

WeCo

meTop



COMBINED COMPETENCE UNDER ONE ROOF



DigMet

The digital copper industry

The digital solution for copper production

Copper is an essential material for many industries, from electrical to construction to transport. The copper production faces challenges such as declining ore grades, rising costs, and environmental impacts. Advanced knowledge of the process steps is a high key to success. That's why copper processing needs to embrace digitalisation, which can improve productivity and efficiency. With process digitalisation complex know how is documented and can be used for further process optimizations. Digitalisation can also help copper producers reduce their carbon footprint and contribute to the development of green technologies.

Copper - the key to innovation and sustainability

Digitalisation in metallurgical processes

Our approach

- Conduct a comprehensive analysis of your existing processes and systems to identify areas for improvement
- Develop customized digitalisation strategies and solutions tailored to your specific needs
- Implement state-of-the-art technology solutions to optimize your production and processing systems
- Provide ongoing support and training to ensure successful adoption of digitalisation solutions

Benefits of digitalisation

- Improved efficiency and productivity
- Reduced operational costs
- Enhanced safety and quality control
- Increased flexibility and scalability

Why choose us

- Team of experts with extensive knowledge of digital transformation and metallurgical processes
- Proven track record of delivering successful digitalisation solutions
- Commitment to providing ongoing support and training for long-term success

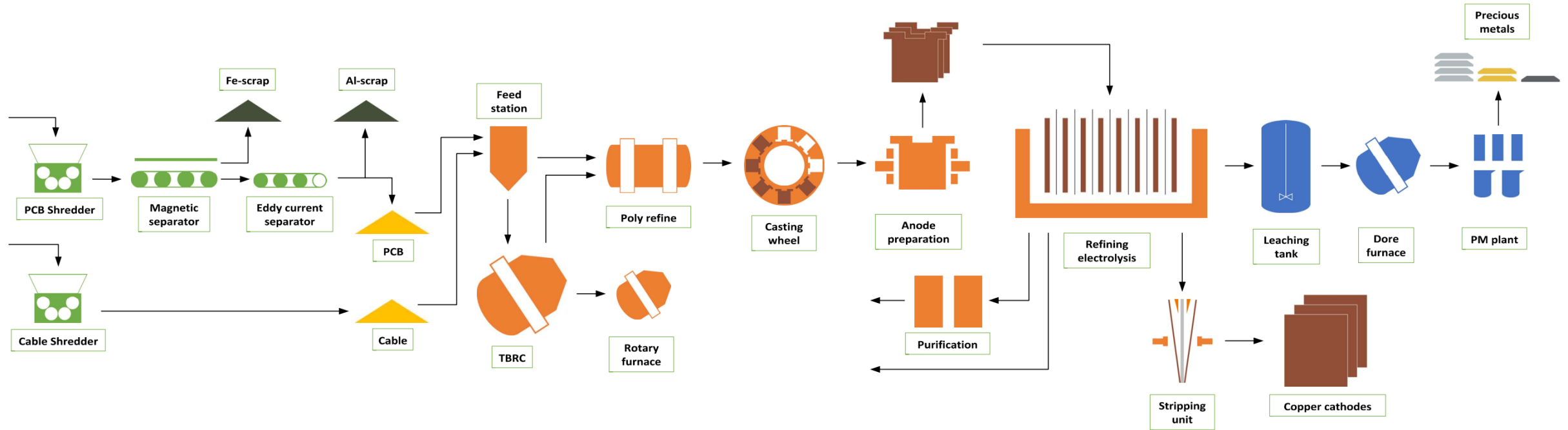
The digital copper industry

Our service

- Solutions for analysis and optimization of metallurgical processes, including introduction of new ideas and processes
- Minimizing gas consumption by optimizing furnace operation, reducing costs and environmental impact
- Predictive maintenance services, ensuring equipment reliability and minimizing production downtime
- Optical analysis and tracking of cathodes, improving product quality and reducing waste
- Track and trace services for products and raw materials, ensuring quality and transparency
- Neural networks to optimize cathode quality based on anode and electrolyte properties
- Short circuit detection between anodes and cathodes, enhancing productivity and current efficiency
- Minimizing batch time in the anode furnace, improving production efficiency
- Online measurements of O₂ by soft sensors ensure accurate and timely monitoring of furnace operation

Partner with us for a comprehensive suite of solutions to optimize your metallurgical processes and drive success

The digital copper industry



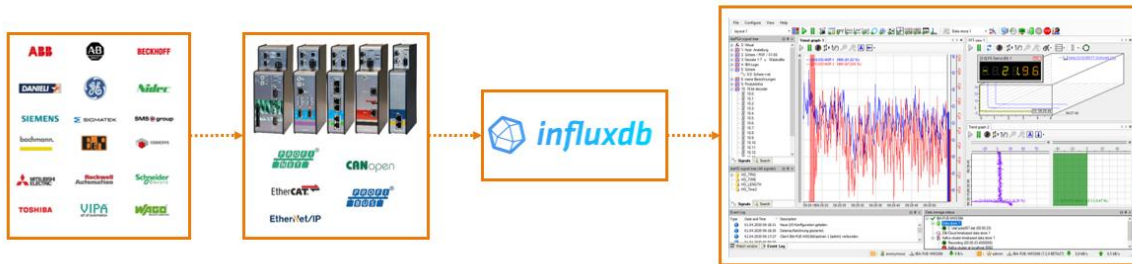
Whether you use scrap or ore as your input, METTOP can help you to digitalise and optimise your processes, from the shredder to the anode furnace to electrolysis. With METTOP, you can increase your efficiency, reduce your costs, and improve your environmental performance.

METTOP is your partner for copper production in the 21st century.

Data recording

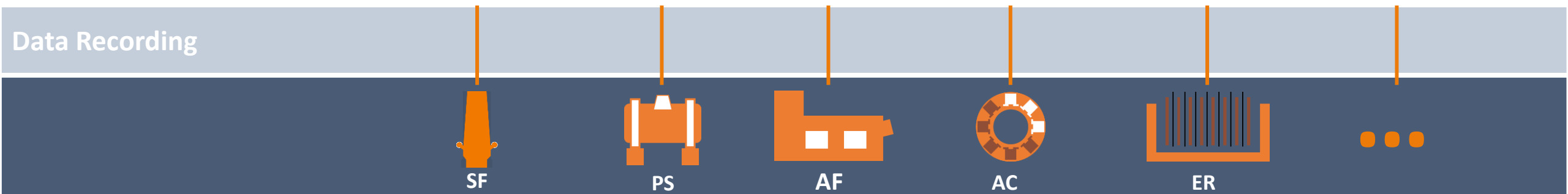
Data analysis is a key component of METTOP's approach to optimize metallurgical processes and increase efficiency and quality

- Allocating data to individual process steps and interpreting the data to understand the current state and performance of the process.
- Identify potential areas for improvement and make recommendations for process adjustments and changes.



