Automatic Asset Administration

White Paper

Sensorik

4.0

Your automation, our passion.

PEPPERL+FUCHS

Abstract

In addition to pure process data, automation components that communicate digitally provide a multitude of extra information that is seldom fully evaluated by traditional machine control. By using a gateway to access the automation components at the lowest level and a data platform to manage type and instance data, this additional information already offers valuable added benefits for the safe operation of machines and plants.

In cooperation with its partners Hilscher Gesellschaft für Systemautomation GmbH and SAP SE, Pepperl+Fuchs is exhibiting a demonstrator that visualizes the benefits of managing component data centrally on a data platform.

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Classification

Sensorik4.0®-Solutions for Industrie 4.0 Applications

Industrie 4.0 is the pioneering concept of totally interconnected production systems that support the exchange of small or large amounts of data within a process—via the cloud—and can also communicate with higher-level information systems outside conventional corporate boundaries. In contrast to the classical strategy of hierarchically structured communication (horizontally, vertically), this modern interconnected methodology offers the advantage that communication can occur anytime, between any participant, on any hierarchical layer. Sensors having the ability to communicate is a significant characteristic of Sensorik4.0®: This term embodies Pepperl+Fuchs' innovative sensor solutions for applications within the Industrie 4.0 framework.

The Solutions Park Brings Industrial Sensors to the Internet of Things

The Solutions Park demonstrates real-world sensor solutions that highlight the customer benefits of Industrie 4.0. The customer benefits of Industrie 4.0 stem from the availability of process and diagnostic data from sensors and actuators within a company's internal or external IT systems. For instance, using this data, these IT systems can perform visualization, realize model-based optimization processes, and schedule demand-based preventive maintenance processes. For such applications, Pepperl+Fuchs and our IT partners offer solutions that allow sensing technologies to be directly connected to a company's IT infrastructure.

Pepperl+Fuchs offers a wide range of products designed to collect data from spatially dispersed sensors. Then, we make that data available to application-relevant databases on the internet. This data is accessible on these internet portals through mobile devices or can be used by downstream processes. In the context of Industrie 4.0, the idea of continuous engineering throughout the entire product life-cycle plays a crucial role: All data must first be collected in a digital format, then be made available for electronic processing. To this end, Pepperl+Fuchs has developed a system that directly compares quality data obtained during the manufacturing process to the design data—deviations are automatically identified.

Sensor Data within the Corporate IT-System

Replacing hierarchically organized machine communication with networked solutions offers several advantages: all data from field devices like sensors and actuators can be transmitted directly and without a loss of fidelity due to intermediate translation and processing transmitted to a corporate IT system. The information concerning availability and state of a machine or system allows early intervention, reducing the risk of product faults and costly downtime. With our IT partners, we developed solutions where a separate communication path brings sensor data directly from the field into the corporate IT systems.

Description

Type and Instance Data Ensures Greater Operational Reliability of Machines and Plants

The job of a traditional machine control system involves the reliable operation of machine control and regulation processes. For this, it is necessary to complete the control task between sensors and actuators as efficiently as possible and in real time. It stands to reason that traditional control panels only evaluate the process data that is necessary for operation and not the entire data volume received from the intelligent automation components that communicate with one another. However, this additional data contains information that is valuable for the reliable and convenient operation of machines and plants.

A good example of such unused additional data is the electronic identification data from IO-Link sensors and actuators. This data contains information about the manufacturer, the unique product identification, the production date, or the software status. If this data is automatically captured and managed in a central location, it provides an electronic image of the component basis installed in a machine or plant. This helps operators to retain an overview of their plants if individual components need to be replaced over time. When a part has been replaced, the electronic comparison with the centrally saved image guarantees compatibility, which enables the operator to restart their machine or plant smoothly and safely.

This unique electronic identification of replaceable machine components is an important advantage of Industrie 4.0 that offers valuable benefits to both maintenance personnel and operators:

- Electronic documentation of the component basis installed in a machine or plant
- Access to product-accompanying documents can be automated
- Protects against the use of replacement products that are technically unsuitable or legally unacceptable

Demonstrator Design

The exhibit provides a visualization of a simple machine design, consisting of a conveyor belt as an actuator, and sensors, which change the direction of motion of the conveyor belt when the transported object approaches. In addition to the original sensors for activating change of direction, externally similar replacement sensors are also installed on the conveyor belt.

