Look into the Future

How ML helps to optimize maintenance today

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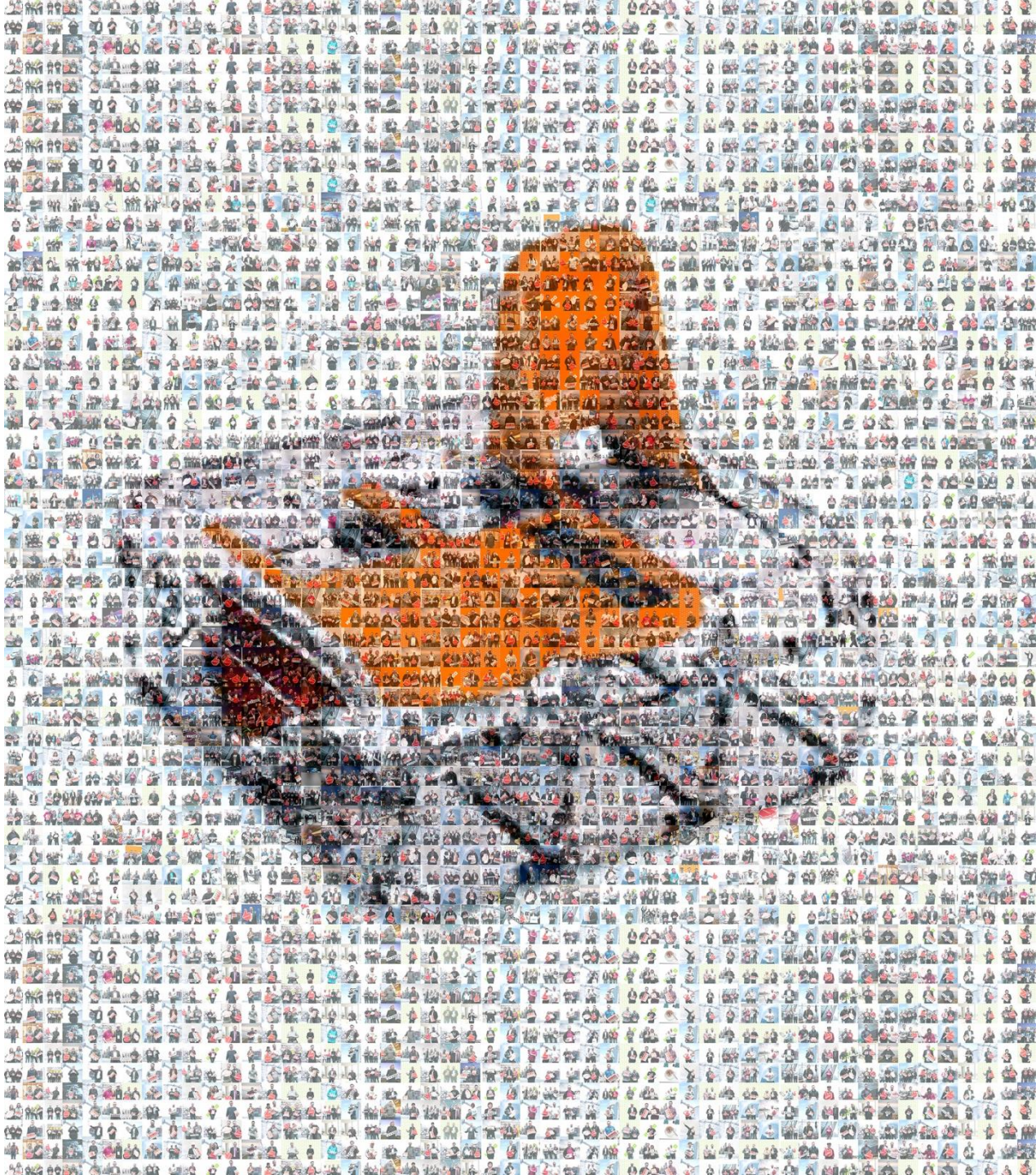
WAGO GmbH & Co. KG

We are WAGO



WAGO today

> 25,000
Catalog items

approx. 9,000
Employees worldwide

Today

€ 1.37 Bn.
Sales in 2023

We stand beside our customers as a reliable partner in all branches of industry with our product and solution portfolio!

**This has always been and continues to be our claim –
it's anchored in our DNA.**

> 270
Trainees and dual study program participants

Public

Our Business Units

Electrical Interconnections

Electronic Interface

Automation Technology

Solutions

Public

Digitalization in Production

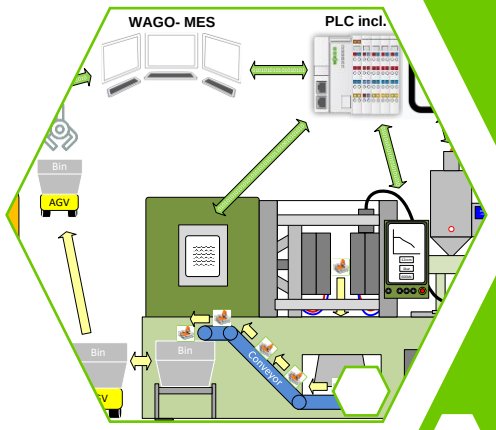
WAGO is the backbone of a sustainable and smart connected world.

