Energy Efficiency with the zenon Software Platform

Together towards sustainability with Carlsberg Srbija

Brewery in Čelarevo was founded in 1892 by the influential landowner Lazar Dunđerski. In 2003, it became part of the Carlsberg Group. Throughout its history, the brewery has always kept up with the latest technologies; improving processes without compromising the quality of its products or services. This tradition continues today. A desire to optimize energy and resource consumption has led to the implementation of a detailed utility management system for energy analysis and cost control.

Lazar Dunđerski dedicated special attention to the building of the Čelarevo brewery. He wanted to use the site to try out the new tech-niques and technologies that he had seen in breweries in large European cities. The initial capacity of the brewery was 10,000 hectoliters (hl) per year. Today, it has a production capacity of more than 2,000,000 hl of beer per year. One of the priorities of Carlsberg Srbija – and, indeed, of the wider Carlsberg Group – is continuous improvement in reducing environmental impact. This includes the preservation of natural resources such as water, electrical energy, natural gas, and other resources. Given the current capacity, the need to improve the brewery's energy management system had become a priority.

HISTORY OF DEVELOPMENT

The first automation introduced to the Carlsberg Srbija dates back to 1970, when the automatic brew house and the new bottle-filling unit were completed and put into operation. To meet increased demand, a new bottle-filling unit was built in 1978 with equipment or-dered from Germany. A new bottle-washing machine and laboratory were subsequently added. At the end of the 1980s and in the be-ginning of the 1990s, production was expanded again with another new bottle-filling line, an entirely new brewing line and eight large tanks and fermenters. Over the next 20 years, the factory was fully modernized and the latest

Sustainable work process in can filling line.

Energy management and cooling systems.

standards and certificates were introduced to underwrite the quality of Čelarevo beers.

STEPS TOWARDS ENERGY MANAGEMENT

Until a couple of years ago, the capture of energy consumption data was undertaken manually. The sites on which the meters were locat-ed were visited on foot. Some metering was not available or hard to access, so a full picture of consumption was never successfully com-pleted. Data was entered manually into various tables so it could be used for reporting. The reports, which were also created manually, were inevitably imprecise and incomplete.

It took an hour and a half to gather all the data. This was done on a daily basis from 6 a.m. when the meter values measured in the previous 24 hours were recorded. This process offered no possibility to monitor consumption by shift or using any other more detailed analysis. Plus, without continuous monitoring, responding to issues in a timely fashion was all but impossible. Action could only be tak-en after the manual system had recorded deviations in consumption or when the equipment or infrastructure suffered overloading.

A PATH TOWARDS OPTIMIZATION AND EFFICIENCY

With no systematic monitoring of energy consumption or data analysis which could enable a rapid response to issues, the brewery decided to implement an energy management system. Carlsberg Srbija d.o.o. found a partner in URAM system d.o.o. from Gložan. Its USW 4 EnMS solution is based on zenon by COPA-DATA.

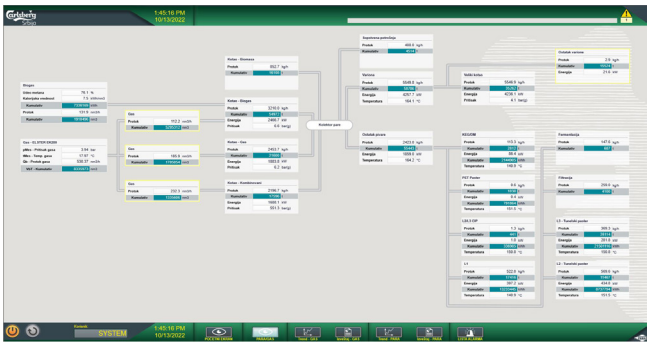
The team at Carlsberg Srbija identified the main tasks as:

- defining measuring points,
- adding any missing meters or sensors for gathering the data in the various production units,
- establishing a network which included the various monitoring technologies,
- creating a software control and monitoring system in accordance with user demands,
- validation of the gathered data,
- launching the system.

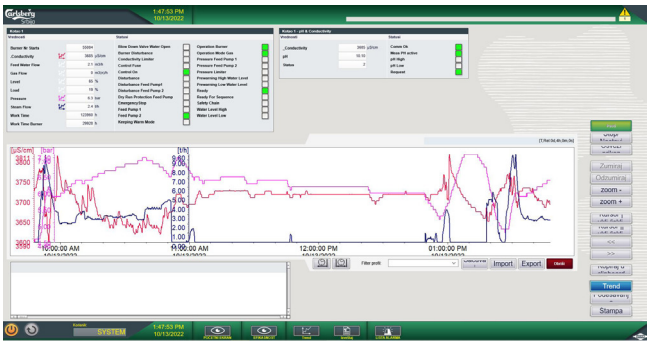
One of the key objectives of the brewery is to preserve the environment through the implementation of the group's global "Together Towards ZERO" strategy. This defines clear ambitions, including "ZERO Carbon Footprint" and "ZERO Water Waste". These sustainability goals are also closely aligned with the company's long-term financial goals. To assist on this journey, the system has been implemented so that it monitors the consumption of renewable energy sources, including biogas and wood chips.

