

Crucible cleaning machine

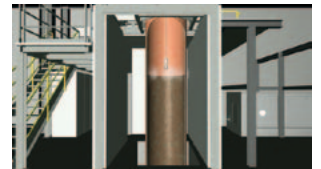
Efficient cleaning of crucibles using high-pressure water systems made by RST for the iron & steel industry

Gentle, residue-free removal of slag from crucibles using the power of water

Profit from the advantages of high-pressure water-jets for cleaning crucibles using integrated solutions from a single source – RST.

When stainless steel is processed, blocks of the metal are resmelted by a vacuum process to improve the metal's purity. During this process, residues of slag adhere to the inner walls of the crucible and these would impair the quality of the next batch of stainless steel if the crucibles were used in this state. These brittle, high tensile-strength slag residues can be removed from the crucibles using high-pressure water in a safe and reproducible manner. Guided into position by a telescopic structure, the specially designed high-pressure turbo nozzle powered by high-pressure water is fed into the crucible where it proceeds to follow the vertical contour of the inside of the crucible.

After twenty minutes, the completely cleaned crucible is ready for the next production job. As a result of the high and reproducible cleaning quality, the cleaned crucibles need no further treatment. Conventional manual cleaning of crucibles is extremely worker intensive and time consuming. The brushes and polishing tools used in manual processing damage the crucibles and make the surfaces rough. This rougher surface results in increased levels of slag residues which means that the subsequent cleaning processes are even more time consuming. In contrast to this, the crucible cleaning machine by RST is a fully automated process which removes all residues from the inner surfaces of the crucibles and with no wear at all. The valuable copper crucibles are therefore given much improved service lifetimes.



Crucible ready for cleaning in the RST high-pressure water jet machine



All-over water jet cleaning thanks to the vertical motion of the revolving starburst formation turbo jet



Crucible cleaning machine TRA



Transporting a crucible to the RST cleaning machine



Inserting the crucible



Slag residues removed from the crucible in the collection pan in the housing

Soundproofed machine housing

The automated high-pressure water cleaning process is performed in the soundproofed housing with its stainless steel lining. The crucibles are inserted in the machine and removed from it using the gantry crane. The residues washed off the workpieces are collected in a perforated residue pan which can be removed for emptying when required via the housing door.

Dependable cleaning telescope with turbo jet

The vertical motion of the revolving nozzles producing radial jets inside the crucible to be cleaned is assured by the telescopic control mechanism which is physically controlled by a powered winch. An incremental encoder integrated in the winch guarantees that the motion inside the crucible is exactly measured. The high-pressure water jet system is forced to rotate by the power of repulsion as the water leaves the nozzle and, in this way, it revolves around its own longitudinal axis. The water is fed to the system via a high-pressure hose which is guided by a hose magazine which takes into account the permissible bending radius of the hose. The entire telescopic structure is mounted on a frame above the housing and is moved horizontally into the parking position to allow the crucible to be inserted or removed. In the cleaning position, an integrated safety cover rests on the crucible flange to prevent high-pressure water being ejected from the workpiece.

Clearly designed operating panel

The menu-based operator guidance system uses a panel and intuitive navigation. This guarantees short training times for operators. The detailed view of the machine and animated machine assembly status provides a quick, clear overview of the information pertinent to the production process. A comprehensive range of diagnostic options allow faults to be localised quickly and efficiently.



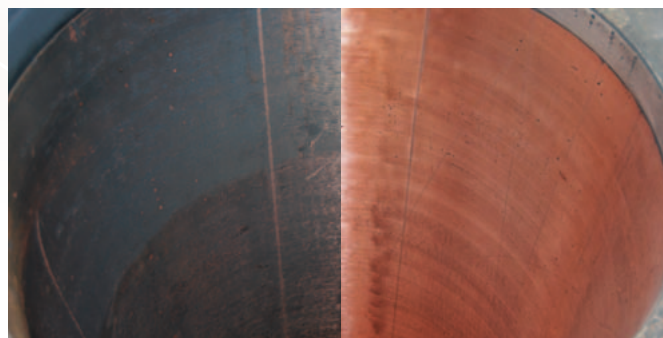
Operating panel with intuitive navigation

Variable high-pressure water

Being able to regulate the pressure / speed of the high-pressure pump via a frequency converter enables energy-efficient, material-saving pump operation and exact adjustment of the water pressure as required.

