

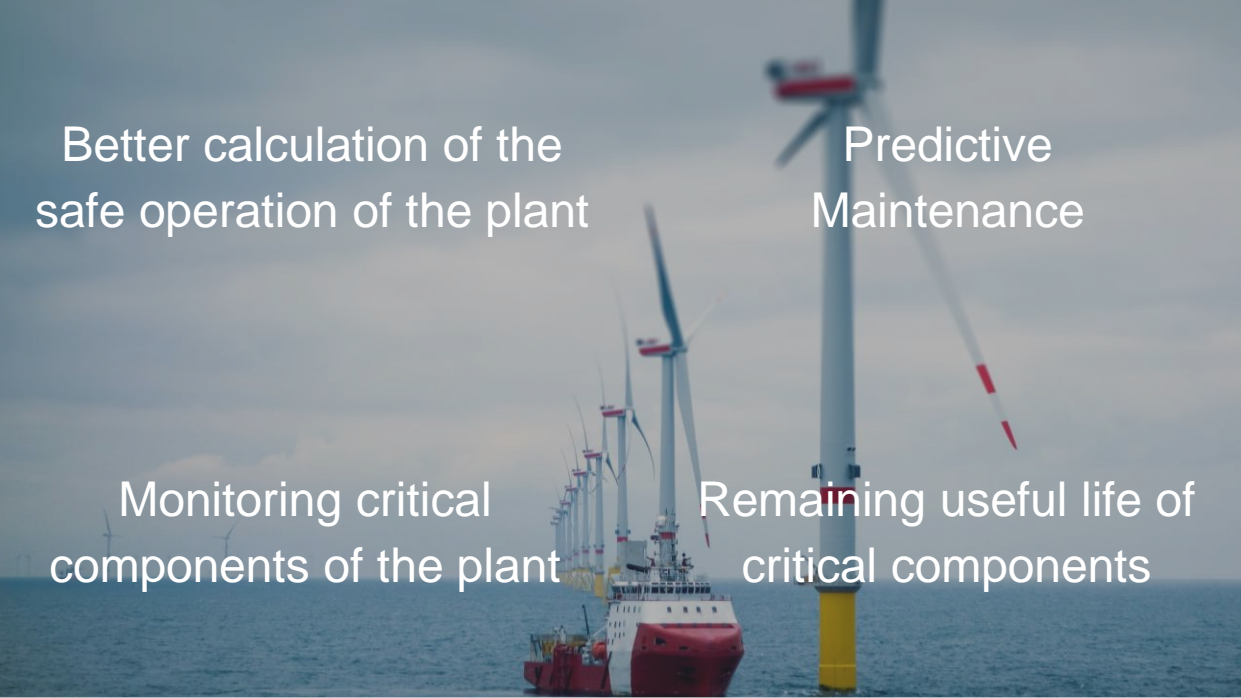
# Applications and Benefits of Digital Twins for the Manufacturing Industry

Teresa Alberts, ITficient AG  
February 22<sup>nd</sup> 2024, OZENCON 2024



**Gartner**<sup>®</sup>

Gartner estimates that by **2027**,  
over **40%** of large companies worldwide will be using  
Digital Twin in their projects to increase revenue.

