THROUGH-PROCESS OPTIMIZATION

FROM DATA TO INTERCONNECTED OPERATIONAL EXCELLENCE

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Contents

PRIMETALS
T E C H N O L O G I E S

What's TPO?
Through-Process Optimization

Interconnected solution that covers services for process and product quality of metals industry by know-how embedded IT solution (TPQC).

- One-click access to all quality and process related data from liquid steel to final products.

- Intuitive & easy analysis, visualization and monitoring of quality and processes by different features.

- Process and metallurgical services for all aspects of operational excellence.

- Data analytics for process optimization and new steel grades development

TPQC Software

TPO Services

TPO – the enabler for digital transformation of steel production.

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# Through-Process Optimization

TPO Services

- Steel grade development, Coating Technology
- Process standardization & optimization
- KPI, best practice, KPI improvement
- Quality Management, Certification support
- Data Analytics Services
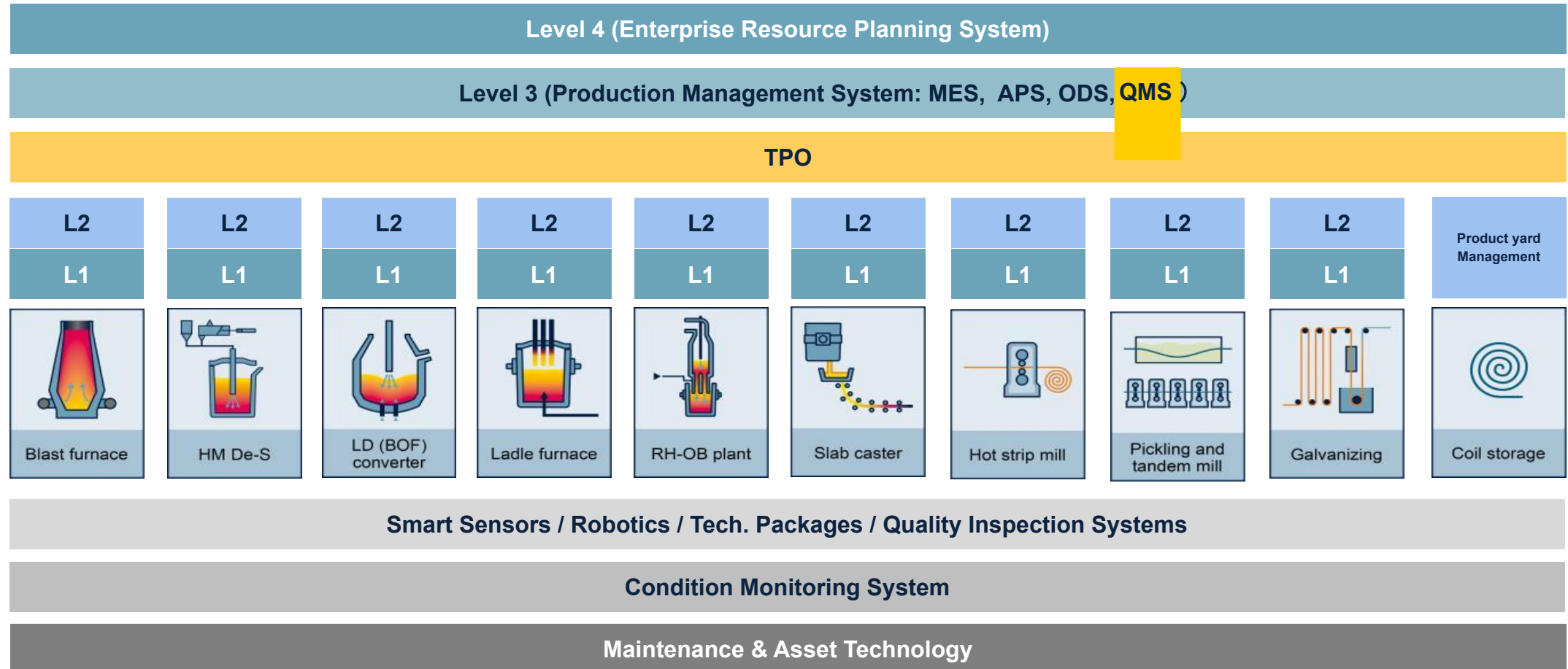- Consulting & trainings

