

1 COMPANY OVERVIEW

In 1994, “**Vitmark-Ukraine JV LLC**” (hereinafter Vitmark-Ukraine) launched its own production of Jaffa juices and nectars and started upgrading its core production facilities at the Odessa Baby Food Cannery by fitting it up with state-of-the-art European equipment.

In 1995, Vitmark-Ukraine became one of the first companies to produce juices in cartons. In 2002, the company was the first one to have launched the production of affordable juices at the Odessa Baby Food Cannery dubbed by consumers ‘juices in white cartons’. In 2007, its Odessa Cannery commenced the manufacturing of “Chudo-Chado” purees and juices that became leaders in their product category boasting a share of over 25%. 2012 was marked by the launch of first-ever smoothies in Ukraine – “Just Fruit”. In 2013, the company launched a new line of not-from-concentrate juices “Pryamo Sik” that constitute a new segment and premium quality standard on the market.

In the past 22 years, Vitmark-Ukraine’s products have been successfully exported to CIS countries, Europe, the USA, Canada, and Israel. In 2013, the company got certified to ISO 9001:2008 (International Quality Management System Standard) and ISO 22000:2005 (International Food Safety Management System standard).

In 2016, the company joined the UNIDO-GEF project “Introduction of Energy Management System Standard in Ukrainian Industry” (hereinafter UKRIEE project) and started implementing an energy management system (hereinafter EnMS) as per ISO 50001 requirements.

The company also has in place uncertified occupational health and safety management and environmental management systems.

2 INITIAL CONDITIONS FOR EnMS

The EnMS scope encompasses the entire organization. The energy resources consumed by the company include electricity, natural gas, sunflower husk pellets, and water.



Vitmark-Ukraine was aware of the importance of building an EnMS and systematic energy consumption management even before joining the UKRIEE project.

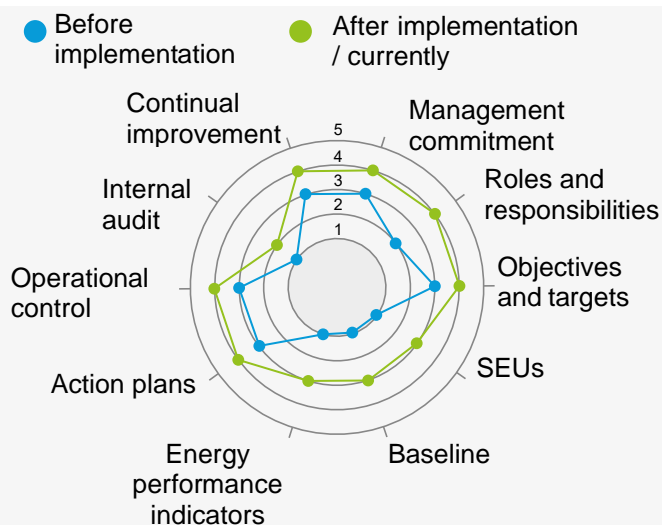
Prior to project participation, energy performance was evaluated based on:

- Energy consumption trends.
- Comparisons with previous years.
- Calculation of specific energy consumption (SEC).

The following elements were not in place:

- Training in energy saving and energy performance improvement.
- Energy review.
- Evaluation of compliance with legal and other requirements.

Energy performance was basically not used as one of the evaluation criteria for procurement and design. The diagram below depicts the level of energy conservation at Vitmark-Ukraine before and after EnMS implementation.





3 BENEFITS FROM EnMS IMPLEMENTATION

Within the UKRIIE project, the company acquired both theoretical and practical knowledge of EnMS operation.

The training program was comprised of 3 modules that encompassed all the requirements of the International Standard ISO 50001 and equipped the company staff to evaluate its actual energy consumption with regard to production output.

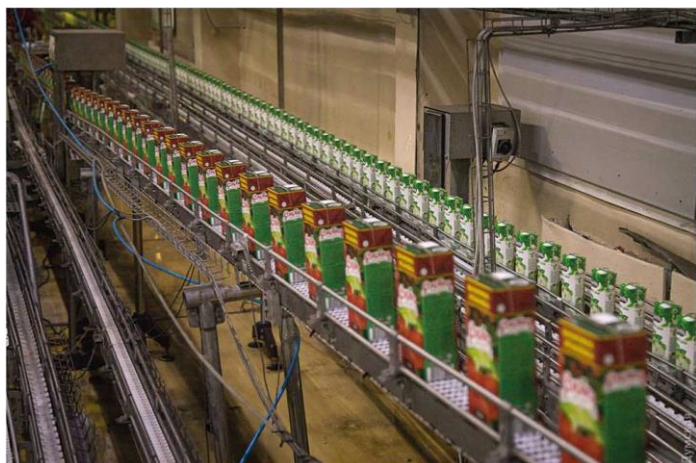
The company's products are shown below.



