

Automated tank cleaning systems



> **BUCHEN-ICS GmbH**

We specialise in automated tank cleaning systems. Our comprehensive know how and cutting-edge technology ensure stringent safety standards are always met

buchen-ics.com

A strong group

It is essential that operations run smoothly at chemical and petrochemical businesses which means professional cleaning services and maintenance work are a must. Both BUCHEN and XERVON are well-known specialists in this field.

Our number one priority: compliance with all relevant quality, health, safety and environmental regulations

BUCHEN tank service (BTS) – your specialist for tank cleaning

BUCHEN-ICS is your one-stop shop for tank services and tank cleaning with a variety of automated tank cleaning systems.

The technology we use is not only highly efficient but also extremely safe. As the name suggests, our modern non-man-entry systems mean staff no longer need to enter the tanks; all our automatic cleaning processes are closed systems.

Thanks to our qualified staff and innovative technology, we are able to help our customers to preserve the value of their equipment and ensure their tanks and industrial facilities run smoothly.

BUCHEN – a partner for industrial services across Europe

A variety of automated closed systems are available so that tanks of all sizes can be cleaned

> BUCHEN industrial services

- Tank service
- Catalyst service
- Power plant service
- Sludge dewatering
- Cold cutting and many more

BUCHEN provides industrial and waste management services that are setting new standards – both on its home market and abroad. We offer our customers professional industrial services at different locations in Germany, Europe and the Middle East. Our bespoke solutions enable our customers to focus on their core business. Our staff regularly take part in training and further training courses – held at our own accredited training centre – to ensure they know all about the latest developments in their field. BUCHEN has Europe-wide accreditation for its quality, health, safety and environmental management systems. Moreover, we are continuously optimising our processes and improving our technology to further develop our comprehensive portfolio of services for the chemical and petrochemical industry.

XERVON – a leader in technical services

Together, XERVON, BUCHEN and their subsidiaries and sister companies make up the specialist 'industrial services' division within the REMONDIS Group. Being one of the market leaders for technical services, XERVON's portfolio ranges from the maintenance of processing plants, to surface technology and industrial insulation work, all the way through to turnaround management. Moreover, XERVON is one of the world's most highly respected scaffolding businesses, thus complementing BUCHEN's services perfectly.



BUCHEN-ICS is continuously further developing its tank cleaning systems – so they can be deployed all around the world



> TANK CLEANING SYSTEMS

BUCHEN's innovative tank cleaning systems (BTS)

BUCHEN-ICS has chosen to use automated cleaning technology because it has so many advantages over manual systems: firstly, it eliminates most of the stress factors involved in manual cleaning work; secondly, it is able to recover the majority of the crude oil in the tanks helping to reduce disposal costs.

Automated systems: efficient and cost effective

Tanks and containers used for storing crude oil and heavy oil products need to be inspected and cleaned on a regular basis. This has to be done, for example, every time a tank's content is changed, repair work and leak tests are carried out, the thickness of the walls need to be measured or when TÜV inspections are due. Without this, residue builds up, deposits accumulate on the tank wall and the tank's storage capacity is reduced.

A further problem are the layers of sludge which gradually settle on the floor of the tank. This sludge not only consists of sediment, sand and rust but also of a significant amount of valuable paraffin and other hydrocarbons, especially in the case of crude oil. Conventional manual cleaning methods create high levels of emissions throughout the whole cleaning process and the staff cleaning the tank are continuously exposed to the contents, some of which may be harmful. Moreover, manual cleaning systems are extremely time consuming which in turn leads to high downtime costs for the tank operators. To avoid all these, BUCHEN-ICS works with automated, closed tank cleaning systems which it has further developed over the last few years to meet the specific requirements of the international market.

The stress factors involved in manual cleaning work are, for the most part, eliminated when automated systems are deployed. As chemicals are not used, the majority of the crude oil stored in the tank can be recovered, making the system particularly cost effective as there is less waste to be disposed of.