Through-Process Quality Control - TPQC

LEARNING

| Root cause analysis & corrections | Data Analytics | Artificial Intelligence | Digitalization of corporate know-how |

ASSISTANCE

| Automatic grading | Digital Assistant | Decision support | Process supervision & predictive quality control |

Monitoring

| Data visualization | **KPI & SPC** | Reporting & documentation (BI) | Digital fingerprint |

DATA Collection

| Interconnecting machines & plants | Data warehouse | product genealogy | Seamless quality data |

# Scalable along three dimensions

FEATURES

SERVICES

PLANTS
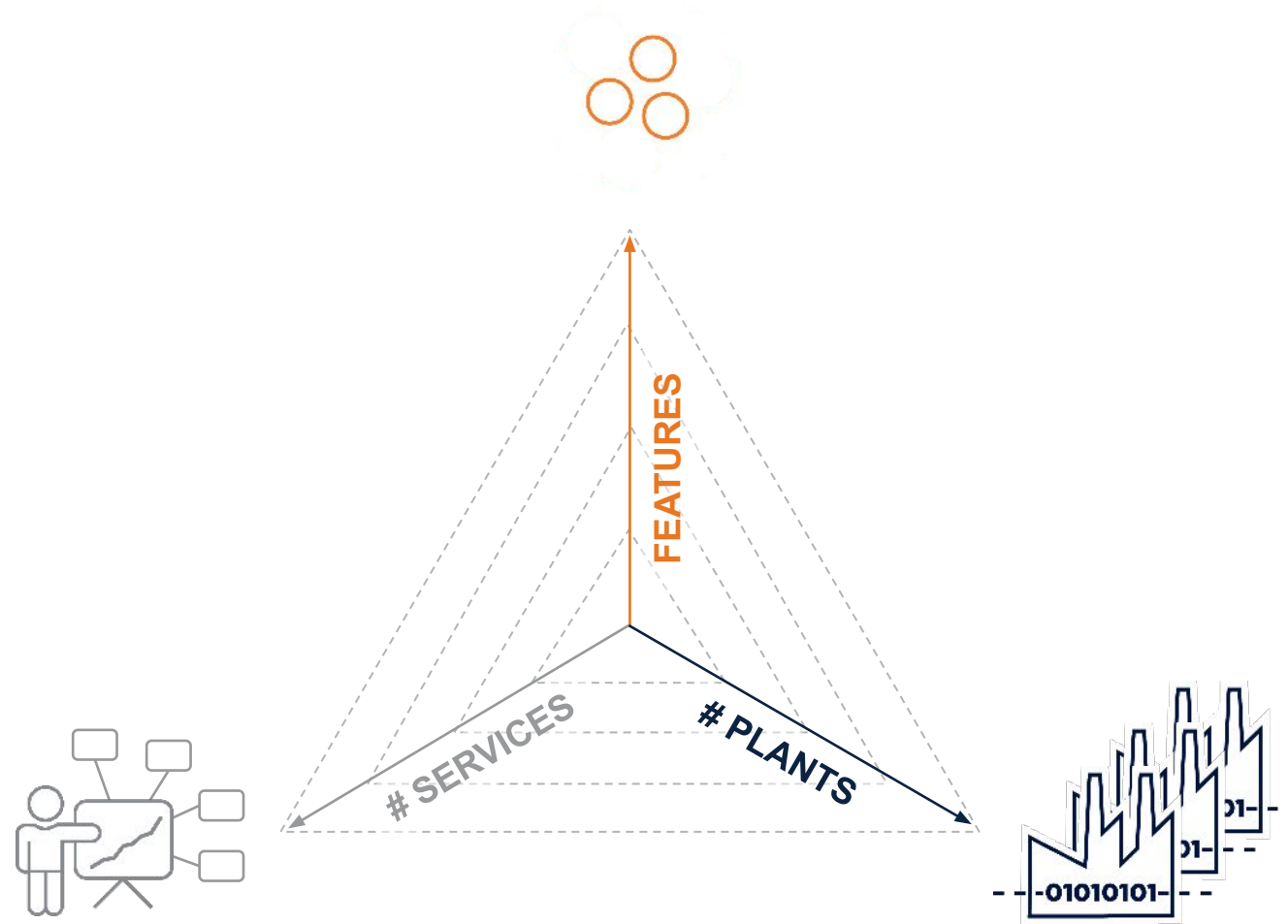
Digital landscape of an intelligent steel factory
SEAMLESS CONNECTION THROUGHOUT FULL PROCESS CHAIN

