Digitalization is driven by steel producers' requirements and enabled by new technologies.

STEEL PRODUCERS’ REQUIREMENTS

- End-customer integration
- Lot-size 1
- New business models
- Know-how management
- Supplier integration
- New steel grades
- Availability of information
- Ergonomy/operator support

NEW TECHNOLOGIES

- Communication technologies
- Computational power
- Internet technologies
- Cloud technologies
- Big data analytics
- Self-learning systems
- Mobile devices
- Augmented reality

ACHIEVED BY HOLISTIC AUTOMATION

QUALITY

FLEXIBILITY

PRODUCTIVITY
Three major requirements in steel production shall be supported by digitalization

- Outstanding quality
- Reproducible results
- Seamlessly documented

- Flexibility to customer requests
  - Flexible product specification
  - Shorter delivery times
- Flexible in used raw materials
- Flexible in optimization criteria
  - Production
  - Energy consumption
  - Equipment lifetime

- Throughput
- Yield
- Plant availability
- Operational costs
- Maintenance costs
A digitalized plant is like an orchestra –
The Metals Orchestra
Metals Orchestra
Teach your players to play better
Know more – improve your processes

Smart sensors provide additional information about the process or the entire plant.

Smart sensors either directly measure physical values or use existing measures to indirectly calculate additional information.

Smart sensors are the enablers for the implementation of advanced automatic functions, process models, as well as condition monitoring.

Example:
Camera-based slag detection and free-board measurement for converter tapping

More focus on the essentials

Repetitive, labour-intensive and dangerous work is supported by fully-automated mechatronics solutions.

This gives more room to focus on the essential tasks.

Example:
Automated converter tapping incl. the positioning of the ladle transfer car and alloy charging

Your plant and its digital twin

Process models, digital “twins” of the plant, enable process optimization in real-time as well as offline simulation.

This means perfect process guidance and full support for further process development.

Example:
Blow-end calculation
Knowing how your plant “feels”

Comprehensive information about the condition of the equipment and the respective processes enables predictive maintenance, which will help to avoid unplanned outages. This means improved plant availability and therefore increased plant productivity.

Example:
Converter tilting-drive monitoring, LTC drive-train and railway condition monitoring

Get connected – anytime – anywhere

Advanced communication technologies allow for information to be transported beyond conventional limitations. From the collection of sensor data in harsh environments or from mobile equipment to displaying the information on mobile devices. From the shop floor to the “manager’s pocket”

Example:
Wireless data transmission from the ladle transfer car, KPI dashboards for mobile devices

All the necessary information – when and where you need it

To ensure best possible operation and maintenance of a plant, a vast variety of information sources is required. The core concept of “smart work” is that all personnel will automatically receive exactly the information they need at the time to get their job done. This means that all information is automatically tailored to the actual needs of the staff.

Example:
Online-documentation retrieved via QR-coded equipment, augmented reality applications to guide maintenance work
The Digital Unity –
The conductor of the Metals Orchestra
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The conductor of the Metals Orchestra
Production Management System
A comprehensive approach

PRODUCT DEFINITION,
ORDER DRESSER
Transformation of sales orders to process and quality instructions
Centralized process knowledge base

ORDER & LINE SCHEDULING
Cross-plant scheduling of the order book
Throughput optimization

PLANNING
Holistic planning from melt shop to shipping, from demand planning to material planning

PRODUCTION EXECUTION
Realtime information about the production process
Transparency across the whole process chain
Logistics

Benefits
• Increased utilization of production facilities
• Higher productivity with increased flexibility and better quality
• Reduced inventory
Production Management System
Order dresser

State-of-the-art technology

- Comprehensive translation of sales orders to production orders including routings and process instructions considering production capabilities, technological rules, standards and quality directives.
- Creating test and sample instructions along the production route.
- Calculating material demand for each production step
- Considering cost and time models
- Easy system integration with ERP including certified SAP I/F
- Modern GUI for easy data administration

Benefits

- One central knowledge base with all production related data to determine how to produce products from casting to finishing lines. - Fewer systems to maintain
- Integrated with planning, scheduling, production and quality. - No complicated and expensive interfaces
Production Management System Planning and Scheduling