Digitalization in Production

Focus Topics in Production

Keeping Competitiveness

Sustainability

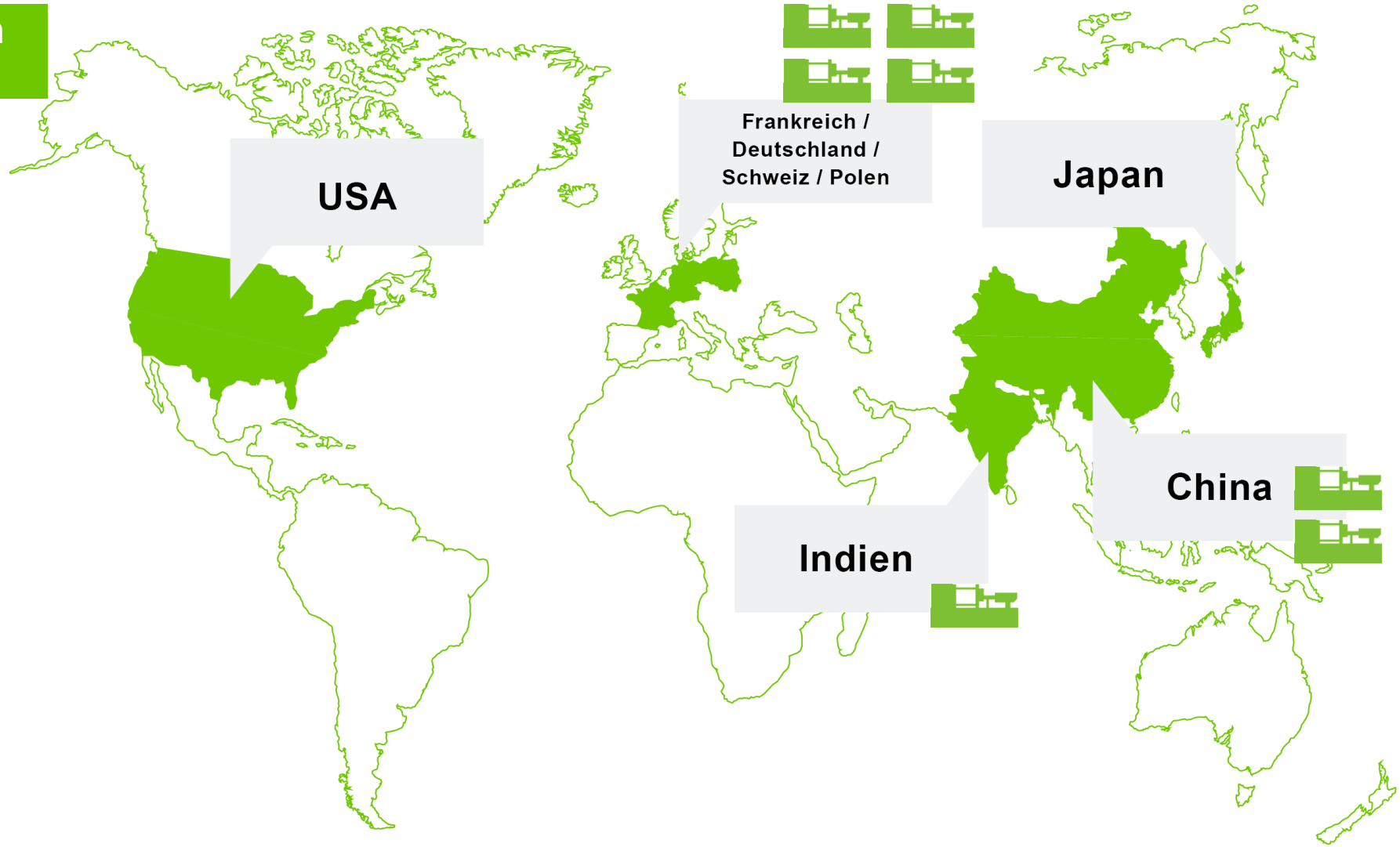


Growth

Increased Efficiency

Production sites

with injection molding



”Cut the elephant into small slices”