Level 4 (Enterprise Resource Planning System)

Level 3 (Production Management System: MES, APS, ODS, QMS)

TPO

L2	L2	L2	L2	L2	L2	L2	L2	L2	Product yard Management
L1	L1	L1	L1	L1	L1	L1	L1	L1	
Blast furnace	HM De-S	LD (BOF) converter	Ladle furnace	RH-OB plant	Slab caster	Hot strip mill	Pickling and tandem mill	Galvanizing	Coil storage

Smart Sensors / Robotics / Tech. Packages / Quality Inspection Systems

Condition Monitoring System

| Maintenance & Asset Technology |
|---|

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Main Features and Benefits

✔ Through-process data collection and integration, Fast access to all operational data by length projection to final product

✔ Automated product grading and quality conformance checks

✔ Identification of possible root-causes for non-conforming products

✔ AI based approach for corrective actions to eliminate quality deviations, compensational actions to repair non-conforming products

✔ Support for product certification (e.g. IATF 16949)

✔ Claim management and time saving up to 70%

✔ Data based quality prediction of full length of the coils, support product design and process optimization

✔ Know-how services (PD, Maintenance, QM, DA etc.) for higher performance

✔ Short Return of Investment

✔ EBITA improvement up to 7%

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TECHNOLOGIES
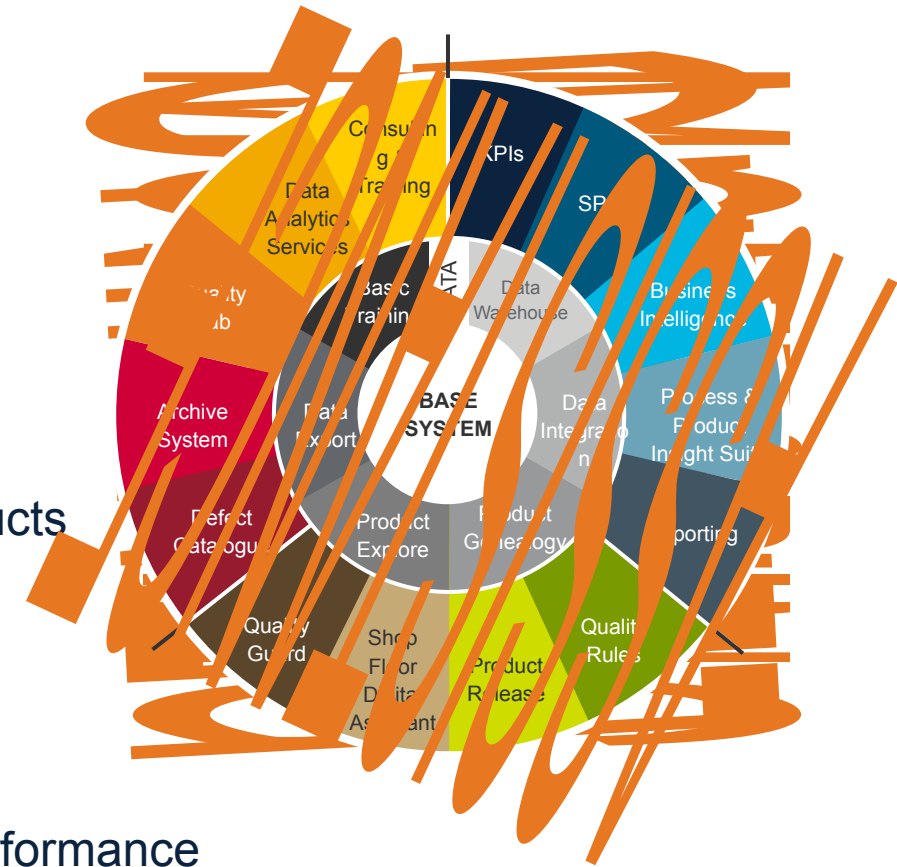
Applications of Data Analytics at Primetals Technologies