Non-man-entry system

These extremely effective tank cleaning systems consist of a series of modules which can be installed in sea containers making them easy and safe to transport. Other advantages of these automated systems include short cleaning times and high levels of safety for the operatives as they do not need to climb into the tank (non-man-entry system). The tank cleaning systems described on the following pages are suitable for both tanks with floating roofs and tanks with fixed roofs.

> Automated tank cleaning systems

- Jet washer systems:
BTS jet washer system,
BTS compact system, BTS BLABO® system
- Manway cannon:
Mover Cannon, Dozer

BTS jet washer system and BTS compact system

These innovative systems stand out thanks to their high hydrocarbon recovery rates, their short cleaning times and their stringent safety standards to protect both people and the environment. The actual cleaning work is carried out via jet washer nozzles which are inserted into the tank through liner tubes.

The product in the tank is pumped out, heated up and then returned to the tank so it can be used as a cleaning media

BTS jet washer system – a precisely controlled, multi-stage cleaning process

The BTS jet washer system consists of a number of modules which can be installed in sea containers enabling it to be transported to wherever it is needed at short notice. The main components of this explosion-proof cleaning system are its mobile suction and pressure modules as well as its jet washers. To be able to clean the tank, a number of the tank roof supports are temporarily removed so that the washers can be inserted through the openings into the tank. The whole cleaning process is further facilitated by the special pipe system with its tried and tested, quick release stoppers and its high performance filters.

Once the system has been set up, the product is first removed from the tank using one of the suction modules and then run through a steam-powered heat exchanger where

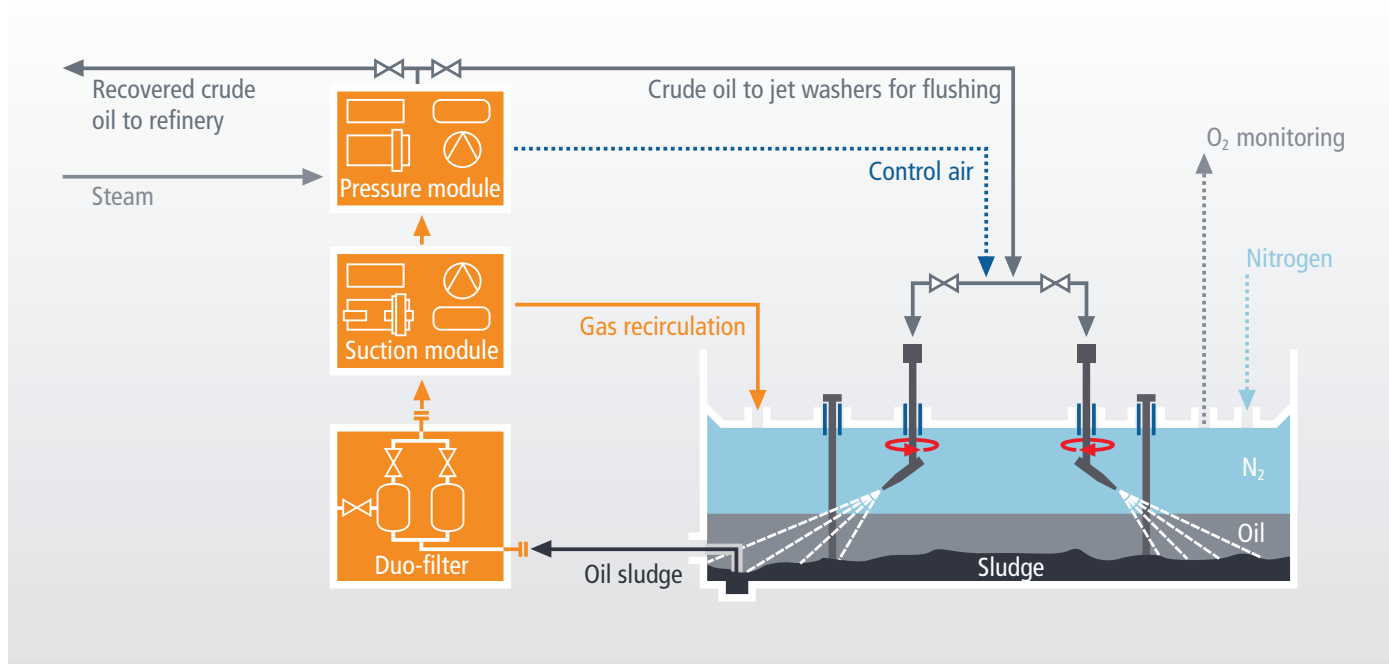
it is heated up to between 40°C and 60°C. The pressure module then pumps this warm product back into the tank via the three dimensional rotating jet washers so it can act as a cleaning media. With the nozzles rotating in three dimensions, the product enters the tank at high speed and is aimed at the solid and semi-solid contents in the tanks so that they are dislodged and liquefied. The heat reduces the viscosity of the cleaning media further facilitating this process. Inorganic residue such as sand and rust settle on the floor of the tank, while the organic components in the sludge are dissolved.

