Food and Beverage

FOOD AND BEVERAGE

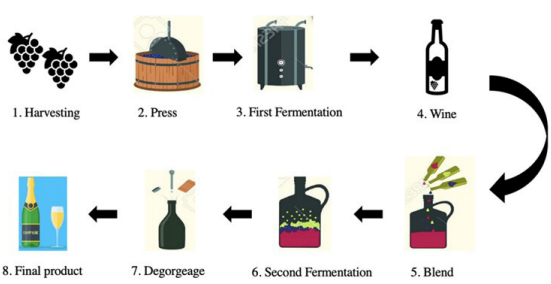
Environmental monitoring system

DESCRIPTION

Digitisation of wine and champagne grape production can bring significant economic, environmental, and social benefits. The future of the champagne and wine sector implies an exponential increase in observing and monitoring key production elements cost-effectively.

The demonstrator implements an industrial monitoring system that enables an accurate analysis of the production process in the vineyards and the Vranken-Pommery caves.

The data obtained by this monitoring infrastructure enabled accurate decision-making accordingly to an external environmental condition that can impact the production step under analysis.



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With the implementation of the proposed monitoring solution, it will be possible for the first time to automate the complex and manually controlled processes to the overall vineyards surface, reducing the labour cost and eliminating possible human misjudgements.

Connectability of the IIoT system is one of the key functions, and the system implements a new way of collecting data from different types of IIoT sensors, devices, and related AI technologies at the edge for continuous monitoring of the environment, soil, meteorological conditions, and/or plant performances.

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Autonomous environment-aware robot

DESCRIPTION

The demonstrator addresses implementing a method of capturing images and data using an autonomous robot to support cameras and sensors. The data analysis from the Vranken-Pommery vineyards allows precise decision-making regarding the yield, vine diseases, and missing vines. Rapid intervention is the key challenge to optimise the harvest quality, logistics, and production costs.

The autonomous environment-aware robot is designed to navigate in the vineyards to help automate specific tasks such as yield estimation or diseases identification. This will give viticulturists valuable insights for planning the harvest and treating the vine plants.

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With the implementation of the proposed autonomous-aware robot solution, it will be possible for the first time to automate the complex observation and counting process to the overall vineyards surface, reducing the time, and increasing the precision.

This is a novel concept for a completely autonomous system using on-board sensors capable of providing nearly instantaneous estimation results. More parcels can then be controlled and eliminating errors related to the random sampling, which is destructive and inaccurate.

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Quality control system

DESCRIPTION

The demonstrator is setting up an image acquisition system in the Vranken-Pommery presses facilities. The data analysis from the Vranken-Pommery presses allows the neural network training based on the quality classification of the grapes.

The use of semantic segmentation enables the detection of target classes. According to grape maturity and possible diseases, fast decision-making regarding grape quality will allow the best trial of the grape crates.

The short and precise intervention are the key challenges to optimise pressing logistics and the quality of the grape must.

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With the implementation of the proposed quality control solution, it will be possible to automate the complex and human-dependent assessment of the grape's quality, reducing the analysis biases.

Development of an automated image capture mechanism coupled with edge AI-based inference to improve the evaluation accuracy and produce a more uniform assessment of the grape quality.

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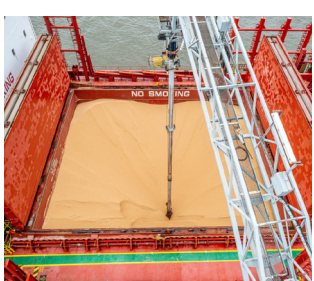
Production process optimisation

DESCRIPTION

The soybeans production process optimisation demonstrator uses IIoT-based sensors for machine vision, temperature, humidity, and moisture measurements throughout the preparation phase and correlates real-time data from these parameters using AI-based models. It is essential to have optimum moisture and temperature in the soybean processing after preparation and before extraction. If the moisture is too high and the temperature is too low, it will negatively affect the extraction's effectiveness. The moisture variation exists in the raw material, but there is no continuous measurement, and it is challenging to optimise the moisture content. It is essential to correlate the moisture measurements with size, colour, fractions, and other parameters in the raw material. This could potentially optimise the conditioning and drying phase in the preparation plant and give real-time data to optimise the yields of the products.



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The process optimisation solution offers key characteristics such as adaptive control, more careful handling, and reusability of stored knowledge in the soybean production process. The AI-based system integrates with the edge platform and improves the existing supervisory control and data acquisition (SCADA) system design.

It integrates IIoT monitoring, wireless connectivity, and AI algorithms integrated into an edge processing platform to provide a means to develop AI models and algorithms and deploy them in the real-time process flow.

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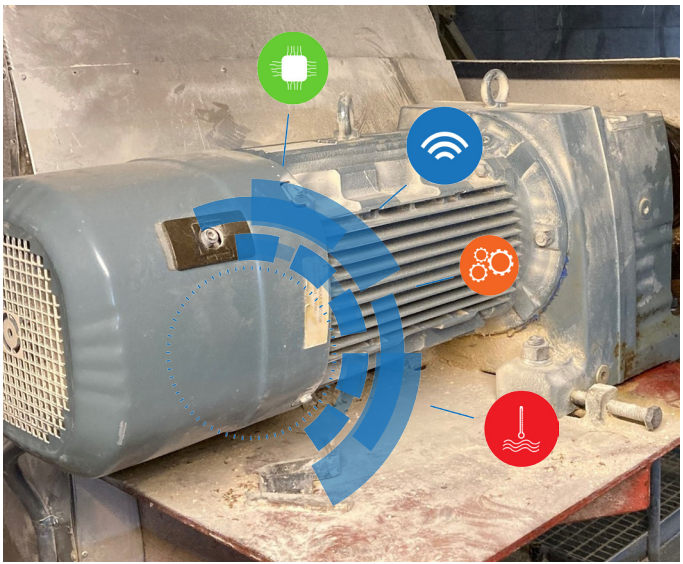
Predictive maintenance

DESCRIPTION

The predictive maintenance demonstrator offers a solution to implement an intelligent monitoring system that separates the equipment's normal and abnormal conditions. IIoT-based sensors are installed to measure different parameters such as vibration, current, sound, temperature, etc. The maintenance is today preventive in the soybeans production facility. Advanced predictive maintenance solutions reduce downtime and potential breakdowns. Today there is equipment that has no or little communication back to the control system, and it is challenging to determine the actual fault that causes a stop on the equipment. The measurements depend on the type of equipment, and the chosen equipment in predictive maintenance demonstrator is based on historical faults in the production line. Data from the IIoT devices are sent to AI-based models that correlate with normal and abnormal conditions.



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The maintenance concept is based on the combination of technical, supervisory, and managerial actions performed during the life cycle of the equipment/motors to maintain the soybean production and provide an enhancement through the introduction of AI-based, real-time sensor monitoring.

The system design is based on a heterogeneous wireless sensor network consisting of sensor nodes and IIoT devices with different communication interfaces (e.g., BLE, LoRaWAN, Wi-Fi), computing power, sensing range and AI-based processing capabilities.