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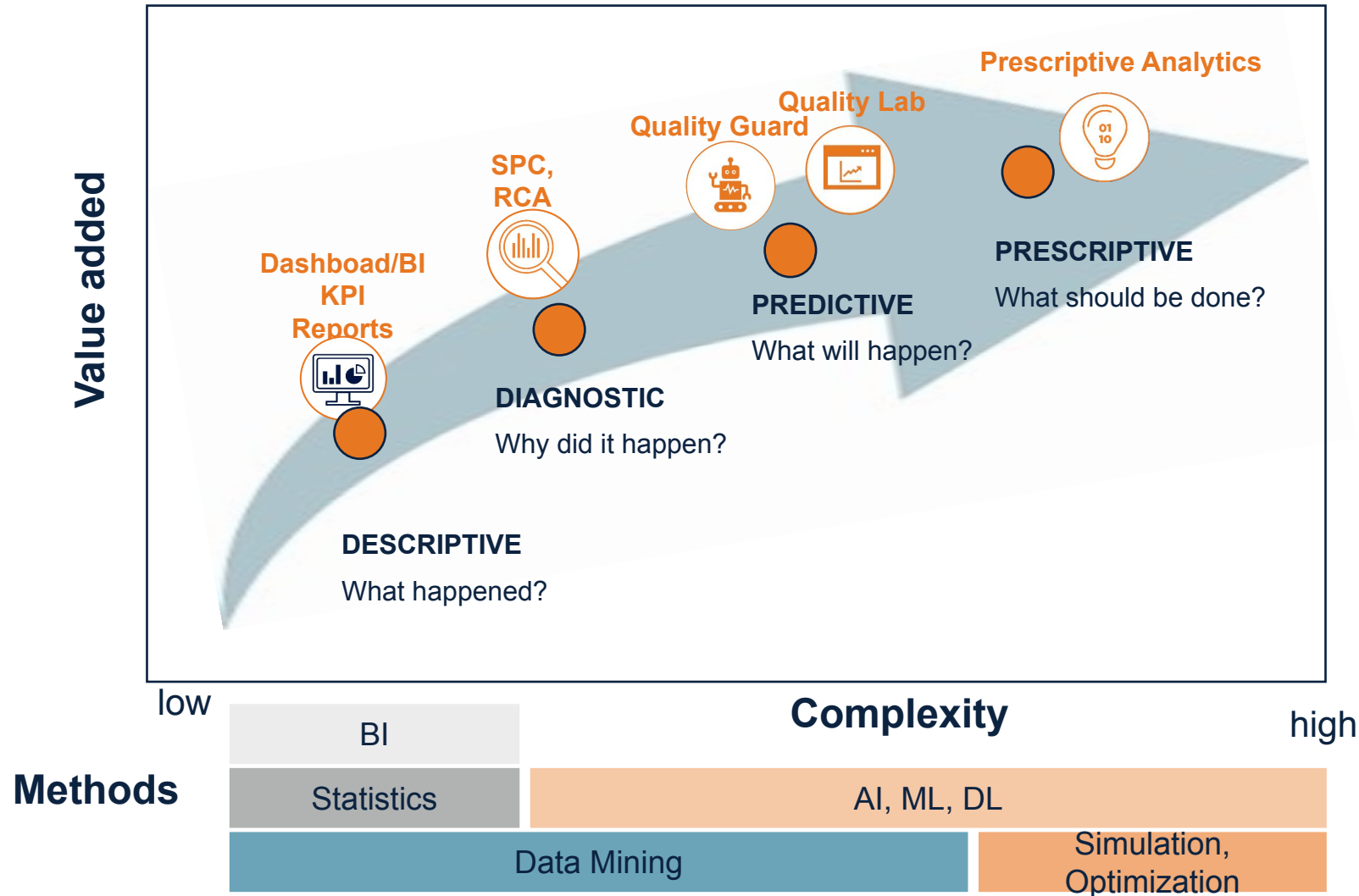
Data Analysis for Steel – Development and Application
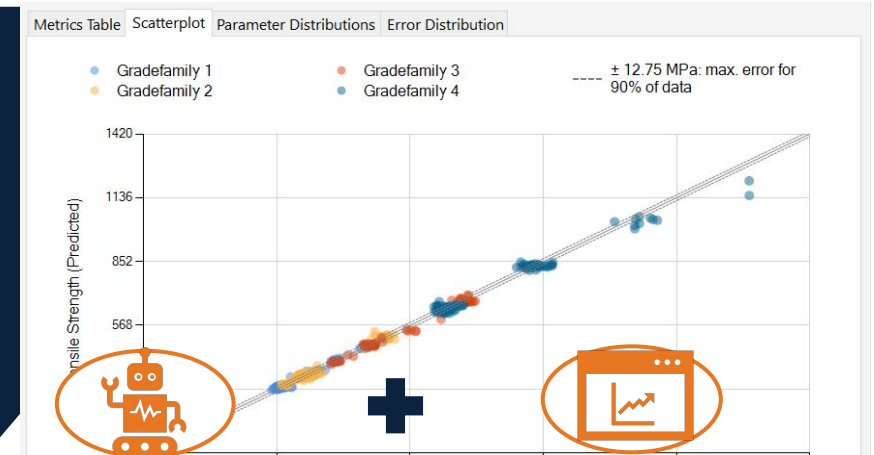
Quality GUARD and Quality LAB:

