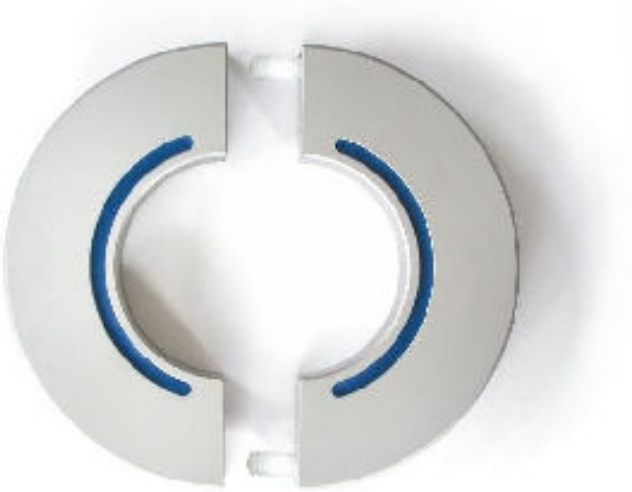


MERUS®
Liquid Processing

Passive Preventative Maintenance
Smart Technology Water Treatment
For All Water Bearing Systems

Rust...

Turns water brown and can corrode a steel pipe causing leaks and malfuctioning equipment. Sometimes blockages can occur for example rust flakes may block a Fire sprinkler head.

The Result...

- More Maintenance
- Broken machinery
- Brown water
- Blockages
- Leaks

Lime scale...

is an insulator and will reduce heat transfer. Lime is found in almost all water in its dissolved form. Lime precipitates and deposits in pipes, machines and on other surfaces as a stone hard substance.

The Result...

- Blocked Pipes
- Equipment failure
- Higher energy costs
- More maintenece
- More downtime

Biofouling...

The growth of algae & other bio film organisms can occur in some water systems. Sometimes this results in deadly bacteria such as Legionella.

The Result...

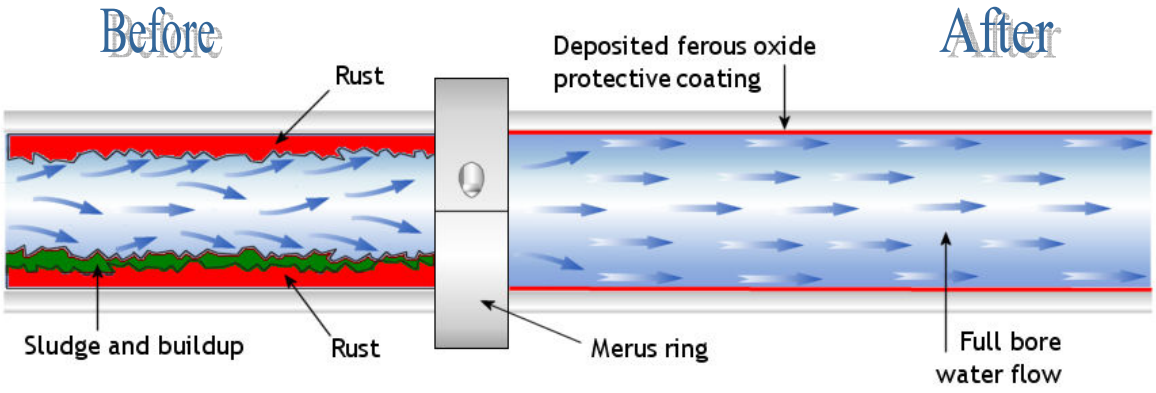
- Inneficient heat transfer
- Legionella disease
- Blockages
- More maintenance
- More downtime

Merus...

Water treatment technology. Fighting bio fouling, corrosion from rust & lime scale problems.

The Result...

- Reduce energy costs
- No more blockages from scale
- bio fouling & algae treatment
- Protective ferrous oxide coating
- No more brown water
- Much less or no maintenance
- Much less or no downtime



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Water corrosion and fouling

Rust
Water has many characteristics. Unsaturated water is an aggressive liquid that can destroy metals through rust, even high quality stainless steel can be corroded by water.