METTOP is your partner to achieve

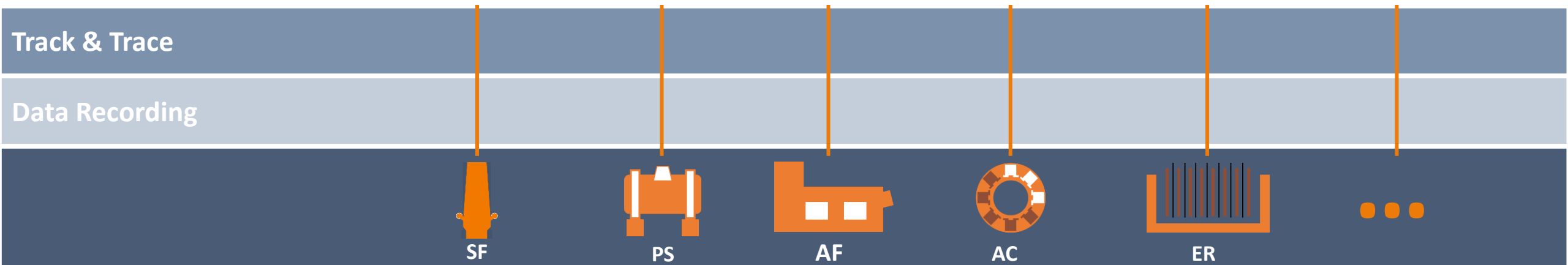
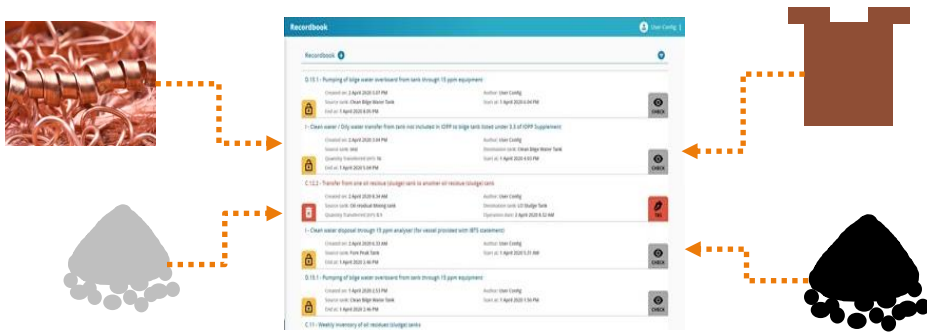
- **higher productivity**
- **lower costs**
- **better environmental outcomes**



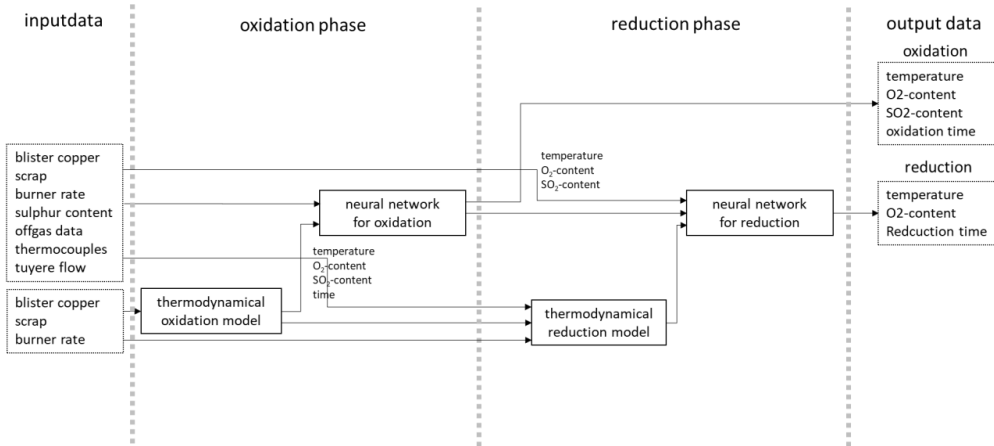
Track & trace

METTOP's Track & Trace solution offers a comprehensive and reliable way to monitor and track your processes

- Track the movement and quality of copper anodes, additives, raw material, cathodes, and scrap throughout the production cycle
- Trace the origin and destination of each batch
- Analyze the performance and efficiency of your processes and identify areas for improvement and cost reduction

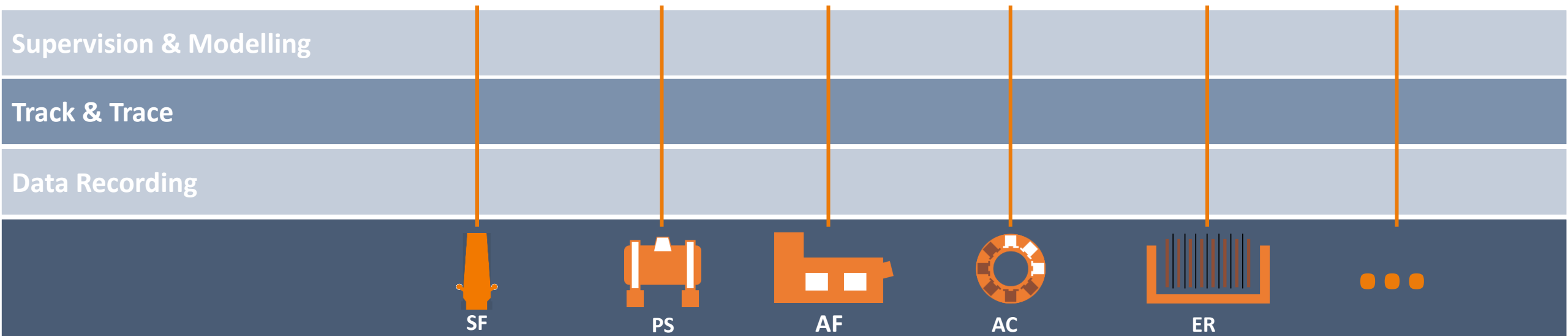


Supervision & modelling



METTOP optimizes processes with HSC and machine learning

- METTOP uses HSC software to model the optimal aggregate from input materials and energy for different types of furnaces
- The model predicts the output quality and quantity, but faces non-linearity and irregularity challenges
- METTOP solves these by combining thermodynamic modelling with machine learning
- This improves the accuracy and robustness of the model, and enhances the efficiency and profitability of the process

