

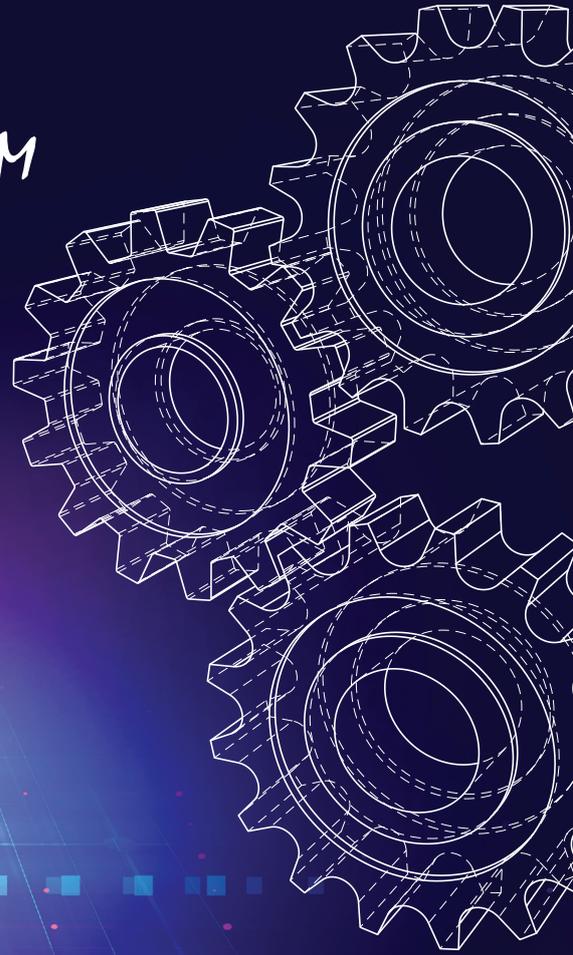


PAUL WURTH

SMS group

DATAxpert™

Designed for Industry

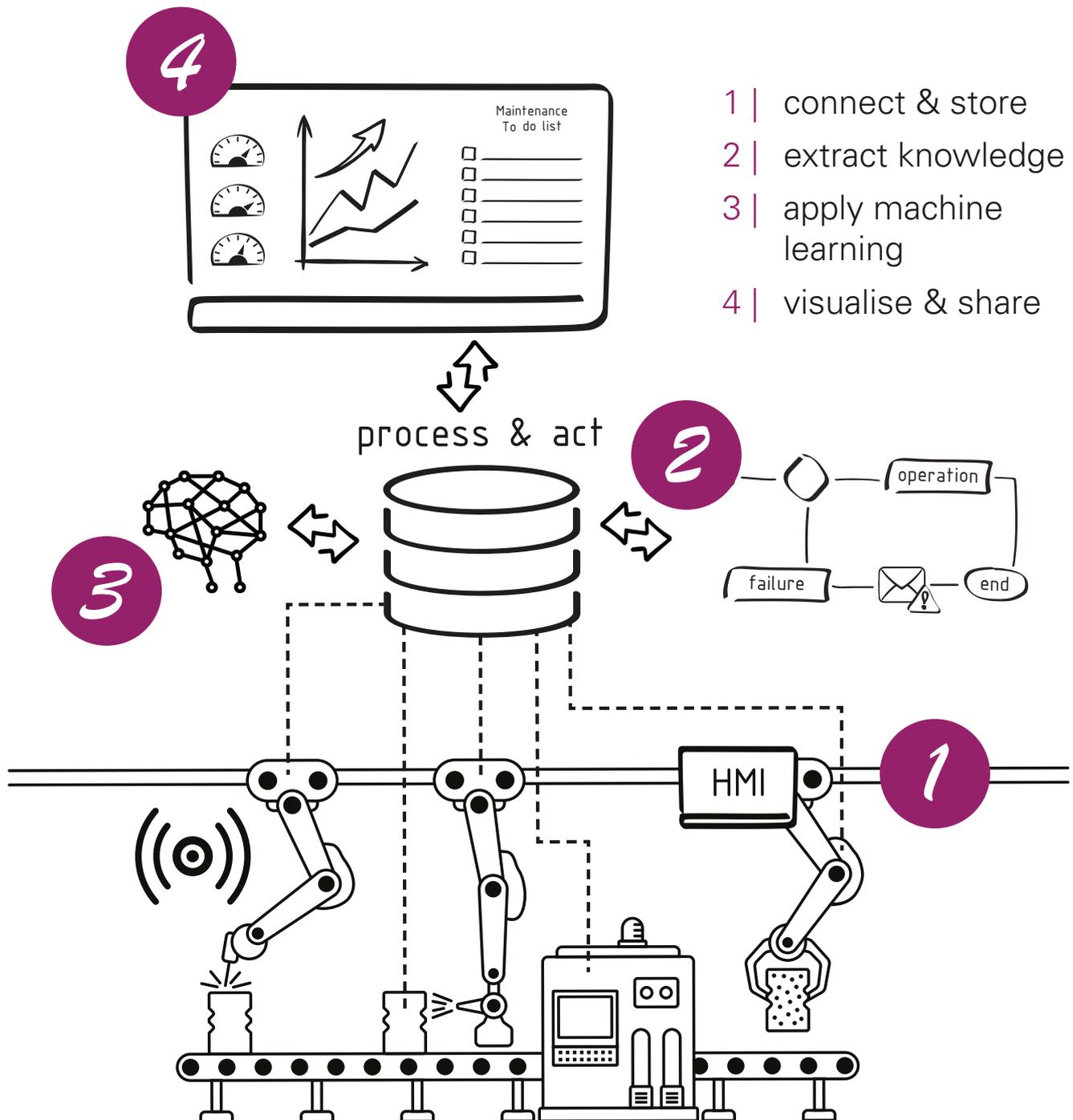


DATA *Xpert*TM

SUPPORTS ENGINEERS

- ▶▶ to store and capitalize valuable process and maintenance knowledge that you have gained about your own production
- ▶▶ to continuously optimize your maintenance and production processes
