



## Datengetriebene Prozessoptimierung - Mit oder ohne Connectivity?

Experten-Roundtable zu den Mehrwerten vernetzter Lösungen in der Industrie



# Content

1. Introduction Digitalisation at SMS group
2. Data Driven Process Optimization
3. Summary and Discussion



# The world of metals becomes increasingly challenging

## PROCESS CHALLENGES



- › Ensure plant utilization
- › Improve punctuality (OTIF)
- › Secure profitability
- › Reduce operational costs
- › Employee safety

## EFFICIENCY AND SUSTAINABILITY



- › Reduce carbon footprint
- › Improve efficiency
- › Utilization of green energy
- › Apply energy certification

## MARKET CHALLENGES



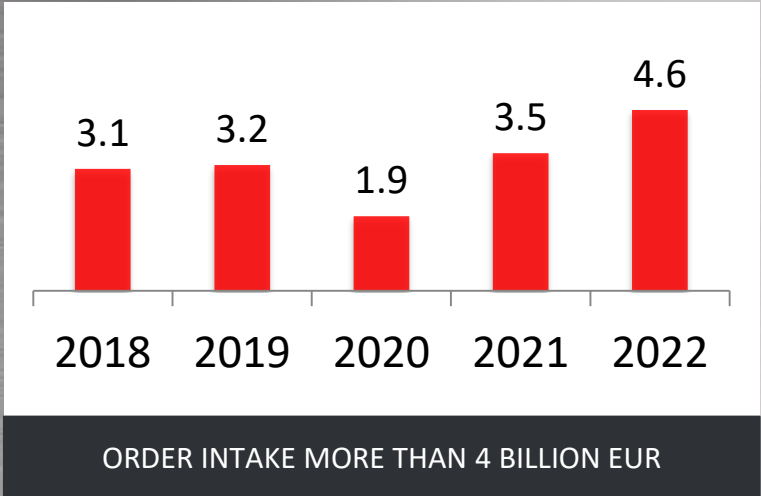
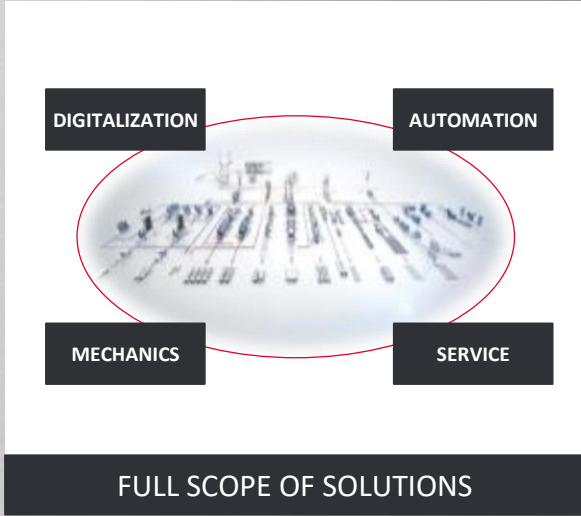
- › Global overcapacities
- › Smaller lot sizes
- › Product quality certification
- › Resource price fluctuations

## ENABLING DIGITAL TECHNOLOGIES



- › Industry 4.0
- › Artificial intelligence
- › Data-driven decision making
- › 5G data streaming
- › AR / VR / 3d visualization
- › Cloud computing / big data
- › Robotics and smart devices
- › ...