*"Every 1mm of limescale buildup, increases power consumption by **11%**"*

Lime scale
In almost every kind of water there is also dissolved lime, and it becomes a problem when it precipitates and deposits on surfaces. The higher the temperature – the more lime will precipitate. Lime and other minerals are deposited as a stony hard scale.

Microbiological fouling
Biofilm fouling consisting of microorganisms can be found for example in cooling towers as well as inside pipes. Water fountains are also a good environment to encourage the growth of micro organisms. Systems that use sea water are also prone to bio fouling.

Conventional technologies in the market are mechanical and chemical cleaning or the use of magnetic devices. Physical and chemical cleaning involves costly shut downs to open the systems and intensive labour is required to physically remove buildup. Automated chemical dosing systems are also used. Both are equally innefective and expensive and will never reach throughout the entire system

"The Merus collar uses water itself in the fight against rust, limescale and bio-fouling including Legionella disease".

Whether chemical, physical or magnetic, these methods work only at the point of installation. Once the water has passed this point, such methods of treatment can no longer control the water or be relied upon.

Chemical's or magnetic devices in theory change or should change the lime scale, the corrosion or the microbiology in water. However the changes to lime scale are not stable, and the lime will revert back to a solid substance and the effect on rust or microbiology is very limited. When chemicals are used, they degrade and dilute quickly. Technically, it is not feasible that the necessary concentration of chemicals will uniformly reach the total surface to be treated within the system.

In reality this type of maintenance can be delayed or not carried out for long periods, or not carried out at all, or carried out partially, because there is not enough time to do it properly, because of costs and labour and difficulty involved. The methods discussed only have an indirect or partial short lived effect, if any.

What is Merus Technology

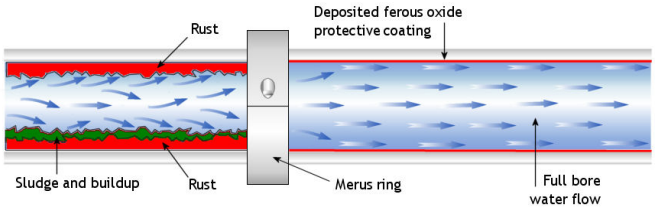
The Merus pipe collar is a smart technology that is transforming the water treatment industry. With over 15,000 successful installations worldwide the effectiveness of Merus technology is set to become an industry standard, as a totally passive, preventative maintenance solution for protection against corrosion and microbiological buildup inside pipework and all water bearing equipment.

Passive Preventative Maintenance

- Consumes no power
- Has no moving parts
- Is easy to install
- Requires no maintenance

The Merus Pipe Collar uses water itself in the fight against rust, limescale and bio fouling, including Legionella Disease. This unique technology delivers Active Oscillations to the water as it passes through the Merus collar. These oscillations will reach throughout the entire system, up to 10 kilometers, even reaching into the dead legs of pipes, by pass loops and tank vessels. Merus technology works using specifically modulated molecular oscillations and is **not** based on using fields created by electric coils or magnets. Merus technology has been developed empirically, and has been shown over and over again to work; however there is still no in-depth scientific explanation for this phenomenon.

Each element in nature, each molecule, has its own typical natural molecular oscillation. This natural oscillation is unique and compares well with the human fingerprint. Merus technology, isolates, stores and records these oscillations of, for instance, rust. Based on these original oscillations, Merus develops new active oscillations. The aim is to influence the original oscillation of the element in question through new active oscillations in such a way that ultimately the physical properties of the element or of the molecule are modified in the water. Today, Merus has a database containing a great number of active oscillations, each with a specific task. These active oscillations are recorded on an oscillation carrier in a similar way as writing on a data carrier (CD/DVD). In most cases for cost-benefit reasons, an aluminium alloy is selected as carrier material. This alloy can store an almost unlimited number of active oscillations and emit these in water in a constant and stable form.



