July 2014

TermoRens Offshore Service AS

Clean water - clean pipes - clean energy

TermoRens Offshore Service AS

Saving customers millions with a new product.

See page 5.

Legionella protection on board

PGS and Seadrill take the Legionella problem seriously.

See page 2-3.

Your complete provider of efficient energy use and Legionella solutions!

www.tros.as

Legionella and high levels of bacteria on board is a major problem

Many people struggle with bacterial levels that are too high, without really knowing what to do about it. There are many solutions, but few good enough to manage keeping the germs away at all times.

TermoRens supplies all kinds of plants for the elimination of bacteria, but the Anodic Oxidation method has proved to be superior when it comes to Legionella. This method was introduced to the Norwegian market in 2008 and quickly became a success.

Among those who immediately took this into use were property management providers, hospitals, schools, retirement homes, and sports facilities etc. that were all battling with high levels. The results were immediate and today about 400 plants have been installed in Norway.

HVAC consultants have begun to recommend this type of plants, for many reasons such as; the bacteria elimination is ongoing 24h a day, you do not have to add chemicals or heavy metals, the installation is easy and inexpensive and it comes with low maintenance. In short, a dream for property owners who always want to be one step ahead of the authorities when it comes to legionella control.

TermoRens has not yet been marketed to the shipping and offshore industries, but this is proofing to be a large market.

Many people are struggling with high levels of bacterial and believe that UV-light solves the problem. It does not, as it does not have any effect on the rest of the system.

Anodic Oxidation on the other hand uses the water's natural salinity to create hypochlorite with the help of electrolysis when the water passes the titanium anode in the plant. This also prevents any biofilm building up inside the walls of the pipes, and it is in this kind of biofilm that bacteria can develop freely.

They are available in several different sizes and most of them can be installed for under half a million (NOK). This makes it a reasonable insurance against legionella.

Welcome to TermoRens as

Almost twenty years have passed since we started TermoRens AS here in Skien.
The business idea has always been for our customers to save a lot of money using our product, Termorens, which removes build-ups inside the piping. The purpose is both to get back to full performance as well as to prolong the life of the equipment installed.

Many people were sceptical of this and had previously bad experiences with so-called acid wash, but over time TermoRens has proven to be a fantastic product that is being used in more and more areas.

Initially it was used to clean heating systems, then cooling systems, which proved equally effective and now potent water systems. Many people believe that water pipes are clean, but they are sadly mistaken. All pipes start to build up as soon as they are taken into use and if people had seen what the pipes look like on the inside very few would be drinking tap water. Termorens removes coating and bacteria and leaves the pipe with a completely clean surface.

In regards to water pipes, legionella in particular has been in focus in recent years after a few tragic outbreaks. Already after the first major outbreak in Stavanger I went looking for an efficient system that could handle this problem without adding chemicals or heavy metals to the water.

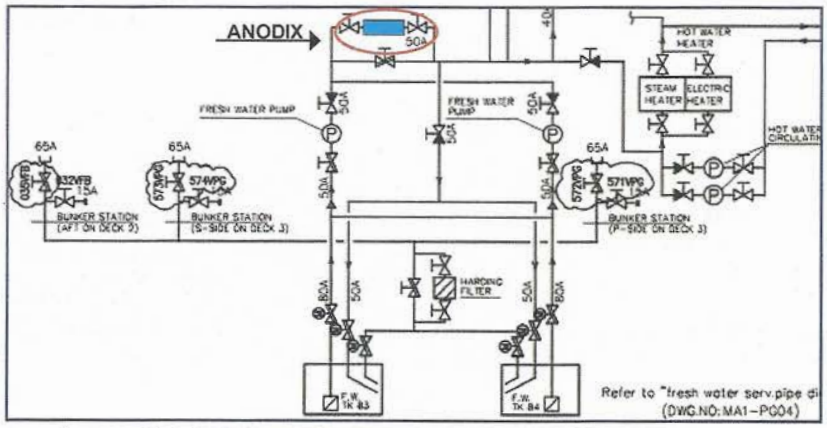
In 2005 I met Wolfgang Strele, the man behind Anodix, in Germany and a close cooperation started. Anodix is a device that eliminates legionella 24h a day and you can read more about this in this newsletter. Long story short; Anodix and Termorens have become market leading in efficient energy use and energy savings, saving our customers millions of kroner.

