Basic Oxygen Furnace
There for you, wherever you need us

The more closely we work with our customers, the greater the impact we can make for them. So a global network of offices, research centers, and production sites is important to us, and to them. We are continuously extending our global reach to be closer to even more customers.

Being closer to customers doesn’t just mean we can be more responsive to their needs. It also helps us to listen better — to understand their concerns, cultures and ways of working. It makes us alert to new ways of thinking and ideas that enable us to deliver even better advice, services, and solutions.

Our exceptional resources and expertise extend far beyond making and selling products. We provide solutions to customers worldwide for cover projects, material specifications, thermal studies, numerical simulations, follow-ups and technical support in application of minerals, and maintenance and electromechanical services for refractory equipment.

35 Main production and raw material sites
70 Sales offices
180 Countries shipped to worldwide
The Basic Oxygen Furnace

- Mouth
- Trunnion
- Taphole
- Tapping Area
- Bottom Joint
- Purging
- Upper Cone
- Permanent Lining
- Scrap Impact (Charge Pad)
- Bottom Cone (Knuckle)
- Bottom
RHI Magnesita provides lining concepts which are suited to the customer-specific converter operation and process conditions. Both carbon-bonded and synthetic resin-bonded bricks are offered as required. Highest campaign lifetime levels can be achieved in combination with the specifically adapted RHI Magnesita maintenance concepts.
Product Variety of Bricks & Mixes for the BOF

ANKER
Fired Magnesia Bricks
- Compatible with basic slags
- Niche products restricted to special applications - commonly used in converter safety linings
- With carbon impregnation used in the mouth area of BOF

ANCARBON
Magnesia Carbon Bricks
- Very high refractoriness
- Unparalleled versatility for various and even changing process conditions
- Commonly used in BOF
- Available in many different raw material combinations and special treatments (e.g. carbon impregnation)

RUBINIT, ANKERJET, ANKERREP, ANKERTAR, ANKERMIX, etc.
Basic Mixes
- Wide range of characteristics available for gunning, ramming and patching.
In order to minimize the time required for installation of the lining, RHI Magnesita offers individual concepts which reduce the duration of lining work significantly.

The following individual measures are combined optimally depending on customer requirements:

- Simplification of the lining concept — fewer shapes and grades
- Better use of space on the pallets
- Mixed pallets (several shapes on one pallet)
- Special shapes and solutions (domed bottom)
- Logistic measures (e.g. storage, shift model, etc.)

**Domed Bottom Design**

- Problematic bottom joint area is eliminated
- Substantial stress reduction
- Suitable for removable bottoms, an exact and precise bottom joint is used, which greatly contributes to the stabilization of the bottom.
**Purging**

The BOF bottom purging system consists of:
- Purging plugs
- INTERSTOP Gas Control Box Type “CIP”
- Gas and control station
- Visualization, archival storage and supervision of process data

**Purging Plugs**

RHI Magnesita offers standard single hole plugs and state-of-the-art multi hole plugs.

**Customers benefit from**
- Know-how and expertise
- Development of optimized purging plug arrangement
- Design based on metallurgical requirements
- Recommendations for purging programs
- Installation instructions
- Installation and commissioning

**SHP (Single Hole Plug)**
Common inner pipe diameter: 4 to 8 mm

**MHP (Multi Hole Plug)**
Common pipe quantity: 18, 24, 32, 46 or 100 with a pipe inner diameter of 2 mm
Taphole System Overview

HYFLO C
The HYFLO C taphole represents the latest evolutionary stage of BOF tapholes and was especially tailored to the demands of slag detection devices, e.g. IR cameras, and slag prevention systems, e.g. pneumatical slag stopper.

TBD Taphole Changing Unit
The TBD has been developed for a rapid and efficient change of worn taphole repairsets.

RUBINIT VK3
RUBINIT VK3 represents the BOF taphole premium repair mix with highest performance.

ANKERTAP JET-VK3
Automated Gunning Equipment
Automated BOF taphole gunning process for RUBINIT VK3 with programmed water adjustment according to mix feed rate.
HYFLO C

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RHI Magnesita is able to provide optimal solutions tailored to customers’ requirements, ranging from the smallest to largest converter vessel up to 400 mto tapping weight.

Advantages
- Maximized taphole lifetime
- Self-centering repair sets
- Massive outlet sleeve
- Compact and bundled tapping stream
- Later appearance of the vortex effect
- Patented channel design
- Shorter annular gap (less mix needed and shorter drying time)
Taphole System Automated Repair Equipment

Premium mix RUBINIT VK3 is a key factor to avoid steel penetrations in the annular gap especially for long life time converter campaigns.

Programmed and efficient gunning process with perfect water consistency with RUBINIT VK3.

Advantages
- Customized gunning equipment
- Programmed water adjustment according to feed rate
- Perfect mix consistency
- No steel penetration in the annular gap
- Low drying time
- Reduced taphole repair time
- Higher converter availability
- Automatic filling system
- Load cells & water management
- Update of existing gunning machine possible
- Gunning time 5-7 minutes
- Drying time 5-10 minutes
Steel / Converter

Taphole System TBD (Taphole Changing Unit)

The TBD has been developed for a rapid and efficient change of worn taphole repair sets.