- ▶▶ to visualize your plant's operation data and analyses in real time or in the past on any device
- ▶▶ to build up your company-specific knowledge hub to avoid a loss of knowledge over decades

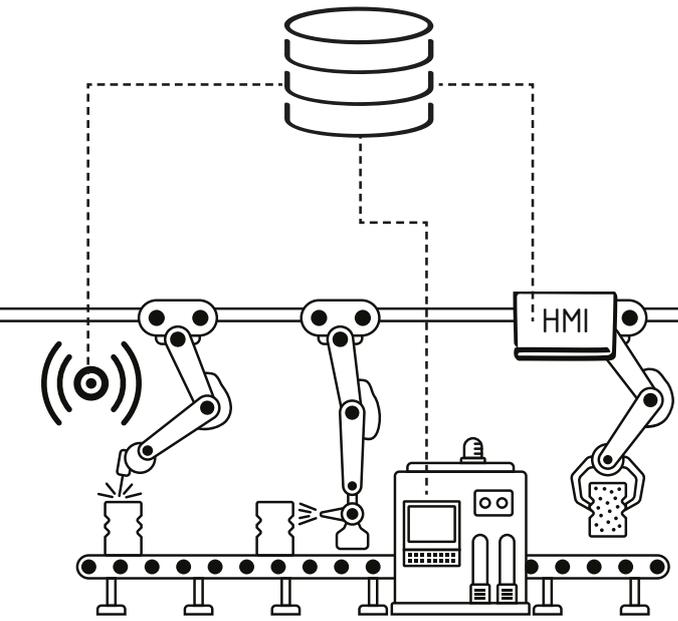
OPTIMIZE YOUR PRODUCTION AND MAINTENANCE PROCESSES IN 4 STEPS



1

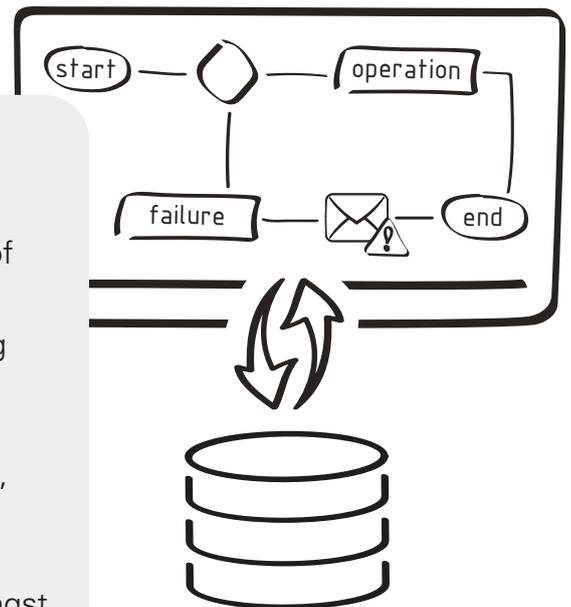
CONNECT YOUR INDUSTRIAL MACHINES AND PLANTS