The machine performs its technical control function with the aid of a machine control. The object moves in one direction on the conveyor belt until the relevant sensor at the reversal point gives a signal to change the direction of transport. The sensors from Pepperl+Fuchs communicate with the control panel using a digital IO-Link protocol. An edge gateway from Hilscher is connected on the level of the machine control panel. This gateway accesses the control panel using PROFINET communication and transfers the sensor data to the SAP Asset Intelligence Network (AIN) via the Internet.
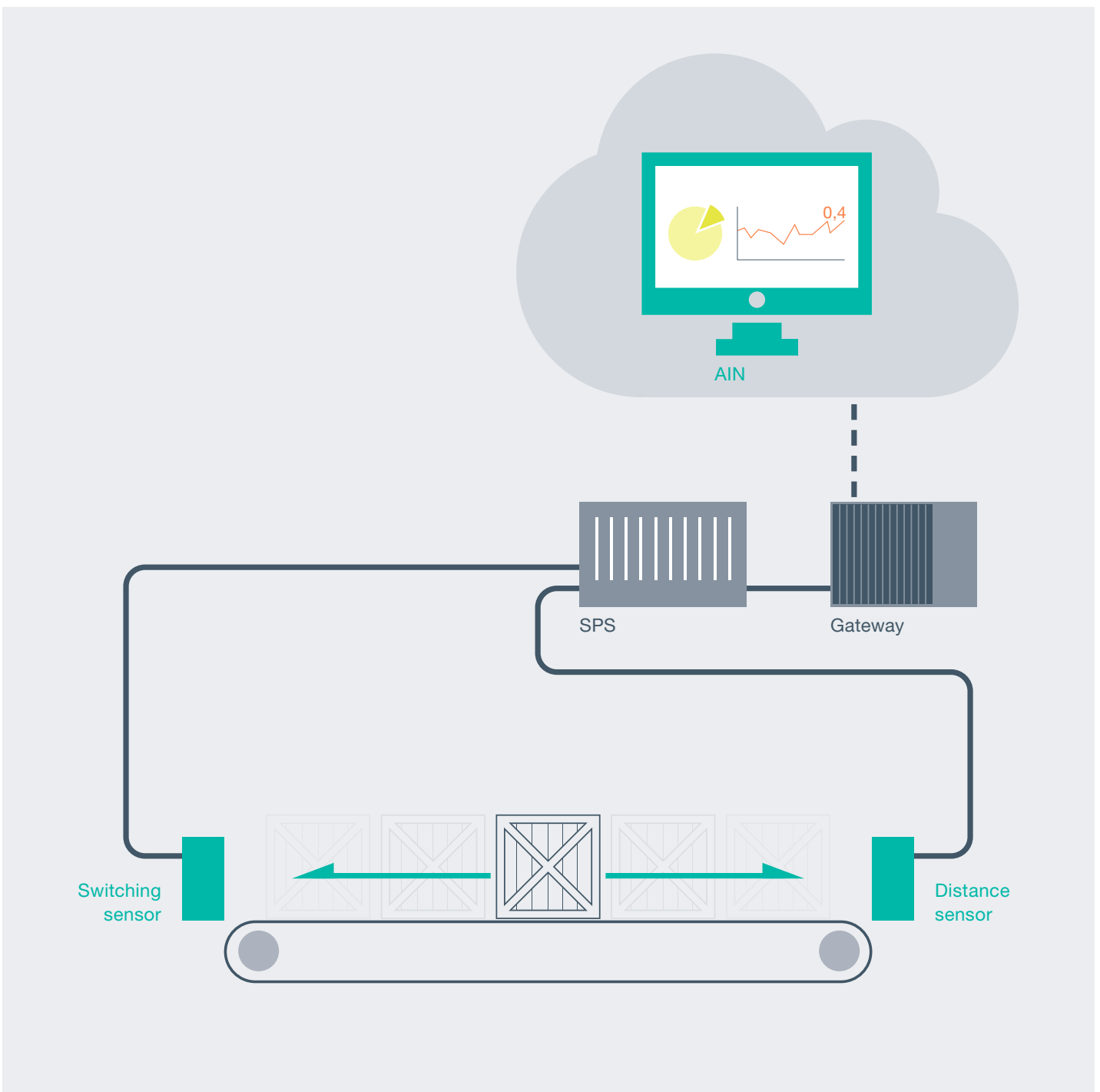
This design enables the sensors to be detected automatically in the AIN. The components are registered electronically when the plant is commissioned. If a failure occurs during plant operation and a component needs to be replaced, the data read for the replacement product is compared with the specified data for the original product. The AIN is able to analyze and display not only type data for the same series, but also deviations in the instance data of the individual product.

In the exhibit, the replacement of the sensor is performed by reconnecting the sensor cable: the incorrect replacement of the sensor using another type of sensor is simulated on one side of the conveyor belt. In this case, the safeguard already takes effect at IO-Link protocol level. Due to the unknown device ID, the incorrect sensor type is not addressed by the IO-Link master, which prevents the machine from starting up. The IO-Link master does not supply any information about the nature of the fault. However, information about what is wrong with the replacement product can be easily read in the AIN.

A sensor of the same type but with a different date of manufacture is provided as a replacement product on the opposite changeover point. When the sensors are replaced, the control panel will recognize the new product because it has the same device ID, and initiate the machine. Under certain circumstances, however, the replacement sensor may still have an unsuitable parameter set or even altered functionality due to deviating firmware. Using its data records, the AIN is also capable of detecting specific deviations in such instances and informing operating personnel of unacceptable deviations before the plant restarts. As a consequence, the centrally stored parameter set for the previous product can be transferred to the replacement product, and the functional-electronic design of the machine is updated by the system.

Thanks to its automatic component management, the AIN gives both maintenance technicians and operators greater insight into the design and function of the machine and plant. This higher-level control mechanism helps to achieve greater transparency and ultimately leads to greater operational reliability of components in technically complex production systems.

AIN

SPS

Gateway

Switching sensor

Distance sensor

Your automation, our passion.

Explosion Protection

- Intrinsically Safe Barriers
- Signal Conditioners
- Fieldbus Infrastructure
- Remote I/O Systems
- HART Interface Solutions
- Wireless Solutions
- Level Measurement
- Purge and Pressurization Systems
- Industrial Monitors and HMI Solutions
- Electrical Explosion Protection Equipment
- Solutions for Explosion Protection

Industrial Sensors

- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
- Fieldbus Modules
- AS-Interface
- Identification Systems
- Displays and Signal Processing
- Connectivity

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