Toyota, AVEVA™ PI System™ and dreams of a green new world

Toyota Motor Europe
Industry - Manufacturing

Goals

- Reduce energy consumption at Toyota's European production plants

- Create a single, centralized energy monitoring system (EnMS) to communicate with all plant devices and collect data automatically

Challenges

- Different plants had large disparities in data monitoring capabilities and lacked a standard data model

- The lack of standardization made it hard to compare data and create benchmarks for energy consumption

Results

- It now takes less than one minute to validate and share data

- In one plant, engineers are experimenting with predictive analytics using Power BI

Solution

- AVEVA PI System

Imagine a world in which you could drive a car, knowing it will have zero CO_2 impact throughout its entire lifecycle. The plant producing the car uses the least amount of energy possible, and the energy it does use comes from renewable sources.

The car runs on renewable energy until the end of its life, when you recycle it, leaving the world with a zero-carbon footprint. This is the world Toyota has been imagining. Recently, Toyota Motor Europe began relying on real-time operational data to manage energy use as part of a project called Toyota Environmental Challenge 2050. Toyota uses AVEVA PI System to gather and process the data it needs to understand its energy usage so it can lead the automotive industry's transition toward an environmentally sustainable future.

Toyota's Environmental Challenge 2050 includes several targets. Three of the targets focus specifically on reducing CO_2 emissions. Most recently, Kevin Rosati, a production engineer at the Plant and Environment Department of Toyota Motor Europe, and his team, have been busy with the third target; reducing energy consumption at Toyota's European production plants.

To tackle this challenge, Rosati's team had to first identify the plants' current energy usage. They needed real-time data from the plants. "Data is key. We need information about how much we're consuming," Rosati said during his presentation in Gothenburg in 2019.

Before implementing AVEVA PI System, engineers like Rosati at Toyota's European headquarters faced a time-consuming energy monitoring process. The European plants used different data systems without a standard data model and had large disparities in monitoring capabilities. Some plants relied on digital visualization tools but used disparate conventions for timestamps and units, while others were still using paper. The lack of standardization made it hard to compare data and create benchmarks for energy consumption.

Rosati's team wanted a single, centralized energy monitoring system (EnMS) that could communicate with all plant devices and collect data automatically. They also needed smart reporting and the ability to compare assets across different countries and sites.

The team wanted to give operators the choice to rely on the headquarters' data infrastructure or continue using their own local system. They looked at different options and settled on AVEVA PI System for three reasons:

- AVEVA PI System offers the flexibility to build different architectures and to adopt a unified data model at each plant.

- AVEVA PI System is a proven solution with hundreds of use cases the team could browse for inspiration.

- AVEVA PI System can interface with many protocols and manufacturing systems.

Rosati's team connected the central AVEVA PI System in Brussels to the different monitoring systems and meters in each plant and began gathering data about the plants' gas, electricity, compressed air, and water consumption. The team also connected to different API servers, like weather services and energy suppliers. "AVEVA PI System is very convenient and very easy to set up. We're able to pull data automatically, turn it into data points, and use it with metering data to make our analyses," Rosati said.

The team used AVEVA PI System's asset framework, the contextualization layer of AVEVA PI System, to build template-based data models for running analyses on gas, electricity, and air compressors usage. "It was very easy to create a lot of assets and a lot of attributes in the architecture in a limited time," Rosati said about AF.
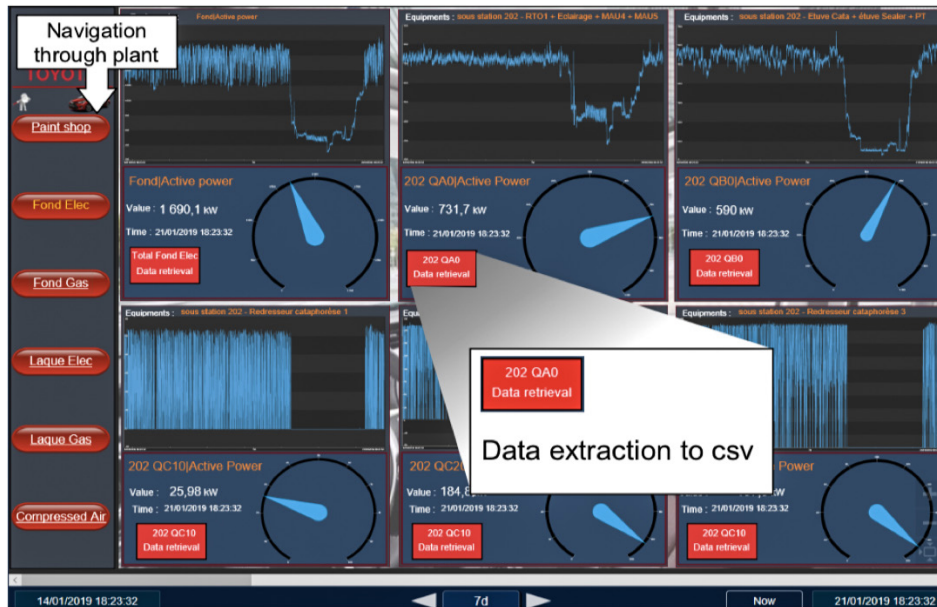
Toyota's PI Vision navigation dashboard allows for intuitive access to data across multiple sites, giving engineers insight into gas, electricity, and compressed air usage

The team also deployed AVEVA™ PI DataLink™ to create automated reports that track the changes in a plant's efficiency. "It was taking hours to build and to check to make sure the data was correct and then to share it with the management and headquarters. Now, it takes less than one minute," Rosati said. In one plant, engineers are experimenting with predictive analytics using Power BI. These analytics can reveal the impact of different weather on energy usage and allow engineers to model different electricity usage scenarios. Engineers can then compare these predictions with actual usage, creating new performance indicators.

In the future, Toyota Motor Europe is hoping to further empower plant engineers by using more AVEVA™ PI Vision™ screens to provide intuitive representations of data regarding a plant's energy usage. "It's like giving new capabilities to our engineers," Rosati said. "They're motivated to think creatively about finding new ways to improve efficiency and reduce usage."

"We're empowering people to do things, giving our engineers the capability to understand the processes and track if what we're implementing is working."

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Kevin Rosati
Production Engineer, Plant and Environment Department, Toyota Motor Europe

For more information about AVEVA PI System, please **click here.**

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