

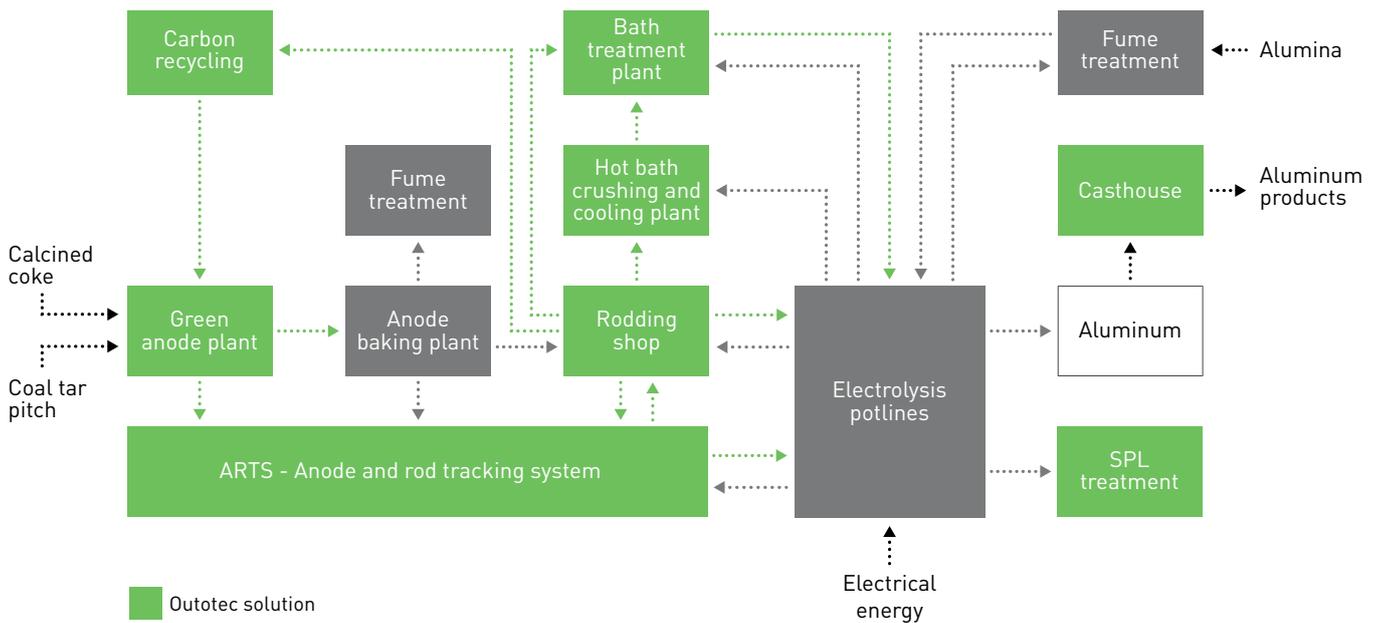


# OUTOTEC ALUMINUM SOLUTIONS

**Our aluminum processing offering is based on our proven, reliable proprietary equipment portfolio and our comprehensive service expertise. We provide complete solutions for paste plants, rodding shops, carbon recycling plants, bath treatment plants, and casthouses, as well as plant upgrades. We are committed to innovation and continuous improvement and have a strong track record, having served every major aluminum producer in the world.**

## BENEFITS

- Extensive expertise in all processing and production stages
- Advanced technologies, developed through continuous R&D
- Complete life-cycle solutions, from design to operation and maintenance
- Custom-designed solutions for every step in your process flow
- Long-term partnership supporting sustainable, profitable, and safe operations



## COMPREHENSIVE SUITE OF PROCESSING AND PRODUCTION SOLUTIONS

Outotec provides proven business solutions and comprehensive expertise in the field of paste plants, rodding shops, carbon recycling plants, bath treatment plants, and casthouse machinery.

We are committed to continuously developing equipment for our customers' production plants, enhancing the production process and taking care of the entire delivery.

### With you every step of the way

We can custom-design solutions for every step in your process flow. Working with a single, experienced technology provider is not only more cost-effective, it also saves you the time and hassle of coordinating with multiple suppliers.