Even though all the major players in the market now use us, we feel that so far we have only have "scratched the surface," and look forward to the future and to contribute to even more savings for our satisfied customers at home and abroad.

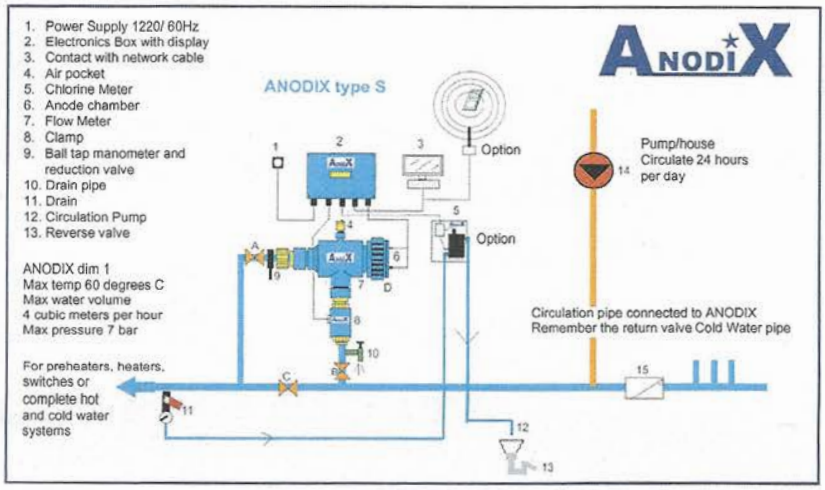
Thore Andreassen
General Manager

Two Anodix L installed on a water tank on board the Seadrill's West Epsilon platform.

Anodix L installed on a water tank on board the PGS-ship Ramform Challanger.



Anodix installed in the potent water supply system aboard. (Two tanks)



ANODIC OXIDATION –

What is it and how does it work?

A further development of the 'Anodic Oxidation' in which not only legionella bacteria but also other bacteria are killed as they flow with the water through a specially developed and patented electrode package (pipe-in-pipe design).

The oxygen radicals that occur on the anode surface (in statu nascendi) bring about an oxidation of the flowing bacteria, viruses, fungi and algae.

At the same time, metastable oxidants are formed from the contents of the water (for example chlorides). This process is continuous all through the hot water system. This to make sure that the existing biofilm - which is the basis of the microorganism's existence – is broken down.

The various oxidising agents formed from water by the electrical field are far more effective than for instance individually utilized disinfectants. The oxidizing agents are formed though anodic oxidation – the Original ANODIX Method complies with item 1a and 1c (The list of treatment substances and disinfection methods according to §11 of the German Drinking Water Regulations of 2001).

According to DVGW's (German Association for the Gas and Water Industry) worksheet W 551, April 2004, ANODIX equipment may be used.

After the biofilm has been broken down in the pipes, a repository effect is maintained over several days. The prerequisite for the hygienic water quality is thus the water renewal in pipes that are not frequently used (1 x weekly is recommended). To ensure that the water flowing through the electrode part is treated, it is necessary to treat the entire water flow. This is achieved with ANODIX, due to the specific shape of the electrode (pipe-in-pipe electrode) and the direct connection with the water pipe.

The Original ANODIX Method is a combination of anodic oxidation and chlorine measurement and/or ultrasound (the latter is patent protected). The combination of anodic oxidation ultrasound is primarily used in old plants with a strong amoeba presence. The amoebas open up in the ultrasound chamber and the bacteria that are released in the process are killed in the oxidation chamber that follows.