The Vision

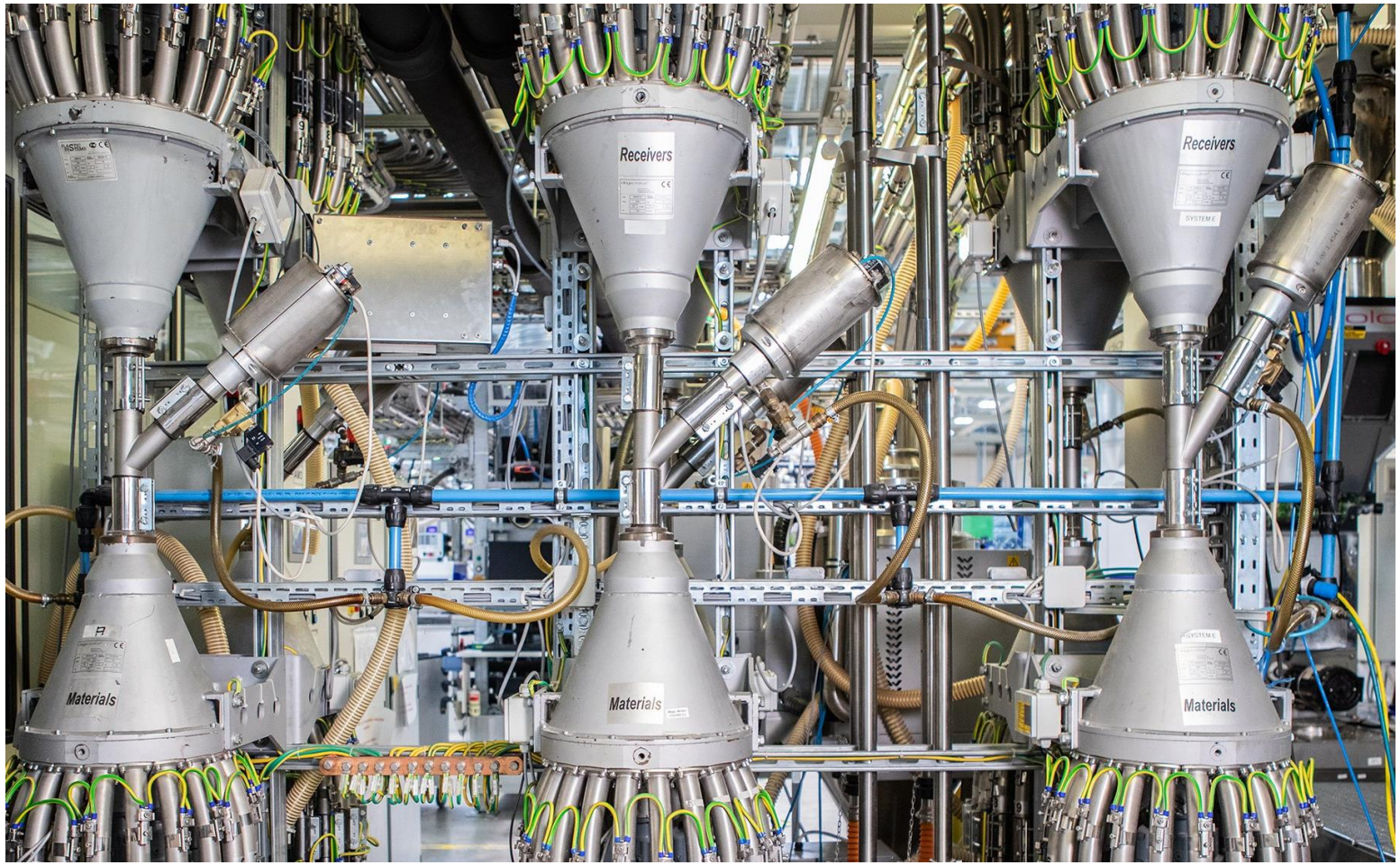
**"THE SYSTEM AUTONOMOUSLY RESPONDS AT THE RIGHT TIME WITH AN IT ORDER AND POINTS OUT THE COMPONENTS TO BE CHANGED / REPAIRED?
THE SYSTEM ENSURES THAT ALL REQUIRED RESOURCES ARE AVAILABLE AT THE APPROPRIATE TIME."**

