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**PREDICTIVE MAINTENANCE WITH  
ADVANCED CONDITION MONITORING**  
MAXIMIZE MILL UTILIZATION WITH THE  
INDUSTRY'S MOST COMPREHENSIVE  
PREDICTIVE MAINTENANCE SOLUTION

# THE MOST TRUSTED PROVIDER BY MORE THAN 200 STEEL ROD AND FLAT ROLLING MILLS AROUND THE WORLD

## MAXIMIZE MILL UTILIZATION

Unscheduled downtime due to mechanical equipment failure can be costly and time consuming, while catastrophic equipment failure can be devastating to a company's bottom line. Complex rotating equipment with variable speeds and loads have hundreds of bearings, gears, shafts, seals, couplings, and other component interfaces and alignments, any of which could face imminent failure or develop problems that could lead to sudden failure. These issues are often undetectable through traditional preventive maintenance programs or standard vibration monitoring methods such as RMS trending and screening. If an issue is identified using traditional methods, it is often discovered too late in the component's failure cycle to allow you to react in a timely and cost-effective manner.

Detecting developing issues before they become catastrophic failures is one of your most challenging tasks. Early detection of problems is key to extending the life cycle of your critical equipment and maximizing your asset utilization. Early and specific identification of the failing component provides insight into the operating condition of your equipment. It also provides direction to your maintenance activities and better use of your fixed resources. To identify equipment defects in their earliest stages, your equipment needs regularly scheduled periodic vibration signature analysis.

With more than 125 years of

experience in the design and production of high-speed rolling mill equipment and after more than three decades as a pioneer in the vibration condition monitoring industry, Primetals Technologies is uniquely qualified and capable of connecting mechanical vibration signatures to potential issues related to equipment design and function. Primetals Technologies is the only vibration analysis service provider offering full signature analysis and reporting on every measured asset, every time, without exception. Full vibration signature analysis is the only way to reliably analyze variable load, variable speed machinery, and is the best analysis method available to detect the greatest number of equipment defect modes at the earliest point in their development.

What allows Primetals Technologies to perform signature analysis 100% of the time is our proprietary, interactive and intelligent software, coupled with our world-class collection of service technicians and analysts. Our analysts have access to the greatest amount of vibration data, which allows Primetals Technologies to provide you with the clearest possible picture of your equipment's condition. Our simple yet highly practical reports include full current and historical analysis summaries, alert severity, and comprehensive reporting on what we see. We identify the vibration source, root causes, and suggest the preventive or corrective action needed to efficiently and effectively focus maintenance activities on areas of greatest concern.

Primetals Technologies partners with our customers. Our key focus is to keep your equipment running at maximum production capability.