- ▶▶ Aggregate data from all production facilities – including disparate systems such as industrial databases, PLCs, or IOT enabled sensors. Proprietary protocols and open standards such as OPC-UA are supported.
- ▶▶ Store data on the edge or transfer it to your isolated cloud space.
- ▶▶ Provide high performance visualizations and analyses through high-speed storage at up to 5 million process tags per second.
- ▶▶ Organise the data according to your plant organisation thanks to information modelling.
- ▶▶ Easily query your data with predefined operations and RESTful web services.



EXTRACT PROCESS AND MAINTENANCE KNOWLEDGE

- ▶▶ Zero-code platform to succeed in the digitization of your manufacturing processes.
- ▶▶ Capture process knowledge without programming skills in a simple graphical user interface. Transfer knowledge directly from anyone on your team.
- ▶▶ Develop rules based on real-time or historical data, individual samples or batches.
- ▶▶ Collect, store and share process and maintenance knowledge of your processes and equipment amongst individuals, teams and large-scale operations.
- ▶▶ Reliably execute time and event-based business logic directly on the edge (at the operational site) or in the cloud (securely hosted and maintained).
- ▶▶ Integrate machine learning algorithms from AIXpert or as R, Julia or Python scripts.
- ▶▶ Rapid industrialisation & deployment platform for data-scientists.
- ▶▶ Create automated reports delivered periodically or event-based.



RULESXpert™

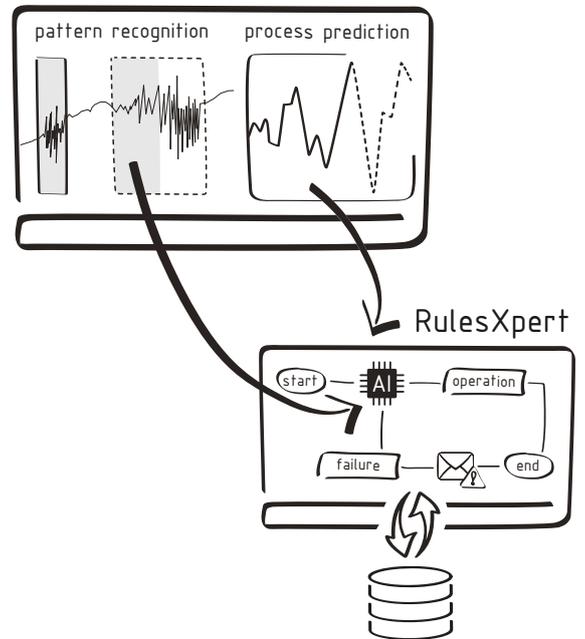
2

3

APPLY MACHINE LEARNING – INTUITIVELY AND WITHOUT ADVANCED KNOWLEDGE

- ▶▶ Use machine learning without advanced knowledge or specialized skills. Intuitively train your own models for process predictions or predictive maintenance.
- ▶▶ Apply pattern recognition and anomaly detection to your data for detection of emerging equipment failures.
- ▶▶ Achieve reliable predictions using the latest advances in RNN, LSTM and more.
- ▶▶ Let AIXpert choose the best algorithms, models or combinations thereof, depending on the nature of problems or use cases (AutoML and Meta Learning).
- ▶▶ Integrate AI models directly into RulesXpert using real-time and historical data.
- ▶▶ Use AI models on the Edge with Runtime RulesXpert or in the Cloud.

AIXpert™



4

SHARE YOUR KNOWLEDGE AND OPTIMIZE YOUR PROCESSES

- ▶▶ Build dashboards in an intuitive web-based tool. No coding skills required!
- ▶▶ Extension of the popular web-based open-source Grafana dashboarding software with industry specific plug-ins.
- ▶▶ Use industry specific panels to visualize complex process patterns.
- ▶▶ Use data sources to select data interactively and provide a plant-hierarchy for navigation.
- ▶▶ Input data from your panel to the database to store operator set-points and feedback over time.
- ▶▶ Execute RulesXpert rules on demand for advanced data processing on the fly.
- ▶▶ Change the language of your dashboard with one click.