Holger Wilhelm Schlink
VP Real Estate International | WAGO

Look into the future

Filter monitoring in a material distribution system

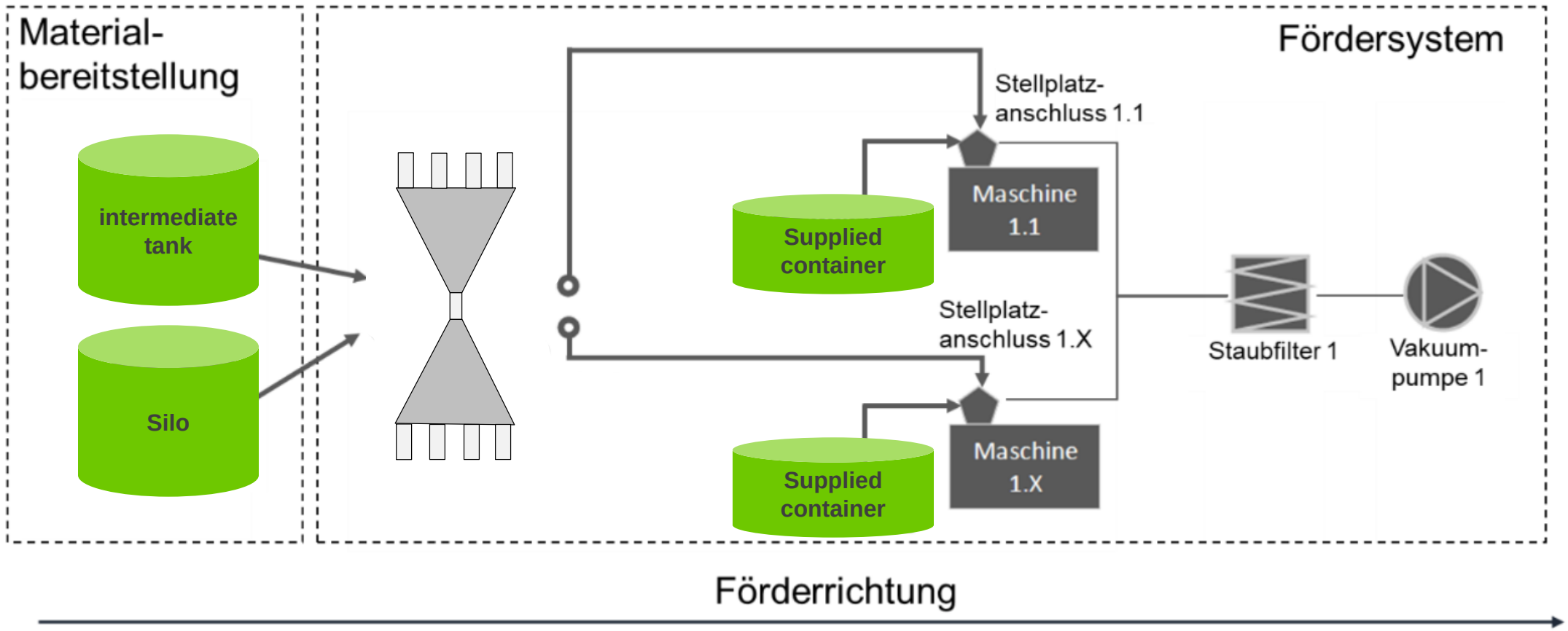
With the help of a self-developed **predictive analytics system**, WAGO has significantly reduced the maintenance effort in production. It is also a pre error recognition and the optimization of process services to the system value services.



Internal

Automated Material Provision

Schematic Structure of a Material Distribution System



Initial Situation

- **Cyclic maintenance intervals** based on fixed time intervals generate an increased workload
- **Elaborate manual troubleshooting** of the process data using a spreadsheet program

Rule-based **monitoring of measured values** with fixed limits in the IEC program failed

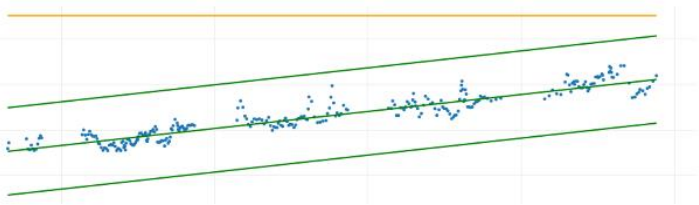
```
IF rThreshold > 10 THEN
    xError := FALSE;
ELSE
    xError := TRUE;
END_IF
```