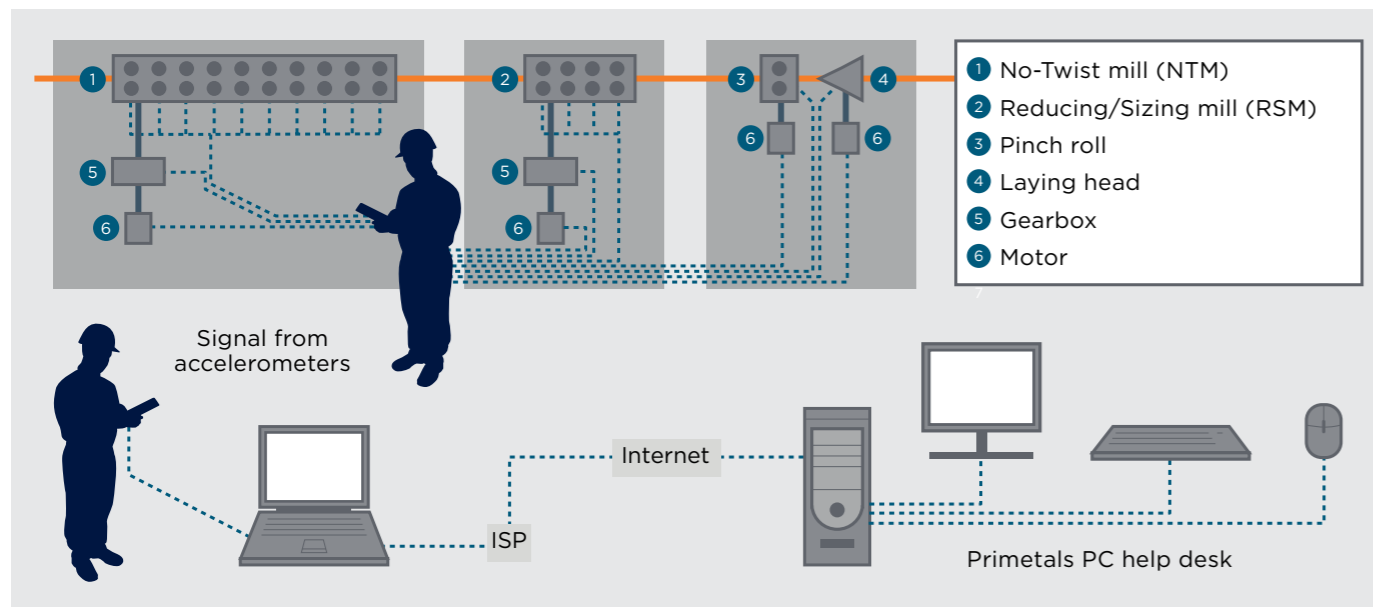
## ADVANTAGES OF PRIMETALS TECHNOLOGIES CONDITION MONITORING

- Correlates vibration signatures to equipment design and function, providing our customers with the most expert, practical vibration analysis services in the industry
- Analyzes and reports on every measured feature every time, without exception, to reliably analyze variable load, variable speed machinery
- Utilizes proprietary software specifically designed for complex, variable load, variable speed equipment.
- As process focused service provider, Primetals Technologies seeks to serve as most effective and efficient vibration analysis provider in the world.



# COMPREHENSIVE SOLUTIONS

## UNIQUE SYSTEMS FOR YOUR NEEDS



Periodic vibration data collection and analysis process architecture

### FULL RANGE OF CONDITION MONITORING SOLUTIONS

Condition monitoring is the cornerstone discipline of most Predictive Monitoring (PdM) programs and provides the critical data for many proactive maintenance decisions. Primetals Technologies works closely with our customers to develop risk-based, hybrid, cost-justified vibration monitoring and analysis solutions. As a full vibration analysis provider, Primetals Technologies ensures the right PdM solution is applied to each asset type based on our customer's industry, operation, and application.

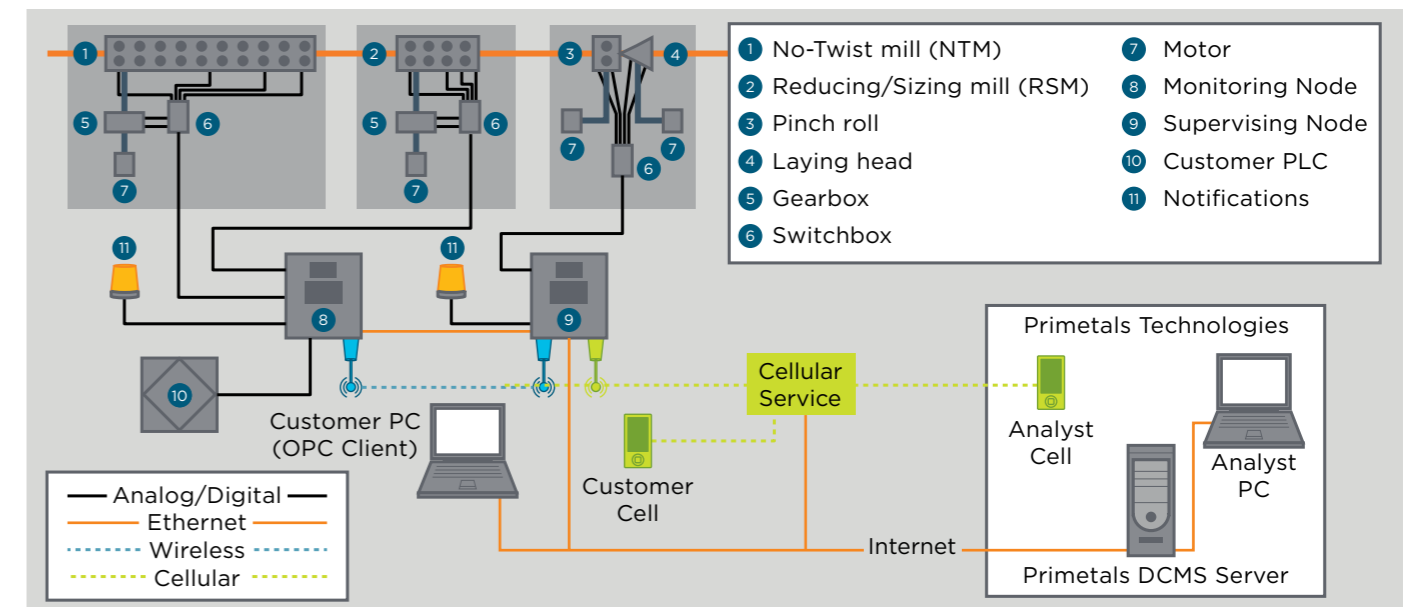
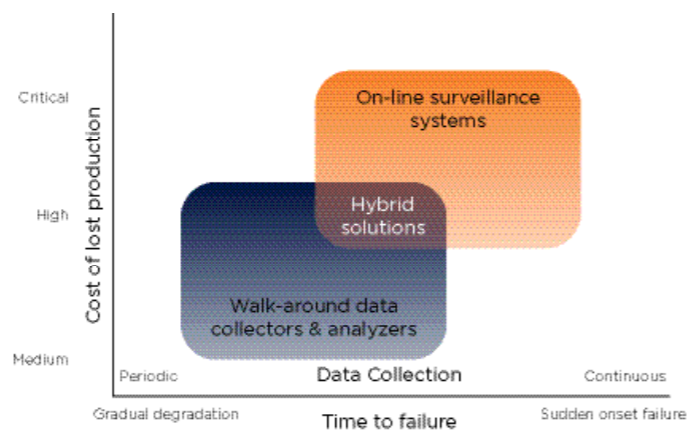
### VIBRATION ANALYSIS PROGRAM - HOW IT WORKS