State-of-the-art technology

- State-of-the-art technology
- Holistic planning – from melt shop to shipping and from demand planning to detailed scheduling
- Streamlined and consistent decision making across sales, planning and production processes
- Maximizing throughput, quality and service level
- Minimizing costs, energy consumption, stock levels and lead times
- User-friendly, fast and adaptable schedules and plans
- Planning evaluation based on KPIs and scenarios comparison
- Central repository of planning rules and priorities

Benefits

- Highly specialized optimization models for metals specific production technologies like casting, rolling, hot charging, etc.
- KPI-driven Planning: Plan and schedule calculation can be adapted to specific and dynamic business goals
- Supports multiple demand fulfilment models: make-to-order, make-to-stock, …
- Highly adaptable user interfaces optimized for planner's daily tasks

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### Production Management System

#### Production Execution

**Material and Stock Management**
- Administration of all material types
- Goods receipt, movement tracking and goods issue on material and batch level
- Management of scrap yards, bunkers, small part areas, semi finished products and equipment

**Schedule Execution**
- Fast reaction to production issues by modifying released line schedules
- Management of line schedule states

**Production Tracking**
- Tracking of material flow
- Registration of all production data in the different facilities
- Basis for reporting and quality control

**Production Order Lifecycle**
- Managing production orders during their lifetime
- Status Management
Holistic ironmaking
Efficient coordination of ironmaking plants

- Optimized production meeting requirements of respective downstream plants
- Cross plant coordination for optimal gas network utilization
- Transparent and traceable production decisions
- Reduction of costs and increase of production
Through-Process Optimization (TPO)
Quality along the entire production chain

QUALITY MONITORING
Continuous recording & supervision of quality parameters
Automatic identification of deviations
Root cause identification
KPI evaluation
Statistical process control
Product genealogy across the entire process chain
Data storage for big data analytics

QUALITY CONTROL
Corrective actions feed forward and feedback
Rule based expert system
Quality grading

THROUGH-PROCESS KNOW-HOW
Process and quality optimization
Metallurgical and process rules
Product development

Benefits
- Quality management support
- Reduced manual inspection, rework and downgrades
- Support for quality certification (ISO/TS16949)
- Reduced influence of human factor
TPQC keeps track of each product throughout the production chain and thereby directly supports the TS16949 requirements of identification of the product throughout the product realization.
Corrective and Compensational Actions

- **Corrective Action**: Set of actions for resolving the *cause* of the problem.
- **Compensational Action**: Set of actions **compensating** the nonconformities.

Example: slab inspection reveals longitudinal surface cracks on slab
Through process optimization  
KPI Examples

- Overview of production and quality related performance at a glance
- Indicates effectiveness of QM-measures related to quality and process improvements (typically required by automotive industry and acc. quality standards e.g. ISO9001, TS16949)
- Reviewing the effectiveness of corrective actions with respect to quality and production efficiency
- Overview of the achievement of business plan objectives
MAINTENANCE MANAGEMENT
Real time transparency on work, material, assets
Automatic work order suggestions based on your asset strategies
Advanced planning, mobile work execution
Data History for every asset
Link business data to ERP

PREDICTIVE MAINTENANCE
Pre-set link to CMS
Analytics on CMS data and maint history enables predictive maintenance

Benefits
• Smart Maintenance schedule adjusted to order scheduling and vice versa
• Trim your expenses according to the best maintenance strategy for your plant
• Maintenance data available for analytics and deep learning

MAINTENANCE KNOW HOW PACKAGES
1. Actionable items for your team from condition monitoring information
2. Analytics on your growing maintenance know how base
3. Select maintenance strategy to maximize asset performance
   Based on advanced analytics
4. Increase productivity through smart networking with plant data and PMS
Dynamically align production and maintenance schedule

Schedule production based on quality prediction based on condition prediction

Feed TPO learning back to ODS

Re-assign products to customer orders in case of deviations

Know the impact of the plant condition on product quality
The Digital Unity enables steel producers to achieve their targets
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