Digital plant to accelerate green hydrogen revolution

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Reducing the costs of green hydrogen production, and maximizing plant efficiency is key and is likely one of the biggest challenges for achieving successful projects. This requires a solid blueprint for operations, as well as collaboration and co-innovation with strategic partners. We engage with customers early in the design phase for developing the digital plant to improve project returns, break-even costs, and safety outcomes.

The combination of digital plant and operations leads to autonomous operations. For Yokogawa, this is an operating environment with minimum human intervention and maximum automatic adaptation driven by data.

Yokogawa's green hydrogen design team develops agnostic blueprints for autonomous operations through an integrated approach incorporating key elements, such as infrastructure, integration, cybersecurity, and applications.

The blueprint represents the strategic operation plan for all important stakeholders involved in the various plant modules, such as owners, managers, contractors, and suppliers.

End-to-end autonomous operations across the entire plant are seldom achieved from day 1. Based on a project developer's priorities and criteria, our design team collaborates to finalize which processes will operate autonomously and where human intervention is initially required. Some elements of autonomous operations include real-time performance monitoring, such as energy consumption, asset performance, production rates, purity, energy feedstock, and storage, which are required to ensure efficient production. Then, over time, plant autonomy can be increased.

The autonomous operation blueprint is supported by intelligent, data driven technologies.

Through our blueprint and technology, we can help you build a responsive and resilient clean hydrogen energy business.

Through the deployment and use of technology, our design team develops the blueprint for optimizing the entire plant lifecycle. This includes the use of robots, edge computing, artificial intelligence, smart mini-grid control, digital twin for the balance of plant, and OT Security Operations Center to meet the NIS2 requirements.

A green hydrogen plant is subdivided into different modules such as the electrolyzer, voltage system, water system, and compressor. The integration of the different modules on-premise is called horizontal integration. Often, these systems have different interfaces/protocols such as UPC UA, Profibus DP, Modbus TCP/IP, or IEC61850. Vertical integration refers to integration with the business domain, cloud, or remote center where cybersecurity is crucial in supporting different architectures and protocols. A typical interface with the cloud is, for example, MQTT.

Our CI (Collaborative Information) server is an industry 4.0 ecosystem specifically designed for vertical and horizontal integration, simultaneously. The integration of the different modules, e.g. the cloud, a remote center, and even the industrial Internet of Things devices, is a prerequisite for autonomous operations. When we talk about integration, it doesn't only refer to data and Human Machine Interface (HMI) but also to alarms and safety. To operate the plant efficiently and safely with minimum staffing, or even remotely, the operators must have one unified interface that includes the integration of alarms and safety overrides from the different systems (modules).