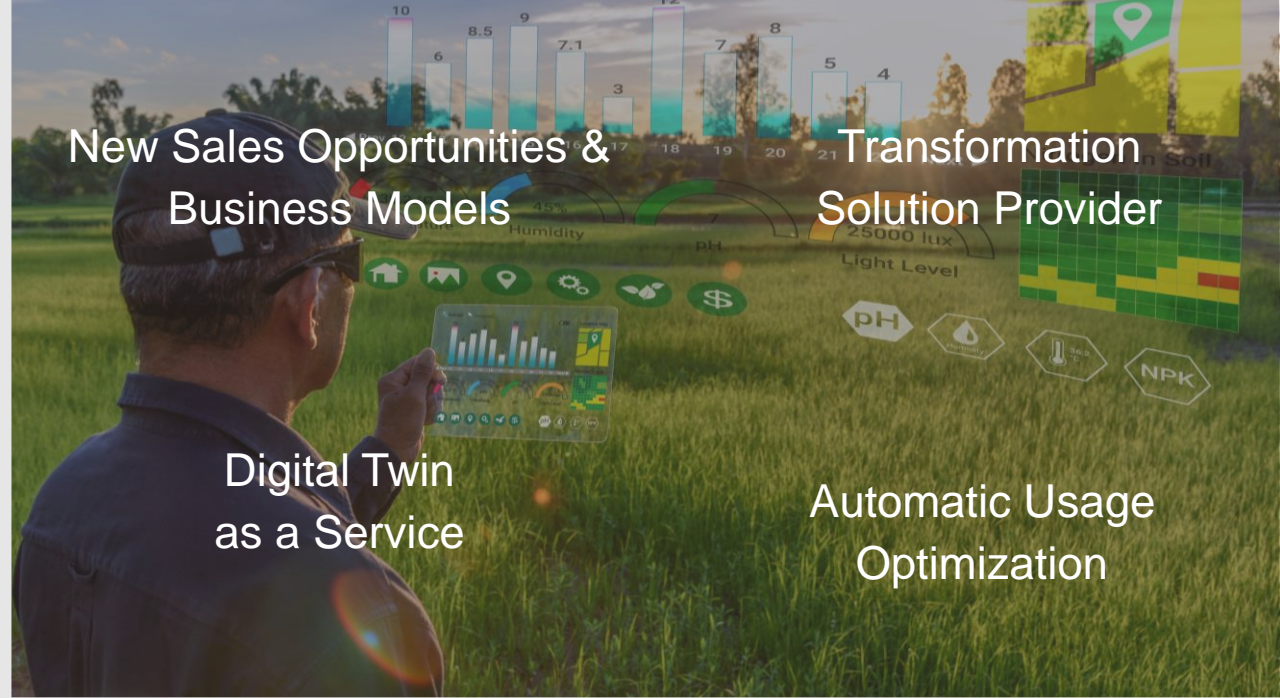


Better calculation of the safe operation of the plant

Predictive Maintenance

Monitoring critical components of the plant

Remaining useful life of critical components



New Sales Opportunities & Business Models

Transformation Solution Provider

Digital Twin as a Service

Automatic Usage Optimization



Standardization and Optimization Processes

Automation



Sustainability

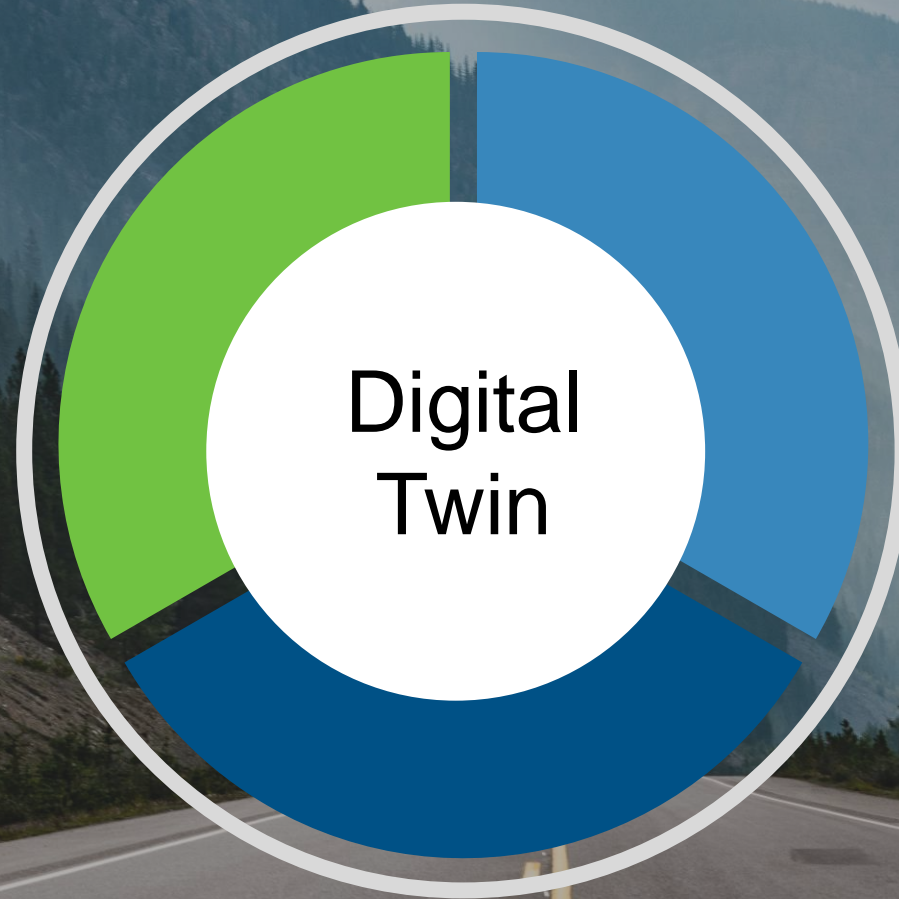
Energy Efficiency



Evaluate operating & usage Data for new Product Series

Reduction Development Times

# Our Digital Twin Approach



---

## Business Model

Vision, Strategy, Use Cases

---

## IT-Infrastructure

Architecture, Cloud/Edge,  
Visualization

## Simulation

Fatigue, remaining lifetime, What-if  
Scenarios

# Typical Customer Infrastructure

## Asset Sensor Data & IT-Infrastructure



## Visualization & Analytics



## Centralized Data Storage

↑  
Telemetry data  
(Sensors, Field Data, ...)

## Assets



## Models & Algorithms (physical based)



## Digital Twin Models

↑  
Simulation Models, Algorithms,  
Identification critical Hotspots,  
virtual sensors

## Engineering Know-how



How to  
connect  
both  
worlds?

# Digital Twin Integration

Asset Sensor Data & IT-Infrastructure



Visualization & Analytics

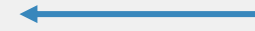


Enriched Insights through  
Condition Monitoring,  
Remaining Useful Life,  
What-if Scenarios

Centralized Data Storage

↑  
Telemetry data  
(Sensors, Field Data, ...)

Twin Insights



Telemetry Data



Assets



Models & Algorithms (physical based)



Digital Twin Models

↑  
Simulation Models, Algorithms,  
Identification critical Hotspots,  
virtual sensors