# Facts & Figures





# The SMS approach

## Merging Domain Expertise with Digitalization Knowhow

### SOFTWARE SOLUTIONS

Viridis Energy & Sustainability  
Suite

Manufacturing Execution  
Suite

Product Quality  
Suite

Asset Optimization  
Suite

Infrastructure  
Solutions

### ADVANCED SERVICES

Expert know how  
Equipment | Consulting | Process

Training

Software & data model  
customization

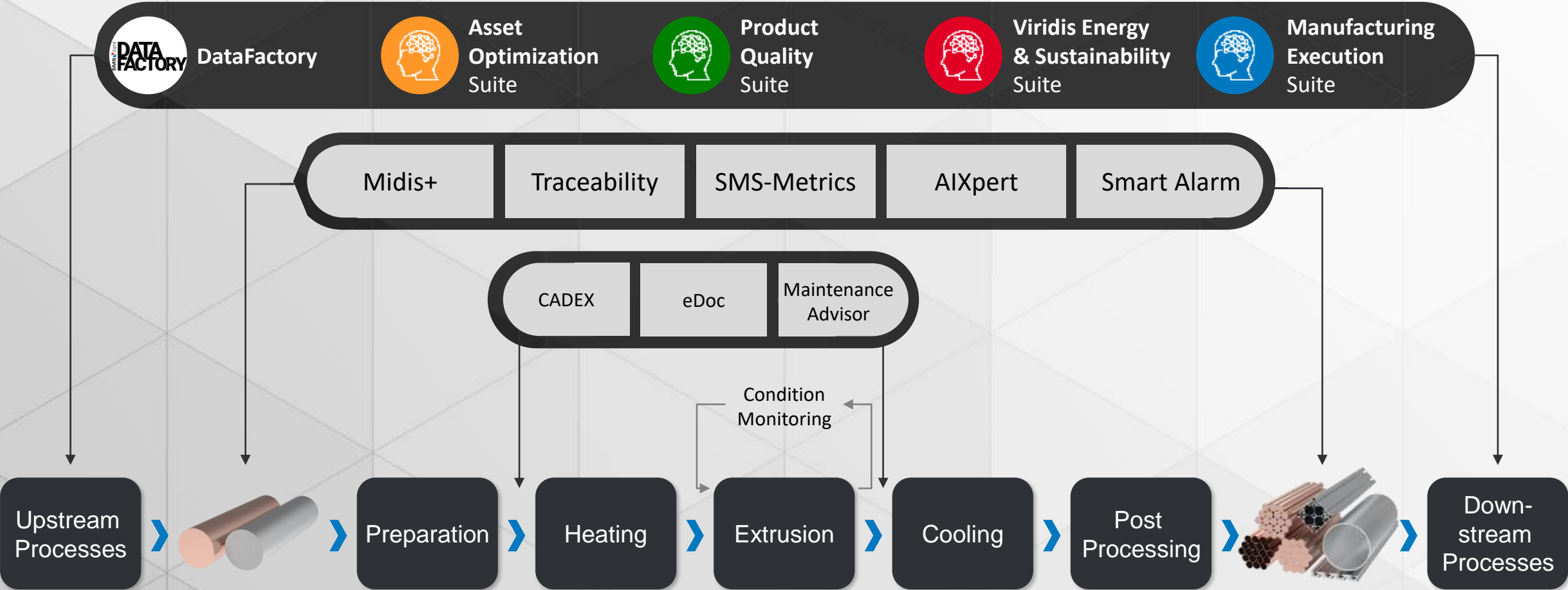
Software maintenance

CapEx- based business models

Subscription models

Performance-based contracts

# Digital solutions for extrusion





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# SMS-Metrics

## Optimize Your Plant based on Real-Time Data



Please check the video: <https://youtu.be/zUBvTcA-7uA>

### Identify Improvement Potential by Having all Process Data on Hand



Store aggregated sensor data intelligently in time-series database



Prebuild web dashboards visualize process data interactively



Flexible data processing and analyzing capabilities



Optimized for future Machine Learning tools



# Process and Data Overview for Extrusion Lines

## Material properties

- Batch No.
- Efficiency
- Material denomination
- Material supplier
- Shift designation
- Dimensions
- Input weight
- Site temperature

## Furnace

- Temperature per zone
- Energy Consumption
- Billet ID
- Burner Flows / Currents

## Cooling

- Times

## Straightening

- Roll position
- Drive current

## Quenching

- Medium
- Amounts
- Times

## Extrusion

- Input billet weight
- Input billet temperature
- Input billet diameter
- Profile ID
- Tool ID
- Hydraulic pressures
- Press pressure / -speed
- Press position (Stem, Container, etc.)
- Operation mode
- Profile ID
- Output temperature

## Superior data

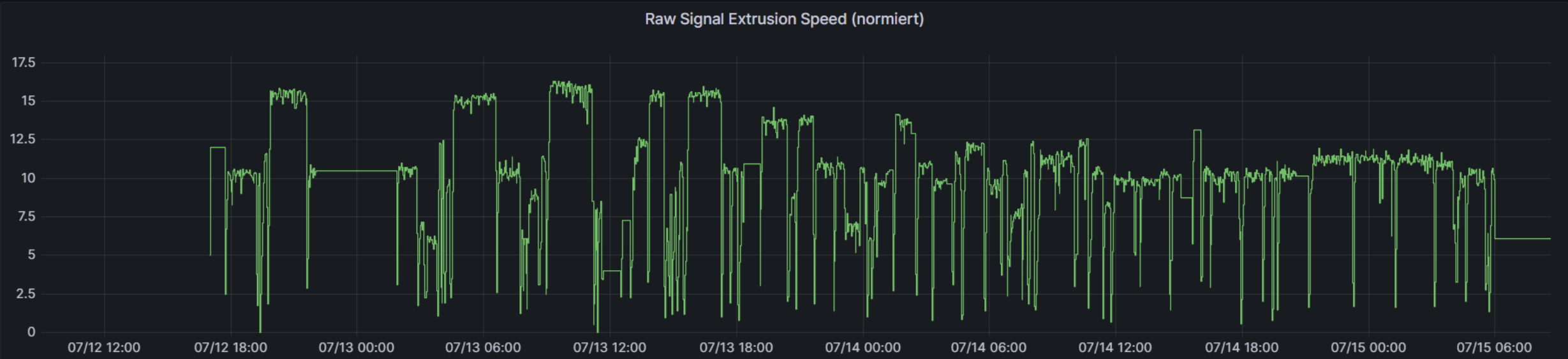
- Cumulated power consumption of individual units
- Quality related data (CAQ-data)
- Condition Monitoring data



