AREAS OF APPLICATION

The hardware and sensor upgrades implemented in this project were designed for the metal producing industries but are easily transferrable to other use cases involving (extreme environmental) conditions where similar sensor technology is needed. Integrated data sources require custom communication and storage infrastructure tailored to the specific plant control system. On the other hand, the adopted database unification concepts and use of standard protocols can be adapted across a range of similar industries.

CONTRIBUTING PARTNERS

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UNIQUE VALUE PROPOSITION/ADDED VALUE/NOVELTY

The data collection and sensor technologies explored within the INEVITABLE project improve and expand the range of data and information obtained about industrial processes and provide the basis for advanced digital technologies. The potential of digital upgrade of the processes through new sensor implementation and improved data collection was demonstrated. The approaches serve as recommendations for specific digitalization measures in process industries and could represent guidance for similar efforts in other industries.

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DATA COLLECTION AND SENSOR TECHNOLOGIES IN THE METAL PRODUCING INDUSTRY

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APPROACH

Digitally integrated production sensorics enable better process control and analytics, leading to reduced emissions and energy demands as well as the creation of more sustainable and higher-value products. Sensors in the metal producing industry tend to vary in age (legacy systems, digitally retrofitted systems, new systems) and range from traditional process sensors (e.g., sensors for pressure, flow, laser-based scanners, or distance sensors) to smart sensors (e.g., vibration-based reasoning of process conditions or camera-based image processing to analyse materials or to detect process changes). The main challenge is to integrate all these diverse information sources into a central process surveillance and control system.

SOLUTION

Within the INEVITABLE project data collection and sensor technologies have been explored on the basis of the digitalization needs of the metal producing industries. The key aspects addressed were (i) acquisition of data through new or upgraded sensors and (ii) design and setup of appropriate data communication and storage infrastructure.

Digital upgrades and retrofits performed include **the installation of new sensors** that were not previously incorporated into the process surveillance chain. A prerequisite for all of these applications is to evaluate the capabilities needed and define the required precision, measurement frequency, availability, and practicability of the solutions. Some of the newly implemented sensorics solutions within the INEVITABLE use cases are listed within the following table.

	Direct measurements (Traditional sensorics)	Indirect measurements (Smart sensorics)
Benefit	Improved process insight	Extracting hidden process information
Newly implemented sensors	• Laser sensors for precise speed measurement (rolling mill) • Close mesh of sensors (capturing the production process and its surrounding in higher resolution • Intensified sample-taking with lollipop samplers (measuring material properties with LIBS analyses)	• Vibration sensors (vacuum degassing plant) • Optical cameras (RH degassing plant) • Soft sensor for Hot heel estimation • Selective aggregation of operational data for batch identification and tracking • Setup of data files/ protocols to link data from existing sensors to database)

The design and setup of the data communication and storage infrastructure must consider several different issues to integrate data sources into one monitoring system and to make efficient use of plant data. Within the INEVITABLE use cases the following aspects has been emphasized to enable seamless connectivity along the process chain (horizontal connectivity) and along the production information layers (vertical connectivity).

- Identification of data sources (direct measurements from sensors and data from different PLCs and local databases)
- Unification of data handling systems and implementation/adjustment of several acquisition agents
- Implementation of data interfaces and communication infrastructure using standard communication protocols (OPC-UA, MQTT)
- Capturing specific process characteristics using different data aggregation techniques.