Engineering Know-how




.twin, ROM,  
Postprocessing





Use Case  
Exploration



Implementation &  
Scaling



Our  
Digital Twin  
Approach



High Level  
Concept



Prototype (PoC)  
Development



# Verbund

**Digital Twin: Hydropower**

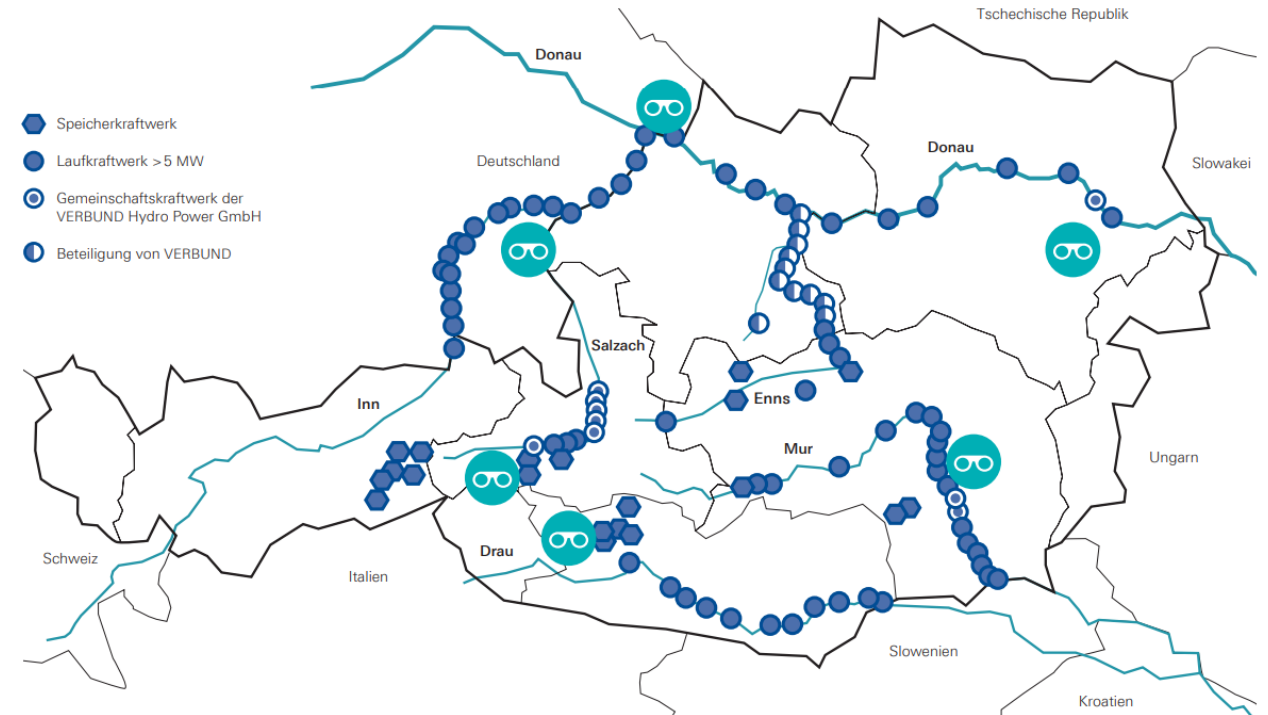
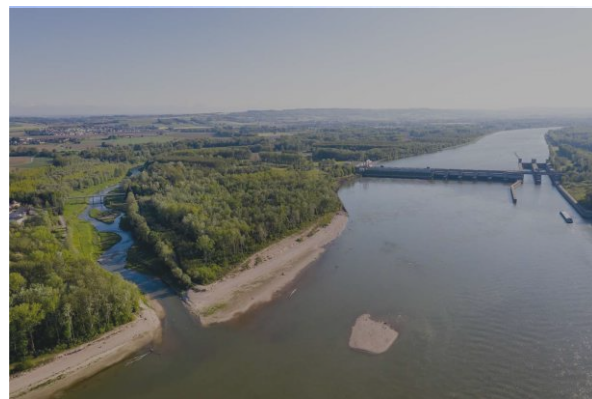
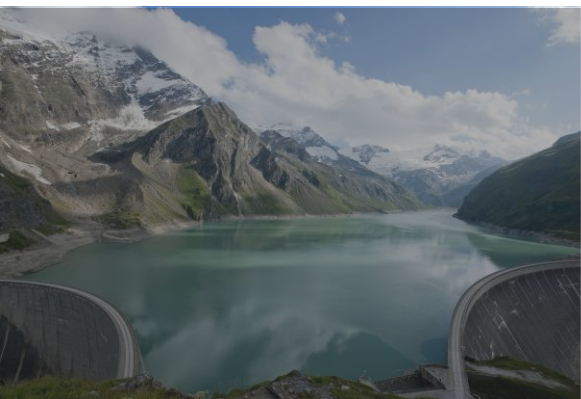




# Verbund Hydropower

Austria's leading electricity company and one of the largest producers of electricity from hydropower in Europe