- Data collected by customer or Primetals Technologies
- Analyzed by Primetals Technologies Predictive Services
- Analysis report with findings and recommendations issued to customer
- Training provided to customer
- No-cost lease for analyzer

### PERIODIC VIBRATION DATA COLLECTION AND ANALYSIS

The Primetals Technologies Periodic Vibration Monitoring Program is a route-based vibration analysis (VA) solution that uses trained customers or Primetals Technologies personnel for data collection on a periodic basis, often monthly, coupled with expert analysis and reporting by Primetals Technologies Predictive Services. This service is the most cost-effective and flexible option available and can easily be expanded to monitor more of the mill equipment if required. Each measurement point contains a set of 3 data measurements taken simultaneously, one in each of the X, Y, and Z axis. This tri-axial data collection provides for safer and more time efficient data collection as well as more integrated information for better analysis.

Data collection will be performed based on strategic measurement points arranged in an efficient "route" along the equipment to be evaluated, providing optimal coverage for maximum reliability and minimum down time.



Dedicated Condition Monitoring System (DCMS) process architecture

### DEDICATED CONDITION MONITORING SYSTEM (DCMS):

Primetals Technologies engineers developed Computerized Vibration Analysis (CVA) over 25 years ago. Since that time, we have led the industry with our unparalleled understanding of how variations in speed, load, product, product temperature, product grade, ambient temperature, operator choices and other factors can influence reliability and performance.

Many online dedicated continuous monitoring systems (DMCS) simply do not work as advertised. An effective DCMS must be ready to act locally and independently of external communication networks. Primetals Technologies, dedicated condition monitoring systems are built with intelligent monitoring nodes that apply both adaptive and static rules to real-time condition data to provide immediate, local alerts. In addition, local nodes communicate with the Primetals Technologies centralized web portal to allow its expert staff to analyze real-time data as it happens.

With real-time condition monitoring of critical equipment, you can have an unprecedented level of confidence in the reliability of your equipment. You can remain confident that the Primetals Technologies system will alert you to immediate or emerging problems with its intelligent, on-site nodes that, even during internet outages, can alert you to immediate potential problems.

### PRIMETALS TECHNOLOGIES DCMS PROVIDES:

- 24/7 equipment monitoring and feedback to system alarms independent of external networks
- Expert analysis by the most experienced staff in the industry
- Full analysis of data submitted by the customer or the Primetals Technologies Predictive Services remote system

### PRIMETALS TECHNOLOGIES DATAMANAGER

All customers who opt for our periodic vibration analysis program receive access to our online web portal: Primetals Technologies DataManager™. A Computerized Maintenance System (CMMS) focused on PdM it automatically populates full asset analysis data into your account. The system allows for data sorting by date, alert severity, asset type, etc., and includes charting features and collection/presentation of historical data for internal continuous improvement activities, ISO and QC documentation and corporate reporting. This exclusive and powerful asset management tool is included in the cost of the Primetals Technologies vibration analysis program.

