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# **MINERAL PROCESSING**

## SPECIALIZED IN IRON ORE BENEFICIATION

# TAKE ADVANTAGE OF OUR FULL-LINER EXPERTISE FROM RUN-OF-MINE TO PELLETS

With more than 60 years of experience, we're your leading global engineering, plant-building, and lifecycle partner for solutions throughout the entire iron and steel production chain.

## WHAT YOU CAN EXPECT

- Metallurgical expertise in beneficiation and the entire iron- and steelmaking process
- Optimal processing route for your specific feedstock
- Process development and engineering services
- Tailing beneficiation service
- Hybrid flotation technology



### IMPLEMENT CUSTOM AUTOMATION AND INDUSTRY 4.0 SOLUTIONS

From basic control mechanisms to fully automated plants: You'll benefit from customized solutions equipped with the latest features like cloud services and sound-based software monitoring.



### SELECT THE PERFECT PROCESS EQUIPMENT FOR ACHIEVING YOUR OBJECTIVES

You'll profit from the portfolio of global processing equipment suppliers that are highly advanced in their specific fields. We're not limited to a single supplier.



### SPECIAL PRODUCT SOLUTIONS FOR YOUR SPECIFIC NEEDS

In addition to our worldwide selection of equipment suppliers, you'll be able to take advantage of our own developments like hybrid flotation technology, which efficiently separates ultra-fine particles.



### COLLABORATE WITH THE WORLD'S LEADING PARTNERS

With your specific project requirements in mind, we select the most appropriate partners from our global network of laboratories, universities, and institutes. We only consider partners with outstanding qualifications to ensure the success of your project.



### ENGINEERING, PROCUREMENT, AND CONSTRUCTION MANAGEMENT (EPCM)

We provide you with a wide range of services covering the complete scope of supply. In several markets you can choose from basic engineering services, a full-process turnkey scope that includes advisory services for construction and commissioning, and even management services for the civil and construction phases.



### UTILIZE OUR IN-DEPTH EXPERTISE IN GREENFIELD AND BROWNFIELD PROJECTS

Benefit from our vast global experience in engineering and plant-building and intelligent solutions for your greenfield or brownfield projects.

## ASSESSMENT



From target definition to cost evaluation

## PROCESS DEVELOPMENT



Raw material characterization



Small-scale laboratory test work



Pilot-scale test work



Raw material (Run-of-mine)

## PLANT DESIGN



Pre-engineering



Basic and detail engineering

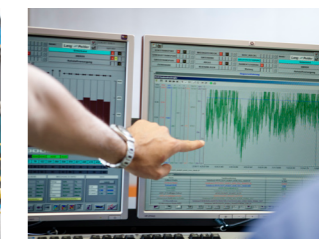
## ENGINEERING, PROCUREMENT AND CONSTRUCTION MANAGEMENT (EPCM)



Equipment supply incl. automation



Erection supervision



Commissioning and start-up



Process control



Pellets

# PROCESS DEVELOPMENT AND ENGINEERING SERVICES

## MAKE IT HAPPEN WITH OUR FULL-LINER EXPERTISE

Constant development is essential to staying competitive in the iron- and steelmaking business. With our extensive experience in mineral processing and beyond, we have a thorough understanding of your entire process route, product quality, and technical issues. Our focus is to provide a wide range of process design and engineering services to optimize your beneficiation process.

### Process design



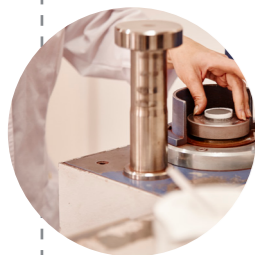
#### RAW MATERIAL ASSESSMENT

Our metallurgists and process experts evaluate the beneficiation potential of your raw materials and advise you on opportunities for mineral processing.



#### PROCESS AUDIT

We audit your processes on-site to identify potentials for process improvements.



#### LABORATORY AND PILOT TEST WORK

We conduct beneficiation testing for you at all scales in our own facilities and in close partnerships with renowned institutes and universities worldwide.



#### PROCESS SIMULATION

We execute software-based process simulations of your existing and future mineral processing plant. A mineral process simulation is embedded in our integrated simulation of your entire iron- and steelmaking route.

### Engineering services



#### PLANT AUDIT

Specialized teams with specific competencies conduct audits at your plant to identify potentials for brownfield improvements.



#### PRE-, BASIC, AND DETAIL ENGINEERING

We provide you with basic and detail engineering services at all stages of plant design.



#### CAPEX/OPEX ANALYSIS

We support you with CAPEX estimations in early project stages, detailed feasibility studies including consumption figures, and OPEX analysis – also embedded in studies covering your entire iron and steel process route.

### YOUR ADVANTAGES

- Reliable basis for pellet and DRI/ HBI production
- Highest profitability in the ironmaking process
- Development of projects that can withstand market fluctuations
- Improved competitiveness

### PROJECT SAMPLE

#### 16 x 1 mtpy mineral processing plant for magnetite

##### Challenge:

Use existing equipment to the greatest extent possible at an ironmaking plant.

##### Solution:

A variety of upgrade measures to improve the efficiency of the beneficiation process at a Kazakh ironmaking plant. Improvement measures included the application of an advanced slurry-handling and ore-treatment procedure, a more effective dewatering and filtering system, and an innovative binding agent that reduced the quantity of required additives. These measures allowed the iron content of the iron ore concentrate and resulting pellets to attain a concentration of 69.17 percent and 66.5 percent respectively.

All laboratory, pilot, and pelletizing tests were performed in the labs at Primetals Technologies in Austria.