134 hydropower plants in Austria, Germany and Albania

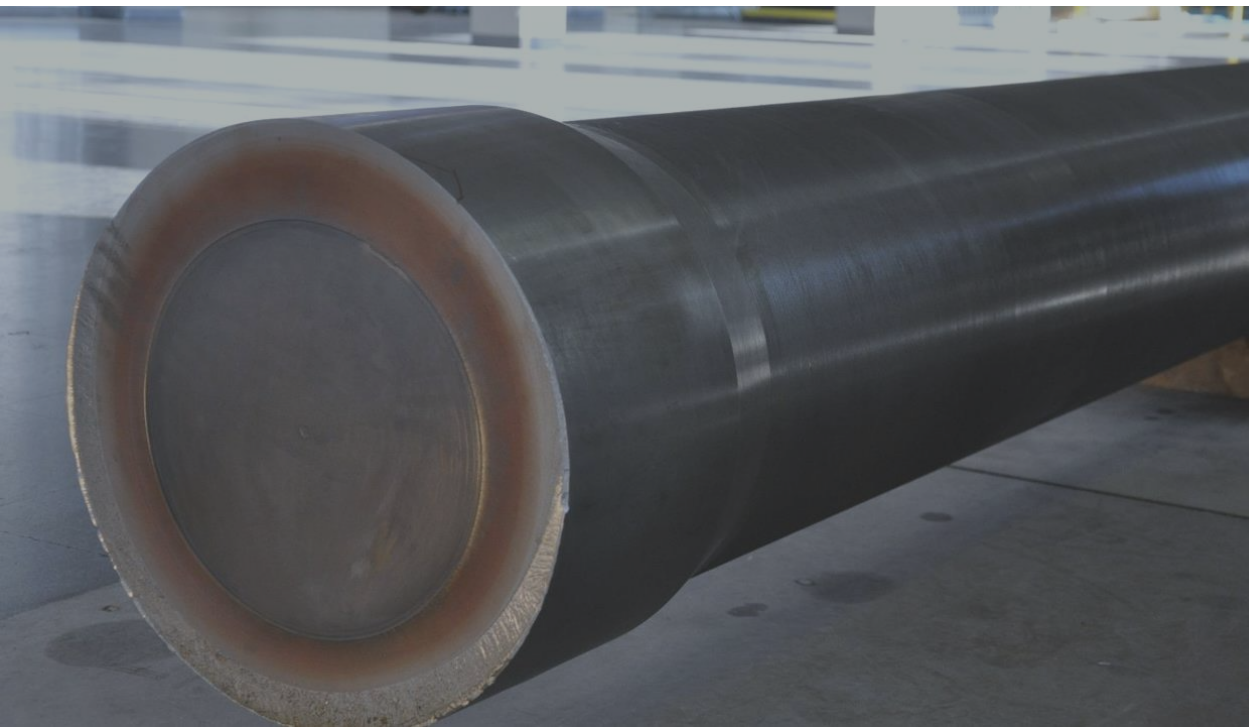


# Verbund

# Challenges

Fatigue Crack: Control rod turbine blades

**Downtime: 3 Month**



Fatigue Crack: Impeller blade

**Downtime: 2 Month**



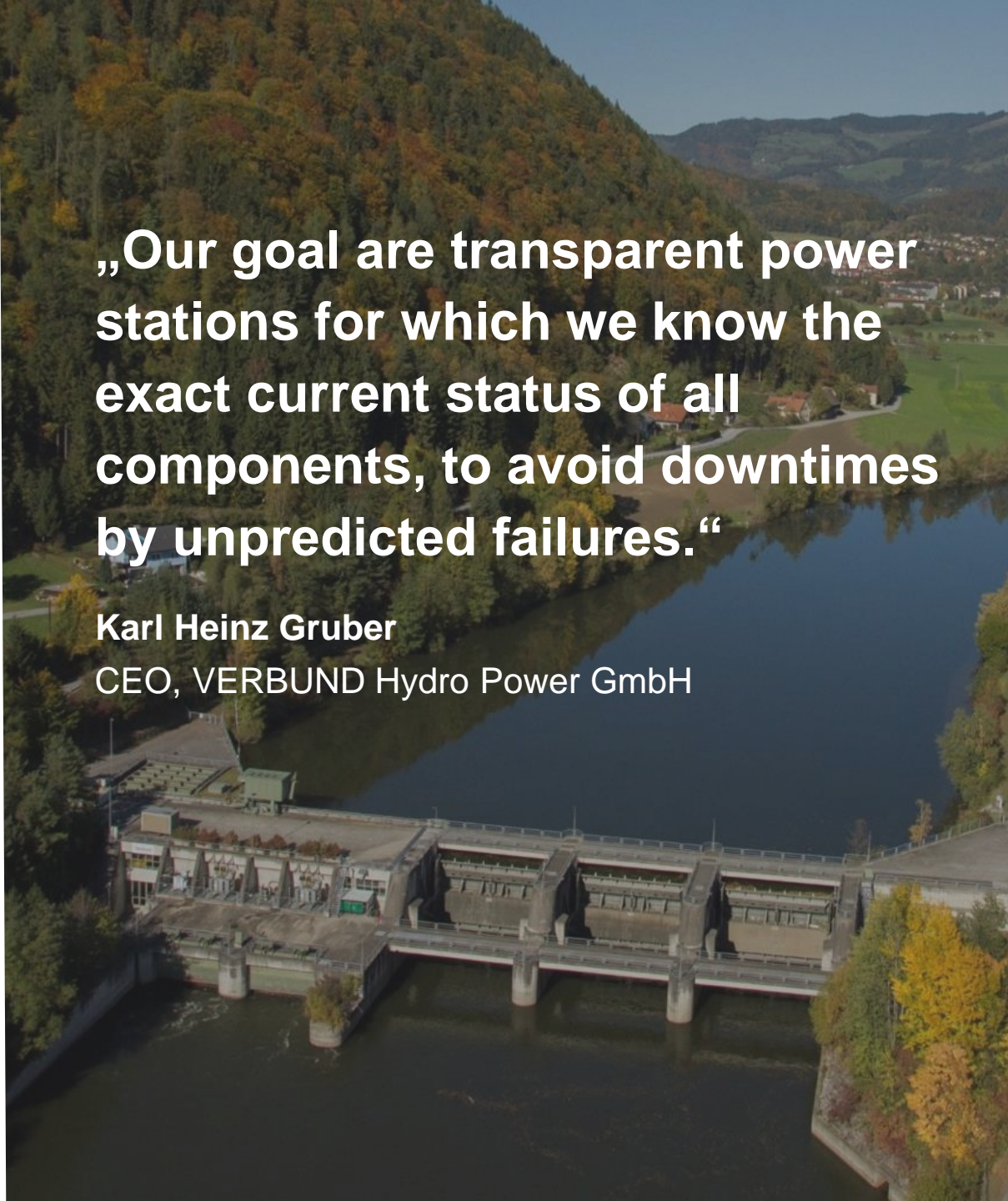
# Digital Twin Goals

## Digital Twin Goals

- Identify critical stress locations through virtual sensors and fatigue calculation for the critical component turbine
- Scaling solution to all Verbund hydropower plants

## Technical Realisation

- Simulation model, sensitivity analysis and digital twin generation
- Implementation in Verbund IT-Infrastructure
- IT-Infrastructure development to ensure operation of multiple digital twins



**„Our goal are transparent power stations for which we know the exact current status of all components, to avoid downtimes by unpredicted failures.“**

**Karl Heinz Gruber**

CEO, VERBUND Hydro Power GmbH

# Digital Twin Journey @ Verbund



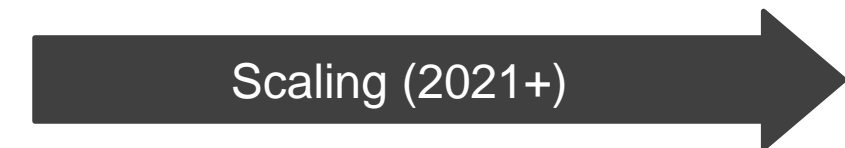
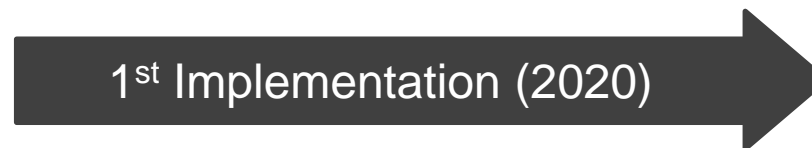
- 1 Component
- 2 Virtual Sensors



