

Metso

DC Smelting



Flexible, sustainable, and cost-efficient

Metso's Outotec DC (Direct Current) Smelting Furnace is a cost-efficient, sustainable, and compact solution for ferroalloy processing. It can be used for direct smelting of fine ores, even those with highly variable chemical or mineralogical compositions, as well as for recycling challenging by-products like steel dust. The furnace capacity is custom-designed for your specific application, and can easily be scaled up to meet changing requirements.

The flexibility of the Metso's Outotec DC Furnace opens up opportunities for exploiting reserves that would have been considered economically unattractive using conventional smelting technology. Typical applications include fine chromites, ilmenite, low-grade laterites, and dust generated during steel production, especially stainless steel.

Robust, safe, and easy to operate, our DC furnace solutions are custom-designed for each individual application. The optimized furnace and feed system layout makes it a highly cost-efficient solution with a low CAPEX requirement. Cost-efficiency is further improved with the possibility to use cheaper, lower-grade reductants such as anthracite or coal.

We can provide a complete solution for a wide range of production capacity requirements, with typical furnace power ranging from 10–45 MW. Our offering includes proprietary technology, process design, and fabrication services, as well as supervision, training, and operation and maintenance services.

An experienced technology partner

Metso has a long history of success in project deliveries. Our vastly experienced personnel and harmonized project management processes ensure agreed project budgets and schedules are adhered to. Metso has the test campaign capabilities as well as the supplier and partner network necessary to deliver successful projects, from studies to complete technology packages and EPC(M) agreements.

Benefits

- Enables direct smelting of ores with fine particle sizes
- Accurate process control with high metal recovery, even with lower-grade ores
- Cost-efficient recycling method for challenging by-products
- Cuts operational cost with the ability to use low-cost reductants
- Optimized layout and design ensures lower CAPEX and better economies of scale for smaller plant capacities

Huge range of potential applications

One of the biggest benefits of DC smelting technology lies in recycling applications. It can be used to process and recover valuable metals from materials such as the dust resulting from the production of steel and other metals. Traditionally these materials would have ended up in landfill, but with Metso's Outotec DC Smelting they can be processed without any agglomeration.

Metso's Outotec DC Smelting is suitable for a wide range of commodities and applications, including:

- Ilmenites (Ti) and titaniferous magnetites (Ti, V)
- Chromites (Cr)
- Laterites (Ni)
- Steel-plant dusts (Ni, Co, Cr)
- Slag cleaning (Co, Cu, Ni, V)
- Blast furnace slag (Pb and Zn fuming and condensing)
- Platinum group metal smelting (including Pt and Pd)
- Dolomites and magnesites (Mg)

We have successfully completed smelting test campaigns with chromite, titanomagnetite, and ilmenite at our Pori Research Center in Finland. Prereduction test campaigns can be carried out in parallel with smelting test campaigns.

Combining DC smelting with other Metso technologies

Metso's Outotec DC Smelting can be combined, for example, with the Metso's Outotec Ferrochrome Process to enable efficient treatment of all side streams.

DC Smelting can also be combined with Metso's Outotec Rotary Kiln for energy-efficient ilmenite smelting, or Metso Circulating Fluidized Bed technology as part of the modified Metso Circonickel process for laterite smelting.

Technical overview

- Continuous electrical direct current supplied by transformer and rectifier
- Graphite electrode forms negative cathode and bottom of the furnace the positive anode
- Smelting energy supplied by open plasma arc
- Raw material reduced at high temperature with carbon reductant such as anthracite or coal
- Alloy sinks to bottom and slag floats at top; these are tapped intermittently through dedicated tap holes
- Off-gas – mainly carbon monoxide – is cleaned and can be reused as combustible fuel

Proprietary key equipment

Because we design and manufacture all the key equipment associated with Metso's Outotec DC Smelting Furnace, we are also able to supply process guarantees.

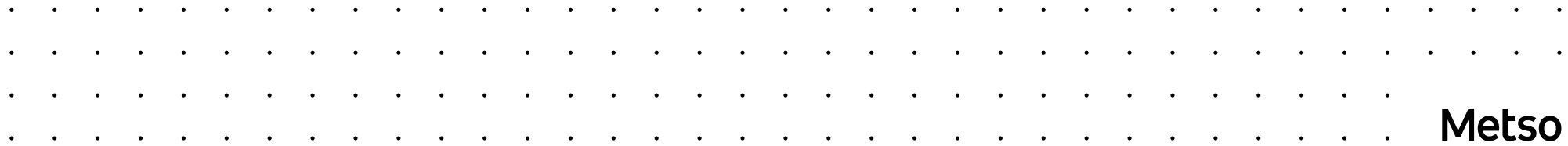
Key equipment includes:

- Metso's Outotec Furnace Feed System
- Metso Furnace Water-Cooled Shell, Roof, and Electrode Seal
- Metso's Outotec Graphite Electrode Equipment
- Metso High-Current Conductors and Flexibles
- Metso's Outotec Bottom Anode
- Metso's Outotec Venturi Scrubber
- Metso's Outotec CO Gas Filter
- Metso Cogeneration
- Metso's Outotec Smelting Plant Control System
- Equipment for selected downstream processes – for example, slag granulation and pig iron casting



Metso is a frontrunner in sustainable technologies, end-to-end solutions and services for the aggregates, minerals processing and metals refining industries globally. We improve our customers' energy and water efficiency, increase their productivity, and reduce environmental risks with our product and service expertise. We are the **partner for positive change**.

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