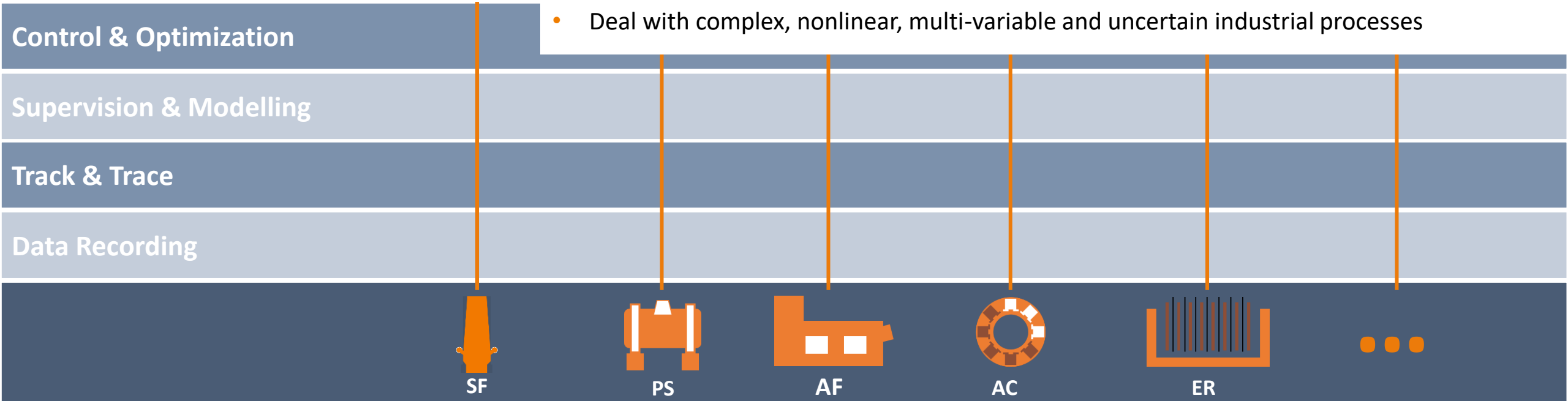


Control & optimisation

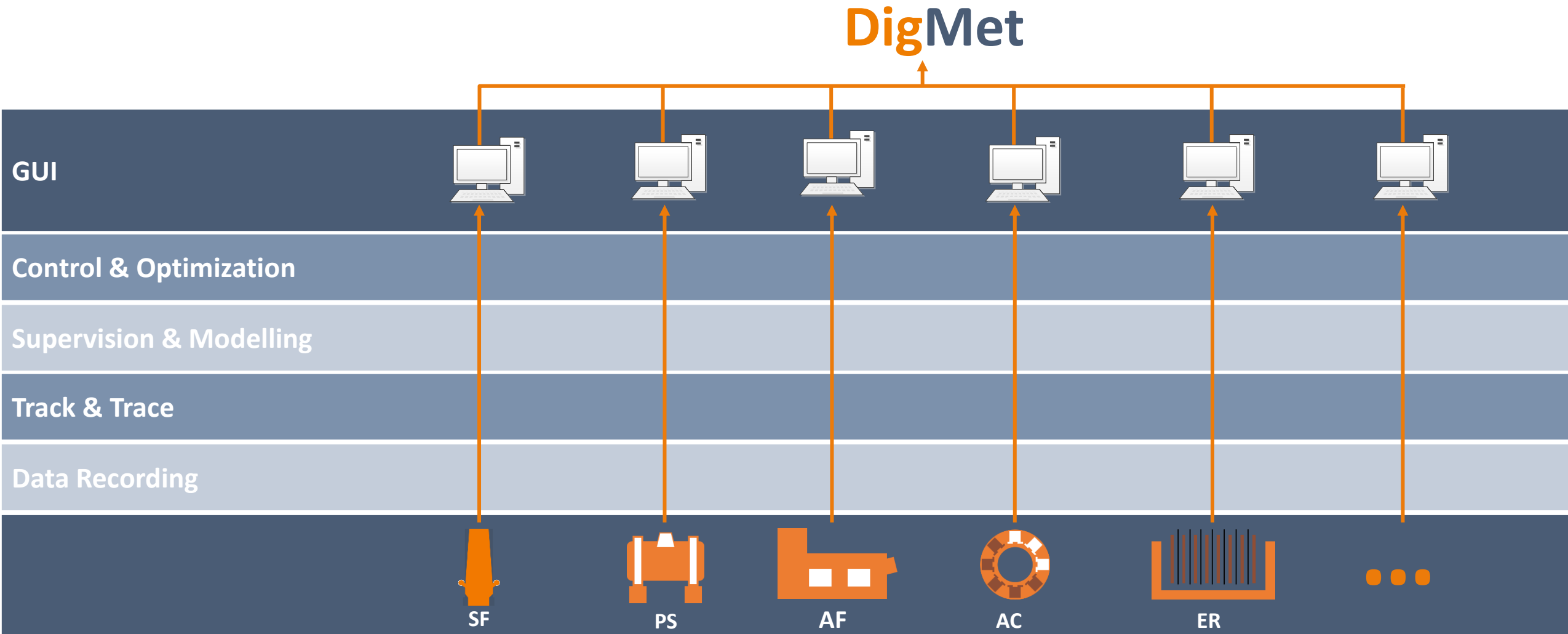


METTOP helps you to control and optimise your industrial processes using data-driven techniques.