PATH TOWARDS THE IMPLEMENTATION OF ISO 50001 STANDARD

The new, automated solution now gathers, processes, and presents data from 100 datapoints for electrical energy, water, steam, gas, air, and CO2. The system is located in the control room where the surveillance and the data analysis can be performed at any moment by the operator. By analyzing the data through trend diagrams, alarm and event lists, in-depth graphical reports, and key performance indicators (KPI), it is now possible to directly influence and take action to optimize



Overview of the water/steam/gas consumption based on more than 100 datapoints.



The consumption diagrams can be filtered in a simple manner.

the consumption of energy resources and, as a result, to optimize total production costs.

The monitoring of the consumption of energy resources in real time over defined periods ensures the better detection of peaks and ir-regularities during production. The flexibility of the zenon software platform is particularly appreciated because the solution meets all the specific demands of the users. It does so in full compliance with the requirements of the energy efficiency standard ISO 50001. The sys-tem also offers the opportunity for data exchange with other databases, including SAP or other ERP systems. Carlsberg Srbija plans to take advantage of this capability when it implements its new ERP system.

USER EXPERIENCE AS A PRIORITY

One of the main advantages of the new energy management system is the improved user experience. Screens can be visually adapted to each operator who monitors the processes. This ensures a fast and safe reaction to any unwanted changes identified by the system, such as increased consumption or other anomalies. The user moves very simply through various consumption overviews. They can filter the data depending on their needs: by relative or absolute time intervals; by standard daily, weekly or monthly overviews; or by production activity, such as energy resource consumption for a particular series of products.

PREPARATION OF WATER FOR BETTER BEER QUALITY

Following the success of the energy management system (EMS) implementation, Carlsberg Srbija wanted to expand the supervision and management system to enable further analysis. The natural next step was to include monitoring of the chemical preparation of water (CPW) process. The control and monitoring of the CPW process was previously completed using three different elements: the pump station, carbon filters and reverse osmosis. By implementing the system based on the same zenon software used in the EMS, everything has been integrated in a unique project with three controllers. The system now provides centralized supervision with management of the CPW process for the entire plant. The water production capacity is 165 m^3/h and the operator can review this against the utilities of the entire plant through the intuitive graphical interface.

COOLING PLANT ENSURES THE STABILITY OF ALL PROCESSES

Subsequently, zenon was used in another project. The brewery decided to replace and upgrade an existing but dated system in the cool-ing plant. This consisted of six ammonia compressors, five evaporating condensers, and primary and secondary glycol pumps. The cool-ing plant cools the water used in the beer brewing line and cools the yeast and wort used in the fermentation processes. The new system is much more intuitive. The interface is more graphically pleasing and, therefore, easier for the user. The system ensures the surveillance and management of the entire cooling system with much better alarm monitoring. Detailed insights into potential dangers caused by changes to cooling system process parameters can now be quickly identified. This includes pressure or temperature increases or changes to the level of ammonia in the receivers (collector tanks). Action can be taken, for example in response to the load of the ammonia com-pressors in the cooling system, much faster now. The response can be immediate.

> *By introducing the energy management system based on the zenon software platform we are one step closer to the ISO 50001 implementation and working towards zero environmental impact.*

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A MORE EFFICIENT SYSTEM DELIVERS BIGGER SAVINGS

The system had not been in operation for long when Carlsberg Srbija started to reduce consumption of several key energy resources, even as production continued to increase. The reported savings include savings in steam, water, electricity and CO2 emissions. To date, steam savings of 5.9% (kWh per hl of beer) and water savings of 4.5% (hl per hl of beer) have been achieved. In addition, electrical en-ergy savings are 2.5% (kWh per hl) and CO2 emissions have been reduced by 9.6% (kg per hl). These numbers might seem small but the savings are significant and represent a big step towards the group's zero waste water goal. The switch to automated data collection, re-porting, and analysis has also delivered significant efficiencies. The time saved on walking the site and crunching the numbers can now be used more productively to take action that drives further improvement.

HIGHLIGHTS:

Energy Management with zenon:

- Simple, fast and flexible engineering
- Out-of-the-box solution
- Flexibility in designing the user interface and meeting user demands
- System in accordance with the requirements of the ISO 50001 standard
- Independent choice of hardware equipment
- Reduced time for testing and rolling out the system
- Great availability and efficiency of COPA-DATA technical support
- Expert certified system integrator: Uram System d.o.o. Gložan