The gas space created in the tank is made inert with nitrogen to prevent a build up of static electricity during the individual cleaning phases. Moreover, the oxygen content is monitored throughout the whole process. If oxygen levels reach a certain point, the tank cleaning system automatically shuts itself off.

Very little electricity is needed to start the new automated compact system; additional pumps are not required either



How the BTS jet washer system works



The product is first removed from the tank and heated up, before being returned to the tank at high speed and under pressure via the rotating jet washers where it is used to detach the solid and semi-solid contents

BTS compact system

The BTS system is a closed, automated tank cleaning system that has been designed and built by the company itself. It fits into a single container which means it is both easy and economical to transport and is particularly suitable for international projects. For the most part, the equipment runs mechanically as a conscious decision was made during the planning stage to only install electronic parts if they were absolutely necessary. As a result, it is easier to maintain and, if required, the tank cleaning experts are able to repair it on site themselves.



The so-called jet-washer units are installed through several liner tubes into the tank

Very little electricity is needed to start the system and get it running. A mechanical bypass connected to the pump makes it possible to regulate how much liquid passes through – accurate to 100 litres. Thanks to the high performance pumps that have been fitted into the system, three jet washers can be used simultaneously: the greater the number of jet washers in action, the faster the tank contents are heated up. Once this stage has been completed, specific areas of the tank are then targeted and cleaned by increasing the pressure and using a single jet washer.

Once the cleaning work has been finished, the BTS compact system is even able to clean itself.

> Your advantages

- Rapid cleaning times
- High safety standards for staff and the environment
- Hydrocarbon emissions are kept to a minimum
- Very high recovery rate of hydrocarbons
- Tank residue and disposal costs are kept to a minimum

BTS BLABO® Jet Washer System

A number of additional options make it possible to further increase the quality of the crude oil recovered by this system. This is achieved by creating two separate material streams – one containing less sediment than the other. One option here is to direct the material stream with higher levels of sediment through a three-phase decanter.

The highest levels of safety are achieved by using nitrogen to create an inert atmosphere in the tanks and continuously monitoring the oxygen content. If oxygen levels reach a certain point, the tank cleaning system automatically shuts itself off

Computer-aided jet washer technology

Our BTS jet washer system based on BLABO® technology is the most effective closed and automated tank cleaning system currently available on the market. Consisting of a number of modules, it can be installed in 20' containers – perfect for transporting all around the world.

The system is based on computer-aided jet washer technology. It operates at pressures up to 12 bar and is fully automatic – controlled via a touch panel in the containers. The jet washers can be inserted into the tank's existing openings which have a diameter of approx. 200 millimetres (manways, sampling pipes etc).

Moreover, we can use certified cold-cutting technology to make openings at any point in the tank roof and then attach a flange foot to fix the jet washer securely into place. This can be performed on both full pontoon roofs (double membrane) and on floating roofs with only one membrane.

The cleaning media is heated up in an integrated heat exchanger and then pumped into the tank through the jet washers where it stirs up the sludge in the tank and binds the valuable hydrocarbons (HC).



The system can be deployed all around the world as its modular design fits perfectly into 20' containers



The system is installed via the tank's existing openings or openings can be created at any point in the tank roof – thanks to our certified cold cutting technology

At the same time, inorganic sediments such as sand and rust accumulate on the floor of the tank allowing the recyclable HC content in the sludge to be pumped out of the tank. The sediment-rich residue generated by the BTS process is removed from the customer's system during the final manual cleaning phase so that it can be sent for disposal.

