. Measurement of electricity flow inside the factory was not sufficient, so the electricity consumption was treated as a whole. The same applies to heat energy.

For every SEU it has been determined what are the drivers the energy consumption depends on, as well as who are the people who have an influence on consumption. Using the available data on energy consumption and on drivers influencing that consumption, we have started defining Base Line for each one of identified SEU.

Komprimovani prirodni gas (CNG)									
ID	Naziv potrošača	Uticajni faktori	Merenje potrošnje Ne/Autom/ Ručno	Godišnja potrošnja kWh	% ukupne potrošnje	Ko utiče na potrošnju	Ciljevi	Ciljna potrošnja kWh	EnPI
1	Peći linije B1/1	Struktura proizvodnje	Autom/ Ručno	1.509.843	8,5%	Planiranje, proizvodnja			CNG_B1/1
2	Peći linije B1/2	Struktura proizvodnje	Autom/ Ručno	1.616.639	9,1%	Planiranje, proizvodnja			CNG_B1/2
3	Peći linije B1/3,4	Struktura proizvodnje	Autom/ Ručno	1.987.594	11,2%	Planiranje, proizvodnja			CNG_B1/3, 4
4	Peći linije B2/1	Struktura proizvodnje	Autom/ Ručno	2.925.521	16,5%	Planiranje, proizvodnja			CNG_B2/1
5	Peći linije B2/2	Struktura proizvodnje	Autom/ Ručno	1.213.967	6,9%	Planiranje, proizvodnja			CNG_B2/2
6	Peći linije B2/4	Struktura proizvodnje	Autom/ Ručno	2.081.102	11,8%	Planiranje, proizvodnja			CNG_B2/4
7	Peći linije B2/5	Struktura proizvodnje	Autom/ Ručno	6.043.956	34,2%	Planiranje, proizvodnja			CNG_B2/5
				0					
Total SEU				17.378.622	98,3%				
Total non SEU				307.710	1,7%				
Total consumption				17.686.331	100,0%				

Napomena: posmatran period 1.8.2015. do 31.7.2016.



3 *Defining of SEU for CNG consumption*

Understanding the people who have an influence on energy consumption and their role in the production system enabled the developing of a detailed matrix of roles and responsibilities. Using this matrix, the roles of people and their responsibilities for the successful functioning of EnMS are spread through the entire company, all production processes and administrative departments. This matrix has enabled people to understand their roles and their part of the responsibility. Strong leadership and commitment of energy team with their leader at the front, showed that this definition of roles and responsibilities has been set properly.

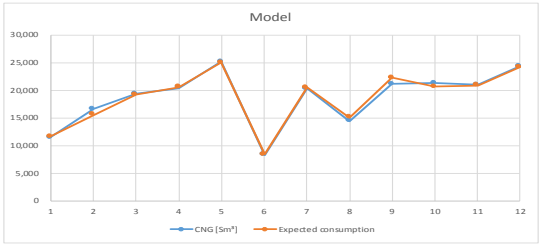
Energy team and company management clearly understood that without widely spread roles and responsibilities the success would be left off. Therefore the special attention has been paid to different training of personnel being involved, in whatever way, in this great and significant work.

Energy consumption data analysis is the key step of implementation. The connection between energy and its dependence on drivers, influencing it, is analysed by the regression method. This method has enabled easier identification of operational parameters within which it is necessary to maintain the production process.

"When it comes to implementing new measures there is no place for excuses. It is important to be passionate about finding inefficiencies and exploring innovative solutions!"

—Saša Milovanović, Energy Team Leader

Consumption analysis depending on drivers, influencing it, by the use of regression analysis as the innovative technology, which was pointed to by ISO 50006, showed the model of energy consumption for every SEU. Model, mathematical equation, for every SEU is then compared to real consumption achieved in the reference year.



4 *Baseline - a mathematical model of energy consumption*

Models, developed in such a way, represent reliable Base Line, for foreseeing the expected consumption in the future. By this, we are able to foresee the expected consumption depending not only on production quantity but also on production structure on the production line, climate influences, duration of day and night and similar.

Energy team carried out a technical audit of all production lines and auxiliary units. Considering all aspects and routines carried out by the workers in production, by talking to the workers and observing different inconsistencies we came up to a greater number of saving opportunities. Energy saving opportunity list has been developed, and all observations and ideas for improvement have been entered into it. Some of them were simple and easily applicable, the others were demanding additional analysis to be carried out. Actions were selected from the ESO list - Energy saving opportunity list, and

according to the principle "lower investments - the greater effect", their prioritization has been carried out. Resources were provided, implementation deadlines were set, responsible persons were specified and the method of verifying the accomplished effects of actions taken was determined for each of these actions.