# 5-Steps – From Data to Value

## Step 1 – Difficult to interpret raw signal

### 1- Raw Signal - Extrusion Speed



### > 2- Filter and Shape Data (1 panel)

### > 3- Build KPI (1 panel)

### > 4 - Classify KPIs to product ids (1 panel)

### > 5 - Product and billet specific statistical analytics and anomaly detection (1 panel)

### > Consider elaboration of best practices to match best-runs (2 panels)



# 5-Steps – From Data to Value

## Step 2 – Define areas to consider





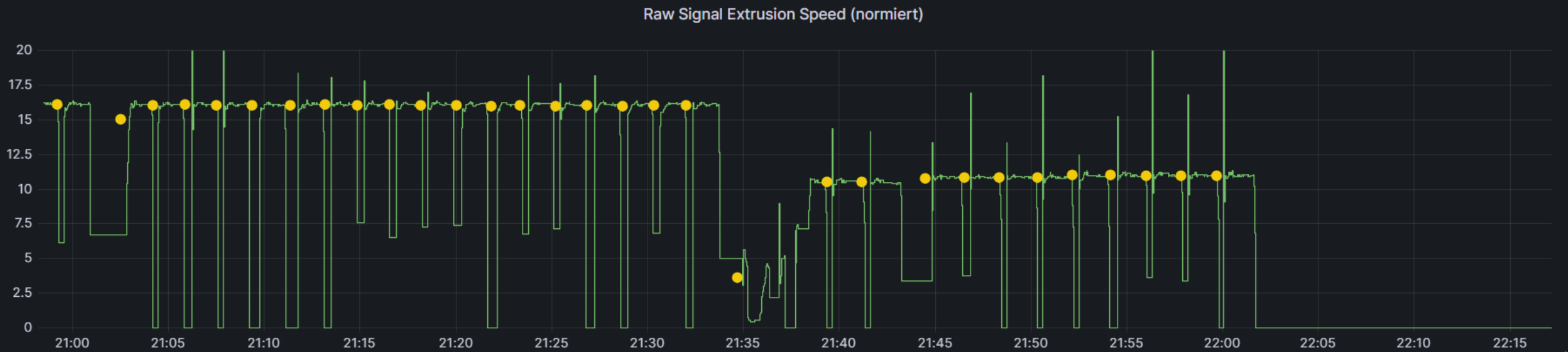
# 5-Steps – From Data to Value

## Step 3 – Calculate from signals a meaningful kpi

> 1- Raw Signal - Extrusion Speed (1 panel)

> 2- Filter and Shape Data (1 panel)

✓ 3- Build KPI



> 4 - Classify KPIs to Product ids (1 panel)

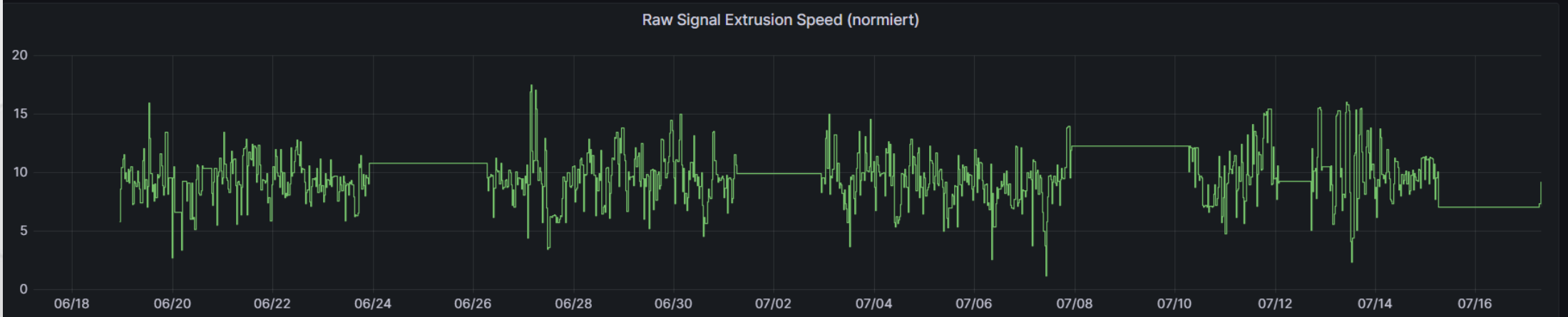
> 5 - Product and Billet Specific Statistical Analytics and Anomaly Detection (1 panel)