A two-stream cleaning process

Hydrocarbon recovery rates of 98 percent have been achieved in previous tank cleaning projects using the BTS LABO® system.

With this technology reaching such high levels of performance, it can also be deployed for cleaning tanks with fixed roofs and especially for removing heavy oil residue and slop as well as catalyst and cracker residue.

Hydrocyclones have been integrated into the system so that the HC-enriched cleaning media can be separated into two individual streams during the automatic cleaning phase. The first stream, which contains the sediment from the tank, is either fed into a decanter or into an intermediate storage tank. The second pre-cleaned and high quality stream is returned to the customer for re-use.

Maximum levels of success

The tank is then rinsed out with hot water to achieve the best possible cleaning results before the staff carry out a final check of the tank. A skimming module is used at this stage to recover any remaining oil from the water.

If necessary, the cleaning media can also be fed through a three-phase decanter. This gas-tight decanter is a safe method for processing the media and separating the oil, water and solids from each other to further improve the quality of the recovered crude oil.

Ideal for more difficult cases such as slop, catalyst, cracker and heavy oil residue



The jet washers are fully automated and are controlled via a touch panel located in the containers



The camera attached to the Manway Cannon records the cleaning work and also facilitates the documentation process

> TANK CLEANING SYSTEMS

Manway Cannon

If the inside of a tank needs to be inspected before and/or during the cleaning process, then the Manway Cannon is the perfect solution – and also a highly effective alternative.

Equipped with onboard camera and lighting system

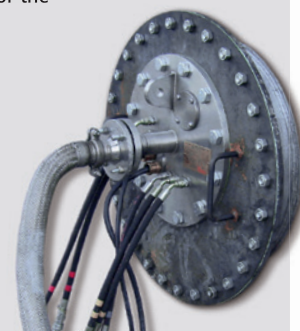
The Manway Cannon is a closed tank cleaning system and is suitable for all tanks with a diameter of up to approx. 60 metres. This cleaning cannon is attached to the manways either at the side or top of the tank. It is equipped with an onboard camera and lighting system so that the whole of the cleaning process can be monitored. The washer nozzle is located between the light and the camera.

A mobile version is also available by attaching the Manway Cannon to a dozer undercarriage

> Technical details

- High pressure pump up to 30 bar at 950 l/min
- Cannon nozzle with a camera and lighting system
- Online station to monitor the atmosphere in the tank

The system complies with the Machinery Directive and has been constructed in accordance with ATEX 114



Control by joystick or fully automated

The whole of the cleaning process is monitored via the screens in the control room (also in a container) and digitally recorded for documentation purposes.

The cannon itself can either be controlled manually via a joystick or automatically using special software. This means that even in extreme situations the staff are able to see exactly where the cannon nozzle is pointing and to adjust it if necessary. The inside of the tank is made inert with nitrogen to prevent explosions. The atmosphere and gas levels in the tank are then monitored via the gas measuring equipment in the control room. Should certain levels be exceeded, the system automatically shuts itself down. Any gases generated by the removal of the residue from the tank (e.g. by the suction module) can be returned to the tank to prevent them having a negative impact on the environment.

Mover Cannon and Dozer

We offer two further cleaning systems based on the Manway Cannon: the Mover Cannon and the Dozer.

The Mover Cannon system is remotely controlled and consists of a cleaning cannon – equipped with a camera, light and jet nozzle – fastened to a dozer undercarriage.

A second camera attached to the system enables the operatives to see all around the inside of the tank being cleaned. This allows them to focus the nozzle on any remaining residue – a function that is particularly useful in large tanks or in tanks that staff are not permitted to enter, for example tanks in danger of collapse. The whole cleaning process is monitored via screens in the control room, from which the Mover Cannon is also controlled.

