Zero Defect Manufacturing

Secure data exchange between factory machines: improving predictive maintenance and enabling Data Economy concept

Challenges of Smart Industry

Managing manufacturing is a challenging task, especially with rising data volumes, information security risks, industrial espionage and costly proprietary IT systems. In addition, factories need to assure impeccable product quality just-in-time at a competitive cost.

Nowadays, managing a factory encompasses the management of machines, work plans, operators and repair workers where a range of technologies are applied, including machine tracking, IoT, telematics and big data processing. The amount of industrial data grows rapidly. Facing these challenges, modern factories need to become highly adaptable, integrating intelligent and cooperative production systems. New approaches are sought for data processing within the factory. Intelligent production systems need to be integrated with the entire factory to improve machine performance and enable manufacturing optimization in a very short time. Interoperability proves to be a key approach in Industrie 4.0. Connectivity and machine-to-machine communication take optimization in production operations to a whole new level.

Data exchange between machines

Machines chained to a shop floor as part of the manufacturing set-up are typically working as information silos. They are 'physically' connected since the part treated by one machine is passed to the next machine in the chain, which in turns treats this part and passes it to the next. Each of those machines generates a large amount of data, which so far has been used to monitor and improve the processes and tasks each machine performs. However, systems associated to each machine are not designed to exploit data from others. Improvements can be gained if the data from one machine 'feeds' the systems connected to the other and if such exchange is made in a way that is secure: access control terms and conditions established by each individual machine provider are preserved and the shop floor operator is also the sovereign on the decisions made: what is exchanged and goes out of the factory.

The Zero Defect Manufacturing use case demonstrates how factories can benefit from IDS and FIWARE open-source technology by obtaining enhanced functionalities for monitoring context data exported from the factory, enabling smarter decision-making.

Challenges

- Frequent breakdowns and defects of the milling machines and CMMs in the factory.
- Data silos.
- Security of the data exchange between the machines.

Collaboration between

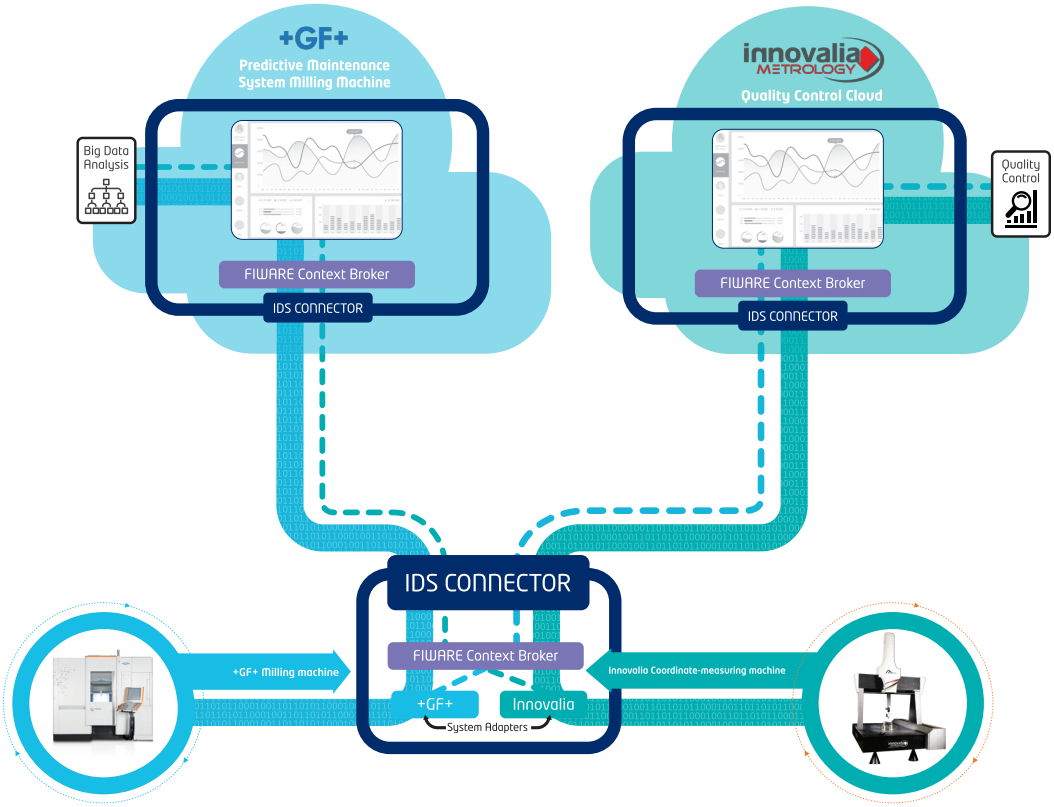
- Georg Fischer milling machine provider. Milling machine - a tool that produces objects by means of using rotary cutters to remove material from a workpiece of raw material.
- Innovalia coordinate-measuring machines (CMMs) provider. CMMs are used for measuring the physical geometrical characteristics of manufactured objects in order to detect defects and ensure quality.
- A factory represented by the shop floor operator.