> Consider elaboration of best practices to match best-runs (2 panels)

# 5-Steps – From Data to Value

## Step 4 – Classify kpi according to product ID

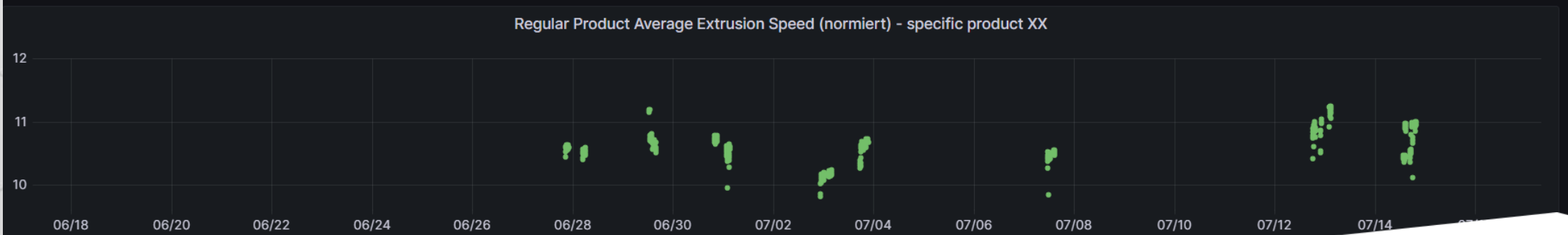
### ✓ 1- Raw Signal - Extrusion Speed



### › 2- Filter and Shape Data (1 panel)

### › 3- Build KPI (1 panel)

### ✓ 4 - Classify KPIs to Product ids



### › 5 - Product and Billet Specific Statistical Analytics and Anomaly Detection (1 panel)

### › Consider elaboration of best practices to match best-runs (2 panels)



# 5-Steps – From Data to Value

## Step 5 – Product specific real time statistics and anomaly detection

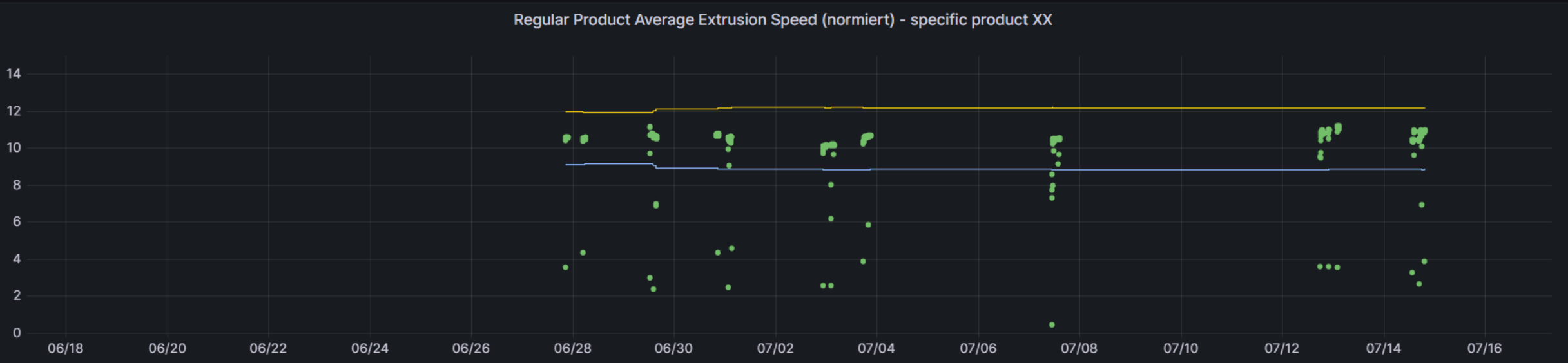
› 1- Raw Signal - Extrusion Speed (1 panel)

› 2- Filter and Shape Data (1 panel)

› 3- Build KPI (1 panel)

› 4 - Classify KPIs to Product ids (1 panel)

