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**THROUGH-PROCESS OPTIMIZATION**  
OPEN DOORS TO NEW MARKETS  
WITH INTERCONNECTED  
OPERATIONAL EXCELLENCE

# GROWTH BASED ON DIGITAL TRANSFORMATION **THAT'S TPO**

Stay ahead in the market or catch up to the leading steel producers worldwide. Through-Process Optimization (TPO) is the interconnected solution that covers assistance to steel production and advanced IT platform functionality—all combined to your ultimate business advantage.

## THE SEAMLESS CONNECTION

TPO allows know-how embedded monitoring and controlling of process and product quality, to improve and speed up communication and information exchange between different upstream and downstream processing units — from raw material to finished product and back. This new level of process control and communication results in decisive advantages for your business: Generate profit faster by dramatically reducing the time-to-market on new products. Satisfy existing and gain new customers with accurate, through-process quality. It's up to you what you make of the opportunities.

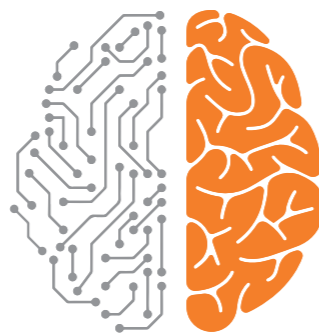
## THINK BIG, START SMALL: FULLY SCALABLE SOLUTION

TPO is a highly scalable solution that can be flexibly adapted to your requirements. The number of functions, the number of production units you want to integrate into TPO and the range of services, can be tailored to meet your specific needs for metals production. Go ahead and open doors to new markets.

## INCREASED EBIT

We are your partner to enter new markets. TPO, combined with the know-how of our technologists and metallurgists will support your team in producing new steels that are increasingly in demand. TPO helps you achieve quality benchmarks and accelerate your product development for advanced steel grades.

**Platform**  
Monitoring and controlling of process and product quality



**Service**  
Excellence in process and metallurgical assistance

**TPO**  
Interconnected  
operational  
excellence

## YOUR ADVANTAGES

- Increased profit and growth
- Faster time to market
- Just-in-time delivery
- Know-how- and data-based decision support
- Return of investment < 1 year

# INTERCONNECTED OPERATIONAL EXCELLENCE THAT'S TPO

Improve performance, efficiency, across all your production units and plants—from the liquid phase to the finishing lines.

1

## DATA

Collect and visualize comprehensive quality data

2

## TPQC

Integrated know-how-based quality control system

3

## SERVICES

Full range of services including know-how transfer

Through-Process Optimization (TPO) is an integrated know-how based solution and covers the entire production chain. TPO targets the smart, digital interconnection of various process units and the accumulation of know-how. This is metals production for a new generation.

Through-Process Quality Control (TPQC) and smart services are two independent parts of TPO that complement each other perfectly. The quality control system TPQC collects and visualizes comprehensive quality data across the complete metals value chain. It enables steel producers to maximize the quality of their products and processes. Smart consulting services include training opportunities to support your team in developing new products and prepare your plant for the future of metals production.

### KPI IMPROVEMENT

Keep important information in view at all times. Clear dashboards provide you with a comprehensive overview of your production and quality-related performance. Plant operators can easily monitor the effectiveness of QM-measures related to quality and process improvements. Plant managers get a transparent overview of the achievement of business plan objectives. Dedicated reports can easily be monitored online by the management.

KPI improvements enable real breakthroughs in terms of quality and allow you to realize through-process quality typically required by the automotive industry.

### YOUR ADVANTAGES

- KPI improvement
- Higher plant performance
- Production transparency and traceability
- Real-time decision support out of your production data
- Accelerate reaction time on process and product quality deviations dramatically
- Speed up root cause analysis
- Benchmark the performance with similar plants via KPIs

# COMPREHENSIVE QUALITY DATA THAT'S TPO



## YOUR ADVANTAGES

- Genealogy across the entire production chain
- Tracking of each segment of the final product across all preceding processing units, including all recorded high-resolution process data
- A big data warehouse as a basis for product development and gaining new insights

TPO assists steel producers to maximize the through-process quality of their products and processes by collecting and visualizing comprehensive quality data in a through-process data warehouse.

TPO is your access to quality data, which enables you to evaluate and control product quality and process performance continuously and at every level of the production chain.

### EASY ACCESS TO HIGH-RESOLUTION DATA AT ANY TIME

TPQC is based on a central database of quality- and process-relevant data. These are recorded from all production units via Level 1, Level 2, or Level 3 automation systems. Additionally, laboratory results and data from all types of automatic inspection systems and other sources are centrally stored. This includes various data formats, including, for example, images and multimedia formats.

