

# **METALS ORCHESTRA**

INSTRUMENTS FOR  
THE DIGITAL ERA OF STEEL



# THE THREE CENTRAL REQUIREMENTS IN METALS PRODUCTION



Today's metals producers are aiming to further improve their end-product quality, their plant's flexibility, and overall productivity.

## METALS PRODUCTION TODAY

The steel producers of today are facing great challenges, but also have great opportunities. Due to the difficult market conditions in many regions of the world, it has become essential to find a niche in which a producer can excel. The quality of the finalized products is paramount, particularly for higher-end steel grades. But to ensure long-term profitability, it is equally important to ensure that all facilities are running at optimal efficiency at all times. There are three central principles that play a major role in the lives of steel producers who aim to safeguard their future success.



### QUALITY

Maintaining a consistent end-product quality is expected to become even more relevant in the years ahead. Conforming with customer requirements will continue to be the primary target, and producers will have to achieve extremely narrow tolerance bands and a very high degree of reproducibility. However, in addition to these demands, it will become increasingly pertinent to establish a seamless documentation of the intermediate product quality at each production step—both to further streamline the internal manufacturing process and to be able to provide customers with in-depth production data at their request. The more information about each step of the production chain is available, the more precisely adjustments can be made. And should an end product ever miss its target specifications, thorough documentation will make it easier to determine the cause.



### FLEXIBILITY

Flexibility means that the production facilities and routes can be constantly re-adjusted to produce a wide range of steel grades as well as products in very small batch sizes. This makes specific customer requests easier to execute and is an incentive to keep delivery times short. But flexibility also means that different raw materials can be used. This is crucial in today's market environment, because the ability to purchase raw materials from various sources—including the spot market—helps to lower production costs and thereby to stay competitive. Finely tuned and flexible production models are of course a prerequisite for buying input material from varying sources, as the production process has to counteract the fluctuating raw-material quality.



### PRODUCTIVITY

The maximization of productivity entails several aspects, all of which contribute to more efficient plant operations. First, the overall throughput of the plant should be as close to its total capacity as possible. Secondly, the yield should be correspondingly high. Thirdly, plant availability should go toward the ideal of uninterrupted production. Finally, both operational and maintenance costs should be kept to a minimum, while sufficiently covering all areas where investments are necessary. In order to reach all of those targets, steel producers require comprehensive knowledge about their plant, which will enable them to plan for all aspects of their everyday production workflow reliably and in great detail.

# IMAGINE YOUR STEEL PLANT AS AN ORCHESTRA REACHING FOR PERFECTION



Each facility along the metals production chain has to fulfill certain requirements to optimally interact with one another for optimal results. Primetals Technologies has developed the solutions to turn your plant into a world-class "Metals Orchestra."

## THE ANALOGY OF AN ORCHESTRA

At Primetals Technologies, we have developed the Metals Orchestra concept to reflect today's requirements for a fully digitalized facility in the metals industry. We have found that there are striking parallels between the players in an orchestra and the units in a metals-production plant.

### EACH PRODUCTION UNIT IS A "PLAYER"

In an orchestra, all musicians need to be able to play perfectly just by themselves as well as alongside each other. The same is true for a steel plant, where each production unit has to be highly optimized in itself but is also required to flawlessly work together with all other equipment of the production chain. To achieve a high-quality production, great flexibility, and exceptional productivity, all units within the complete production chain (and even beyond) need to be in harmony.

### ASPIRING TO PERFECTION

Every single musician of an excellent orchestra has to be thoroughly trained to reach perfection. He or she also needs a good and well-maintained instrument and the correct music sheet to lay the basis for a proper orchestration of all individual efforts. In metals production, each production facility needs to fulfill certain requirements to participate in a digitalized production setup.