Due to the steady increase in converter life time during the past years, a taphole repair method that is gentle to the taphole surrounding elements is of great importance for converter availability.

BOF Taphole Repair Procedure

- Quick and precise positioning of the TBD unit in front of the BOF taphole
- Efficient removal of worn taphole sleeves by counter-percussion technique
- Precise insertion and fixation of new taphole repair set
- Gunning of the remaining annular gap

Advantages

- Individual adaptation of the machine to customer's requirements
- Quick and precise removal of worn taphole sleeves
- Gentle to the taphole surrounding elements
- Highest safety standards
- One-man operation
- Increased converter availability
Augmented Reality and Virtual Reality Device for TBD Maintenance

What?
• Virtual reality (VR) training about TBD and BOF taphole
• Step-by-step guidance and (remote) assistance during removal of old and installation of new taphole sleeves with augmented reality (AR) device
• Remote assistance during maintenance work of machine with AR device

Why?
• The close interaction between refractory material and machine is visible
• Immediate (remote) assistance during removal/installation/maintenance is possible
• Regular training and practicing independent of availability of real machine and converter
• Time for installation/maintenance as well as time for training can be reduced due to immediate remote assistance
• Videos are available at any time for refreshing the knowledge
• Practicing correct handling in a secure environment and addressing safety aspects

How?
• Virtual reality device for training before working at customer site
• Augmented reality device for remote assistance at customer site
Fostering a greater understanding of the correlation between steel production parameters, maintenance and refractory by analyzing data on a central master computer, using artificial intelligence methods.

**Customer Challenges**
- Unforeseen downtimes / excessive maintenance — casting interruption and delayed delivery
- Inefficient processes — increased energy costs
- Unsafe operations

**APO Value Proposition**
- Digital refractory wear model
- Identification of wear influencing parameters
- Refractory benchmarking
- Automated maintenance

**Customer Benefits**
- Matching refractory cycles with plant cycles enables better use of refractory and reduces refractory waste
- Optimized plant scheduling and saves energy costs
- Increased operational safety

Easily accessible via mobile devices

Example of APO lifetime prediction

Critical thickness area

Residual wear lining thickness

Life time
AGELLIS® Solutions

VISIR-FurnaceSafe
Furnace breakout prevention

User Benefits & Advantages

• Early “hot spot” detection and warning
• Used with LF, RH, EAF, AOD, LD/BOF
• Historical database open to process metallurgist

More Information
Modern Converter Maintenance

As a supplier of high-grade refractory products, RHI Magnesita develops innovative solutions for products and machinery to ensure best converter maintenance. These developments are best implemented in close cooperation with our customers in order to guarantee optimal solutions.

Converter Maintenance has Several Objectives
- Reduced specific refractory consumption
- Repair of areas with premature wear
- Increase in operational safety
- Longer life time
- Observance of scheduled lining cycles

RHI Magnesita Offers
- Competent analysis and consultation
- High-end refractory mixes
- Specially designed machinery
- Experienced service technicians
- Complete systems consisting of material + machine + man

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Suitability
ANKERJET A

Application:
Multi-purpose pressure vessel machine for basic and non-basic mixes

Advantages:
- Useable in a variety of aggregates
- Consumption data recording
- Different equipment variants available (e.g. load cells, detachable silo,...)
- Charging by crane or forklift
- Low maintenance and wear costs
- Easy-to-use automatic and manual operation
- Transportable by crane and forklift
Application:
For rapid gunning repairs in the BOF

Advantages:
- High flow rate ensures short repair times
- Highly accurate gunning repair
- Semi- and fully automatic gunning operation
- Increased BOF availability
- Less physical strain on operating personnel
- Small turning radius due to crawler chassis
- Gunning lance endlessly rotatable
- Shooter can be operated by cable and radio remote control
**GEKKO BOF**

**Application:**
For rapid gunning repairs in the BOF

**Advantages:**
- Precise gunning repair
- Less physical strain on operating personnel
- Increased BOF availability
- Battery powered undercarriage
- Four-wheel drive
- GEKKO can be operated by cable and radio remote control
Application:
For fast BOF taphole exchange

Advantages:
- Exact positioning in front of the BOF taphole
- Part of the RHI Magnesita BOF taphole system
- Quick and precise removal of worn taphole sleeves
- Precise insertion and fixation of new taphole repair set
- Breakout and setting unit on one machine
- Counter percussion technique
- Safe working conditions
- Increased BOF availability
PTX

Application:
For filling the annular gap between taphole surrounding elements and taphole sleeves

Advantages:
- Optimal filling of the annular gap
- Less steel infiltration
- Longer life time of the taphole
- Time savings due to shorter drying time
- Easy handling
- Increased BOF availability
ANKERTAP JET-VK3

Application:
For gunning the annular gap between taphole surrounding elements and taphole sleeves with RUBINIT VK3

Advantages:
- Part of the RHI Magnesita BOF taphole system
- Optimum amount of water is set automatically
- Two water settings for wet and creamy mix consistency
- Consumption data recording
- Detachable silo
- Charging by crane or forklift
- Low maintenance and wear costs
- Easy-to-use automatic operation