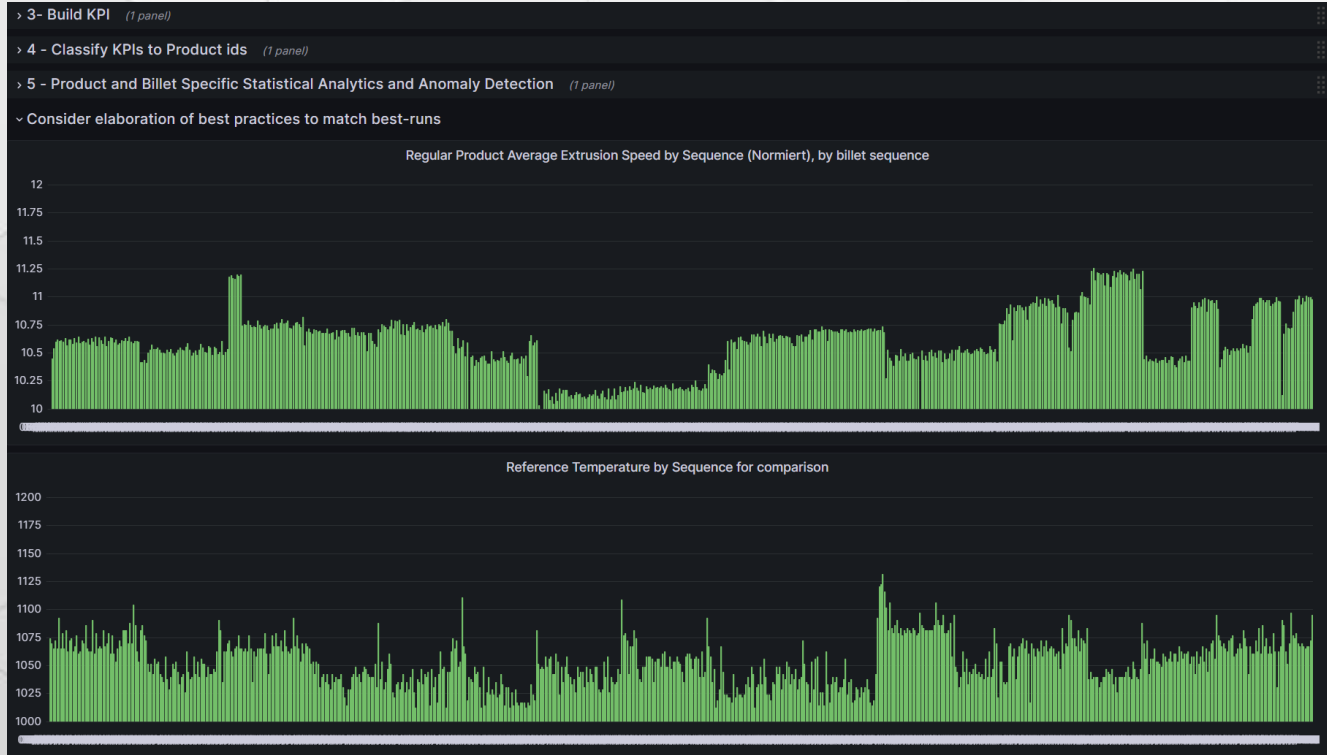
› 5 - Product and Billet Specific Statistical Analytics and Anomaly Detection



› Consider elaboration of best practices to match best-runs (2 panels)

# 5-Steps – From Data to Value

Use processed data to work towards best-run performance



## Get real-time feedback about current performance

- › discuss and react to anomalies faster
- › get immediate feedback to process modifications

## Compare with other process parameters

- › e.g. compare with furnace temperatures to see correlations

## Scale to a lot more process values

- › makes process more transparent

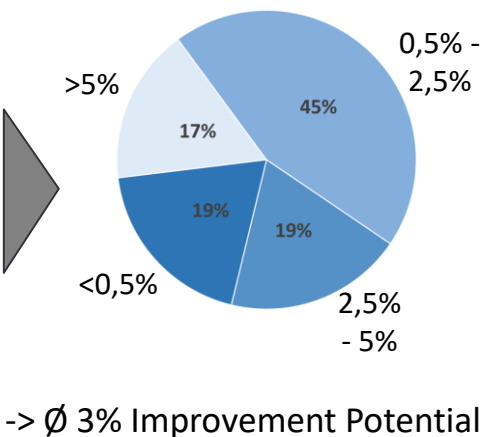
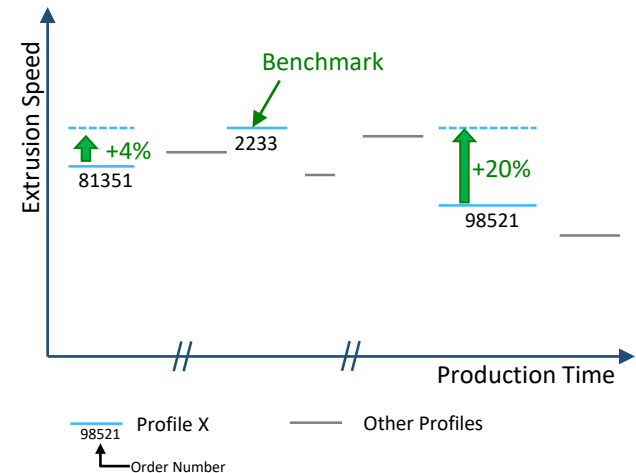


# Example Use-Case

Relevant Customer	Advantage SMS	Effect (quantified based on depreciation period)	Effect (type)
	Increased productivity by determining best practice and enforcing it during all production by automatic notifications.	<ul style="list-style-type: none"><li>Yearly more production with a profit of 52.000 EUR</li><li>ROI of approx. 0.5 years</li></ul>	

### Description

- SMS-Metrics creates product specific KPIs to compare the productivity of the same product at different times.
- Based on machine data, the *best practice* can be identified, understood and established.
- By comparing in real time the current productivity KPIs with the best practice, operator can be informed in case of slower production and advised how improve the process.