### DIGITALIZED PRODUCTION

So what does a plant have to implement in order to reach a state where its individual units can be directed just like the players of a good orchestra? We have isolated four

technological areas and two corresponding infrastructural trends (discussed in more detail on pages 4 and 5):

- Smart sensors for more information on your plant
- Automatic functions to relieve staff of unnecessary work
- Cyber-physical systems that provide abstractions of your equipment
- Condition monitoring for predictive maintenance
- Connectivity for easy access to your information
- Smart work for a streamlined workflow

### THE CHALLENGE OF TODAY

Today, metals production is already automated to a certain extent. However, the systems in place often work in an isolated manner or with limited interfaces to other systems. The major challenge with the digitalization of the steel-production process therefore is the complete integration of all systems and production units.

### THREE FORMS OF INTEGRATION

This integration takes place in three different dimensions:

- Vertical Integration—the integration of all systems across the established automation levels, from the sensors to the enterprise resource planning system
- Horizontal Integration—the integration of all systems along the entire production chain
- Lifecycle integration—the integration along the entire lifecycle of a plant from basic engineering to decommissioning

# IMPROVING YOUR PLAYERS

## PREPARE YOUR PLANT FOR THE FUTURE

Four technological areas are instrumental in turning your plant into a true “Metals Orchestra:” Smart sensors, automatic functions, cyber-physical systems, and condition monitoring. Additionally, the ever-increasing connectivity of plant equipment and the data-based assistance of the workforce’s day-to-day agenda are also important factors that shape the future of metals production.



