

## CUSTOMER CASE STUDY

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

Toyota Motor Europe  
Industry - Manufacturing

## Challenge

- Insufficient data from manufacturing facilities to evaluate energy usage. No standards for data monitoring.

## Solution

- Implement centralized energy monitoring system based on the PI System at European headquarters.

## Result

- Tangible reduction in energy usage in one pilot plant.

Imagine a world in which you could drive a car, knowing it will have zero CO<sub>2</sub> impact throughout its entire lifecycle. The plant producing the car utilizes the least amount of energy possible, and the energy it does use comes from renewable sources. The car likewise runs on renewable energy until the end of its life, when it will be recycled, leaving the world with a zero-carbon footprint. This is the kind of world Toyota has been imagining. Recently, Toyota Motor Europe began relying on real-time operational data to enable energy management as part of a project called Toyota Environmental Challenge 2050. Toyota is using the 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 defines a number of targets. Three of the targets focus specifically on reducing CO<sub>2</sub> 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 at PI World Gothenburg 2019.

Before implementing the 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 of the 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 easily compare assets across different countries and sites. The team wanted to give operators the choice to rely on headquarters' data infrastructure or continue using their own local system. They looked at different options and settled on the PI System for three reasons:

- The PI System offers the flexibility to build different architectures and to adopt a unified data model at each plant.
- The PI System is a proven solution with hundreds of use cases the team could browse for inspiration.
- The PI System can interface with many protocols and manufacturing systems.



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.

Rosati's team connected the central 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. "The 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 [Asset Framework \(AF\)](#), the contextualization layer of the 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.

The team also deployed 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 conditions 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.



Going forward, Toyota Motor Europe is hoping to further empower plant engineers by using more 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."

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"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 about Toyota and the PI System, [watch the full presentation here](#).  
[Watch this 2-minute video](#) to learn more about Toyota and the PI System.