Internal

Achieved Goals

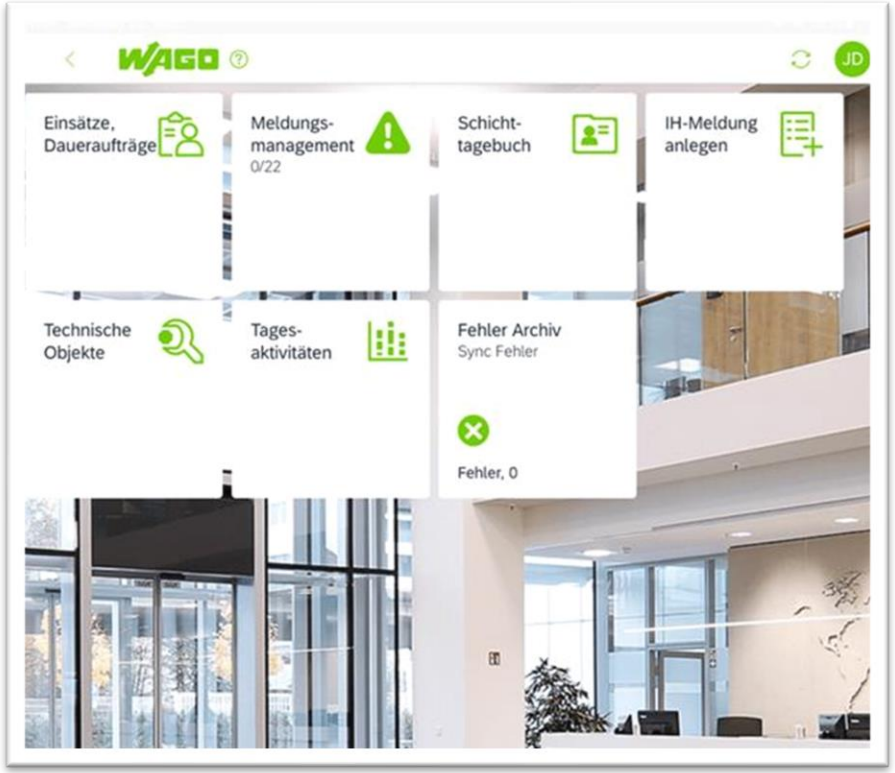
Predictive maintenance

- Adjusting the maintenance intervals
- Predictive Filter Cleaning Planning
- A powerful model for the pollution degree of the central filter - confirmed by our employees



Integration in den Betriebsprozess

- Integration of the CM system into SAP maintenance
- Closed-loop: Model-based generation of maintenance orders and subsequent acknowledgment of failures and activities



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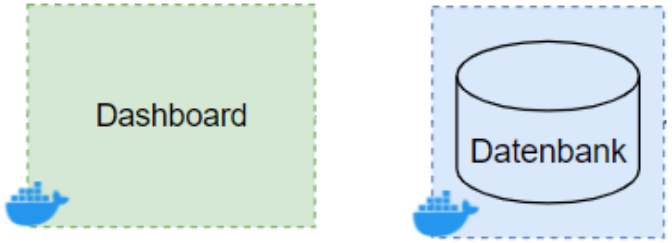
Implementation in Practice

Procedure

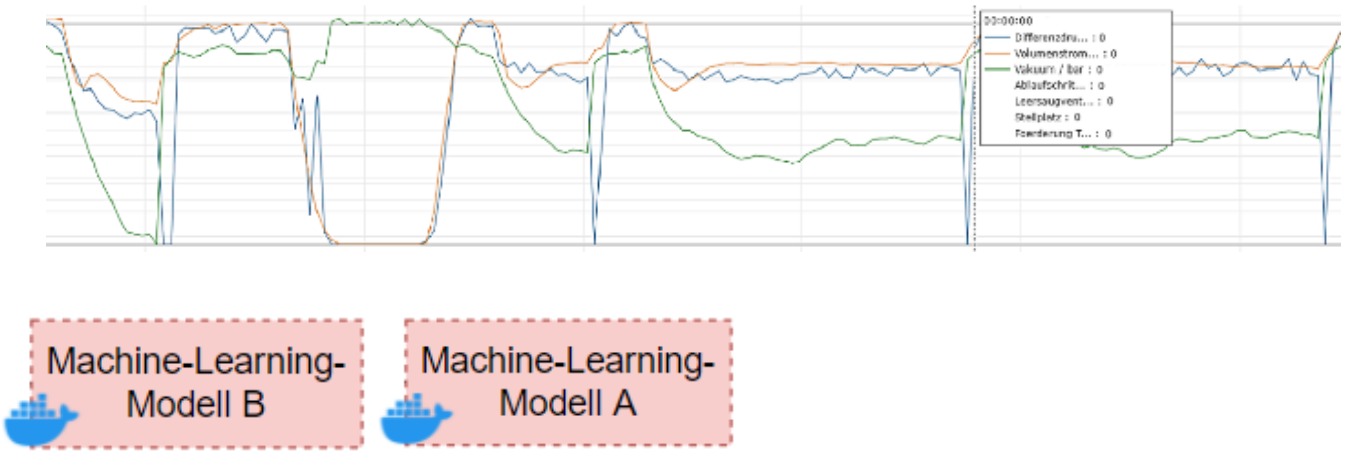
Data analysis and monitoring

- Continuous data acquisition and central storage of process data
- Automated process data visualization with a dashboard



Error detection / training

- Creation of new **machine learning models**
- Creation of **labels**
- Creation of new models for **fault detection**
- Test the created model on **historical data**



Error evaluation

- **Process feedback into the machine** controller to derive suitable measures (e.g., stop the system)
- Creation of **maintenance orders**