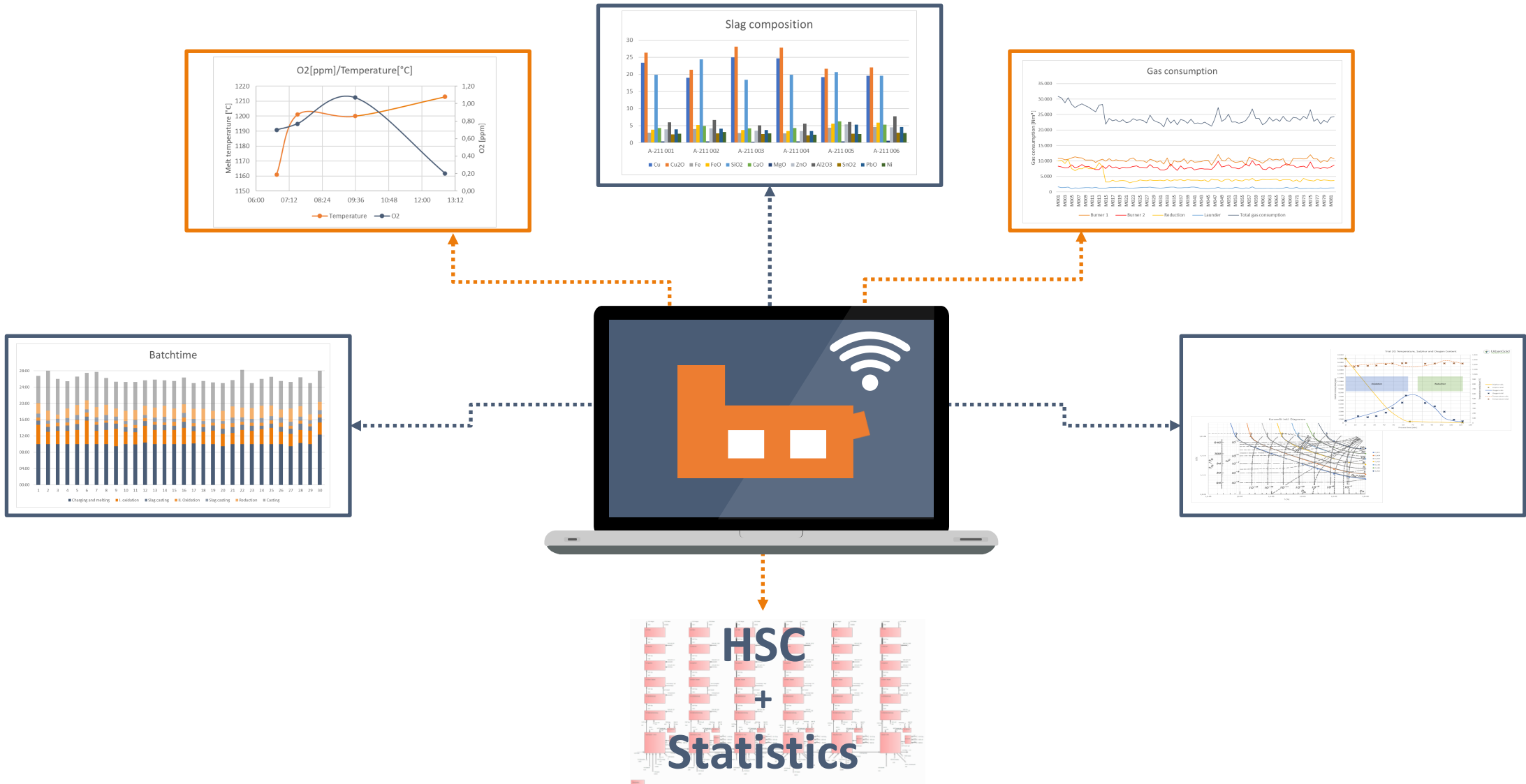
- Monitor and adjust process variables such as temperature, pressure, flow rate, etc. in real time to ensure safe and stable operation
- Find the optimal values of process variables that maximise performance and quality while satisfying constraints and requirements
- Deal with complex, nonlinear, multi-variable and uncertain industrial processes



Vision



Anode Furnace



Anode Furnace example from primary metallurgy

1. Collection and preparation of data

- Collect data from SCADA-system and assign them to process steps
- Understand the information and relevance of each data point

2. Data feature engineering

- Prepare data by washing, transforming and other steps
- Unify frequencies, remove time shifts and perform correlation analyses
- Reduce dimensions and identify important parameters for the model

3. Creation of the thermodynamic model

- Use HSC software to create a model of the optimum anode furnace
- Input blister copper, scrap, energy and other parameters
- Calculate energy and mass balances for the process

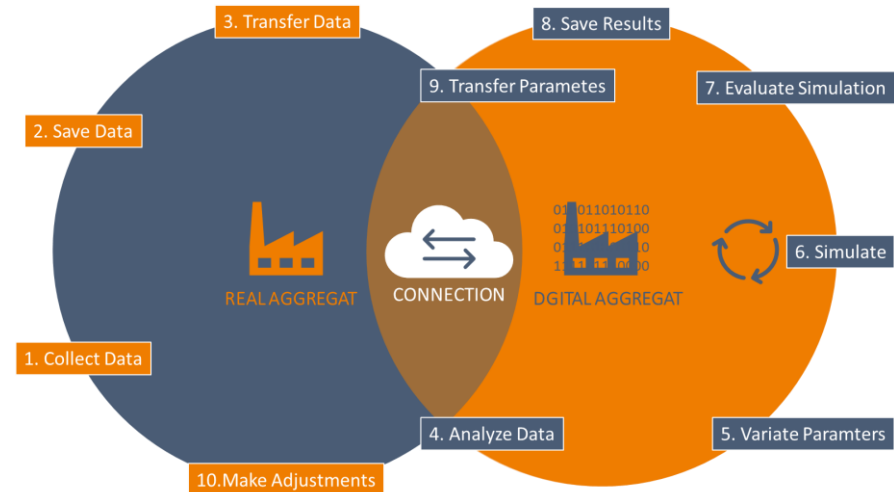
4. Optimisation of the model by means of machine learning