Prediction of mechanical properties
=> Results online available
=> Reduce sampling and testing

Off-line simulation for product and process optimization

Prescriptive-Cross process control
. Reduce scrap ratio
. Increase Cpk value for better quality

Quality Guard

Predict mechanical properties:
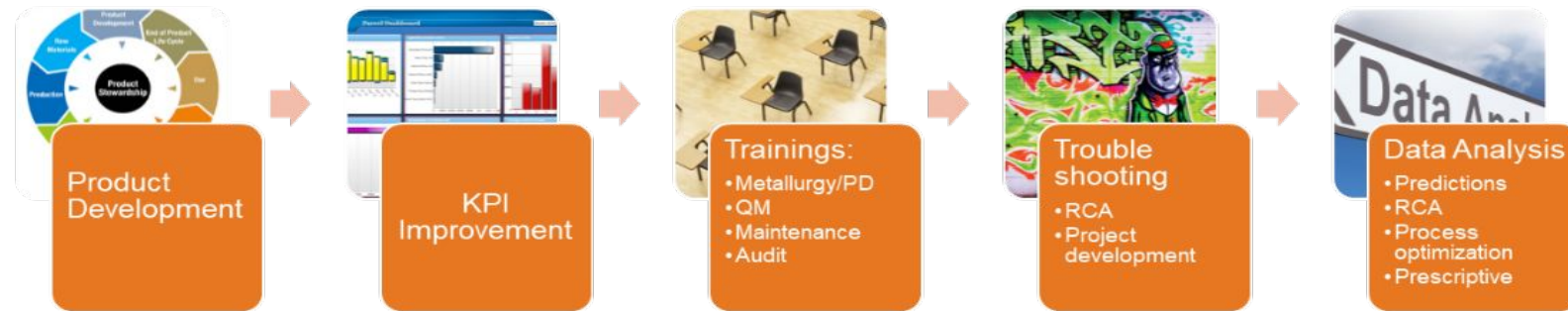- Tensile strength
- Yield strength
- Elongation