### Machine and production parameters

Production output relevant for VP [t/a]	7.000	**
Ingot weight [kg/billet]	218	
Production output relevant for VP [billets/a]	32.110	
Sales price for forging [EUR/t]	5.000	
Profit margin of sales price	5%	

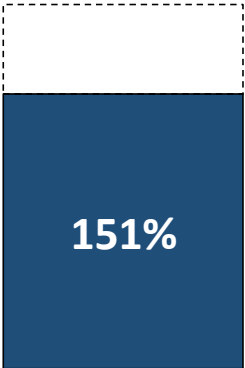
### Improvements by SMS-Metrics

Total improvement potential [%]	3,0	*
Output performance increase	3,0%	
Output increase [billets/a]	+957	
Profit increase [EUR/a]	+52.000	

### Payback

Installation cost [EUR]	20.000	
Yearly usage fee [EUR/a]	14.400	
Depreciation period (DP) [a]	1,0	
Payback (during DP) [EUR]	52.000	
Total costs (during DP) [EUR]	34.400	
Effective invest costs machine [EUR]	-17.600	
Payback ratio	151%	

Payback:  
52.000 EUR



Payback ratio  
related to invest costs

\* real example  
\*\* model calculation: ½ of production

# Use-Case Energy Consumption



## Evaluation of the energy consumption

- › 15 min resolution, hourly, monthly, yearly aggregates
- › For individual machines or the total plant
- › As time series or as pie-charts
- › Summarize in monthly pdf energy report via e-mail
- › Analyze energy during specific time periods
- › Energy analysis based on operating mode
- › Showing energy warnings with colour marking

## Benefits

- › Avoid peak loads and reduced energy costs
- › Optimize energy consumption e.g. in auxiliary devices by switching them off when not needed
- › Increase transparency and determine effects of production parameters on energy consumption
- › Calculate carbon footprint per product type
- › Future: Monthly energy prediction



# Use-Case: Productivity

## Optimization of Dead Times

### The Challenge

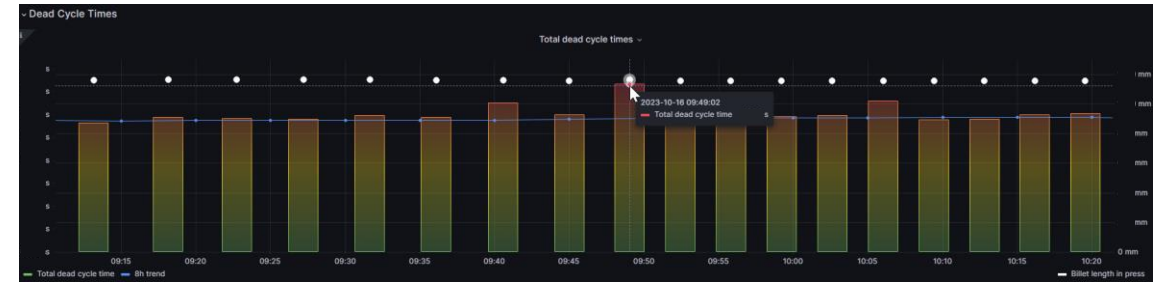
- › Minimizing dead times directly increases productivity
- › Dead times are shown in machine HMI but not systematically analyzed

### The Solution

- › Collect and store all dead times in long time storage
- › Group by billet length and automatically generate best practice
- › Indicate deviations from best practice
- › Use detailed views to
  - › check for known reasons
  - › evaluate trends

### The Benefits

- › Transparency about impact of dead times
- › Trend evaluation to inform about due maintenance activates
- › Know-how collection in case of commonly known deviation from best practices with optional alarming





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# Summary and Discussion

## Advantages of Digitalisation

- More efficient production and lower maintenance costs by digital solutions
- Holistic solutions for plant wide optimization
- Process specific solutions bases on SMS plant know-how
- Continuous improvement process with SMS as strong partner
- Solutions can be extended to the entire plant
- All solutions can be complemented by additional solutions



Domain  
Know-how

**SMS group**

- High quality plants
- Digital Ready Automation
- Technology driven
- Process Expertise
- Service Partner