The active oscillations create a field within the collar, which penetrates all piping material and thus passes into the water as it passes through the collar. Due to its bipolar properties, water can absorb, store and spread the active oscillations well through the entire water system. In the water, the active oscillations interfere with the natural oscillation of rust, lime scale, iron, etc. Owing to this overlapping, of oscillations, the behaviour of the substances is modified. The result is: rust molecules disintegrate in an unstable form and are washed out. Iron no longer reacts to Fe2O3, but to Fe3O4 (magnetite), which is largely inert to further forms of corrosion. Lime remains dissolved in water longer and crystallises out to a much lesser extent.

Overview of applications

Corrosion

Merus collars can be used against corrosion in numerous areas of application. In general, it can be said that simple forms of corrosion are reduced or stopped in all water-bearing systems. Corrosion can be stopped effectively using Merus technology and the existing layers of rust can be reduced in thousands of areas of application, ranging from normal **piping and pipeline**s, **water-bearing machine**s, **steam generators, cooling systems** to **sprinkler system**s and much more.

Lime scale

Merus is used against lime scale primarily in technical water, in other words in systems in which water is used for transferring and transporting heat. Very good operating experience has been made with temperatures well above 100°C. Merus is used in areas ranging from **small dishwashers, machines and tools** to huge **pipe bundle heat exchangers** in the chemicals and heavy industry.

Microbiology

Merus Bio Collars solve microbiological problems in water. The spectrum of applications ranges from **algae** in open systems, **cooling tower**s, **swimming pools** or **fountain**s, and **biofilm/ biofouling** in complex piping to the removal of **legionella** in drinking water installations.

Sea water

Systems that use sea water such as boilers or evaporators for drinking water benefit greatly, with Merus technology. Ships diesel engines are sometimes cooled by sea water, which deposits calcium, salts and other minerals in the system. Current trials indicate that the Merus technology will descale the engine cooling loop, resulting in better engine efficiency and performance.

Crude oil

In the oil industry, pipelines need to be thermally cleaned regularly. Like lime and other sediments, crude oil carries parrafins and waxes which settle out in much the same way as lime. These waxy substances adhere to pipe and pump interiors and build up over time. This of course interferes with the flow. The science, for these applications require that Merus collars are, made to order.

Process water

Merus can also be used in process water, i.e. water that is directly or indirectly a part of the product. In all cases, it should be checked whether or not Merus technology affects the process as well. Some customers have experienced and noticed that the taste and flavour of products (food) have changed slightly. Above all in fermentation processes it is possible that the taste or flavour may be affected. For specific details contact *Maintenance Products Austaralia*.

Merus Technology...

1. Interupts the cycle required for rust, limescale, and bio-fouling to form.
2. Returns rust & limescale back suspension; the system can then be flushed clean.
3. Deposits a protective oxide coating.
4. Can be used on plastic pipes.

Suitable for All Water Bearing Systems, including

- Heat exchangers
- Cooling loops
- Evaporators
- Condensate systems
- Steam / water boilers
- Water Fountains
- Swimming Pools
- Sewage & water treatment plants
- Fire Sprinkler systems
- Pump and motor cooling loops
- Seawater boilers / evaporators
- Irrigation sprinklers
- Golf Course sprinklers
- Pumps and valves protection
- Coffee machines
- Washing machines & dishwashers
- Brown tap water
- Micro biological & Legionella control
- Hotels
- Hospitals
- Factories
- Schools
- Homes
- Mining
- Refineries
- Food Production
- Shipping
- Petroleum
- PET bottle production
- City water supplies
- Health clubs
- Paper mills
- Fun parks
- Town and city water supplies
- Breweries
- Desalination plants

No Maintenance Required – No moving parts

No Power Required – Passive protection

5 Year Guarantee

Technical Data

- working range 10 kilometers
- water temperatures up to 150° C
- surface temperatures up to 500° C
- non circulated water up to 1.500 m^3/h
- circulated water up to 20.000 m^3/h
- total amount of water in circuits up to 25.000 m^3
- pipe diameters up to 2 meters

Merus clients around the world

Fitness First – United Kingdom

Fitness First working with Merus Technology After installation of Merus devices in 193 Fitness First clubs in the United Kingdom the management of Fitness First in the Netherlands decided to equip their 25 Fitness First clubs with Merus devices. This decision was made after a test period of 3 months at two of their clubs. The Merus devices were installed in all the 25 Fitness First clubs in the Netherlands in the second part of 2008.