- Parameters are integrated that are otherwise difficult to take into account

5. Experimental operation and optimisation

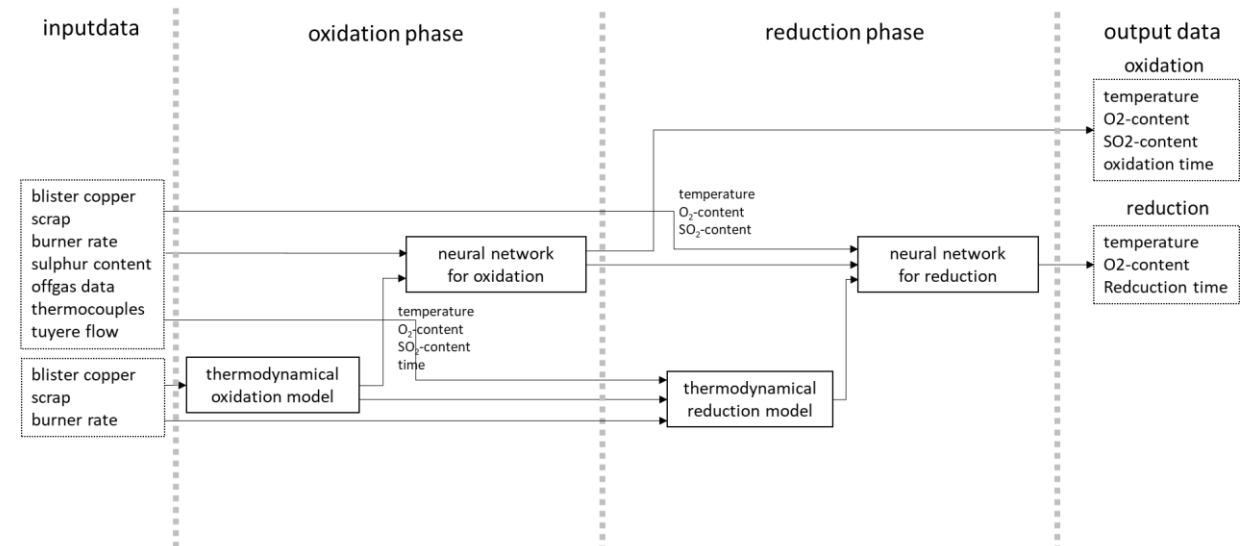
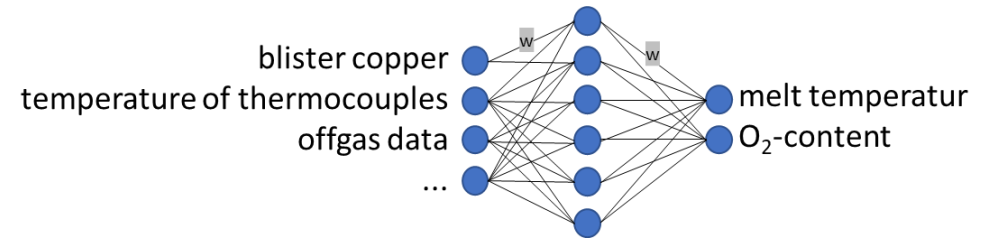
- CELOX measurements to calibrate the model

6. Online implementation

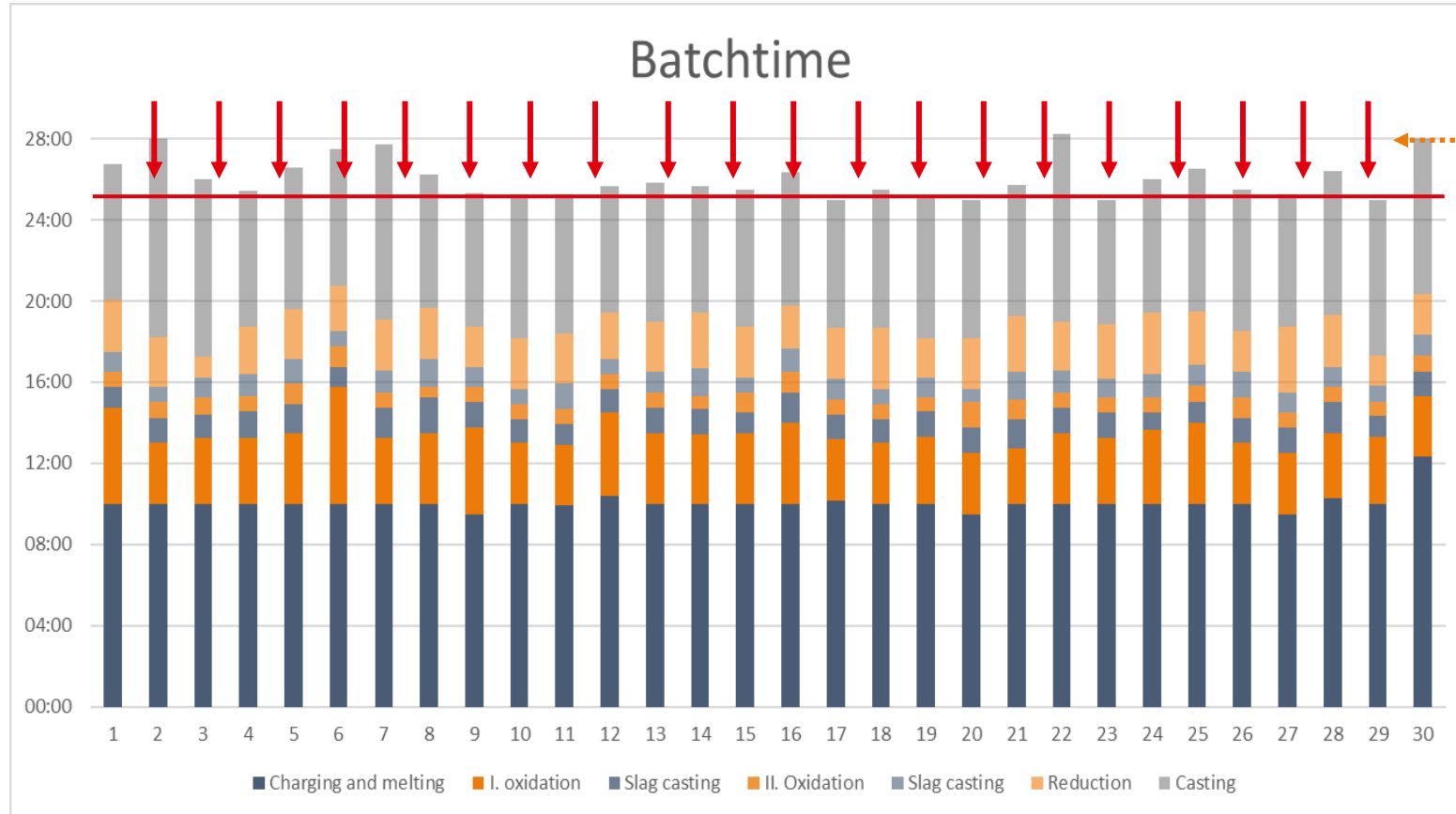


Anode furnace (example from primary metallurgy)

- The digital twin of the anode furnace aims to reach the optimal casting temperature of 1,230°C
- Combination of thermodynamic principles with machine learning methods
- Challenges:
 - ❖ process nonlinearity
 - ❖ false air drawing
 - ❖ irregular measurements
 - ❖ inconsistent scrap charging