- 19 Components
- 109 Virtual Sensors



- 9 Digital Twins





## Digital Twin: Mg Melting Furnace



# About Rauch Furnace

RAUCH stands for high-quality melting technology solutions for the processing of Magnesium, Zinc and non-ferrous metals

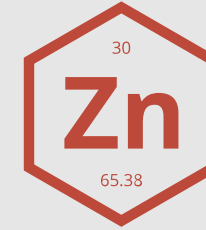
45 years of experience in melting technology

2.200.000 Melting performance (t/year)

Family-owned business, 70 employees



**MAGNESIUM**



**ZINC**



**NON-FERRUS METAL**

# Challenges

High crucible load

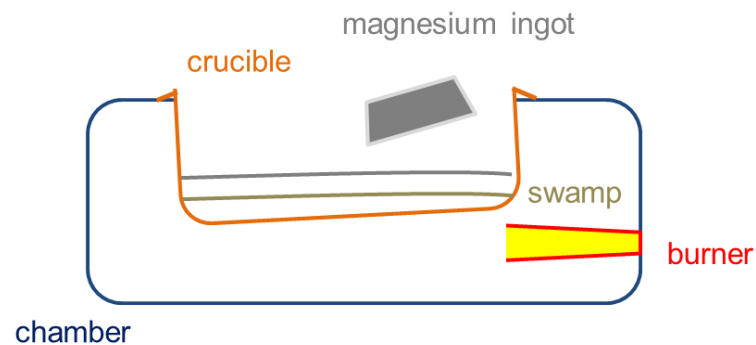
Furnace chamber temperatures up to 1000 °C

Loss of production - crucible failure  
(breakage, deformation, ...)

Very precise process control necessary



Magnesium-Schmelzofen von Rauch-FT.



## Digital Twin Goal

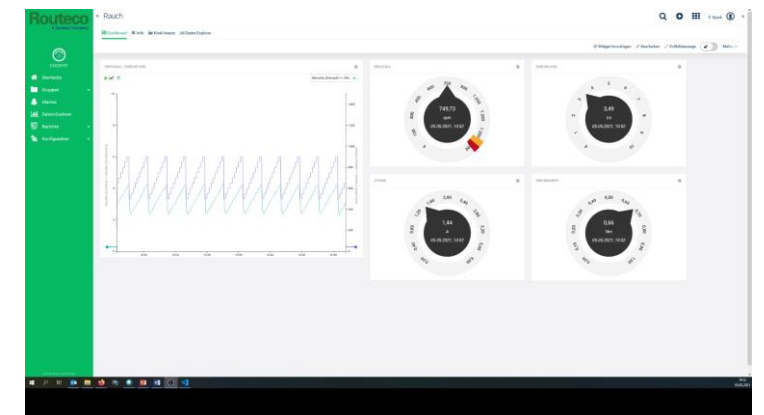
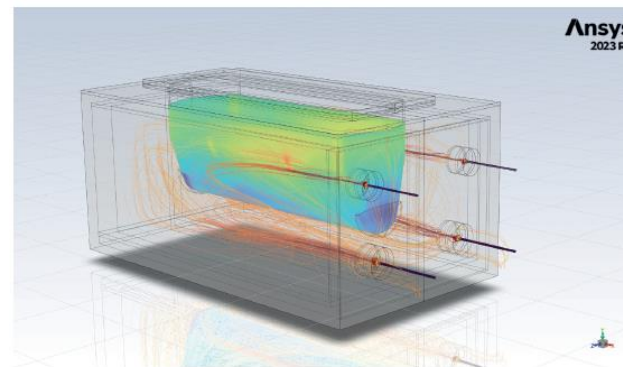
Real-time monitoring of the furnace condition and extension of crucible service life through alarms and cleaning recommendation

## Virtual Sensors

Remaining useful lifetime estimation  
Temperature distribution  
Mechanical stresses  
Local hotspots

## Implementation & Visualization

Real-time monitoring of process- and safety-critical data  
Display of predicted remaining life (Cloud & HMI)  
Alarms  
Cleaning recommendation





# Benefits for RAUCH

## Added Value for RAUCH Customers

- ⊕ Less downtime
- ⊕ Real-time monitoring of the furnace condition
- ⊕ Predictive Maintenance
- ⊕ Extension of crucible service life

## Added Value for RAUCH

- ⊕ Process Optimization
- ⊕ Improved Support and Service
- ⊕ Transformation to Solution Provider
- ⊕ Sustainable Product Solutions

**„Occupational safety and the workload are improved by the Digital Twin.**

**This makes GF Casting Solutions an attractive employer, especially in times of increased shortage of skilled workers.“**