Web Interface



BIXpert™

RULESxpert™

The screenshot displays the RULESxpert™ software interface. On the left, there is a 'Variables' table with columns for Name, Value, Time, and Type. Below it is a 'Config' section with 'Input' and 'Actions' tabs. The main area shows a workflow diagram with nodes like 'Start', 'Decision', 'Function', and 'End'. On the right, there is a 'ToolBox' with various icons for workflow elements.

| Name | Value | Time | Type |
|---------------|--------------|----------|---------|
| Globalization | 1 min | 00:49:46 | Numeric |
| Lapacity | 3.1 t/hm | 16:41:22 | Numeric |
| Stop_Phase1 | 2.31316 t/hm | 00:49:46 | Numeric |
| | | 00:50:37 | Numeric |

The screenshot displays the AIxpert™ software interface. At the top, there are tabs for 'Data selection', 'Quality assessment', 'Pre-analysis', 'Learning', and 'Evaluation'. Below, there is a neural network configuration section with 'Input' (Pre-process: Min/Max Scaling) and two 'Dense layer' blocks. The first layer has 8 Neurons and Sigmoid activation. The second layer has 2 Neurons and Soft Max activation. Below this, there is a 'Log loss' graph showing loss over 100 rounds. A table shows training and validation metrics. At the bottom, there is a 'Distance to reality' scatter plot.

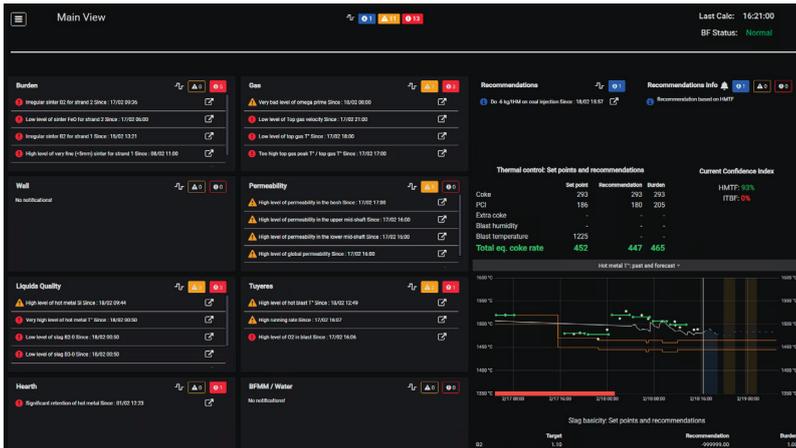
| Total Rounds | Last round train loss | Last round validation loss | Last round test loss |
|--------------|-----------------------|----------------------------|----------------------|
| 100 | 0,307 | 0,310 | 0,270 |
| Best Round | 0,307 | 0,310 | 0,270 |

AIxpert™

BIXpert™

The screenshot displays the BIXpert™ software interface, divided into two main sections: 'PROCESS OPTIMIZATIONS' and 'MAINTENANCE OPTIMIZATIONS'. The 'PROCESS OPTIMIZATIONS' section shows a 'Main View' with 'Burden' and 'Gas' alerts, a 'Permeability' table, and a 'Hot metal T: post and forecast' graph. The 'MAINTENANCE OPTIMIZATIONS' section shows a 33% deviation from reference, a -28% deviation from reference, and a 'NOTIFICATION' list with various alerts.

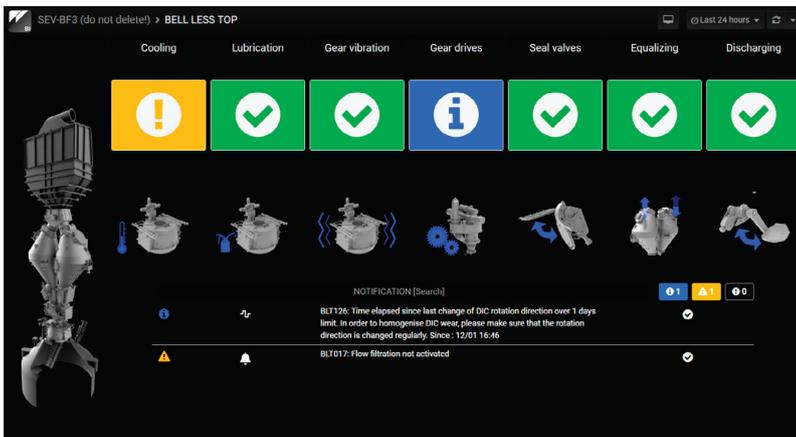
| Set point | Recommendation | Burden |
|-----------|----------------|--------|
| 300 | 300 | 300 |
| 210 | 210 | 205 |
| 1250 | 1250 | 1250 |
| 476 | 476 | 472 |