The core of data storage is the through-process data warehouse, a centralized long-term archive of process and quality-related data.

The collection of process data across the entire production route, their integration, validation, compression, and long-term storage enables intelligent data analytics. Plant operators gain easy access to comprehensive, time- and length-based, high-resolution data per product.

- Centralized, high-resolution process data storage
- Full product genealogy leading to length projection of process and quality data
- Interconnection of production units and plants across multiple locations
- Standard interface design for easy and reliable integration of data from different sources

# THROUGH-PROCESS QUALITY CONTROL THAT'S TPO

## SUSTAINABLE OVERALL QUALITY AND EFFICIENCY

TPO comprises the sophisticated quality control system Through-Process Quality Control (TPQC), covering the entire production chain. Through the integration of data-based models, e.g., predictive and prescriptive models, and integration to data mining platforms the system allows in-depth analysis of extensive process data. It is optimizing performance by applying know-how-based rules for quality decisions, monitoring performance by Key Performance Indicators (KPIs), and stabilizing production by applying advanced Statistical Process Control (SPC).

## FAST REACTION WITH AUTOMATED ROOT-CAUSE ANALYSIS

To ensure a continuous increase in achievable quality levels, TPQC provides advanced monitoring, visualization, and evaluation, using Business Intelligence (BI) dashboards for easy access and production analysis. In the event of deviations, the system supports operators and quality engineers with root-cause analysis and automatically generates suggestions for corrective and compensational actions. One comprehensive and transparent connection from the liquid phase to the end product allows you to identify root causes for quality rejects and unstable processes extremely fast.

TPQC supports your team to take the right actions immediately. This will result in stabilized product characteristics like mechanical properties or surface quality and reduced rejection rates.

## DIGITALIZE YOUR KNOW-HOW

Digitalize the know-how of your staff and your production processes. Providing a powerful rules editor, TPQC allows for the implementation of freely editable rules, which are used for the execution of conformance checks during production. Stored in the central data warehouse together with significant quality and process data, this creates a valuable knowledge database for use in future optimizations and developments. This digitalizes the know-how of your experts which is therefore available anytime. TPQC is your perfect assistance to achieve the next level in product quality—seamlessly and consistently.

### YOUR ADVANTAGES

- Automatic root cause analysis
- Accurate quality execution and fast reaction on quality deviations
- 25% reduction of downgrades
- 25% reduction of claims
- Rejection rate reduced by 12%

LET YOUR BEST  
PRACTICE  
BECOME YOUR  
DAILY STANDARD



# SMART SERVICES SMART DECISIONS THAT'S TPO



## OUR COMPETENCE

- Excellence in metallurgical processes, plant operation, and performance for the entire production chain
- Specific expertise for plant automation, quality management, and data analytics
- Life cycle partnership with tailor made service packages backed up with all Primetals Technologies competences

## YOUR PARTNER FOR OPERATIONAL PRACTICE AND KNOW-HOW TRANSFER

Based on decades of experience, acting as your life cycle partner, Primetals Technologies provides you with the full range of services you need to improve the plant performance and the quality of your products along the entire production chain. We combine operational and domain know-how, as well as metallurgical expertise and IT solutions to your benefits.

Our excellent global network of experts has many years of experience from collaboration with leading global steel producers. In consulting and training sessions, we work closely with your teams and ensure the necessary transfer of know-how to improve your operational performance. We guide your experts during design of rules and setup of Statistical Process Control (SPC). Our service scope includes also the support of digitization of your know-how into TPQC and improvement of KPIs. If required, we may dispatch experts for long-term support on-site.

Our customized expert service includes fact-finding, on-site audits and studies, concept and strategies for revamping, digital transformation and smart production, and proof of concept.

## DATA ANALYTICS

Primetals Technologies offers you data analytics services as supporting product development, root cause analysis and process optimization. Using rule-based algorithms and machine learning, we predict the mechanical properties and optimize through-process operational parameters on-line, to decrease downgrade ratio and to improve process capability index values of the quality.

## RESULTS ACHIEVED

- 20% increased output for processing lines
- Cobble rate reduction by 60%
- 15 automotive certifications within 4 years, including exposed parts

## SMART SERVICES

-  Steel grade development
-  Advanced surface coating development
-  Physical & numerical simulations
-  Production process standardization & optimization
-  Data analytics services (prediction, decision automation etc.)
-  Consulting, trainings & remote services
-  Achieving and stabilizing the best surface for exposed applications

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