Quality Lab

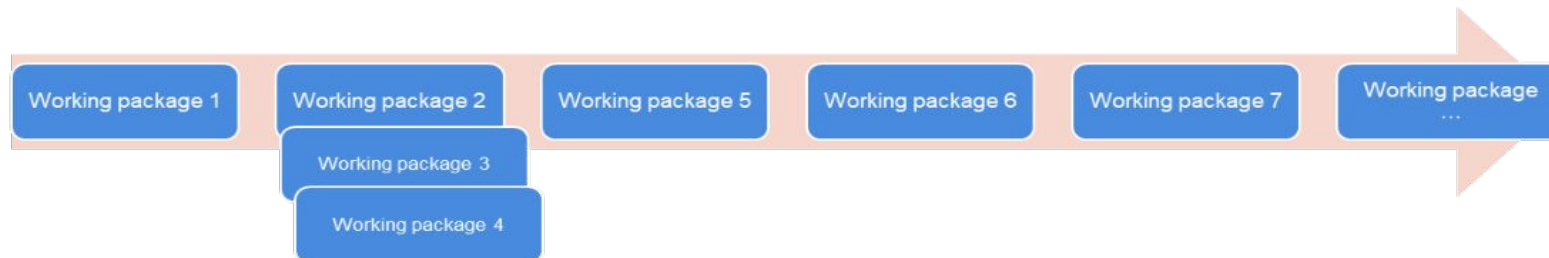Estimate impact of parameters on targets (virtual optimization)
Interactive UI:
- Data import/export
- Display data
- Simulation

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Service Concept:

Service Contents:

Product Development → KPI Improvement → Trainings:
• Metallurgy/PD
• QM
• Maintenance
• Audit → Trouble shooting
• RCA
• Project development → Data Analysis
• Predictions
• RCA
• Process optimization
• Prescriptive

Service Methodic:
topics selection

Working package 1 | Working package 2 | Working package 5 | Working package 6 | Working package 7 | Working package …

Working package 3

Working package 4

3. Main Achievements at Reference Plants

Upstream - TSS Plant

| Converter | RH plant | Ladle furnace | Slab caster | Hot strip mill |

Downstream - THSAS Plant

| Pickling and tandem mill | Annealing line | Galvanizing | Galvanizing | Galvanizing |

Through-Process Optimization - TPO

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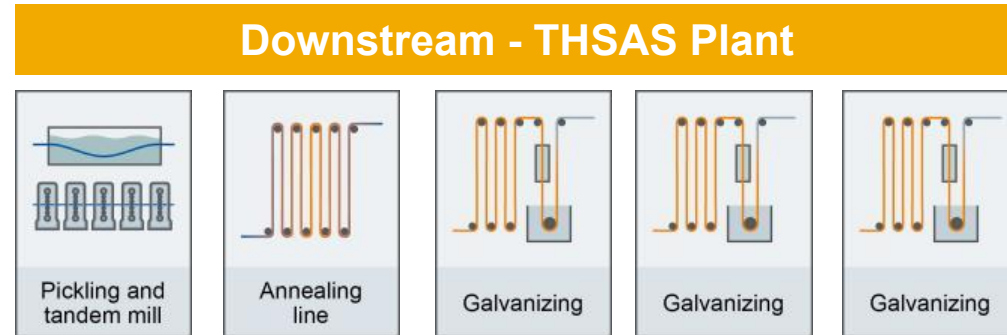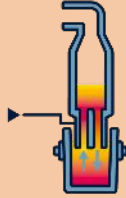
ACHIEVEMENTS

>90%
BOF Direct Tapping

-20%
Al-consumption for IF grades

+20%
Output on CGL

>10 heats
Casting Sequence for IF Grades

<0,1%
HSM COBBLE RATE REDUCED FROM 0.3%

-12%
Rejection rate

TPO

>16
Automotive Certifications

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