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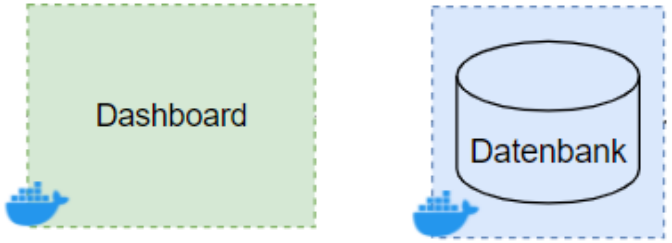

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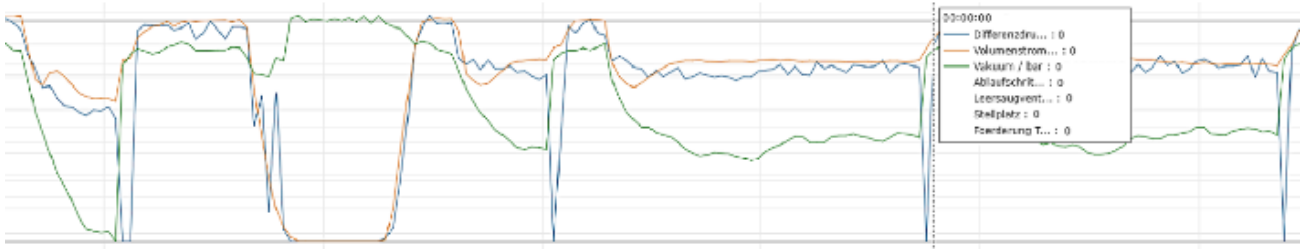

Machine Learning Algorithmus

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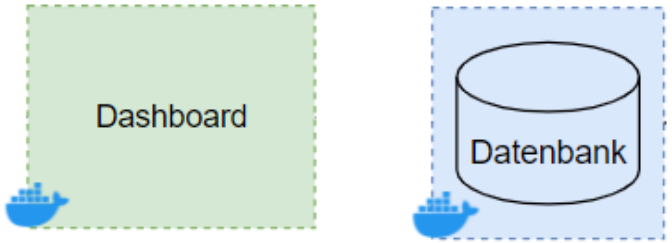

- Definition of meaningful parameters (here differential pressure)
- The process expert (Sebastian Pscheidt) defines critical values for autoregressive ML
- The model predicts the differential pressure → predictive cleaning possible