**Andreas Thaler**

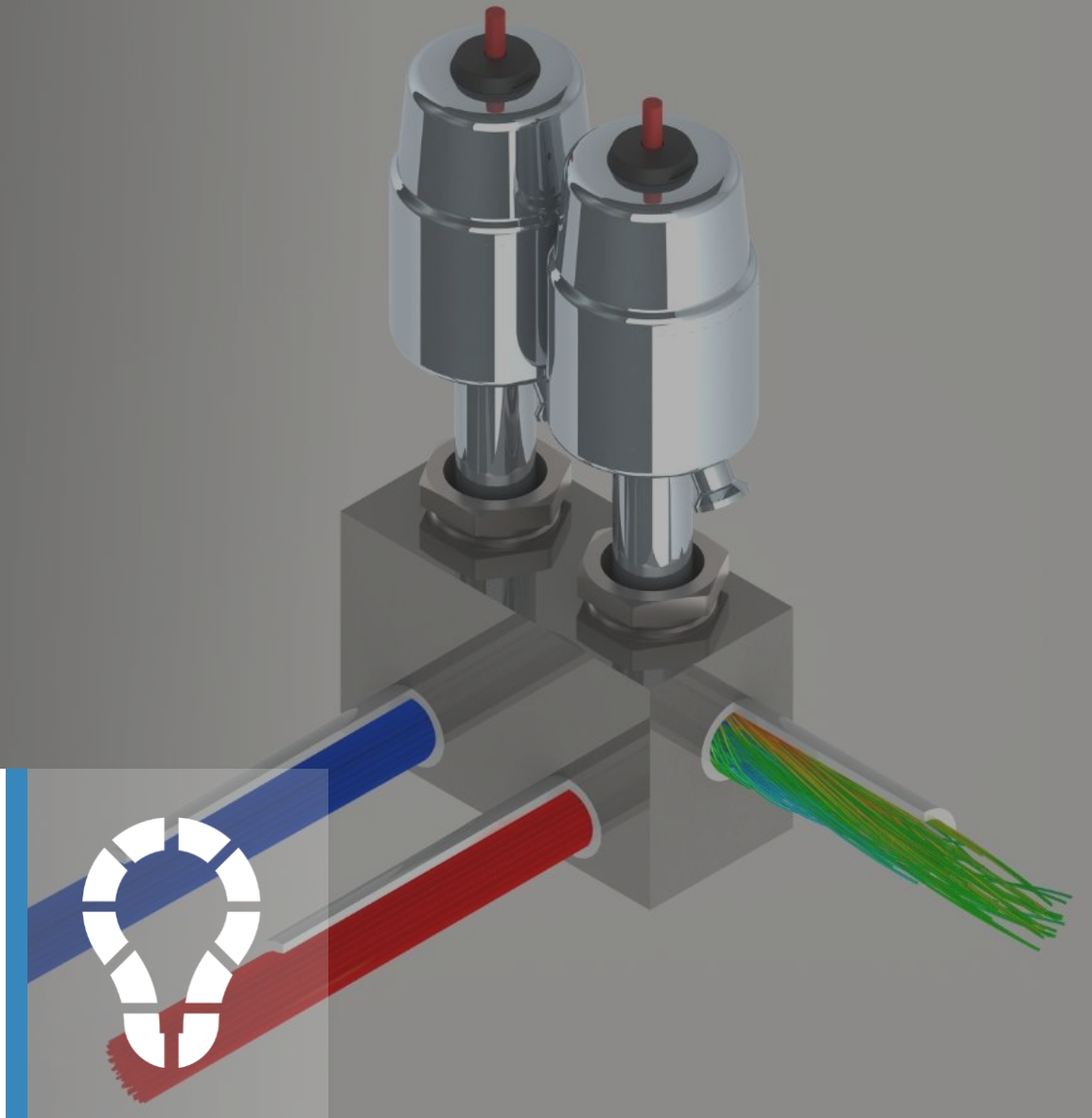
Head of Operation Technology

GF Casting Solutions Altenmarkt



**GEMÜ**

**Digital Twin: Valve System**



# About GEMÜ

GEMÜ is a leading manufacturer of valves, measurement and control systems

GEMÜ is the global market leader in the valves, process and control systems sector for sterile applications

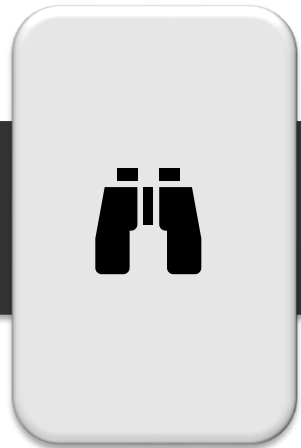
Represented in more than 50 countries on all continents

6 production plants worldwide

> 1.900 employees worldwide



# Pains & Challenges



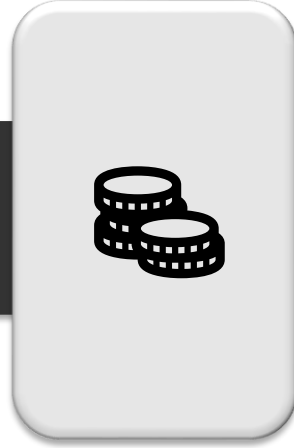
No live insight into production process



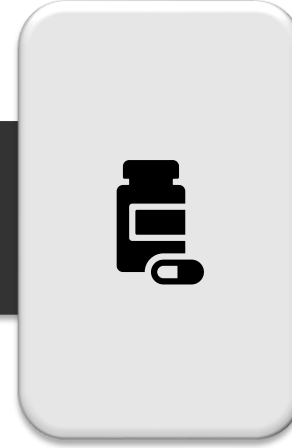
Asset costs are often high



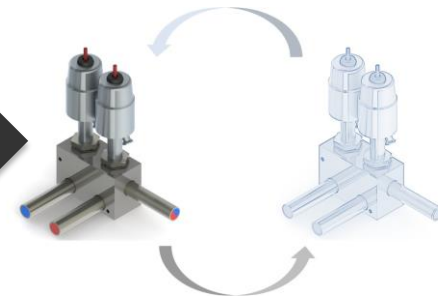
Performance of products must be evaluated in advance for different boundary conditions