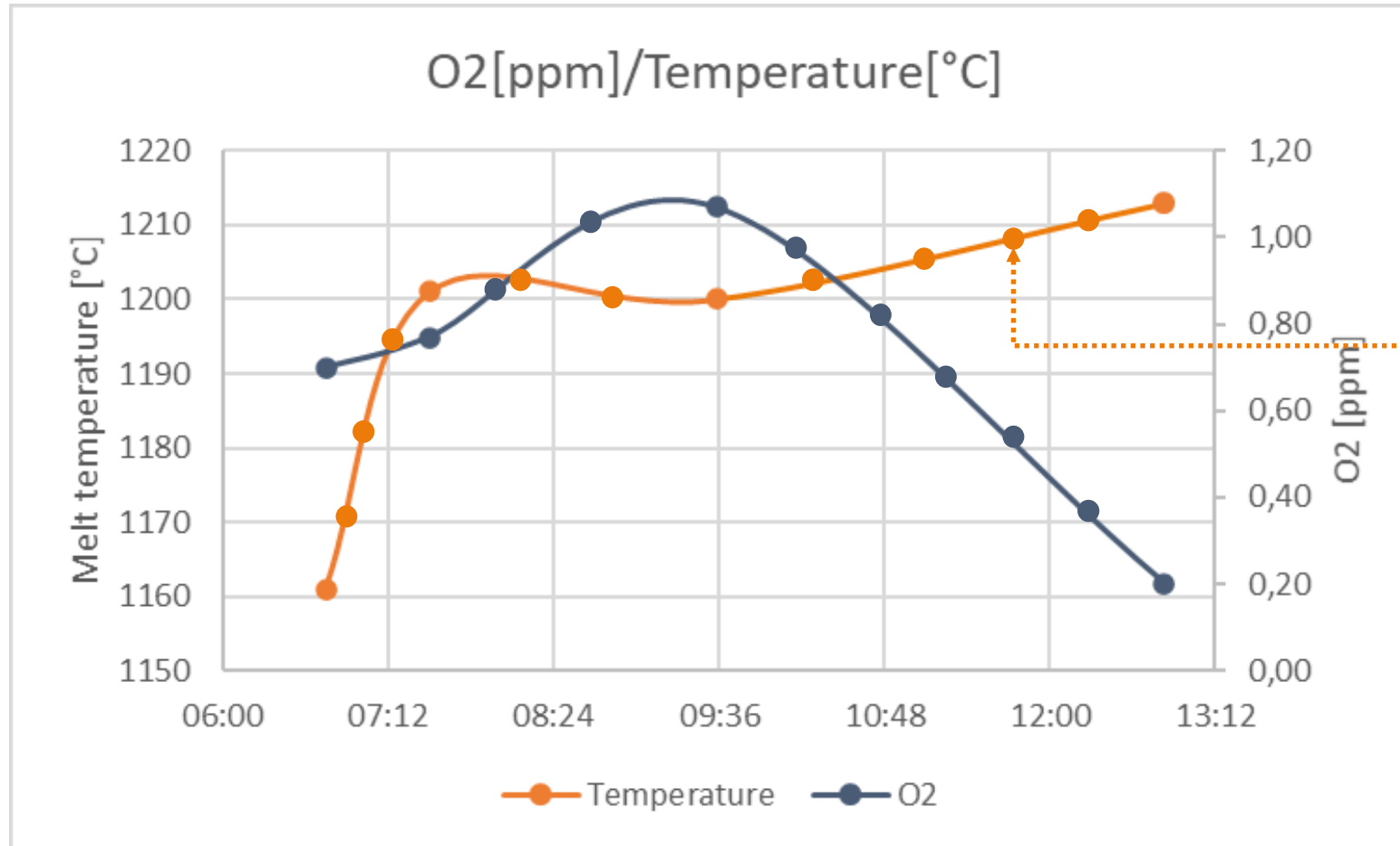


Batch time minimisation



Minimisation of the **batch time** through optimisation of the furnace operation!

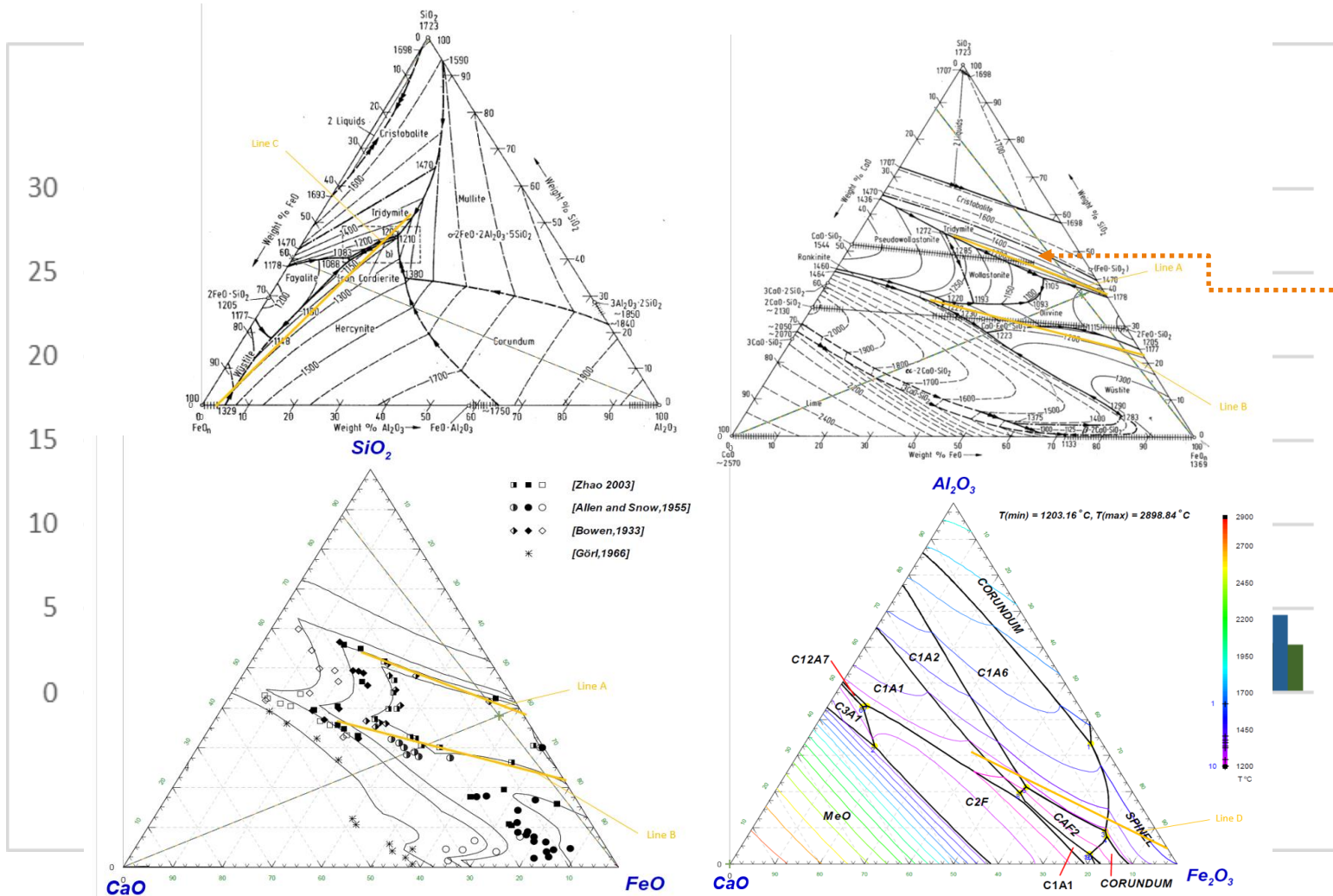
By determining the **optimal end of oxidation operation**, the reduction time can be minimised in addition to decrease the oxidation time!