# COMPREHENSIVE SUPPORT FINDS PROBLEMS THAT OTHERS MISS



Engineering support



Oil analysis

## FULL SERVICE PROVIDER RESPONDS TO ALL YOUR MILL MAINTENANCE NEEDS

- Vibration analysis services
- Balancing and alignment
- Machinery diagnostics
- Root cause analysis
- Motor testing
- Oil analysis
- Infrared thermography
- Bearing failure analysis
- Mechanical-lubrication-process audits
- On-site training
- Reconditioning services
- Engineering support
- Spare parts
- Full modernization and upgrade projects

## TECHNOLOGY AND EXPERIENCE

- Primetals Technologies, proprietary, interactive and intelligent analysis software, coupled with vast experience analyzing assets in the steel industry, enables Primetals Technologies' experienced vibration analysts to identify complex problems that screening software packages miss. Because of the cost and safety implications of one failure, Primetals Technologies leverages technology to improve analysis accuracy and speed without jeopardizing our customer's assets.
- Combination of long-standing experience of the former Morgan (USA), Ashlow (United Kingdom) and Pomini (Italy) companies delivers comprehensive life-cycle support for your mill
- More than 125 years of practical machine design and build experience allows us to more accurately correlate vibration data readings to equipment design and function, thereby providing more accurate, insightful analysis
- Largest single collection of senior analysts in the world, sharing information daily
- Services more than 200 mills the U.S. and in 20 countries
- Decades of data on similar machines means Primetals Technologies sees everyone's problems



Reconditioning services



Protect your critical mill assets

## PRIMETALS TECHNOLOGIES PROCESS

Measurement, analysis & reporting on every asset, every time, without exception:

- No shortcuts or filtering
- Phase analysis performed on every bearing
- Avoidable problems identified before they become actual problems
- Fewer missed problems and false alarms
- Only reliable system to analyze variable load/speed machinery

Proprietary software for complex, variable load, variable speed equipment:

- Gearbox calculations completed 50-100x faster
- All potential failure modes considered

Primetals Technologies owns, develops and continually improves its own technology:

- Analysis not limited by OTS hardware and software
- Ability to tailor service to customer needs

Process-focused service provider with measurable efficiency objectives:

- Less than 3 day report turnaround
- Dangerous and emergency conditions reported immediately
- 24/7/365 emergency response available

## IDENTIFIABLE COMPONENT FAILURE MODES

	Primetals Technologies vibration signature analysis	Major VA competitors (Online or route-based)	Shock, pulse method (SPM)	Routine PMs and visual inspections
Loose, worn or misaligned belts	✓	±	✗	±
Early roller bearing degradation	✓	✗	✓	✗
Early sleeve bearing degradation	±	±	✗	✗
Sudden sleeve bearing failure	✗	✗	✗	✗
Sudden roller bearing failure	✗	✗	✗	✗
Fan, pump, compressor imbalance	✓	✓	✗	✗
Electrical problems	✓	±	✗	✗
Coupling misalignment/looseness	✓	±	✗	✗
Overall or component looseness, soft foot	✓	✓	✗	✗
Gear wear, worn or broken gear teeth	✓	±	±	✗
Improper lubrication, worn seals	✓	±	✗	±
Vane-pass, blade-pass, cavitation	✓	✓	✗	✗

✓ Effective application  
 ± Application works intermittently or occasionally  
 ✗ Inappropriate application, ineffective or N/A