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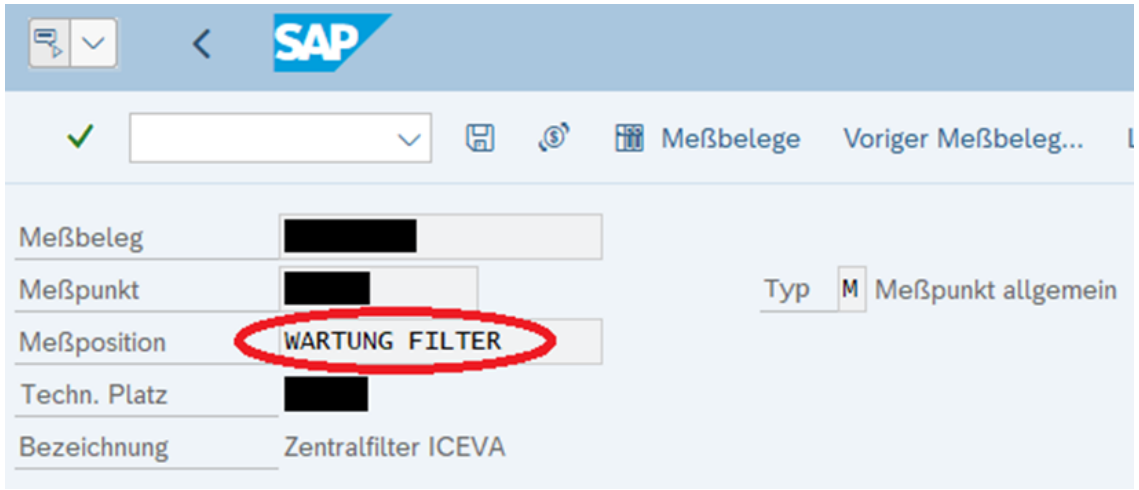
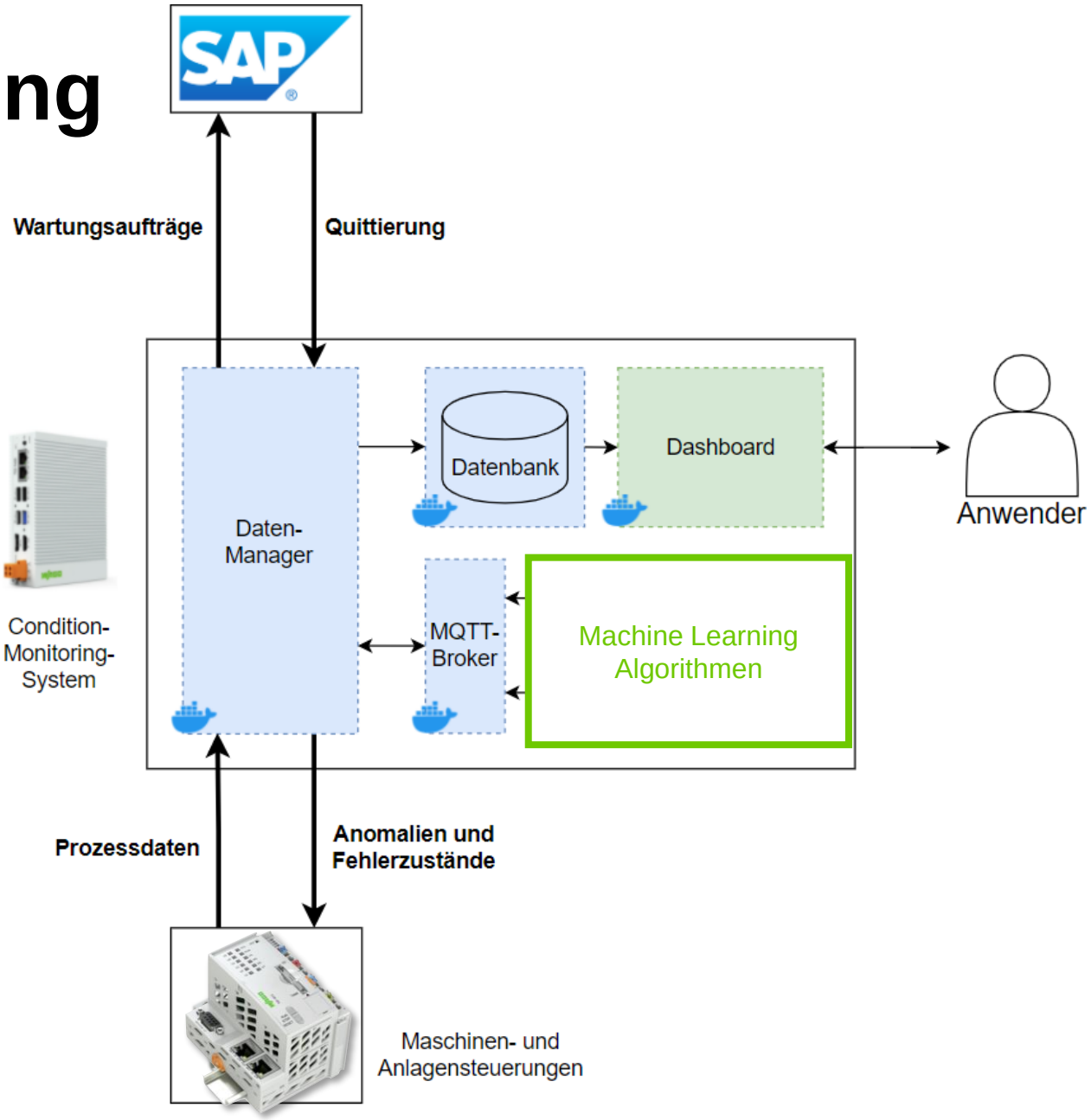
Integration into the ongoing operating process





Internal

“With the analytics solutions and the dashboard, we have provided employees with a digital toolbox that simplifies their work significantly. They will gain a better understanding of cause-and-effect relationships of their actions.”

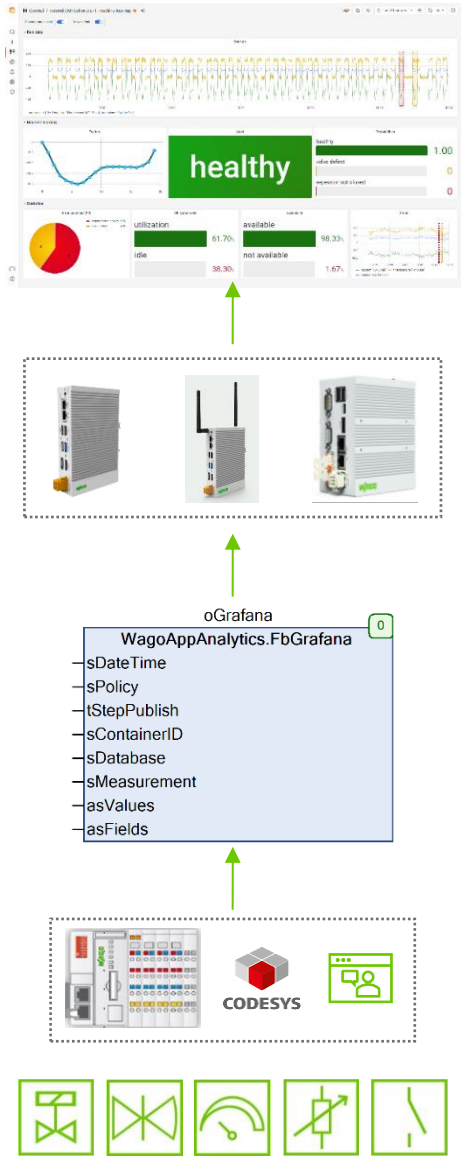
Sebastian Pscheidt | Technical Engineer Injection Molding Technology at WAGO