Our aim is to build a long-term partnership that will support sustainable, profitable, and safe operations. Projects may begin with a feasibility study and can range from smaller upgrades of existing equipment to larger technology packages and complete turnkey plant delivery.

We support you with a wide range of design, operation, and maintenance services through our global service center network.

### Our service expertise covers:

- Feasibility studies
- Risk management
- Project management and control
- Basic and detailed engineering
- Proprietary and global equipment supply
- Site supervision
- Plant commissioning and start-up
- Maintenance and operations support



## PASTE PLANT SOLUTIONS

We provide a complete range of technologies and process solutions for green anode manufacturing, both for new-build plants and the upgrading of existing facilities. We can design a solution based on your flowsheet, or recommend a proprietary solution based on our innovative process technologies.

Outotec paste plant solutions are designed for excellent reliability and availability. They are based on highly efficient anode-forming technology that uses vibrating compactors to produce high-quality anodes with consistent properties and low variability. We are the leading supplier of anode vibrating compactors to the aluminum industry.

### Paste plant applications

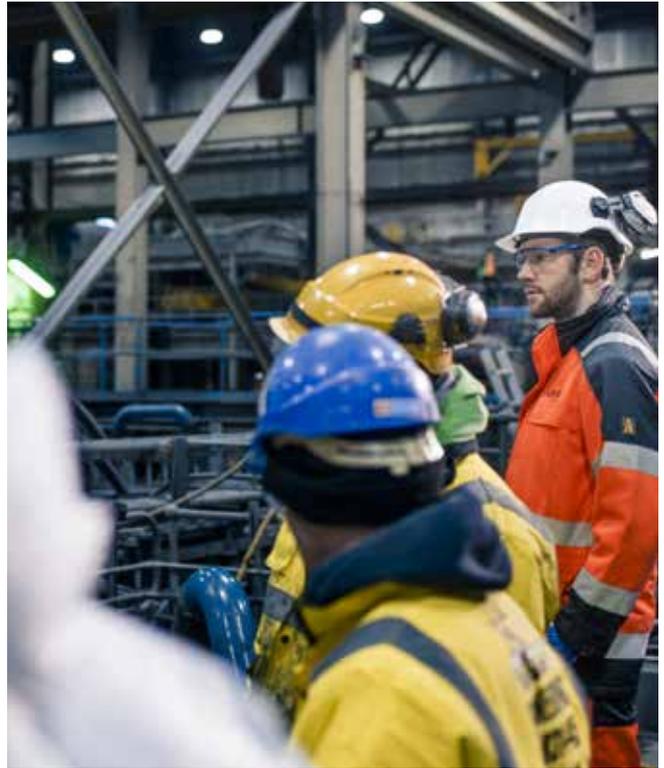
- Screening and crushing of calcined coke and recycled anode scrap for fraction classification
- Fine milling of undersize coke material using an air-swept ball mill or vertical mill
- Proportioning and preheating of dry material fractions, and mixing with binder pitch for production of homogenous anode paste
- Vibrocompacting of green anode blocks
- Water-cooling of green anode blocks by spraying or submersion
- Pitch fume treatment system (thermal oxidation or dry scrubbing)
- Heat transfer medium for generation and distribution of process heat
- Fully automated plant solution with remote process operation, monitoring, and analysis via intuitive graphical interface

### Proprietary equipment

- Outotec Vibrating Compactor
- Outotec Preheating Screw
- Outotec Anode Cooling Conveyor
- Outotec Pitch Fume Dry Scrubbing system
- Outotec ARTS™ Anode and Rod Tracking System



Outotec vibrating compactors ensure production of high-quality green anodes for modern aluminum smelters.



## CARBON RECYCLING PLANT SOLUTIONS

Our carbon recycling plants for aluminum smelters are designed for high reliability and plant availability, with robust equipment capable of performing in harsh environments. We provide complete recycling plant solutions for butts and green-scrap processing, as well as plant upgrades for existing facilities. Our capabilities include global delivery of everything from conceptual engineering studies to full engineering, procurement, and construction services. Our effective project management and control ensures cost-effective delivery with the shortest possible lead time.