The management and the clients from Fitness First will benefit from the advantages of less lime scale build-up and the comfortable sensation of soft water. The reduced sedimentation of lime scale, rust and biofilm will protect all water related devices and will be experienced as less failure and break down of the club's technical installation.

Hotel Ara - van der Valk Group

Hotel Ara - van der Valk Group is using the Merus Technology The management of Hotel Ara (van der Valk Group) decided to equip their hotel with Merus devices. This decision was made after a test period of 3 ½ months in their Hotel. The Merus devices were installed in the second part of 2008.

The management and the clients from Hotel Ara will benefit from the advantages of less lime scale build-up and the comfortable sensation of soft water.
The reduced sedimentation of lime scale, rust and biofilm will protect all water related devices and will be experienced as less failure and break down of the club's technical installation.

Ritz Carlton Hotel

Ritz Carlton - Problem: brown discloured water in sinks in guest rooms. In 45 days the water was clear and no more tainted water.

NOTE: The brown discoloured water is not easily seen in the images above. However the next image speaks a thousand words.

Aryaduta Hotel Pekanbaru

From dark brown Hotel tap water, to crystal clear drinking water in only:

45 Days

"After installation the tubes are free of any scaling".

Queen Elizabeth II

Queen Elizabeth II. Evaporators, working with Merus Technology before the evaporator is used to make drinking water out of sea water, by evaporating the seawater and collecting the vapors in a storage tank. The brine (remaining seawater) is concentrated with salt and scale and is sent back into the sea.

The salt and the lime in the water form a very hard scale on the heated tubes inside the evaporator. These have to be cleaned, manually using chemicals. Merus collars were installed at each feed line of all 4 Evaporators of the vessel. After installation the tubes are free of any scaling. There is no mechanical or chemical cleaning required anymore as can be seen in the images below.

BEFORE

AFTER

For every 1mm of lime scale build up, energy and running costs increase by 11% The image above left shows 2mm – 3mm, on the inside wall and 2mm – 3mm on the outside wall of the tubes. Inefficiency is well in excess of 44%.

Evaporator for bulk carriers and tankers

Merus Technology for Evaporator at bulk carriers and tankers in every tanker there is at least one seawater boiler (evaporator), in which the seawater partially evaporates (at low pressure due to low temperature) and the residual brine is conveyed back into the sea

The produced water vapors are condensed at a cold surface and feed the ship's fresh water tanks. Inside the heat exchanger of the evaporator a stony layer consisting of salt, lime and other solids contained in the seawater is gradually formed. This layer absorbs an essential part of the thermal energy, which is normally intended for the evaporation of the seawater.

"A month later, the boiler did not need any cleaning".

As a result, the evaporator's performance is day by day reduced and the fresh water production becomes insufficient for the ship's needs. When this point is reached, expensive fresh water has to be purchased at the harbours. The traditional solutions are the chemical and the mechanical cleaning. Both processes are hard, tough, unhealthy and expensive. Also they have the additional disadvantage that they presuppose that the evaporator has to be stopped for many hours once per one to two months, which is not always feasible.

We adapted two Merus® rings on the pipe which supplies one boiler with seawater, which had been recently cleaned. At the same time we installed two more Merus® rings on the feed pipe of another evaporator, which had not been cleaned lately and its daily fresh water production had already dropped noticeably. We used two Merus® rings instead of one for safety reasons only; in order to make sure that the trial would be successful, because the flow rate was several m3/h, which might exceed the capacity of one single ring. However, it is very probable that one ring for each boiler would have been efficient, too.

"Evaporators increased water production from 28 to 31 tons".

A month later, the first boiler did not need any cleaning again, because its performance was not reduced. On the contrary, about one month after the installation of the rings the tanker's engineer reported that the daily fresh water production of the evaporator, instead of dropping gradually, as it always did, had increased from 28 to 31 tons.