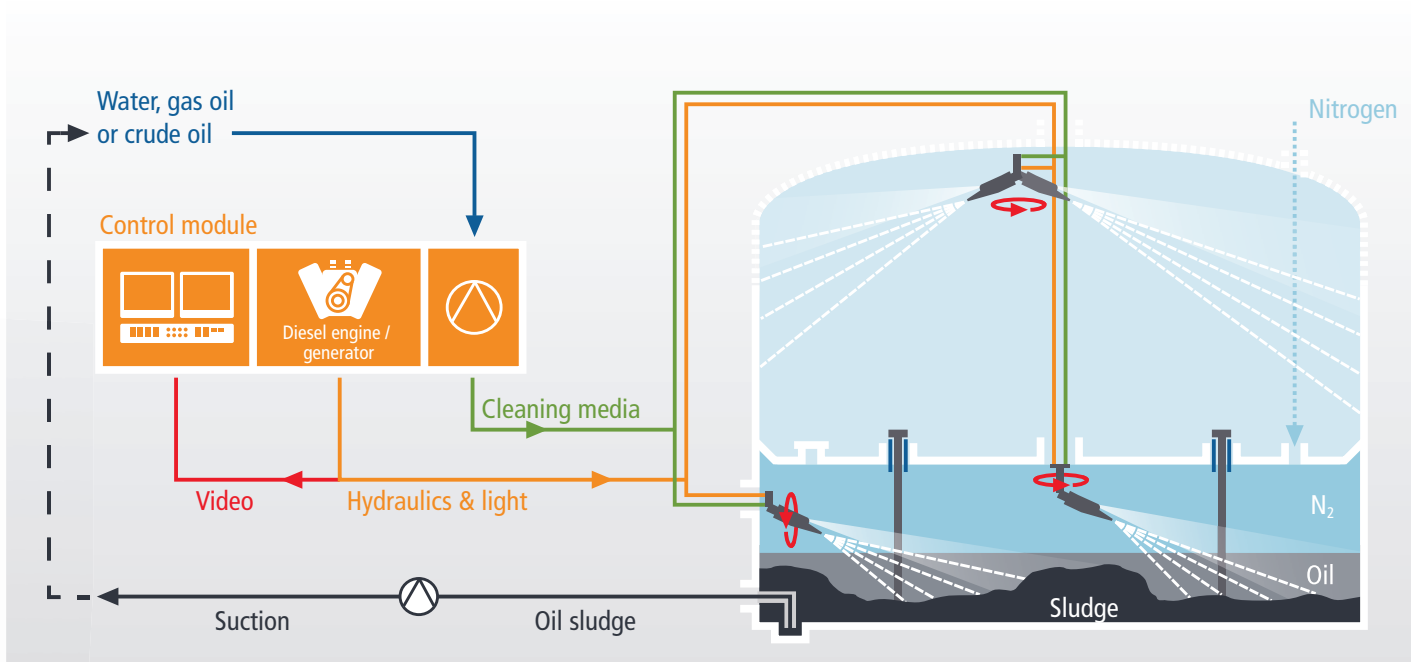
This vehicle can also be converted into a dozer which is controlled manually and used to clean tanks that do not require fully automated cleaning systems. Moreover, it can also be deployed to remove any remaining inorganic material such as sand and rust after a crude oil tank has been cleaned with an automated system.



> Your advantages

- No entry – personnel do not need to enter the tank
- Employees do not have to wear heavy breathing equipment
- Remotely controlled from the control room
- A closed system, no negative impact on the environment

The different ways of using the Manway Cannon in tanks with floating/fixed roofs



The staff control the Manway Cannon from the control room container. They can adjust the direction of the cannon's nozzle whenever necessary

Even the most stubborn of deposits can be detached from the walls with our high pressure water cleaning equipment and then removed from the tank by the flow of water



> ADDITIONAL SERVICES

Additional specialist services

The list of requirements in the field of industrial services is both complex and diverse and this is reflected in the services we offer. Our portfolio ranges from mobile nitrogen production units and mobile combustion chambers, to corrosion protection systems, all the way through to cold cutting work. A brief description of these services can be found on the following pages.