We have successfully delivered more than 25 carbon recycling projects worldwide, ranging from plant upgrades to complete turnkey solutions.

### Carbon recycling applications

- Two-step screening and crushing circuit for recycled anode scrap enables a high crushing ratio and lower CAPEX
- Proprietary anode crusher for primary crushing of recycled anode scrap and full-size anodes
- Fe-separation for tramp iron and to separate thimbles remaining in butts after stripping
- PLC-based automation system

### Proprietary equipment

- Outotec Hydraulic Anode Crusher



The Outotec Hydraulic Anode Crusher is specifically designed for the primary crushing of butts, carbon scrap materials, and full-size green and baked anodes.



## LIQUID PITCH STORAGE AND HANDLING SOLUTIONS

Our liquid pitch storage and handling solutions, which include loading and unloading terminal solutions, are designed for long-term, sustainable, and profitable performance. Moreover, special attention is given to all health, safety, and environmental requirements (HSE). Our HSE Rules and Standards establish the principle of managing quality, occupational health, safety, and environmental matters in accordance with the corporate policies of our customers and with their local legislation and regulations.

Our ultimate goal is to ensure that our industrial plants provide a risk-free, safe, and healthy working environment.

### Liquid pitch storage and handling applications

- Ship unloading arm with flexible joints for easy loading and unloading
- Liquid pitch storage tanks
- Fully sealed pitch pumps
- Tanker loading arms with fume return line
- Peripheral systems including heat transfer medium, pitch fume handling system, and nitrogen blanketing system for storage tanks



Unloading road tankers using hydraulically actuated unloading arm with quick-connection coupling for easy operation.



## ANODE RODDING SHOP SOLUTIONS

We offer the full scope of technologies for anode rodding shops, including solutions for processing spent anodes and rodding new ones. Our cost-effective solutions are based on over 40 years of experience serving the aluminum industry and are designed to help you improve productivity, reduce maintenance costs and downtime, and contribute to a safer working environment.

Outotec solutions are designed to meet your specific plant layout and operational requirements. Our high-quality proprietary equipment is built to last, with low operating and maintenance costs that contribute to a faster return on your investment. All our systems are rigorously tested prior to delivery to ensure trouble-free installation and commissioning.

### Rodding shop applications

- Basic and detailed engineering for any plant solution
- Proprietary and key equipment supply
- Site supervision, commissioning, and start-up services
- Complete turnkey plant deliveries
- Plant retrofit and machinery upgrade services

### Proprietary equipment

- Outotec Loading and Unloading
- Outotec Primary Bath Cleaning
- Outotec Butt Shotblast
- Outotec Butt Stripping Press
- Outotec Thimble Stripping Press
- Outotec Combination Butt and Thimble Stripping Press
- Outotec Rod Reconditioning Station
- Outotec Mating Station
- Outotec Semi-Automatic Casting
- Outotec Anode Slot Saw
- Outotec Cast Iron Thimble Cleaning



Butt shotblast.



## CASTHOUSE SOLUTIONS

Outotec is a leader in the design, fabrication, and supply of casthouse equipment for today's highly competitive and quality-driven aluminum industry. Our solutions draw on our extensive experience in the research, testing, design operation, installation, and service of ingot and sow casters.

We have supplied both air and water-cooled sow casters, including delivery of the largest automated sow casting system in the world. Our equipment portfolio also includes ingot casting plus saw lines for billet, rolling slab, and T-bar. Our modular systems can be customized for your specific plant layout and offer easy integration and maximized productivity and safety.

### Proprietary equipment

- Outotec Sow-Caster System
- Outotec Rolling Slab and T-bar Sawline
- Outotec Foundry Ingot Casting



Rolling slab saw and handling.

# Outotec

Outotec provides leading technologies and services for the sustainable use of Earth's natural resources. As the global leader in minerals and metals processing technology, we have developed many breakthrough technologies over the decades for our customers in metals and mining industry. We also provide innovative solutions for industrial water treatment, the utilization of alternative energy sources and the chemical industry. Outotec shares are listed on NASDAQ OMX Helsinki. [www.outotec.com](http://www.outotec.com)