Online temperature and O₂-measurement

Online temperature and O₂ measurement through thermo-dynamic calculation and statistical optimization!

Traditional methods like CELXO lances and slag analysis are slow. They only give you a snapshot of the melt condition at a specific point. But with our innovative solution, you can **measure the temperature and O₂ content continuously and accurately!**

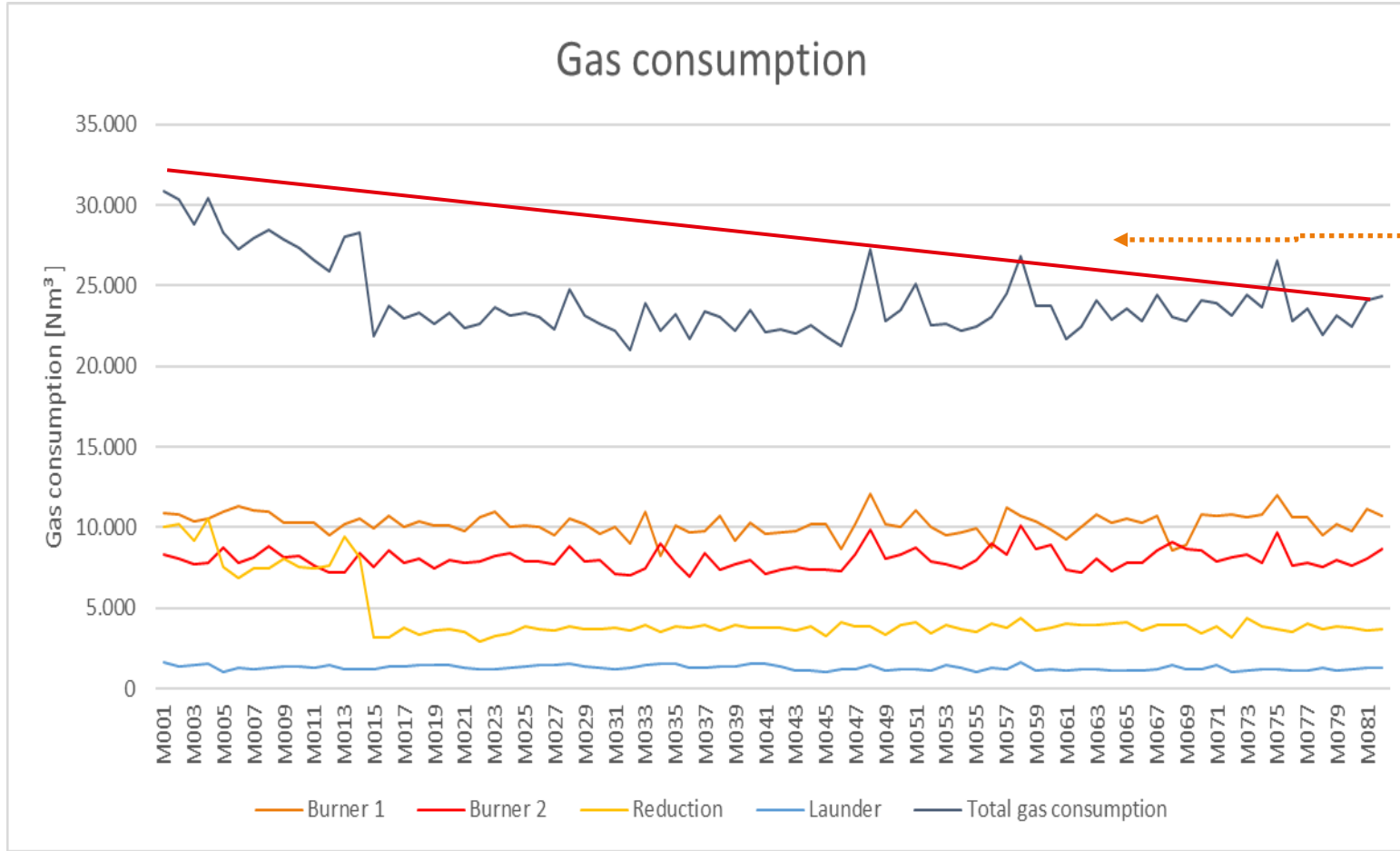
Automatic slag selection



Automatic selection of the **optimum slag composition** and matching of the additives to it.

The determination of the optimal additives is essential in order to be able to adjust the slag viscosity and thus remove all unwanted impurities.