Vibration signature analysis identifies more failure modes sooner

# CUSTOMERS WE SERVE

## COMPLEX MACHINERY EXPERTISE



High-speed rod rolling Morgan No-Twist Mill



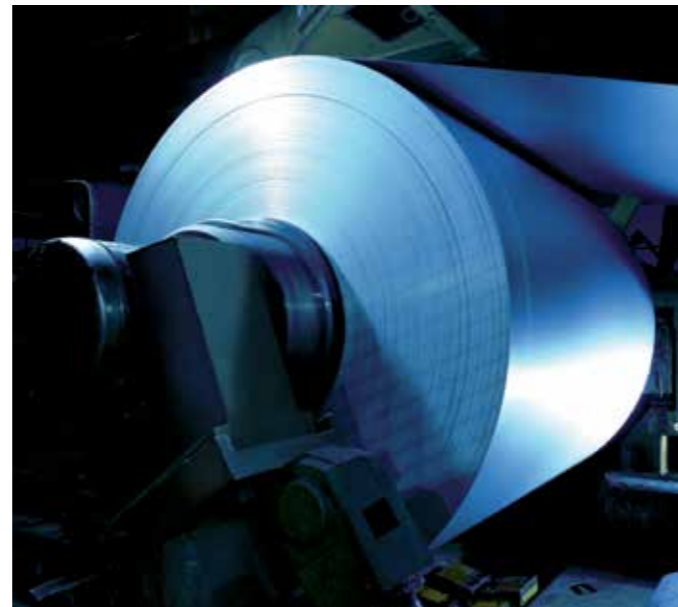
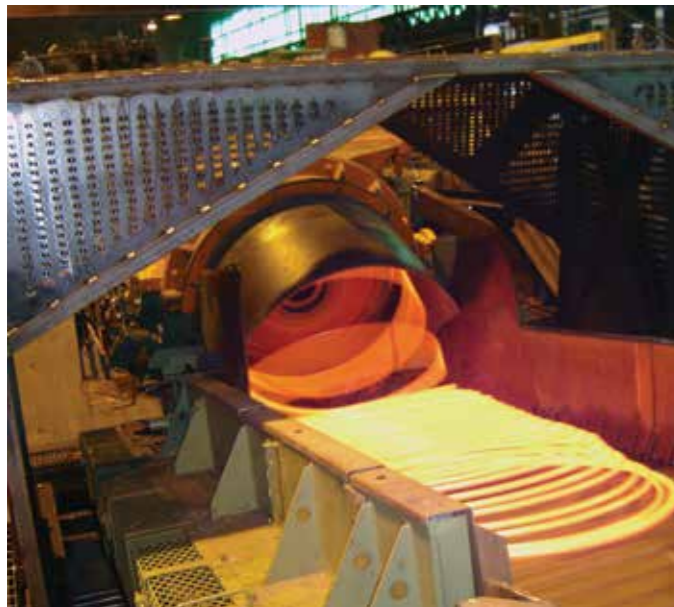
Hot strip mill

### HIGH-SPEED ROD, WIRE, BAR AND SECTION ROLLING MILL LINES

- Roughing mills
- Pre-finishing mills
- No-Twist® and rod sizing mills
- Pinch rolls, shears
- Laying heads
- Motors, gearboxes, fans, pumps, blowers
- Auxiliary equipment

### PLATE AND FLAT STRIP ROLLING MILL AND PROCESS LINES

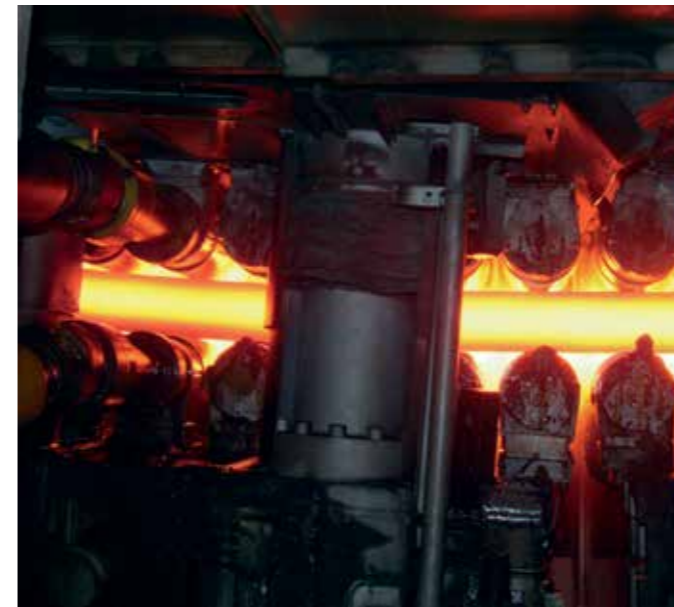
- Plate and flat strip rolling mills
- Pinion stands and gearboxes
- Edgers
- Pinch rolls, shears
- Payoff, take-up equipment
- Motors, gearboxes, fans, pumps, blowers
- Auxiliary process equipment