Downtime process customer is expensive



Quality product customer is critical



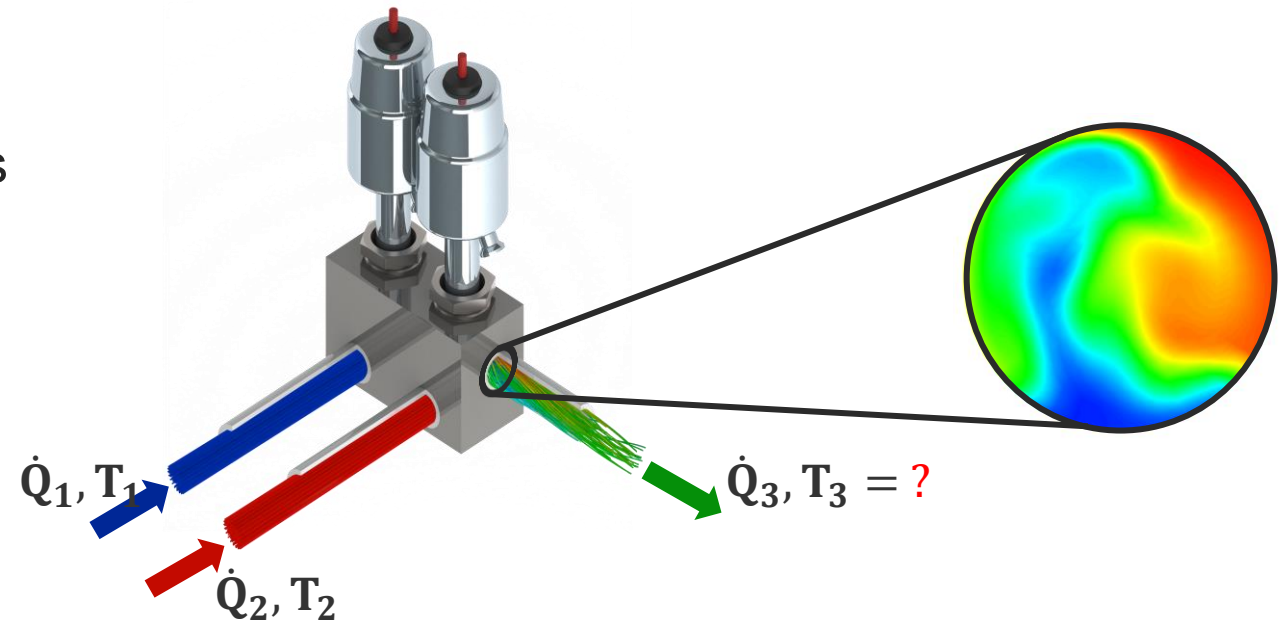
**Digital Twin of a Valve System**

**GEMÜ**

# Use Case: Digital Twin M-Block

## Motivation

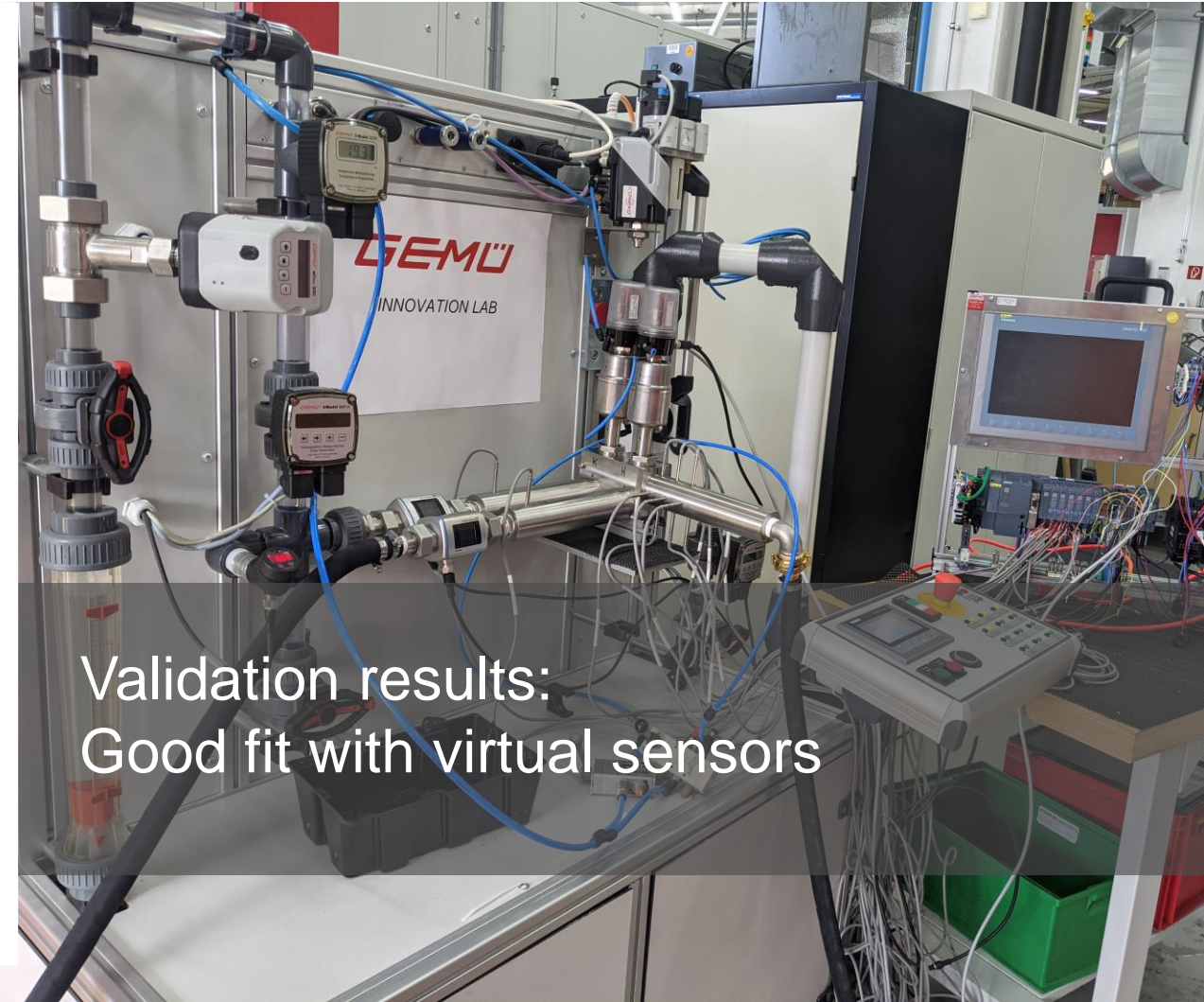
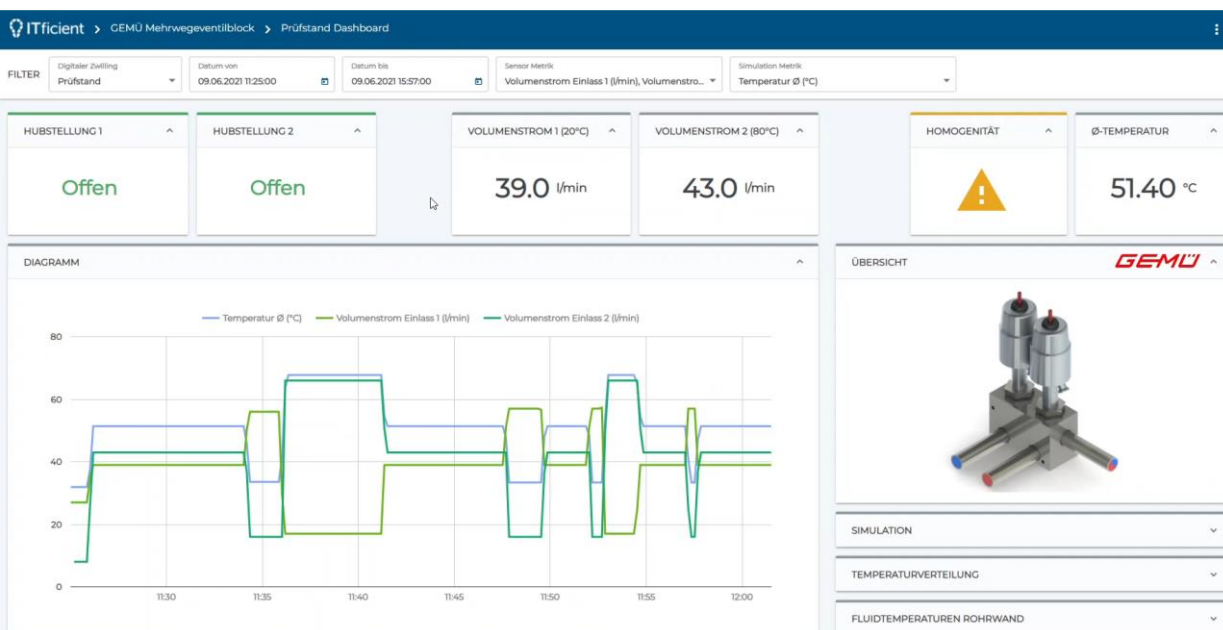
- Local temperature distribution of fluid and homogeneity of mixture is physically hardly measurable
- So far, no live monitoring of mixing process
  - No live monitoring of mixture quality at outlet of M-Block
  - Verification of product quality often time-delayed
  - Testing of product batch may be expensive and time consuming