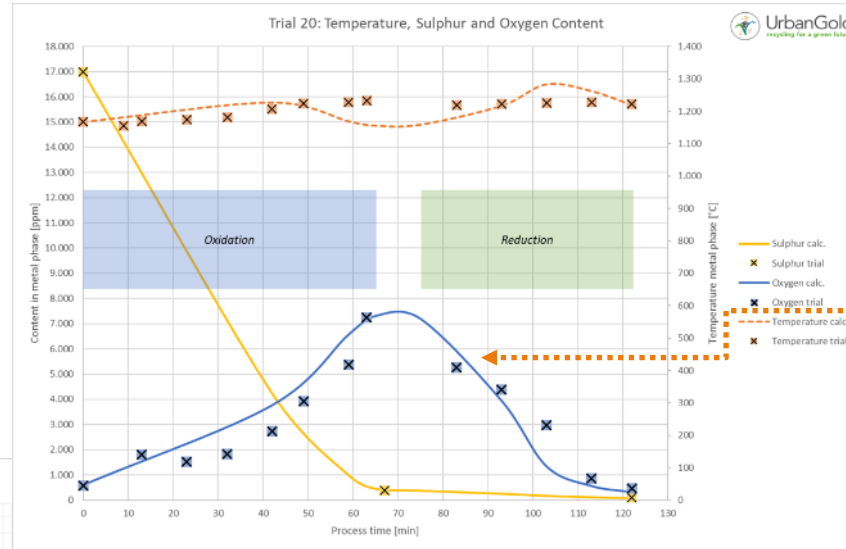
Anode furnace optimisation



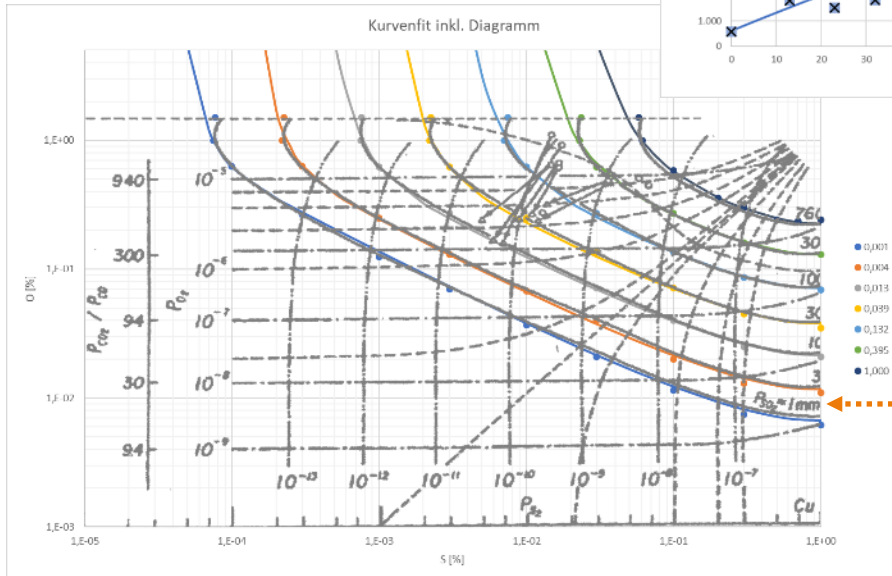
Minimisation of gas consumption due to optimal furnace routing

Minimising gas consumption leads to energy and cost savings, as well as a lower CO2 footprint.

Endpoint determination of oxidation and reduction phase



Modelling of the oxygen and sulphur content during the oxidation and reduction phase, in order to be able to determine the end of the oxidation and reduction phase well.



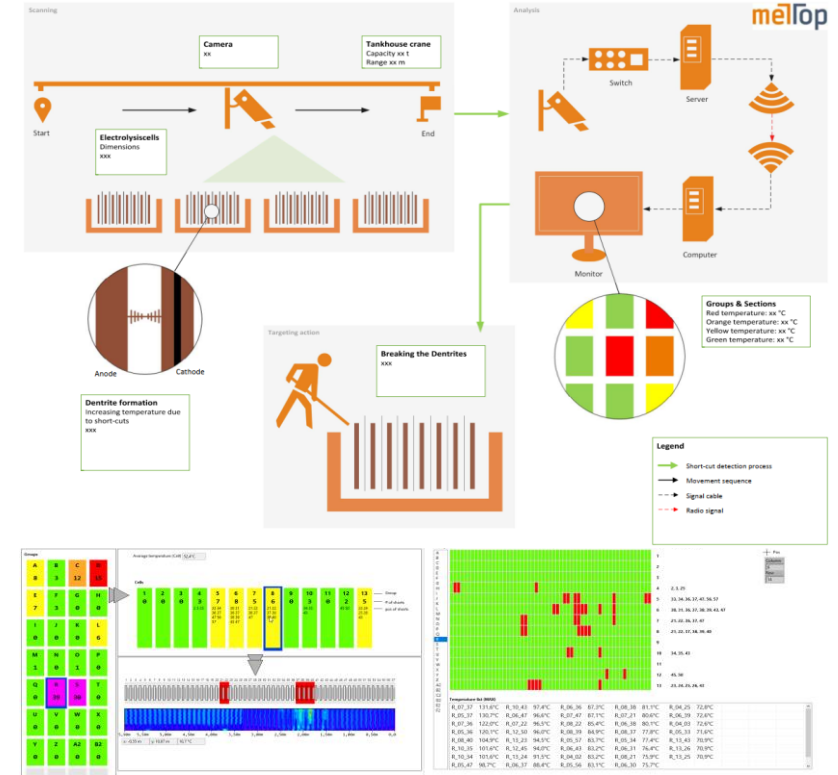
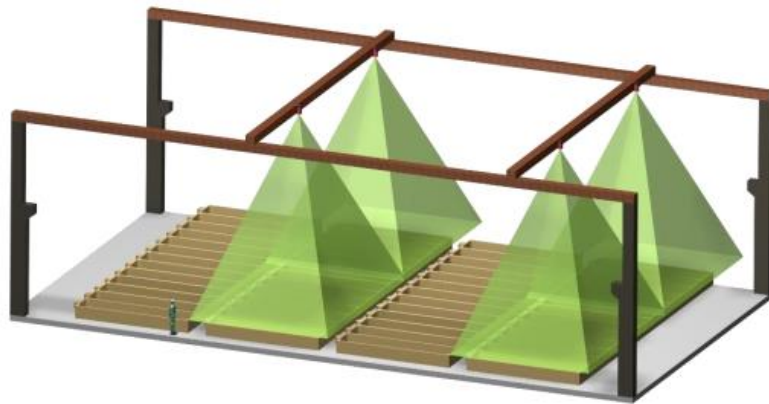
Mathematical replication of the thermodynamic S/O correlation

Shortterm-short circuit detection in a copper tankhouse

Benefits of automatic detection

- Higher current efficiency
- Lower reworking costs

Minimization of the short circuit time from 12 hours to less than 2 hours



With increase of the current efficiency by 1% and annual production of 100,000 t a saving potential of 250,000 € results!



CONTACT

DI Matthias Lindthaler

METTOP GmbH

Peter-Tunner-Str. 4
8700 Leoben
Austria

M +43 (0) 664 88 60 45 67

matthias.lindthaler@mettop.com

or

sales@mettop.com