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Bosch: artificial intelligence paves the way to carbon-neutral production

At Bosch's plant in Eisenach, the Balancing Energy Network from Bosch.IO manages the flow of power to enable a maximal use of renewable energy.

Problem

In the transition towards carbon-neutral production, the Bosch plant in Eisenach is turning to renewable power. This form of energy, however, tends to be volatile. The plant therefore requires a detailed picture of generating output and power consumption, so that it can make best use of these new sources of energy.

Solution

The Balancing Energy Network from Bosch.IO is a software solution based on the Bosch Energy Platform. It combines all the relevant information regarding power generation and power consumption. The software then uses artificial intelligence and machine learning to predict generating output and power requirements. On this basis, it is able to draw up flexible operating schedules for power consumers.

Benefit

By managing and optimizing the flow of power, the Balancing Energy Network helps improve energy efficiency. This enables the plant to make maximal use of renewable power, react to volatilities in generating output and thereby to draw up a precise operating schedule.

"The forecasting provided by the Balancing Energy Network from Bosch.IO helps us react to volatilities in generating output. It enables us to draw up a precise operating schedule, so that we can make the best use of renewable power."

Andreas Klinzing

Head of Technical Functions, Bosch Eisenach

Moving towards carbon neutrality

The Bosch plant in Eisenach produces a host of high-tech components designed to make driving safer, more efficient, and more comfortable. In the process, it makes use of renewable power. "We're aiming to make the production site fully green by 2023," Klinzing explains. "This means we won't be relying on carbon offsets made elsewhere. To achieve this, we've launched a zero emission project."

The road to carbon neutrality at the Eisenach plant rests on three pillars:

- 1 An increase in self-generated power from renewable sources of energy
- 2 The purchase of green power
- 3 Greater energy efficiency in production operations and building systems

"We've substantially expanded our own generation of photovoltaic power, which now covers around 15 percent of our total energy consumption," Klinzing explains. "And we're also going

around 10 percent of our total energy consumption," Klinzing explains. "And we're also going to be purchasing green power from wind parks in the region." In addition, the consumption of natural gas is to be completely eliminated through the use of waste heat recovered from the production of compressed air and through the installation of cooling and heating registers that are more efficient.


Offsetting the volatility of renewable power

Renewable sources of energy tend to be volatile. Changes in wind conditions, for example, or in sunlight intensity lead to fluctuations in the amount of power generated. To make best use of such energy resources, it is therefore necessary to draw up a detailed plan and match a plant's power requirements as closely as possible to these resources. "We need a clear picture, so that we always know how we can meet our power requirements as cheaply as possible," Klinzing explains. "Of course, our top priority is to ship our products on schedule, regardless of where the energy to produce them comes from."


The Balancing Energy Network from Bosch.IO plays a key role here. This software tool combines all the relevant data regarding power generation with information on the plant's power consumption. "We provide the software with data on power generated by the photovoltaic plants we've leased from Bosch Solar Services. And we also feed in data from the wind farms provided by external partners," Klinzing explains. "The Bosch Energy Platform then gives us the information we need in order to assess the plant's power consumption." This energy management tool from Bosch Energy and Building Solutions combines production line data and building systems data. The result is a detailed picture of the plant's overall power consumption.

 Plant operators at the Bosch plant in Eisenach looking at a tablet computer.

The Bosch plant in Eisenach leverages the Balancing Energy Network from Bosch.IO, a software solution based on the Bosch Energy Platform.

 Plant operators at the Bosch plant in Eisenach evaluating energy flows using the Balancing Energy Network from Bosch.IO.

Drawing upon artificial intelligence and machine learning the Balancing Energy Network predicts generating output and power requirements of the plant.

 Plant operators at the Bosch plant in Eisenach evaluating energy flows using the Balancing Energy Network from Bosch.IO.

This forms the basis to draw up flexible operating schedules for power consumers.

Accurate predictions based on artificial intelligence

The Balancing Energy Network processes this information and, using artificial intelligence and machine learning, predicts whether there is scope to defer production processes or the operation of building systems – and the power consumption that this involves – to a more favorable time. In addition, the software analyzes historical time series in combination with various parameters such as weather forecasts and production schedules. “The Balancing Energy Network manages and optimizes the flow of power within the plant,” Klinzing explains. “It helps us keep to an optimal path in terms of power and costs.”

According to Klinzing, the beauty of the Balancing Energy Network is that it draws upon a wide range of data: “Private households are one example of where we have a very clear idea of power consumption patterns. We know, for example, when standard power consumers such as the oven, TV, and heaters are normally in operation, and we also know that this depends on other factors such as the presence or absence of the occupants or users. The Balancing Energy Network takes us one step further, because here we are using data from the past as well as predictions of future consumption.” In this way, the software makes a key contribution to improving energy efficiency at the production site in Eisenach.

A blueprint for climate-friendly production

The Zero Emission project in Eisenach is a lighthouse project that is also intended to deliver a blueprint for climate-friendly production. “The project is about more than just the Eisenach plant,” Klinzing says. “That’s obvious just in terms of the software components. They’re all modular and can therefore be rolled out at short notice in other areas – whether at Bosch plants or elsewhere.”