Main industrial Impact

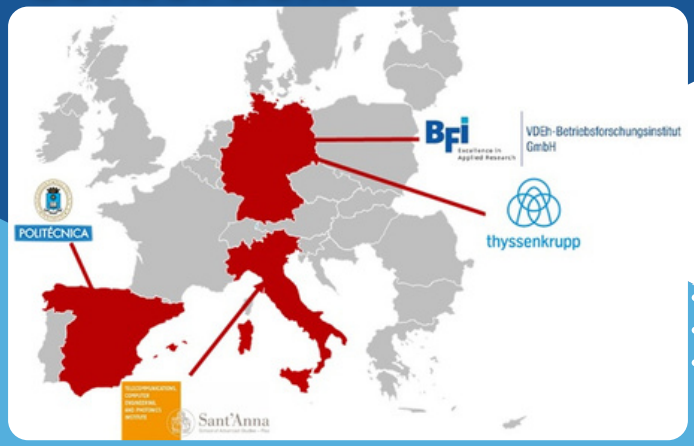
- Reduced manual planning effort
- Optimized and target-oriented use of production resources
- Faster reaction to unforeseen anomalous events and deviations and improved flexibility
- Higher through-process yield and lower Work In Progress (WIP) inventory level with improved delivery performance.
- Fewer target quality deviations through optimized routings
- Higher productivity through (semi-)automated production planning

Reduction of energy and materials costs and improved product quality

THE DYNREACT_PDP PROJECT

The project aims at realizing an open-source platform for dynamic production planning for the steel sector, which generates resource-optimized production plans for flat steel products of the highest reachable quality on a reasonable time scale. Realized as Service-Oriented Architecture this platform enables a modular connection of multiple planning relevant components.

Consortium



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DynReAct

DynReAct_PDP

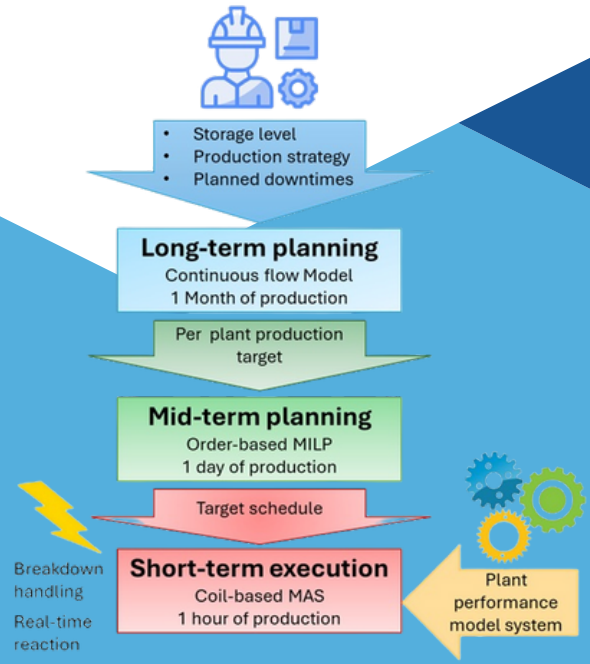
Roll-out refinement of production scheduling through dynamic product routing, considering real-time plant monitoring and optimal reaction strategies

This project has received funding from the Research Fund for Coal and Steel under Grant Agreement No 101112421

Approach of the project

The complex problem of production planning is divided into multiple smaller problems by introducing different planning horizons.

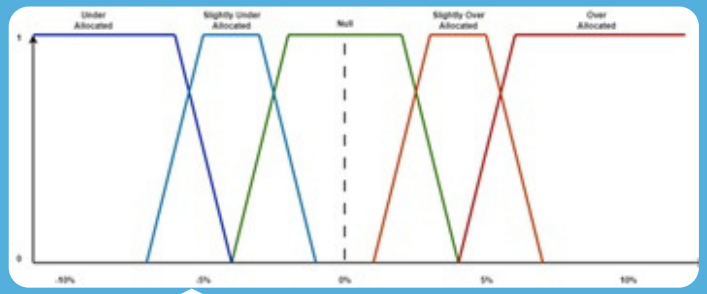
- A **long-term planning module** generates daily production targets for different material types based on strategic target schedules, without detailed order consideration and produces a per-day production target.
- A **daily order-based mid-term planning** module generates valid production sequences, taking into account all static plant constraints but with low reaction capabilities and no consideration of plant breakdowns or low plant performance.
- The **short-term planning module** realized via a Multi-Agent System actively computes flexible schedules on a per-coil basis considering the current production state and by dynamically reacting to incidents without the need for full replanning.



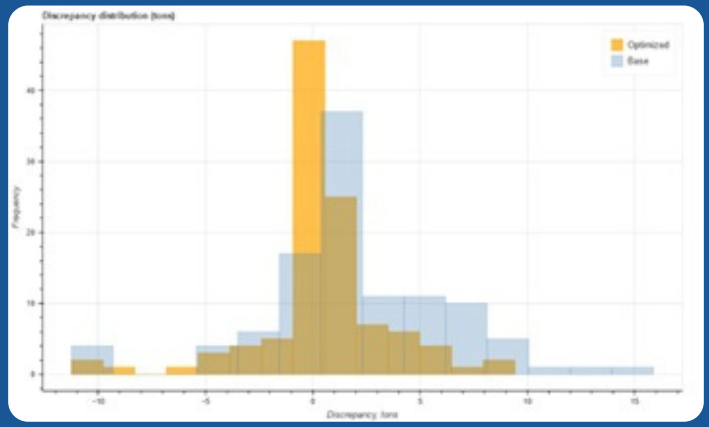
Artificial Intelligence tools

An optimization solution based on **Genetic Algorithms** is used for coil allocation to minimize discrepancies between requested and allocated material while ensuring delivery priorities are met.

A **Fuzzy Inference System** is used to simulate human decision-making to handle allocation criteria in a more flexible way. This solution offers greater adaptability and is easy of customize, as it allows incorporating new optimization parameters without complex mathematical model formulations.



Increased order completion: 69% vs. 54% with manual allocation



Software

A first version of the DynReAct software is published under an open-source license on Github. Interested users can try it and get acquainted with the concepts.

https://github.com/DynReAct/OSS_Platform