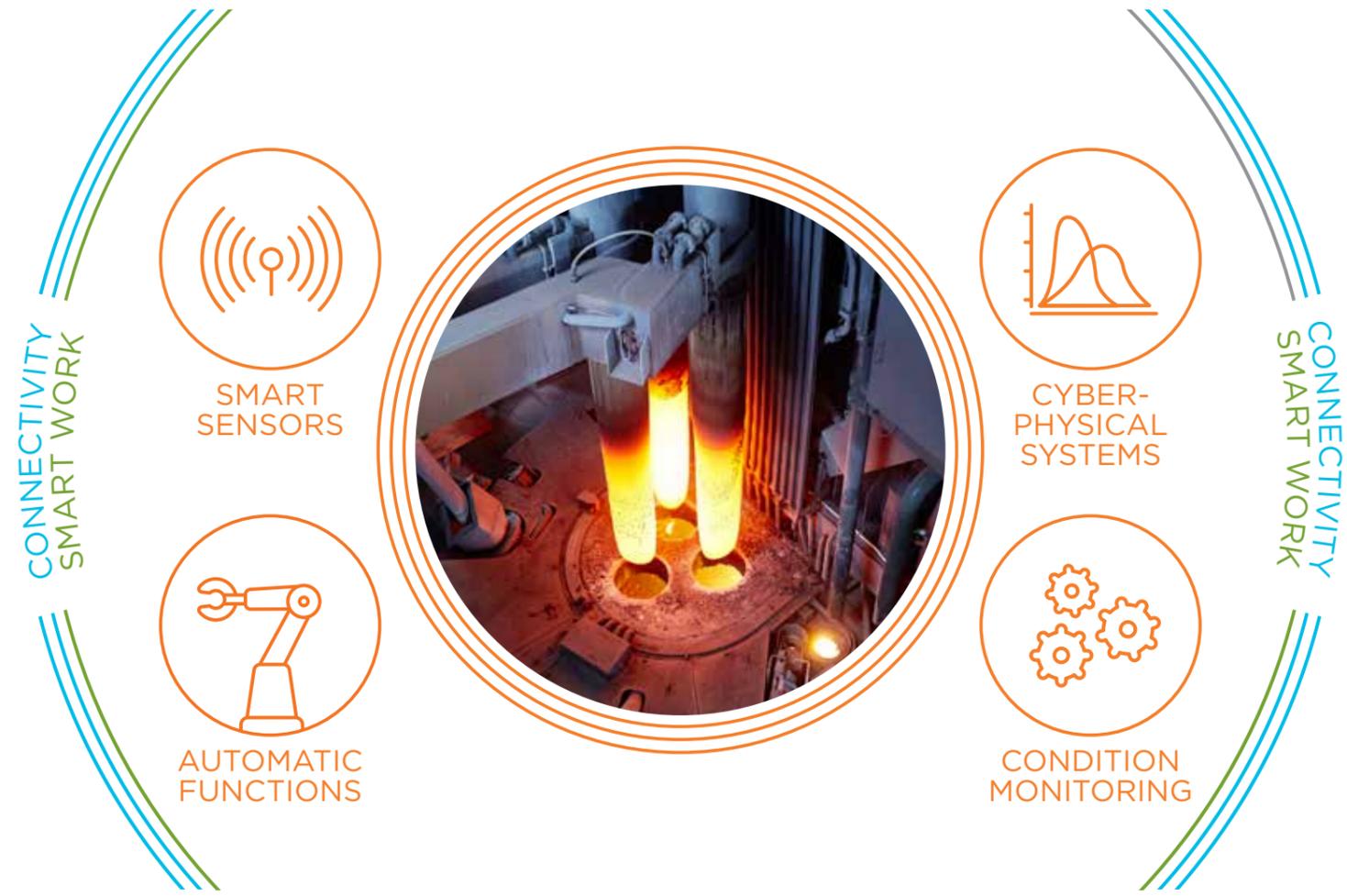
### MAKE YOUR PROCESSES TRANSPARENT

Smart sensors: these kinds of “intelligent” sensors provide essential information about the processes taking place inside the production facility. They either directly measure physical values, or use preexisting data to calculate additional information. This information is the enabler for the implementation of advanced automatic functions, process models, as well as condition monitoring. Overall, the data obtained from smart sensors leads to greater transparency about all production steps, and makes it easier than ever before to improve those processes that could yield a higher performance.



### FOCUS ON THE ESSENTIAL TASKS

Automatic functions: repetitive, labour-intensive, and dangerous work is supported by fully-automated mechatronic solutions and assistance systems. These technologies free up your staff to focus on those tasks where human interaction is actually indispensable.



### YOUR PLANT AND ITS “DIGITAL TWIN”

Cyber-physical systems: the linking of a real steel plant to a virtual version, which then becomes a “digital twin” of the real facility, is the next generation of model-based process control. The fully digital cyber-physical system is based on both modelling and simulations of the actual plant. It can be used online to further optimize the production facility, and also offline for the simulation and development of new production strategies. Furthermore, the models it contains are even used in the design phase of new plant equipment.



### KNOWING HOW YOUR PLANT “FEELS”

Condition monitoring: comprehensive information about the condition of the equipment and the respective processes enables predictive maintenance. This helps to avoid any unplanned outages and save the associated, often very substantial costs. Plant availability is dramatically improved, and plant productivity is considerably raised, as well.

## CONNECTIVITY



### GET CONNECTED - ANYTIME - ANYWHERE

Connectivity: advanced communication technologies can transport plant-related data beyond traditional limitations. Sensor data can be collected even in harsh environments or from mobile equipment. But regardless where the data stems from and what distance it has travelled, it will finally be displayed on the device of your choosing, including tablets and smart phones. In that way, the information gathered in the plant finds its way from the shop floor directly into the “manager’s pocket.”