Internal

How to use IONOS

The basic system architecture

Transparency	Creating transparency through the interplay of data evaluation and analysis
Data evaluation	Evaluation on edge devices of different performance classes or in the cloud
Data analysis	By means of direct integration into the PLC program
Data acquisition	by WAGO IoT gateways or PLCs



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The IONOS based system architecture

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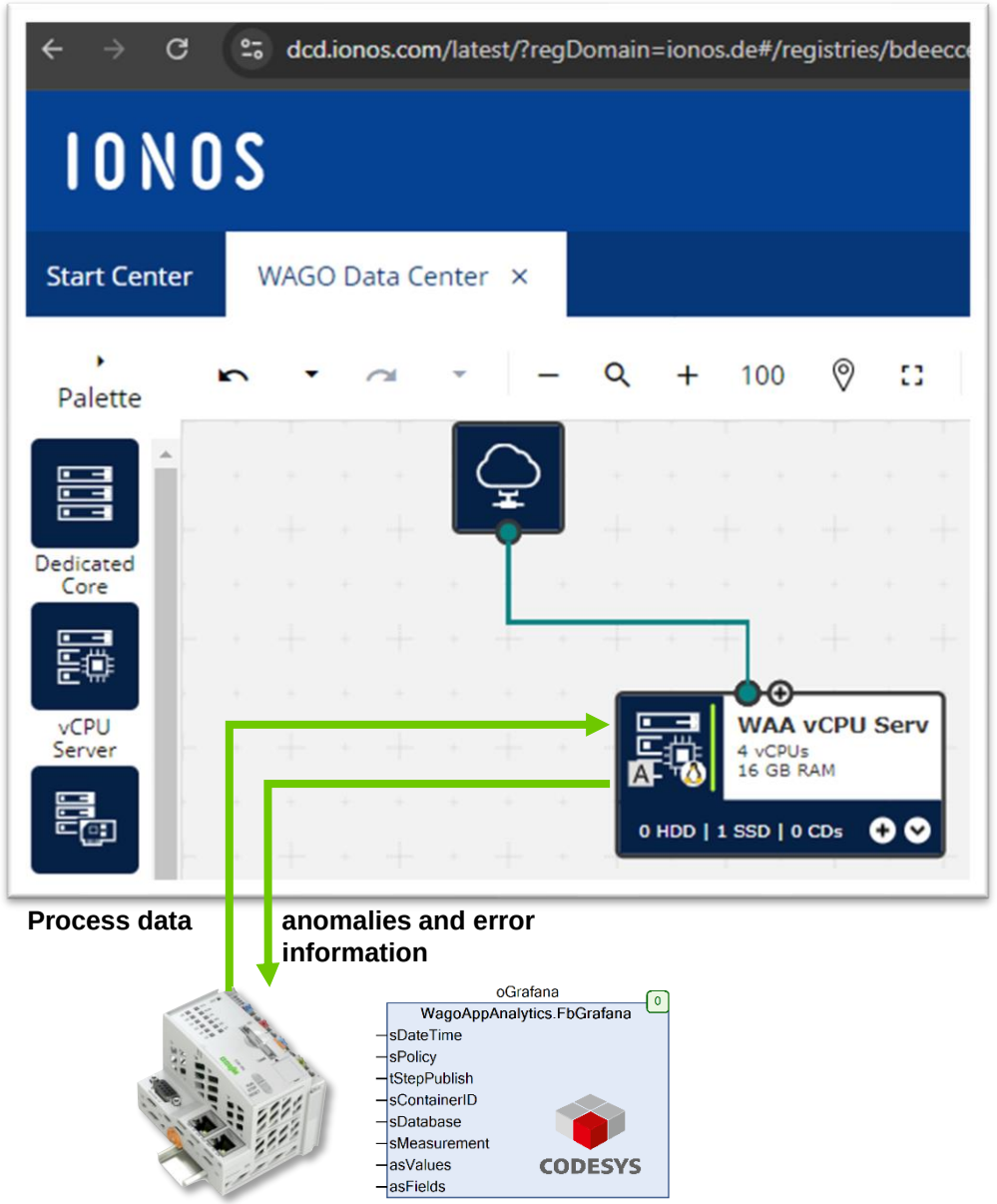

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