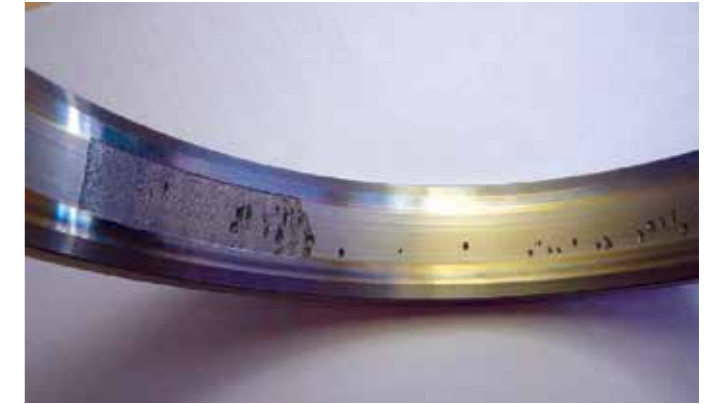
Continuous slab caster

### PLATE AND BILLET CONTINUOUS CASTING LINES

- Ladles, turrets
- Tundish, oscillator, bending segment
- Edgers, shears
- Runout tables
- Lifting and transport equipment
- Motors, gearboxes, fans, pumps, blowers
- Auxiliary equipment



### VOICE OF THE CUSTOMER



"We are very satisfied with your support and very impressed from accuracy of analysis. We replaced GA bearing on weekend and found strong damages on outer race after disassembling the bearing as you can see on attached pictures..."

Gunter Korp - Maintenance Manager,  
voestalpine Austria Draht GmbH



"We thought you'd appreciate some feedback on another one of your teams' successful predictions. May 4th report highlighted a problem with our strand 1 laying head drive, suggesting that we inspect the cylindrical roller bearing, paying particular attention to the inner race for defects. As the photos attached show, your diagnosis was spot-on, inner race damage. This is not the first time you've accurately diagnosed defective equipment, which, if ignored, would have caused us greater trouble."

Stuart Jones - Planning Engineering,  
Celsa Manufacturing (UK)  
Ltd Rod & Bar Mill Cardiff

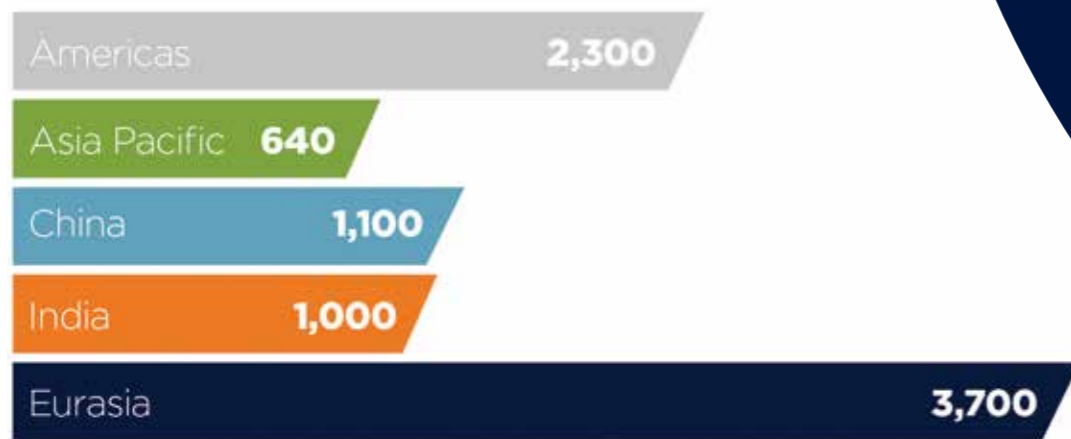
# GLOBAL NETWORK

Nearly 9,000 employees of Primetals Technologies are based in more than 40 company offices, engineering, workshops and service centers to provide immediate support to our customers whenever required. With the added backing from the international office network of the parent companies Siemens and Mitsubishi Heavy Industries, more than 300 group sites located in some 190 countries are at the service of our customers.

## GLOBAL NETWORK OF COMPANY OFFICES AND ENGINEERING, MANUFACTURING AND SERVICE CENTERS



### EMPLOYEES WORLDWIDE\*



London is the headquarters of Primetals Technologies

\*Approximate values

**Primetals Technologies USA LLC**

A joint venture of Mitsubishi Heavy Industries and partners

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