### ALL THE NECESSARY INFORMATION - WHEN AND WHERE YOU NEED IT

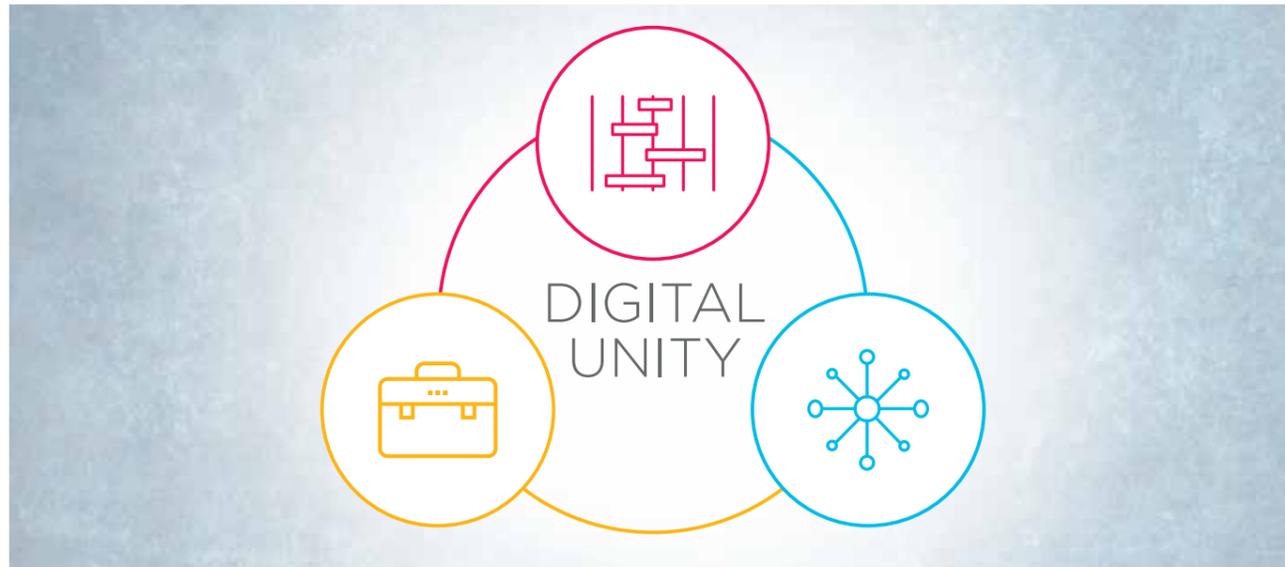
Smart work: to ensure best-possible operation and maintenance of a plant, a vast variety of information sources is required. The core concept of “smart work” is that all personnel will automatically receive exactly the information they require at the time to get their job done. This means that all information is tailored to the actual needs of the staff and serves as the basis for their day-to-day agenda. The result is a highly streamlined workflow.



## SMART WORK

# METALS ORCHESTRA CONDUCTORS

## A “DIGITAL UNITY” OF INTELLIGENT ORCHESTRATION



**PMS**

### PRODUCTION MANAGEMENT SYSTEM

The production management system (PMS) dynamically plans and tracks your production to utilize all facilities at every single step of the production chain in an optimized manner. Customer orders can be transformed into individual process instructions along the full production route, applying deep metals-specific application knowledge. The PMS thereby optimizes productivity, ensures maximum flexibility to your customers' requests, and safeguards product quality.



**TPO**

### THROUGH-PROCESS OPTIMIZATION

Through-Process Optimization (TPO) provides know-how based identification of non-conformities, finds the related root-causes, and suggests corrective and compensational measures throughout the entire production chain. TPO effectively helps to achieve the intended product specifications, increases plant efficiency, and supports quality management. It can dramatically accelerate your time to market with cutting-edge, high-value products.



**MAT**

### MAINTENANCE ASSET TECHNOLOGY

Maintenance Asset Technology (MAT) supports you in managing and executing your maintenance efforts in an entirely new way. Built-in application knowledge generates actionable items for the maintenance staff to carry out. All suggestions are devised in accordance with your core maintenance strategy, and aim to increase the efficiency of your maintenance efforts. Advanced analytics can be used to gain further insight into the ongoing maintenance activities.

# MAKE YOUR PLANT A MASTERPIECE

## WITH OUR INSTRUMENTS FOR THE DIGITAL ERA OF STEEL



### METALS ORCHESTRA VIDEO

Scan the QR code to the left or follow the link below to watch our video about the digitalization of the metals industry on YouTube.  
[www.primetals.com/PMF0099](http://www.primetals.com/PMF0099)

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