ESTEP 2025 Annual Event
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Udine (ITALY)

How decarbonisation, digitisation and circular solutions forge the sustainable European steel future?

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PROCTWIN
A distributed AI platform for optimizing and visualisation of steel manufacturing process chains

ESTEP · DIGIMET · DANIELI AUTOMATION · UNIVERSITÀ DEGLI STUDI DI UDINE HIC SUNT FUTURA

Project and Consortium

PROCTWIN

Duration Jan 2025 – Dec 2028
Budget total 4 826 000 EUR
Coordinator SWERIM
12 partners, 18 WP

Scope and targets

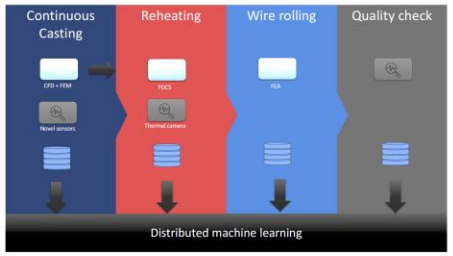
- **Novel Sensor techniques in continuous casting.**
- **Simulation of the process chain.**
- **Distributed Machine Learning.**
- **Data management and integration.**
- **Visualization and communication demo**

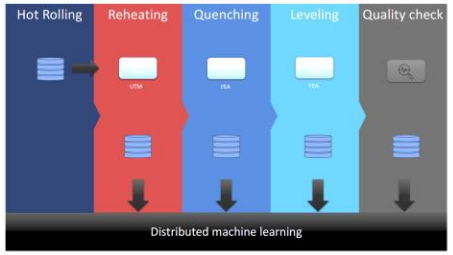
"ProcTwin's optimization tools target energy-intensive steps like reheating furnaces, aiming for a challenging 5% reduction in energy consumption."

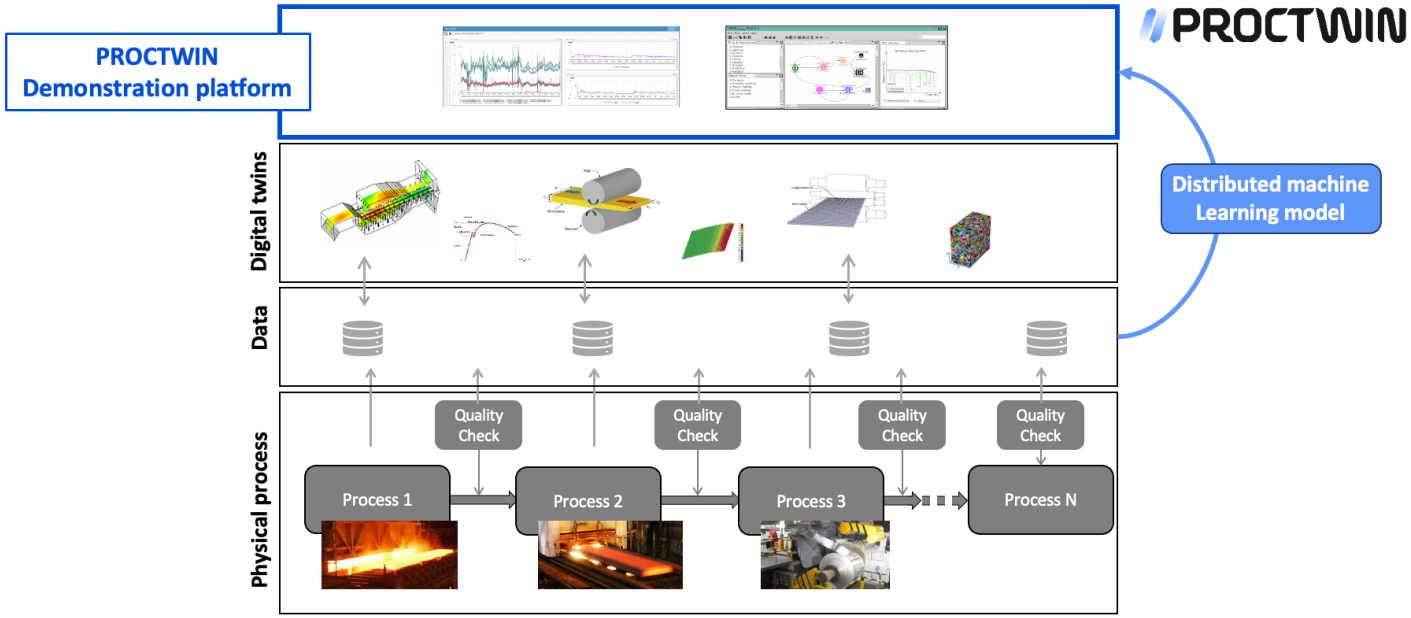
KPI	GSW	SSAB
Reduction of reprocessing	25%	10%
Reduction of energy consumption	5%	5%
Reduction of CO2 emissions	3%	3%
Costs reduction	4M€	3,5M€