This leads to the following two conclusions: First, the chemical and the mechanical cleaning can never remove the whole mass of the accumulated scale and, second, the Merus® rings not only prevent the formation of new scale, but they also manage to dissolve the residual one, which cannot be properly cleaned with the traditional cleaning methods. The second evaporator did not have to be cleaned again. Its performance increased at a quick rate and within a short time reached its highest limit, according to the evaporator's features. This means that the boiler had shaken off the scale, without the planned chemical cleaning, which is very often responsible for the corrosion and the leaks which happen to equipment cleaned in this way.

ARAMCO - Riyadh Refinery Saudi Arabia

RIYADH. October 08, 2008. Heat, pressure, chemicals, corrosion... Saudi Aramco industrial facilities often take a beating. Fouling and scaling reduce heat transfer in exchanger tubes and cause corrosion in pipes. That can lead to a loss of production as unplanned shutdowns become necessary to fix leaking equipment.

A Merus ring is installed upstream from a heat exchanger at Riyadh Refinery. Standard methods of chemical treatment reduce fouling and corrosion, but their effects can be limited. So Riyadh Refinery is pioneering a new technology by Merus.

The technology resolves cooling-water issues and provides a state-of-the-art technique to eliminate fouling and to clean fouled equipment. That, in turn, saves the time and money that would have been required to descale fouled equipment and, in some cases, replace it.

"The technology saved $3,500 in cleaning costs, per exchanger & increased machinery performance by 15%".

Riyadh Refinery introduced the technology early in 2007 by piloting field tests in four cooling-water exchangers that had a troublesome history of fouling. After six months, one exchanger was opened and found to be remarkably clean.

To better understand the technology, a little chemistry lesson is in order: All substances in nature consist of molecules of several atoms that are in constant motion with their own unique oscillations. The Merus unit measures those oscillations and responds with interfering oscillations.

The result is that the physical properties of the substance change, making it more soluble, which carries the substance away, rather than depositing it on vessels and pipes. Lime, for instance, does not solidify as quickly and is continuously flushed out.

Implementing the technology saves an average cleaning cost of $3,500 per exchanger and improves equipment performance by 10 percent to 15 percent.

"We are now working to further pilot this technology in hydrocarbon applications," said senior mechanical engineer Abdullah M. Al-Harbi, who brought the technology to Saudi Aramco

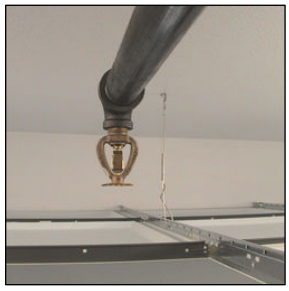
Fire Sprinkler System - Kosmas Thomoglou AG,

During inspection some valves were opened and it could be seen that there was corrosion in the pipes. This led to the risk, that in the case of fire, the rust will clog the spray nozzles of the system and cause failure in operation during an emergency.

Our solution
Merus was installed at the feeding pipe of the fire fighting system. Target of the trial was to remove the existing corrosion and prevent the system from further corrosion.

Instantly after the installation a water sample was taken as far as possible away from the inlet. This was done with slow velocity, and the water was mainly clear.

Some days later a second sample was taken at the same place under the same conditions. This time the water was dark brown. In the sampling bucket, a thin layer of rusty particles was collected.



The system was cleaned by flushing water through several points in the system, until it was clean. This was done only four times, because by then only clear water could be seen..

Extract from Engineers Handover Report, April 2007.

….. "Two vital observations are as follows".

- The Merus ring is effective in removing solids build up even from static locations.
- Its' cleaning effects in the direction of flow has been proven.

The image 'above left', shows a dead end before Dispersant and Merus collar installation

The image above right shows the same dead leg after three months of rigorous dispersant application with Meerus collars. **This location was not mechanically cleaned or flushed**. Being a dead leg there was also no circulation or flow. This means that Merus reaches all parts of the system.

Installing a Merus Collar

1. The collar should not touch the pipe; use a tape or rubber seating between the pipe and collar.

2. The collar is secured with two bolts. The collar takes up as much room as a flange of the same size.

3. Do not fit in close proximity to fields from a power source or magnetic field.

4. Installation does not require the system to be opened or decommisioned.

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