- + Test work expertise
- + Full-liner know-how

# FROM PLANT DESIGN TO PLANT OPERATION

## ONE PROVIDER ONLY - EXPLOIT YOUR PLANT'S FULL POTENTIAL

Primetals Technologies ensures that your beneficiation plant achieves the agreed-on quality and efficient and consistent operation.

Due to our worldwide presence, long-lasting experience in the implementation of projects, and know-how all over the mineral processing chain, we can also offer an Engineering, Procurement and Construction Management (EPCM)-scope for our projects in selected markets.

Greenfield projects require a sequence of phases, often starting with initial/ pre- engineering followed by the basic and detail engineering stages. Visualizations and smart 3D models lead the way through a successful design phase. By supplying the ideal equipment and our support with construction and commissioning consulting, we're your expert partner for successful project implementation. Once your plant is in operation, Primetals Technologies provides services including mechanical spare parts and on-site or cloud-based process consulting.

We're your reliable partner for all phases of your greenfield project.

EPCM realization on time and at the agreed quality



### YOUR ADVANTAGES

- Design and setup of reliable plants that are easy to operate
- Fast and smooth start-up
- High plant performance and profitability

### PROJECT SAMPLE

6 mtpy mineral processing plant for magnetite in Russia

#### Challenge:

Design, supply, erection, and commission a mineral processing and material handling plant that provides raw materials and additives for the pelletizing process.

#### Solution:

A plant with all components working together perfectly and smoothly: The plant dewateres the iron ore concentrate by thickening and filtration. A water treatment plant recovers the process water for re-use.

The train unloading station and pre-trying station ensures a constant supply of bentonite. Using hot gas grinding, the installed vertical mill grinds the bentonite to the required quality for the pelletizing process. To ensure constant quality parameters, we also installed sampling towers for the raw materials and fired pellets. By taking and preparing samples from the continuous material stream, the sampling systems ensure a fast cycle time and quick response to material parameters.

- + A single point of contact throughout the process chain
- + Low CAPEX and OPEX



**YOUR ADVANTAGES**

- Processing of ultra-fine and low-grade ores
- High recovery rate
- Low energy consumption
- Increased profit

- + Unique cell design
- + Recovery of ultra-fines

## HYBRID FLOTATION TECHNOLOGY BENEFIT FROM OUR LATEST TECHNOLOGIES

In addition to the available mechanically agitated and columnar flotation cells, Primetals Technologies offers its innovative hybrid flotation technology. You'll benefit from a technology that can recover ultra-fine particles but doesn't require a lot of space.

**OUR INNOVATIVE HYBRID FLOTATION TECHNOLOGY**

The Hybrid Flotation Cell developed by Primetals Technologies combines a pneumatic flotation principle with a column method. The technology uses the turbulent swirling motion of feed slurry and flotation gas in the mixing chambers of the ejector system before injecting them into the cell - with short retention times.

This significantly enhances the frequency of contact between the gas bubbles and very fine particles - for a high recovery and increased profits. The Hybrid Flotation Cell also doesn't require an impeller system, which means no wear and friction on any rotor or stator.

**PROJECT SAMPLE**

0.11 mtpy hybrid flotation plant for tungsten

**Challenge:**

Enrichment of tungsten in a brownfield beneficiation plant in Austria.

**Solution:**

Installation of our hybrid flotation technology for recovering tungsten particles in a brownfield beneficiation plant. The existing conventional flotation cells in the plant lost coarse tungsten particles, which were still partly associated with gangue. The Hybrid Flotation Cell's unique flotation principle recovered these tungsten particles in the tailing flow and recirculated the concentrate to the grinding stage. After an in-situ test phase using the Hybrid Flotation Test Cell, the appropriate industrial system was implemented.

## TAILING BENEFICIATION SERVICE

### GET MORE PROFIT FROM YOUR TAILINGS AND REDUCE YOUR ECOLOGICAL FOOTPRINT

Our tailings beneficiation plant is designed to recover valuable iron minerals from dumped deposits. By reprocessing them in our tailings beneficiation plant, you can extract a marketable iron concentrate quality. In conjunction with our innovative business model, you'll get an efficient and environmentally sustainable solution that re-utilizes your secondary raw materials, resulting in profits with no initial investment.

**ASSESSMENT SERVICES**

We assess tailings for their beneficiation potential based on chemical, physical, and mineralogical analyses.

**PILOT TESTING SERVICE**

When there are promising assessments, the tailings are tested in our laboratories at small and pilot scales. The results of the tests show the feasibility of the tailings beneficiation in detail.

**BENEFICIATION SERVICE**

In selected projects, Primetals Technologies can offer an innovative build, own, operate/ transfer (BOO/T)- model. We build and operate tailings beneficiation and dewatering plants for our customers based on an offtake agreement.

**YOUR ADVANTAGES**

- Reduced disposal costs and disposal management activities thanks to recovery of tailings
- Flexible plant configuration thanks to modular machine design



- + Service-based solutions
- + Standardized plants

# YOUR TRUSTWORTHY BUSINESS PARTNER FOR MINERAL PROCESSING SOLUTIONS

Primetals Technologies offers specialized solutions for iron ore beneficiation and tailings management and processing. Extensive knowledge of downstream iron production technologies along with access to a large network of renowned institutes and universities means that we're uniquely positioned to focus on the entire ironmaking route - and can therefore optimize our customer's entire value chain in terms of CAPEX, OPEX, and product quality.

Our applications are driven by key factors like minimized ecological footprint, proven sustainability, a high degree of automation, and autonomy in the choice of processing equipment.



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