Funded by the European Union

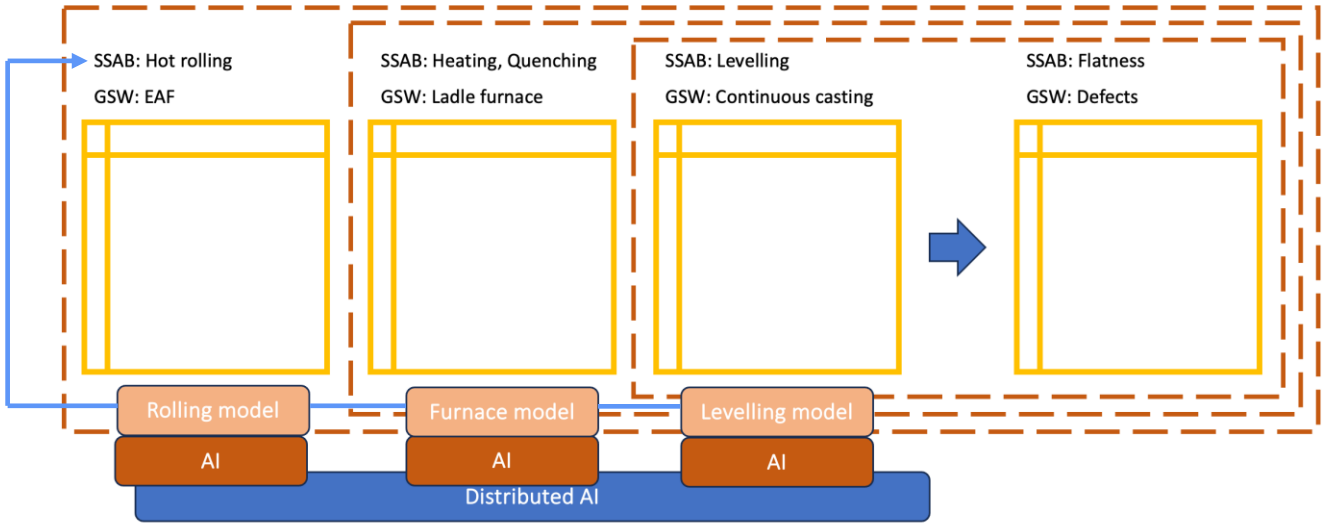
GSW and SSAB cases







Local model integration and collaboration of AI sub models



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Step-wise development of distributed AI

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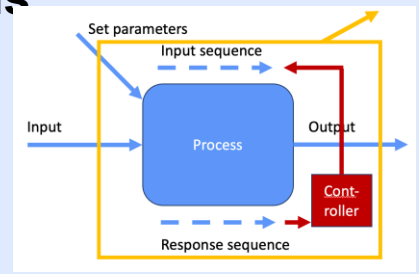
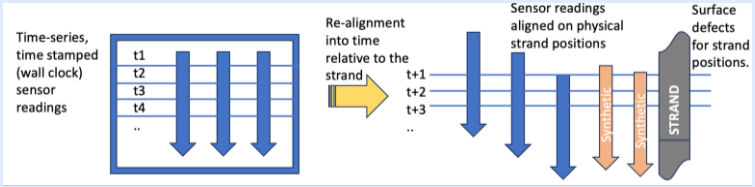
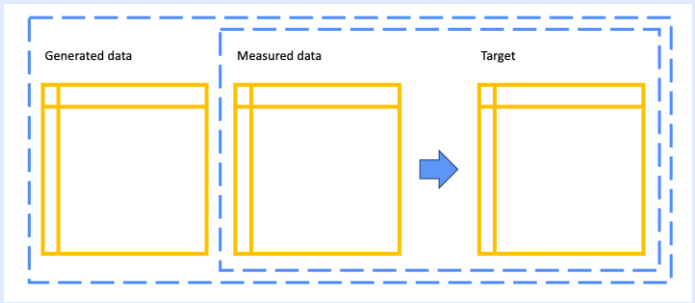
WP10 – Single Operation Machine Learning

Integration of data-driven models and existing physical models



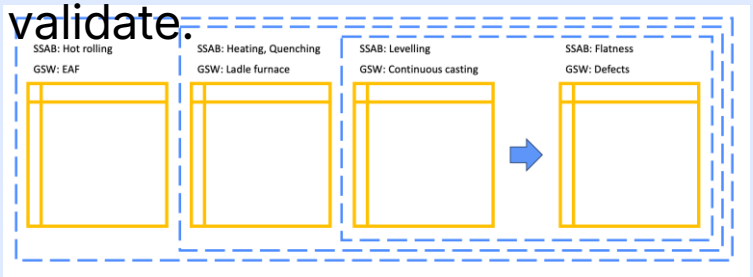




WP11 – Multi-operation machine learning model

Integration of data-driven models and existing physical models over multiple machine operations.

- Establish the communication infrastructure.
- Establish multi sub-model integration.
- Implement approach and validate.



WP12 – Distributed model, validation and evaluation

Development of the distributed AI approach.

- Establish mechanisms for collaborating sub models for loosely coupled agents.
- Sharing of local model info for meeting both local and global goals.
- Extend from Multi-Agent Reinforcement Learning (MARL).
- Implem and validate.

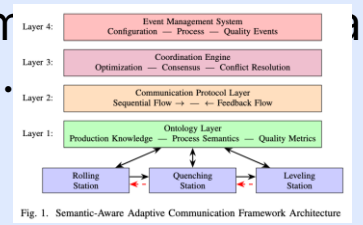


Fig. 1. Semantic-Aware Adaptive Communication Framework Architecture

FRAMEWORK COMPARISON ANALYSIS

Approach	Communication Pattern	Semantic Awareness	Scalability	Adaptability
Traditional Sequential	Sequential	None	Poor	Static
Centralized Control	Bidirectional	Limited	Moderate	Limited
Distributed Agent-Based	Distributed	Limited	Good	Dynamic
Proposed SACF	**Hybrid**	**Full**	**Excellent**	**Highly Dynamic**

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