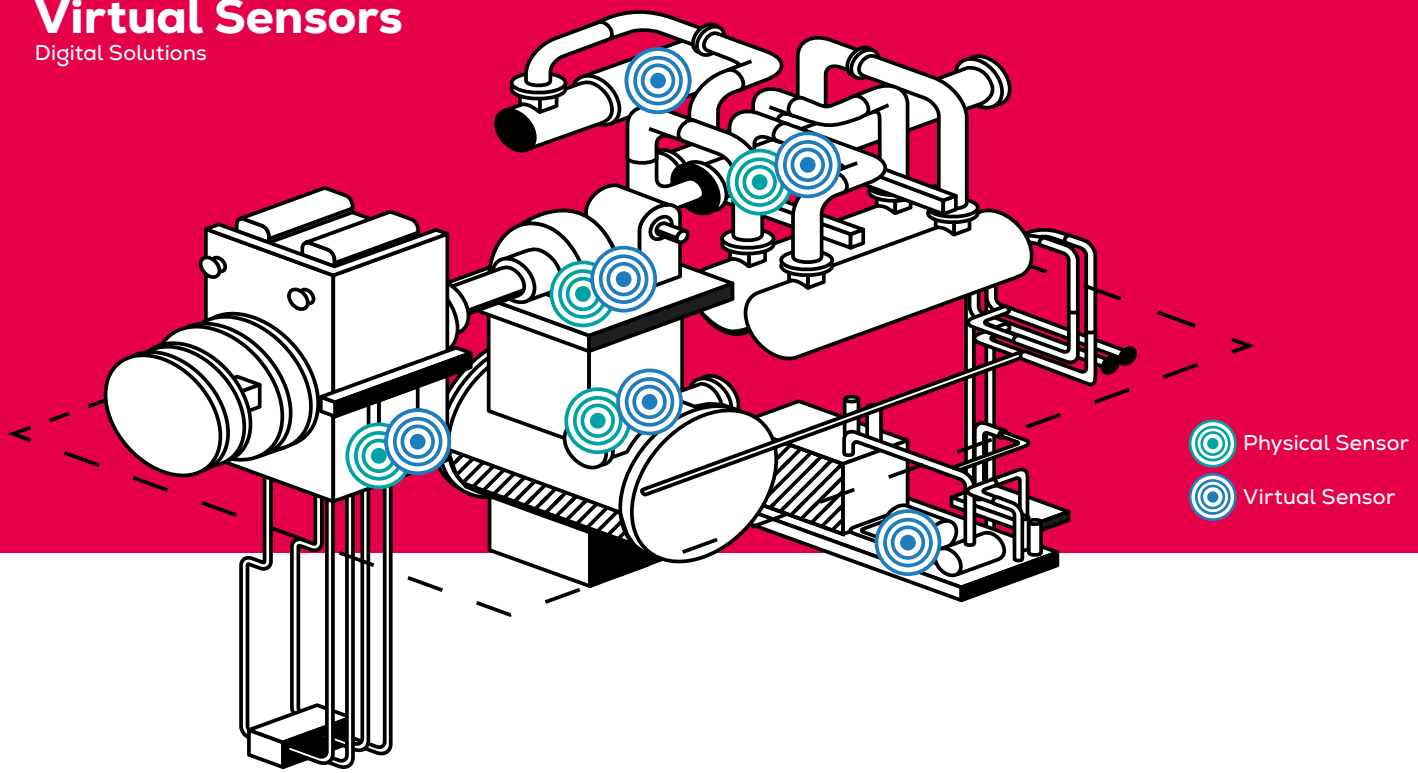
Virtual Sensors

Benefits at a glance

- Prevent false alarms: Virtual sensors enhance system reliability by providing accurate data analyses, effectively reducing the occurrence of false alarms in monitoring systems.
- Virtual redundancy: Running in parallel with physical sensors, virtual sensors ensure backup and resilience.
- Increased system availability: Maintain plant operations even during sensor failures.
- Reduced downtime costs: Avoid costly shutdowns by using predictive data.
- Lower operational expenses (OPEX): Increase overall efficiency and reduce operating costs.

Virtual Sensors

Digital Solutions



Overview

Virtual sensors are software-based tools that learn the behavior of physical sensors by analyzing data from multiple sources. During operation, virtual sensors process data in real-time, allowing them to predict the expected output of physical sensors. This predictive capability is achieved through continuous learning and optimization, which runs independently on an industrial PC within an on-premise solution. Virtual sensors integrate seamlessly into the control system, with data collection and calculations performed directly in the same control rack, ensuring efficient and reliable operations.

Virtual sensors are AI-driven digital twins, trained in real-time. They run in parallel with physical sensors, simulating and replicating measurement signals. This ensures continuous data flow and resilience. Virtual sensors serve three key purposes:

Main Features

1. Virtual redundancy

AI driven virtual sensors serve as digital twins, complementing physical sensors by replicating measurement signals. This redundancy ensures uninterrupted data flow, even in the event of a physical sensor failure. By operating in tandem, both types of sensors provide backup, enhancing overall system reliability and continuity.

2. Virtual replacement

AI-driven sensor models can fully replace physical sensors by functioning as purely digital components. These sensors do not need physical counterparts. Instead, they are trained using AI models which provide accurate measurements and system inputs where physical sensors cannot be deployed or are unnecessary.

3. Virtual enhancement

Additional parameters that physical sensors cannot cover are captured by virtual sensors. This enables system operators to gain insights and monitor previously unmeasured aspects, improving overall data collection and system analysis capabilities.

How virtual sensors work

There are several methods by which virtual sensors perform calculations and generate results. Virtual sensors are based on AI algorithms, specifically artificial neural networks (ANNs). These ANNs are trained on live data directly received from the Programmable Logic Controller (PLC). Virtual physical sensors use measurements from sensors as input, which are highly correlated with the sensor to be virtualized.

After training, the virtual sensors can simulate the value of their corresponding physical sensor by calculation from its input measurements. The accuracy of these calculations is constantly monitored and the ANNs will be fine-tuned if the accuracy falls below a certain threshold.

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