Cutting-edge equipment, state-of-the-art technology and mobile, automated processes help to protect people and the environment and ensure flexible and professional solutions are found no matter what the situation

We produce nitrogen on the go

BUCHEN operates several nitrogen production units. These units, operated according to the membrane principle, consist of air compressors, separators, air dryers and special nitrogen membranes. They have a capacity of 180m³ to 400m³ of nitrogen per hour and achieve a maximum level of purity of 99 percent nitrogen. These nitrogen production units can be used, for example, for creating an inert atmosphere in tanks or other types of technical equipment.



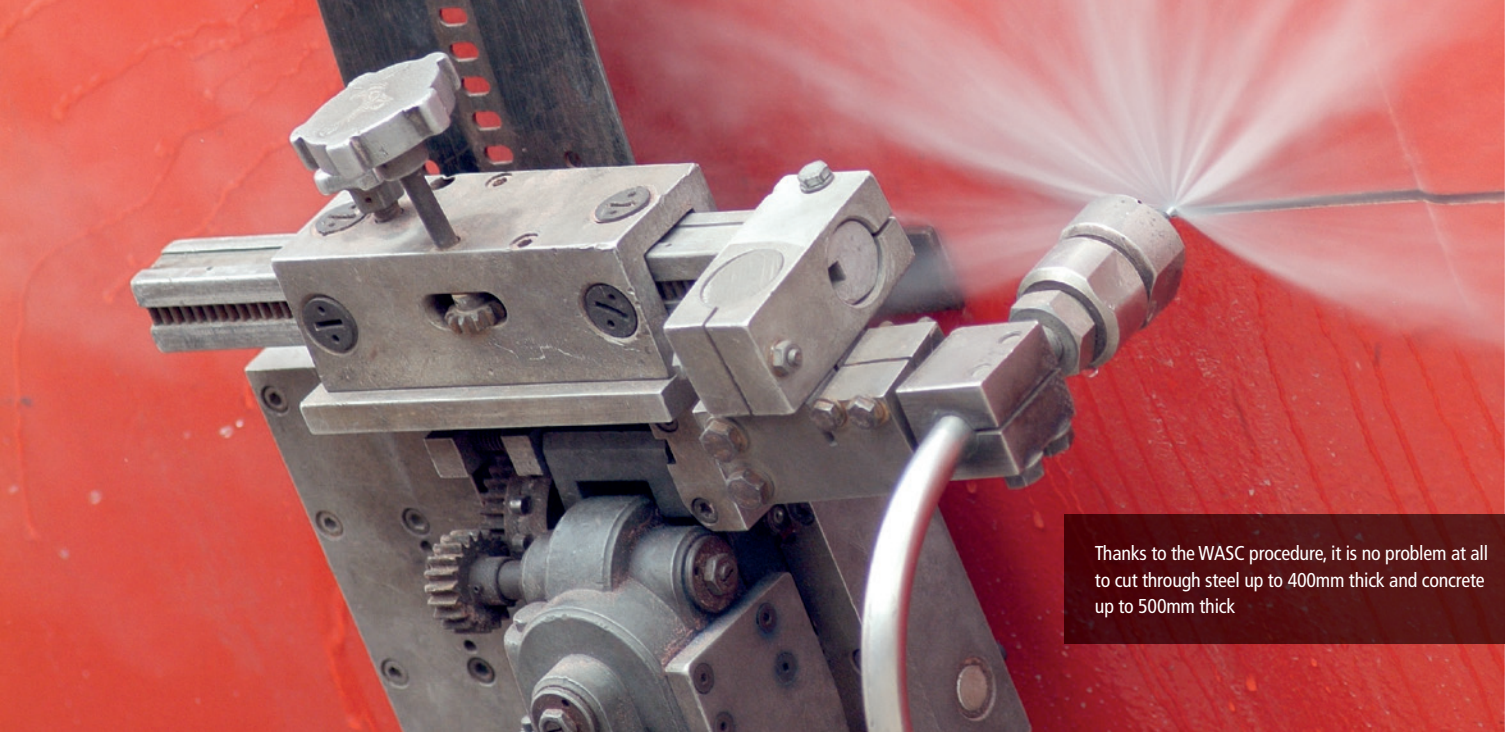
Our mobile combustion chamber cuts emissions reliably, safely and sustainably and prevents hazardous residue being formed in the waste gas