+



Digital  
Expertise

**SMS group**  
**SMS digital**

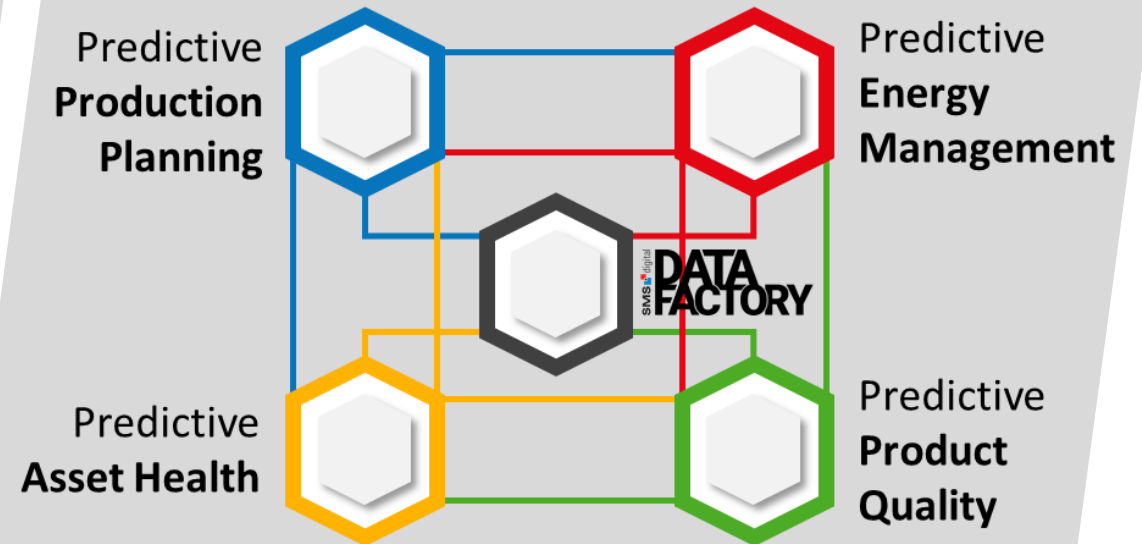
- Infrastructure / Tools
- Data Storage / Cloud
- Web-Development
- Data Science / ML