PROCESS Xpert™

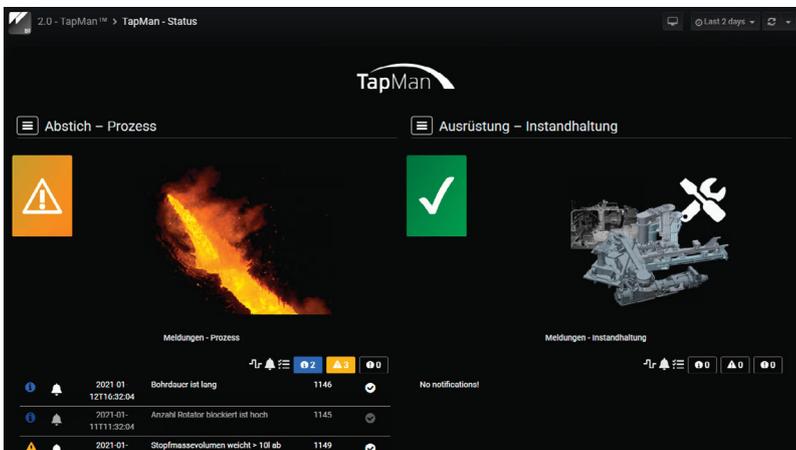
Blast furnace expert system

- ▶▶ Detection of process phenomena in blast furnaces
- ▶▶ Forecast and recommendation system with ML for optimal thermal control



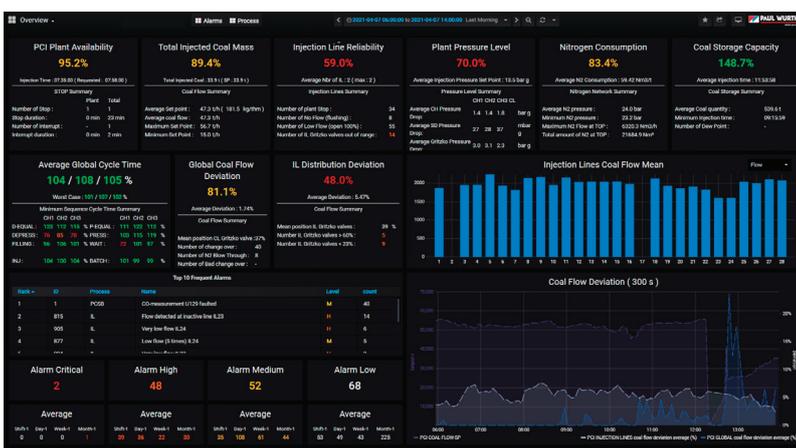
BLT Xpert™

- ▶▶ Condition monitoring system of Bell-Less Top (BLT) in blast furnaces



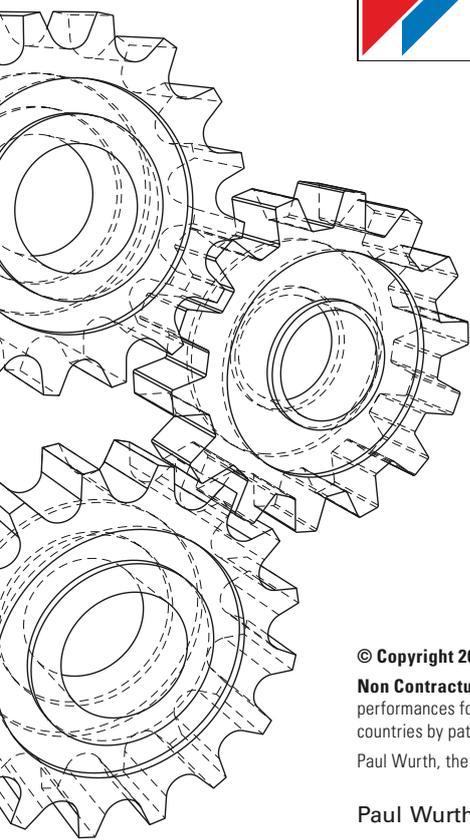
TapMan™

- ▶▶ Condition monitoring system of tapping machines in blast furnaces
- ▶▶ Automatic tapping quality detection and recommendations



PCI Xpert™

- ▶▶ Condition monitoring system of pulverized coal injection plant in blast furnaces
- ▶▶ Shift-level overview of system status and alarms



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