During the training, its participants also gained practical experience of conducting internal audits of the EnMS and were provided with a UNIDO's EnMS Tool developed by UNIDO to facilitate EnMS implementation.

The project considered new approaches to calculating energy efficiency that were not used by the Enterprise.

In particular, the multivariate regression analysis made it possible to approach the assessment of energy efficiency more precisely from a mathematical and statistical point of view. This made it possible to introduce new modern methods of energy efficiency calculation.



4 IMPLEMENTED ACTIONS

The list of actions implemented in 2018 is provided in the table below.

Energy saving measure	Month of 2018	Expected savings after implementation
1. Thermal insulation of steam pipelines and condensate return		800 Gcal/year 500000 UAH
2. Modernization of the water-feeding system of steam boilers by installing a Grundfos CR-15 pump		10000 kWh/month. 22000 UAH/month.
3. Supply of return water from water treatment to the fruit workshop for fruit washing and unloading		500 m ³ /month. with the fruit workshop operating
4. Change in the operating modes of water treatment cooling towers depending on the temperature of the water being supplied		10 % savings 23000 UAH in the summer time (by cooling tower consumption)
5. Replacement of water meters in the boiler house and fruit workshop		4% or 520 m ³ / month.
6. Replacement of 100 mercury arc DLR-250 lights with LEDs at warehouse #1		15000 kWh/month. 32000 UAH/month.
7. Switching a DKVR 10/13 boiler (double-drum, water-tube boiler, reconstructed) to alternative fuel		Savings through lower fuel prices
8. Tele-inspection and repair of the sewerage system		Improvement Operational control



5 IMPLEMENTATION RESULTS

To assess implementation results, the company evaluated its performance based on KPIs.

The company applies two approaches to performance monitoring:

- Calculated – based on actual data in the form of ratios.
- Regression analysis – based on statistical data and drivers of energy consumption.

The results of the calculated method are reflected in the table.

In 2017, three energy sources consumed by the company were subjected to regression analysis:

- Electricity.
- Natural gas.
- Water.

The key relevant variables for the aforementioned types of energy that are available and can be collected are as follows:

- Production output of juices in liters.
- Production output of semi-finished products in kilos.
- HDD 15 C – heating degree-days.
- CDD 5 C – cooling degree-days.

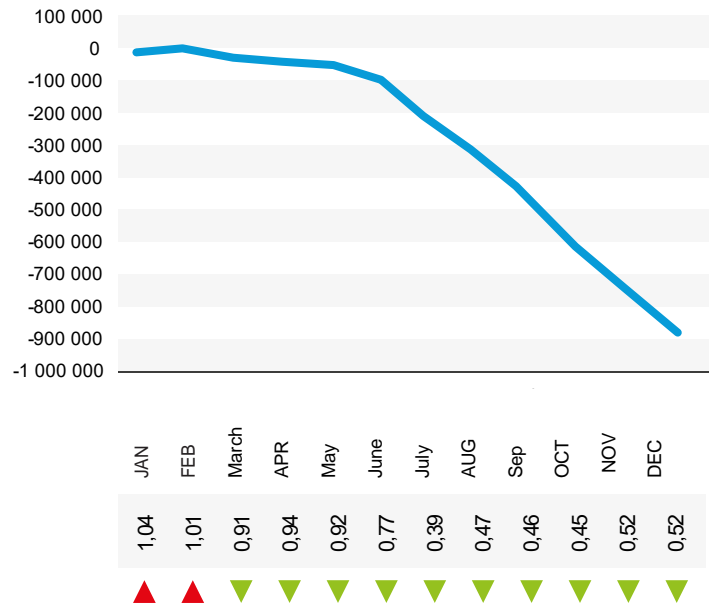
To enhance the accuracy of the regression analysis and consider all possible energy drivers, it was decided to factor in those energy resources that are consumed along with the energy resource being analyzed, i.e.:

- Natural gas consumption, m³/month.
- Water consumption by years, m³/month.
- Electricity consumption, kWh/month.