High flexibility provided by the cleaning programs

Process programs make it possible to store all the parameters for a specific crucible cleaning procedure in the controller. The process parameters water pressure, feed speed and travel distance of the turbo jet are programmed and correspond exactly to the individual geometry of the crucible and its degree of pollution. Similarly, the number of cleaning cycles for each crucible is preset.



Crucible showing slag residues (right) and one after the cleaning operation using high-pressure water (below)

IDEAL ADDITION:

Our water treatment unit WAA



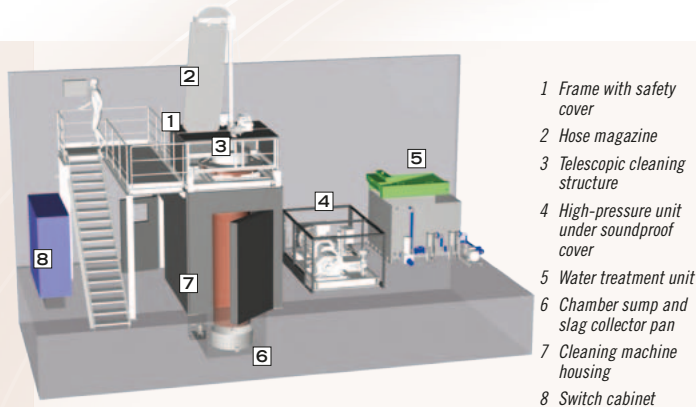
All solid residues are removed from the water via an inclined filter and a combined prefilter and fine cascade filter. All the filter cartridges can be easily replaced and disposed of after use. After being treated, the water is collected in a stainless steel header tank and, from here, is then recycled back to the high-pressure system. In this way, 90% of the water can be reused. A perfect, environmentally friendly recycling system.

Machine data and advantages

TRA

Advantages

- Efficient system solutions from a single source - RST
- Fully-automated cleaning system
- Minimum staffing requirements
- High level of reproducible cleaning quality
- No subsequent crucible treatment necessary
- High quality of smelted stainless steel thanks to thoroughly cleaned crucibles
- Long service lifetimes for valuable copper crucibles because cleaning is a non-wearing process
- Minimum adherence of slag after treatment because surface is not roughened
- Dramatically shorter cycle time in comparison to time-consuming manual cleaning with brushes
- High degree of machine availability
- Recirculating water system made possible by integration of an environmentally friendly water treatment unit
- RST is a qualified enterprise in accordance with § 19 I WHG (German Water Resources law)



Technical specifications and components

Overall dimensions L x B x H	approx. 12,500 x 5,500 x 8,500 mm
Overall weight	approx. 6000 kg
Moving mass	approx. 3500 kg
Cycle time	approx. 20 min.
Water pressure	approx. 1000 bar
Volume flow	approx. 140 l/min.
TRA power requirements including high-pressure pump	approx. 320 kW
Inner crucible diameter	approx. 300 - 1000 mm
Crucible length	approx. 2500 - 4100 mm

Fully automated controller	✓
Measuring technology	✓
Frequency regulated, motorised high-performance high-pressure water pump	✓
Self-powered high-performance turbo jet	✓
Cleaning machine housing with stainless steel lining	✓
Welded-in chamber sump with perforated collection pan	✓
Telescopic structure	✓
Motorised winch	✓
Optional water treatment unit to recycle process water	✓
Sensor technology	✓

Plant engineering

- ▶ Cleaning systems
- ▶ Water treatment systems
- ▶ High-pressure water-jet technology
- ▶ Robotics
- ▶ System integration

Electrical engineering

- ▶ Automation
- ▶ Drive technology
- ▶ Software engineering
- ▶ Process visualisation
- ▶ Switchgear manufacturing

Sheet-metal working

- ▶ Sound-absorbing hoods
- ▶ Machine covers
- ▶ Containers and tanks
- ▶ Control desks
- ▶ Housings

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Enterprise certified to § 19 I WHG

WATER RESOURCES LAW: RST is certified to § 19 I WHG by the German TÜV testing authority and, with its equipment and qualifications, is thus authorised to build plant and equipment which may be used in connection with water-endangering substances. These include LAU facilities (storage, bottling and transhipment of water-endangering substances) and HBV facilities (production, treatment and use of water-endangering substances).