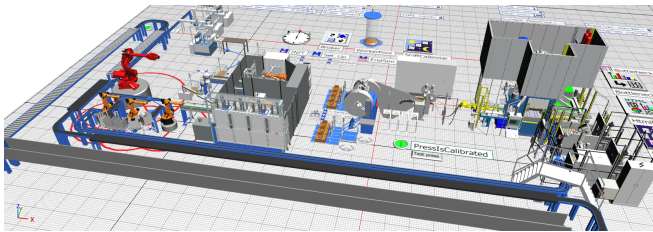


Digitalization and Optimization of a Production Flow

Popular Science Summary of Master Thesis TFRT- 6144

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Abstract: Digital twins are a very essential tool widely used by manufacturing companies nowadays. The scope of this project is to build a digital model of a real production flow present in SWEP's factory in Landskrona using Tecnomatix Plant Simulation. The model is built with real figures extracted from the real production flow and the production orders used in the simulation correspond to the real ones. Advanced tools such as Genetic Algorithms or Multi-level Experiments are used to improve the behavior and the output of the simulation, reaching substantial productivity improvements.



The transformation of modern manufacturing facilities has been a widely discussed topic lately. Market demands require individual attention, customized products, high quality, and short lead times. These fluctuating demands have completely revolutionised modern factories by transforming them into smart systems that are both faster and more flexible. Since modern facilities are increasingly becoming more complex, companies need to optimize and test different configurations efficiently and safely to meet these new requirements. A very interesting way to accomplish this task is by constructing digital twins of the processes.

This Master Thesis [1] consists of the building and validating a Digital Twin (DT) of a real production flow present in SWEP's factory in Landskrona. A DT is a digital representation of the physical object or set of objects that are considered. This technology is divided in three parts, which are the real, the virtual, and the interaction between these two. In this project, only the digital part is considered.

SWEP is a world-leading supplier of Brazed Plate Heat Exchangers (BPHE) for heating, ventilation, air conditioning and industrial applications. The company was established in 1983 by two Swedish entrepreneurs

and nowadays counts with more than 1000 employees. SWEP offers the widest BPHE range on the market, from the smallest sizes to the highest capacities, matching the needs of both sensitive and aggressive processes, and with third-party approvals for performance to trust.

The simulation model was used to improve the throughput by changing the sequence of the processed jobs and other production parameters. Moreover, changes in the configuration were conducted and sophisticated tools such as Genetic Algorithms or Multi-level Experiments were applied in the optimization process. The chosen software to set up the model was Tecnomatix Plant Simulation. This powerful tool offers a broad variety of functionalities that allow the user to create sophisticated models.

Substantial improvements are achieved when certain settings of the production are changed. Moreover, by re-ordering the production plan with the above-mentioned Genetic Algorithms, the production time is significantly reduced. It can be claimed that this project doted the company with a safe environment for testing and validating different scenarios. Even though some experiments have already been performed, there is a wide array of tests to be run in the near future.

References

- [1] M. C. Sergio. "Digitalization and optimization of a production flow". *MSc Thesis TFRT-6144, Department of Automatic Control, LTH, Lund, Sweden. 2021* (Available for download: <https://lup.lub.lu.se/student-papers/search>).