Solution

IDS Connector implemented using FIWARE technologies: Context Broker, Access Control framework, Data Sink Connectors, System Adapters, Automatic Deployment and Configuration tools.

Benefits

- Improved performance of the systems connected to the milling machine and CMM. Each machine can enhance its maintenance by means of using data produced by the other machine:
  - Data produced by the CMM is useful for improving predictive maintenance of the milling machine, e.g. to forecast defects and plan certain maintenance tasks beforehand.
  - Data generated by the milling machine is useful for improving CMM recommended actions e.g. what has to be reconfigured in the milling machine to sustain the quality of the manufactured components.
- Data control. Usage of IDS connectors at the factory brings the necessary warranty to Innovalia and Georg Fischer that only the measurements they approve can be delivered to the Milling machine Predictive Maintenance system and CMM system correspondingly.
- Confidentiality of information. Only selected measurements are delivered outside the factory and only for the purpose of improving the predictive maintenance. None of the used data will be shared with a competitive factory.



The shop floor operator deploys **the System Adapter associated with the milling machine in the IDS Connector** linked to the factory. The System Adapter gathers measurements from the milling machine sensors and delivers them to the **Context Broker** component within the IDS Connector installed at the factory.

The Context Broker within the IDS Connector of the factory and the IDS Connector of the milling machine predictive maintenance cloud service exchange data. Milling machine measurements are sent to **the Georg Fischer predictive maintenance system** where they are being analysed.

The operator installs and configures **the System Adapter on the CMM.** CMM measurements are sent to the **Innovalia CMM precision management system.**

The IDS-ready CMM system sends new measurements to the **Predictive Maintenance** service of the milling machine. Thereby, overall maintenance of the milling machine is improved.

A dashboard application alerts the shop floor operator about detected issues and suggests recommendations for the maintenance of the machine.

The **IDS-ready milling machine** can send selected measurements **to the CMM precision management system** enabling advanced functionalities of that system if it is activated.

About IDSA

The International Data Spaces (IDS) approach addresses a key topic in the evolution of Industrie 4.0: how companies and institutions can build a space where data is shared in a decentralised manner so that each organization can use available data to improve their processes as well as govern and monetize data exported to third parties.

For this, the International Data Spaces Association (IDSA) is creating a reference architecture to implement secure and trustworthy data exchanges where data providers keep control over the use of their data ("data sovereignty"). It also addresses interoperability with many different data types used in global supply chains

About FIWARE

FIWARE is an Open Source initiative whose mission is to build an open sustainable ecosystem around public, royalty-free and implementation-driven software platform standards for the development of Smart Applications in multiple sectors. The FIWARE platform provides a rather simple yet powerful set of Application Programming Interfaces (APIs) and also combines components enabling the connection to the Internet of Things with Context Information Management and Big Data services on the Cloud.

The FIWARE Foundation is the legal independent body providing shared resources to help to achieve the FIWARE mission. The FIWARE Foundation is open: anybody can join contributing to a transparent governance of FIWARE activities and rising through the ranks, based on merit.

FIWARE - fiware.org
IDSA - industrialdataspace.org

Georg Fischer - georgfischer.com
Innovalia - innovalia.com