Adjusted R ²		
Baseline		Equation to determine energy efficiency
Electricity consumption, kWh/month	0,92	544,303+0.037 * (Production output of juices, l) + 0.111 * (Production output of semi-finished products, kg) + (-327)* (HDD 15 C)
Natural gas consumption, m3/month	0,98	70,1. + 0.017* (Production output of juices, l) + 0.288 * (Production output of semi-finished products, kg) + 124 * (HDD 15 C)
Water consumption, m3/month	0,87	33,9+ 0.001* (Production output of juices, l) + 0.003* (Production output of semi-finished products, kg) + 0.083 * (Electricity consumption, kWh/month)

The CUSUM chart for natural gas savings in m³ per month is presented below.

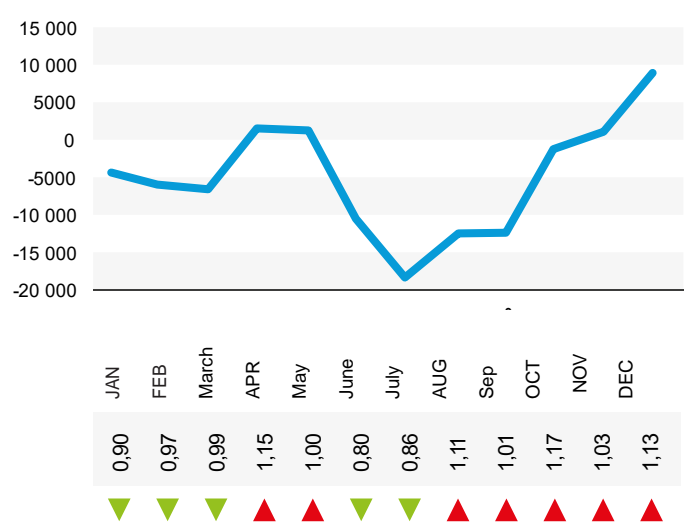
CUSUM Natural gas consumption (savings) in m³



According to the data above, natural gas savings equal 900 000 m³. Poor performance was observed only in January and February.

The CUSUM chart for water consumption in m³ per month is presented below.

CUSUM Water consumption in m³

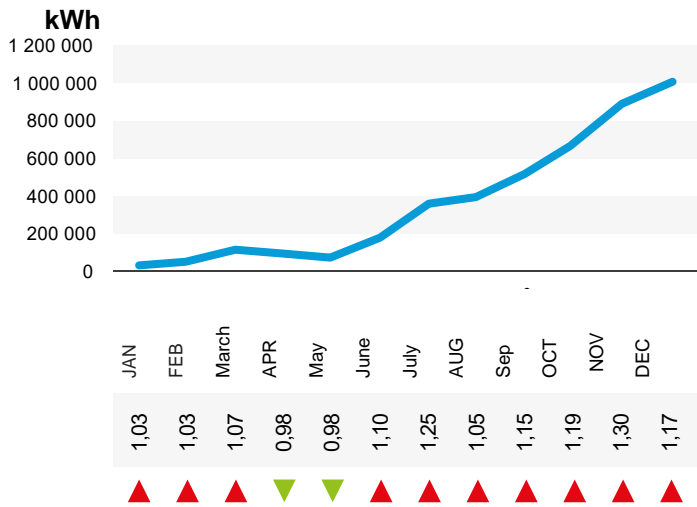


According to the data above, overconsumption amounts to 9000 m³. Good performance was observed only in January, February, March, June, and July.

The chart for electricity savings determined by the Cumulative Sums (hereinafter CUSUM) in kWh per month is presented below.

The baseline period was selected based on data obtained in 2017.

CUSUM Electricity consumption in kWh



According to the data presented above, overconsumption amounts to 1000 MWh, which is related to the underutilization of plastic bottle blowing machines which were used in 2018 but very little time work in 2017.

The company decided to refine the models used during regression analysis with the use of 2018 and 2019 data, as well as to analyze the consumption of sunflower husk pellets separately.

6 CONCLUSIONS AND RECOMMENDATIONS

The training within the UKRIIE Project provided the company **Vitmark-Ukraine** with the:

- theoretical and practical knowledge of EnMS development and implementation as part of energy planning processes;
- more detailed understanding of the use of statistical methods, in particular regression analysis, as a tool for comparing energy consumption under normalized conditions.

The key benefits after EnMS implementation include:

- Improved culture of energy consumption.
- Use of normalization to account for driving factors.
- Improved operational control and its analysis.
- Incorporation of energy performance into procurement and design.

Recommendations before and during the implementation of EnMS:

- to carry out consultative and informative work with employees of the enterprise on the importance of EnMS.
- to consider in detail the procedure of energy analysis of the enterprise.
- to conduct a special regression analysis course;
- to carry out consultative and informative work with employees of the enterprise on normalization of data of energy consumption.

