IIoT enabled manufacturing of multi material machine canopies

In order to stay ahead of competition machine builders are continuously looking for improving the characteristics of their products as well as their production processes. Digitization and AI-techniques form a mean to achieve this, an exhibit a large potential in the context of high-mix, low volume production.

This assignment considers a company which produces machine canopies variants (casings). These canopies consists of several plastic panels, which are assembled using adhesive joining. The production process includes following main activities:

- Thermoforming of the base panels (using presses and product specific molds);
- Deburring of the base panels;
- Surface preparation (roughening, cleaning and thermal heating);
- Mixing of the adhesive;
- Application (dosing) of the adhesive;
- Curing of the joint under controlled conditions;
- Assembly of some optional features.

Many variables influence the quality of the final product. Temperature profiles (heating and cooling) determine deformation of the panels during thermoforming, surface preparation, application of the adhesive, environmental conditions during curing (temperature, humidity) influence the strength of the joints, etc.

Some example canopies are shown below.

Currently, the manufacturer has a paper-based procedure for planning, order processing and to follow up the manufacturing at the different production steps. The manufacturing environment consists of different work cells which are contain state-of-the-art production equipment, but which act independently from each other.

The manufacturer wants to make its production system future prove and considers implementing a digitization. He wants to be able to follow its production orders in a digital way (paper-less productions) and also would like to trace its production (log data of the different production steps), monitor its performance and dashboard it towards operators and management. Finally, he would like to use the gathered data to optimize its production (process parameters or flows). However, he is looking for help to design this digitized manufacturing system.

Can you propose an (software) architecture to achieve these goals?

Which **infrastructure** and IoT **instrumentation** would you need?

Which technological **challenges** do you foresee?

Can you propose an **implementation** plan?

Which **benefits** do you expect for the manufacturer and why?

For which purposes would you advise the manufacturer to use **AI** techniques?

Which **partners/competences** are required in this project?