=



Added Customer  
Value

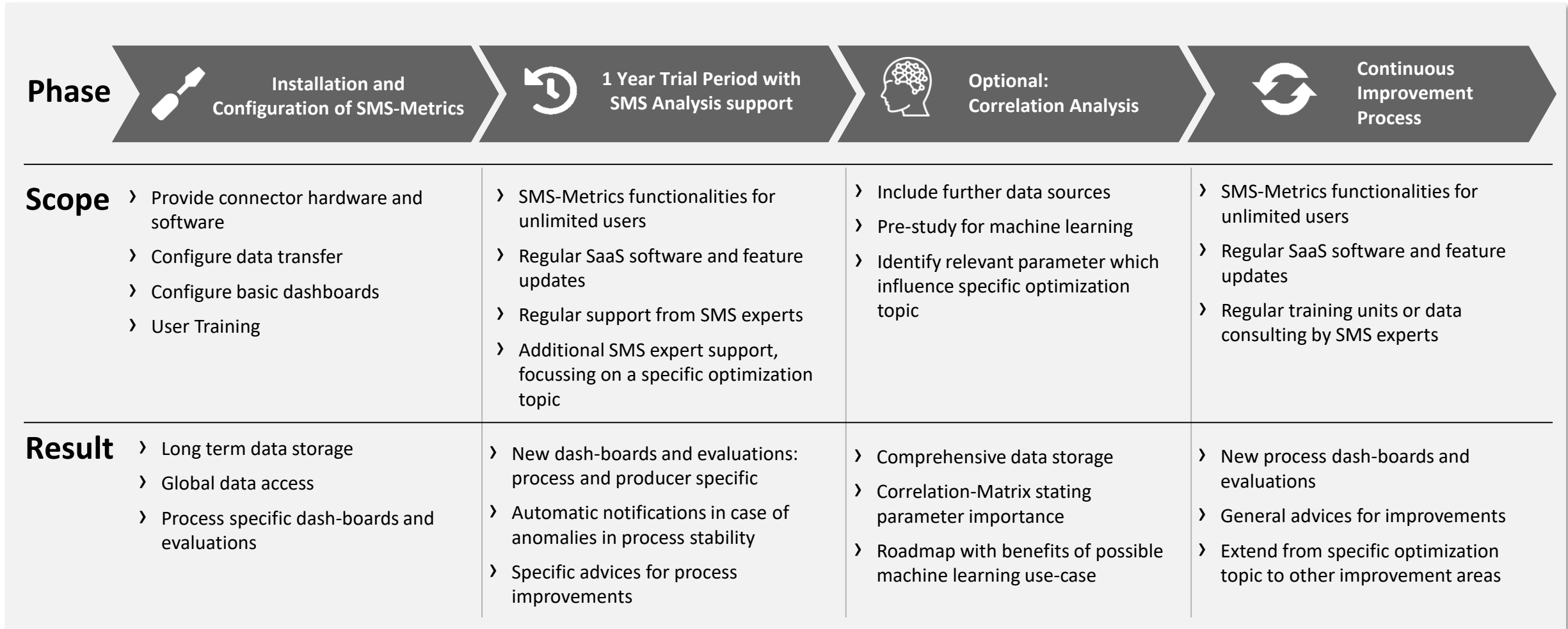
## End-to-end solution from SMS



**SMS group**

# Data driven optimization of products and processes

## Step-by-step to a continuous improvement process





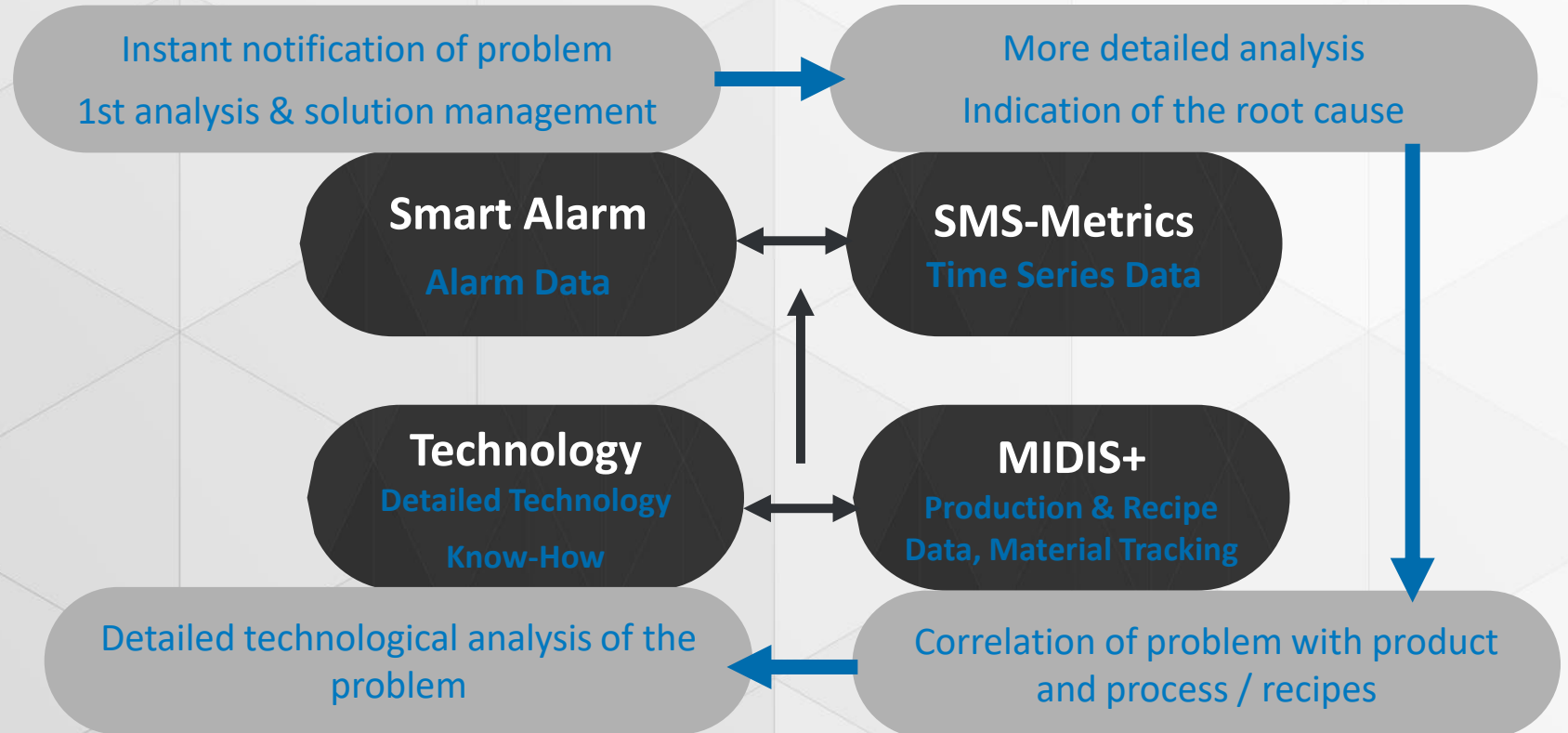
# Interaction between Level 2, Technology and Digital Solutions

## Part 1: Trouble Shooting

- › Fast access
- › Information anytime, anywhere
- › Long time storage

- › Interconnectivity of relevant data
- › Including material tracking

- › Detailed information
- › Local storage
- › Specific for shop und office floor



# Interaction between Level 2, Technology and Digital Solutions

## Part 2: Continuous Improvement Process

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