# Use Case: Digital Twin M-Block

## Live Monitoring Mixing Process

Forecast of homogeneity water mixing process for M-Block



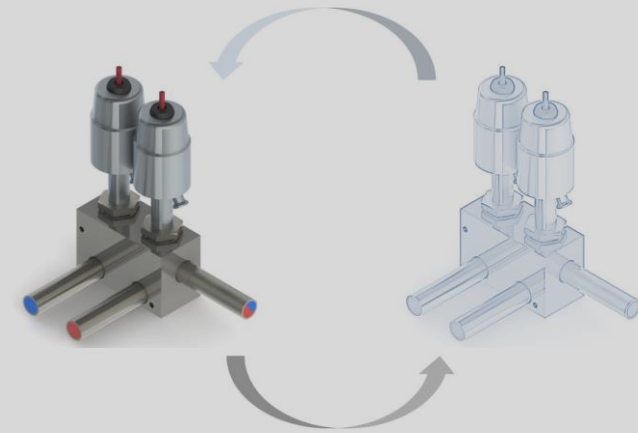
# Benefits for GEMÜ

## Added Value for GEMÜ Customers

- ✓ Live insights into mixing process via virtual sensor data
- ✓ Real-time monitoring of production process  
→ Overview actual & historic states
- ✓ Improvement of mixture quality in production process

## Added Value for GEMÜ

- ✓ New revenue streams through smart products & services  
→ Transformation to process solution provider
- ✓ Capabilities of valve system are transferable to other physical processes



**Digital Twin  
of a Valve  
System**

**GEMÜ**

# Summary







Broad range of  
Implementation in  
different Industries



Unique &  
customer specific



Vision & Use Case  
are essential



Experienced  
Partners

# More about Digital Twins?



## Deep Dive Session: 11. April 2024, Darmstadt

Digital Twin in Action  
Keynotes & Panel Discussion



# ITficient Digital Twin Services

How do Digital Twins create added value for our customers?  
This is the question that drives us.



## Use Case Exploration Workshops

Identification of Digital Twin business cases and development of new service and business models

## CADFEM<sup>®</sup> Simulation Services

Development of simulation models, generation of virtual sensors and post processing analysis

## Data Management Sensors & Simulation

Data Management Concepts, Data Preparation, Storage and further usage of generated data for individual visualization

## Digital Twin IT-Infrastructure Implementation

Design Digital Twin Architecture, Interface Development and Integration into customer IT-Infrastructure

# Contact



Teresa Alberts  
CEO

+41 52 511 12 40

[teresa.alberts@itficient.com](mailto:teresa.alberts@itficient.com)

[www.itficient.com](http://www.itficient.com)