Plan of measurement and measuring result aggregation has been developed. Besides the existing instruments for energy flow measurement, all measurements of drivers influencing the consumption have been put in the plan. The plan includes measurements, which are to be established in the following period, which will enable deeper analyses and further development of the energy consumption model. Besides these measurements, measurements of all operational parameters identified have been foreseen, which should enable proper implementation of operational controls in production and auxiliary systems.

"We choose to cherish nature for ourselves and for future generations - be energy efficient!"

—Marija Savić, Quality System Manager

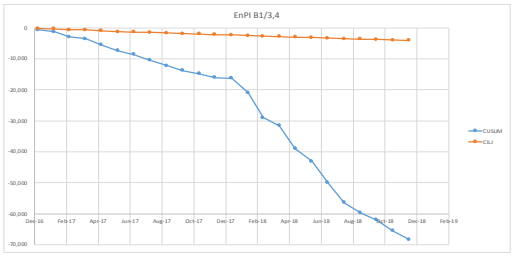
Do, Check, Act

Implementation of Action plan measures is checked on a regular basis and it is reviewed at the meetings of the energy team at least once a month.

After the completed implementation of every Action plan measure, verification of achieved savings is carried out in a predefined way, by measurements before and after, in a calculative way, using the regression analysis and similar.

Monitoring of Energy performance indicators (EnPI) is carried out by comparison of realised consumption and expected consumption, which is obtained by the application of energy consumption model. We have decided to use CUSUM methodology by which cumulative results are obtained.

Thanks to this methodology, we know that improvements in energy performance are possible when the CUSUM (blue) chart is below the x-axis. After each month, by entering new data, a new dot appears in the chart. If the chart shows a downward change, we know that the improvement was achieved during the previous month. Each direction of the chart mostly shows that something has happened and that EnPI for the previous month indicates inefficiency.



5 *EnPI Monitoring using CUSUM*

At the same time, the chart shows the objective (orange) for savings regarding the specified SEU. So, as long as the CUSUM chart shows the value below the objective chart, achieved savings are greater than expected.

Monitoring of the achieved results is done at the meetings of Energy team, once a month. Further development of measuring system will allow the frequency of these meetings to be reduced and result monitoring to be carried out once a week. We believe that this frequency will be ideal for our company, bearing in mind the great number of changes in the production process which is the result of the great number of different products we realize.

Analysis results of Energy performance monitoring are delivered through the reports to all interested parties, as to the management, so to the workers whose operative duties and responsibilities are to manage certain SEU.

In case of bad results, deeper analyses are carried out immediately, and if need be it is started with the resolving of inconsistencies, which result in changes in operational monitoring procedures.

Regular conduction of internal audits is also the way for verification of the achieved results, as in improving the energy performances of the company, so in improving the EnMS system itself. Internal audits are carried out

once a year, and partially, per production facilities, they are carried out more often, especially in cases of variations in the improvement of energy performances.

Transparency

Bambi communicates with external interested parties about its EnMS. Besides the policy, which is published at the company's website, publications of technical papers at professional meetings are often, in which the achieved results are promoted.

Also, at different financial meetings, the effect of the EnMS system are published, and they are discussed at the level of international group Bambi is the part of.

Lessons Learned

Constant awareness raising, motivation and training make the staff that will improve efficiency.

Teamwork is the key to success. Everyone is important. Each member of the staff has the opportunity to contribute to the success of EnMS by his/her ideas and suggestions, as well as to the improvement of energy performances of the company.

All inconsistencies, no matter where they come from, from the process, internal or external audits, should be understood and accepted as the possibility for improvement. We come to valuable understandings, which are to become part of the everyday practice of the company, by the analysis of the reasons and causes for the inconsistency occurrence. This is the way in which the company learns, becomes more mature, better and more successful.

The support of company management is important and necessary. That is the beginning, and the end of everyday hard and responsible work. Continuous improvements achieved by everyday effort will strengthen the support from the management. Technological innovations and expensive new equipment do not imply great energy efficiency. Feeling that "everything that could be done is done" by the procurement of modern, efficient and expensive machine can be misleading. A machine does not consume energy, but people operating it.

Because of all previously mentioned and after two successful years, we continue with training for the purpose of raising the awareness of all employees. Experiences gained within the company should be transferred by our employees to their everyday lives, their friends and their homes, and energy efficiency should become part of us all.

We believe that the key to success lies in:

- √ Strong support of top management and provision of necessary resources
- √ The commitment of the energy team and their involvement in all processes relating to the energy, understanding that it is their priority (even when they kept all former duties) and expanding of their enthusiasm to other employees.
- √ A wide circle of people involved in the EnMS system through which all divisions and departments of the company will be involved in the system
- √ Maintaining the list of opportunities for life improvement, in a way that all departments (maintenance, engineering, development and production) can supplement the list with their ideas and suggestions.