Mobile combustion chamber

Our mobile combustion chamber has been designed to

burn industrial gases at temperatures exceeding 1,000°C in accordance with the 'TA-Luft' (Technical Instructions on Air Quality Control). It has been tested in accordance with 'TRbF 20' (Technical rules for flammable liquids), has TÜV certification and burns both hydrocarbons as well as explosive and hazardous gases. Thanks to our combustion chamber, tanks can be cleaned safely and accessed more quickly at the end of the process.

This unit enables industrial gases to be burned quietly and in a controlled manner whenever containers, such as storage tanks, need to be inspected or cleaned. The mobile combustion chamber prevents hazardous residue being formed in the waste gas. In the case of an emergency, nitrogen is fed automatically into the system. Any flames in the tank or pipes are smothered immediately – the system then shuts itself down quickly and safely. Thanks to our mobile combustion chamber, emissions are cut reliably, safely and sustainably. State-of-the-art burner technology and bespoke technical systems ensure the combustion process is residue free in accordance with the most stringent environmental standards.



Thanks to the WASC procedure, it is no problem at all to cut through steel up to 400mm thick and concrete up to 500mm thick

Protection against corrosion

Whether it be ships, tanks, containers, floodgates or industrial plant components: corrosion will always be a problem when metal surfaces are exposed to the weather. BUCHEN's anti-corrosion specialists provide the full range of services – from carefully removing the old coats and layers of rust all the way through to recoating the surfaces.

Corroded surfaces are often blasted using conventional methods. A more cost-effective and more environmentally friendly alternative is to detach the layers using ultra high pressure water up to 3,000 bar. Thanks to these fully automated units, old coats and layers of rust can be removed via remote control. The water used for cleaning the surface and the coating residue are collected and separated from each other. This is not only faster, it also cuts costs as, for example, there is no need to find a way to access the surface being treated. Once the old coat has been fully removed, the surface is re-coated using certified coating and sealing systems.

Cold cutting using WASC technology

Not only must high levels of precision be achieved when carrying out cutting work at industrial plants, the systems must also be extremely safe. For this reason, cold cutting is, more often than not, the method of choice.

We have perfected this method with our water abrasive suspension cutting technology (WASC). Abrasives are added to the high pressure water jet which is then used to carefully and precisely cut the material. It makes no difference whether the material is soft or very strong: the equipment can cut through steel up to 400mm thick and concrete up to 500mm thick. Despite its immense cutting power, the WASC technology is very gentle on the material.



Thanks to state-of-the-art technology, old coats and layers of rust can be removed – for example from tanks – without the need for scaffolding

Another alternative cold cutting process works with injector cutting nozzles. This is the preferred method for dismantling chemical plants as it is so effective. The unit needed to control the cutting wagon is connected to the container that stores and regulates the amount of abrasives added to the water.

Sludge dewatering

Being part of a group, we are able to provide you with gas-tight, three-phase decanters for separating flammable or harmful substances.

These units are particularly suitable for processing:

- crude oil sludge
- slop residue
- residue from tank cleaning work
- oily wastewater sludge
- sludge containing solvents

They are constructed in accordance with ATEX 114 (formerly ATEX 95 – 94/9/EC Equipment Directive) and our sister company FILTRATEC operates the units in line with ATEX 137 (1999/92/EC Workplace Directive). The customers can rest assured that all valid rules and regulations concerning explosive atmospheres in the workplace are fully complied with at all times.

You will get more details about the gas-tight three-phase decanters in accordance with the ATEX Directive here: filtratec.com/en/technology/decanters

BUCHEN®

WORKING FOR THE FUTURE

BUCHEN-ICS is part of the REMONDIS group, one of the world's largest recycling, service and water companies. The company group has branches and associated businesses in more than 30 countries across Europe, Africa, Asia and Australia. With over 30,000 employees, the group serves around 30 million people as well as many thousands of companies. The highest levels of quality. Working for the future.

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