In addition, the ANODIX comes with chlorine measurement, chlorine control and NaCl-dosage – to comply with local needs and customer requirements.
ANODIX method has been used in hospitals since 1996 and has proven to be effective. A special test guarantees that the ANODIX method has no impact on any medical devices.

The water quality is maintained throughout the planning, installation and operating conditions to comply with the TVO drinking water regulations. No aggressive substances are released into the water. All water-carrying components are regulated by the German association for the Gas and Water Industry, DVGW.

The Organisation for Applied Scientific Research TNO in Zeist (NL), which is recognized all throughout Europe and cooperates with German institutes, was predestined to conduct the survey. They also carry out surveys of products from national and international food corporations.

In accordance with the KIWA (the Dutch organization corresponding to DVGW - the German association for the Gas and Water Industry) and with the approval by the Ministry of Public Health, the microbiological investigation in late June 2000, with excellent results. At the TNO Nutrition and Food Research test facility in Zeist in the Netherlands, three tanks, each with 700 litres of water, were connected in series. A Legionella content of 100,000 bacteria per millilitre of water was cultivated. ANODIX was connected to the circulation loop and got to work.

The test is conducted as follows:

1. Test of Pseudomonas bacteria at 20 degrees Celsius
2. Test of Legionella bacteria at 23 degrees Celsius
3. Test of Legionella bacteria at 40 degrees Celsius

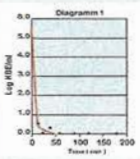


Diagram 1 shows that all the bacteria are killed within 55 min.

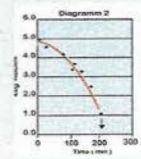


Diagram 2 shows that all the bacteria are killed within 200 min.

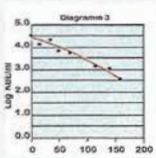


Diagram 3 shows that all the bacteria are killed within 300 min.

The TNO institute's conclusion:
Anodix is a good alternative to kill legionella bacteria, instead of heating the water to over 60 degrees Celsius.
The basis for all tests carried out is sent to Norwegian Institute of Public Health in Oslo.

Why choose Anodix to prevent Legionella?

**One of our customers did a very thorough job and spent considerable effort choosing the system to install against Legionella. Their decision making group consisted, in part, of an Infection Control Medical Doctor, a Safety Manager, a Technical Manager, a Procurement Manager, a Plumbing Manager and a Director.
In all, a reasonably heavyweight professional group.**

Award criteria	Weighting	TermoRens AS	Aquanoah AS	Norkjemi AS	Enwa AS	Nomi Nordmiljø
A) Price	40%	5	1	6	1	6
B) Annual service and maintenance costs	40%	6	1	1	1	3
C) Environmental requirements	10%	5	3	4	6	4
D) Delivery	10%	4	4	4	4	4
Total	**100%**	**5,3**	**1,5**	**3,6**	**1,8**	**4,4**

1= Not Satisfactory 2= Partially Satisfactory 3= Satisfactory, with few exceptions 4= Fully Satisfactory 5= Very Satisfactory 6= Exceptionally Satisfactory

The systems considered were filtration, chemical treatment, addition of copper/silver and anodic oxidation.
In the end Termo-Rens with its Anodic Oxidation received the highest score and was selected.

The basis for the selection is listed in the table, but the conclusion was straightforward: Acceptable price well documented results simple and reliable system and very low operating costs.
The reason for the low operating costs is the fact that the anode used consists of Titanium and has a very long lifespan. There are also no other moving parts required and the system is easily mounted to the "by-pass" of the cold water supply to the hot water system. Anodix comes in 4 sizes.

Urine salts in the vacuum system is a nightmare

It's hard to imagine something worse on a boat than the sanitary system clogging up. It's easy to forget that urine salts gradually build up and that it always ends up with a complete stop and clogged toilets.

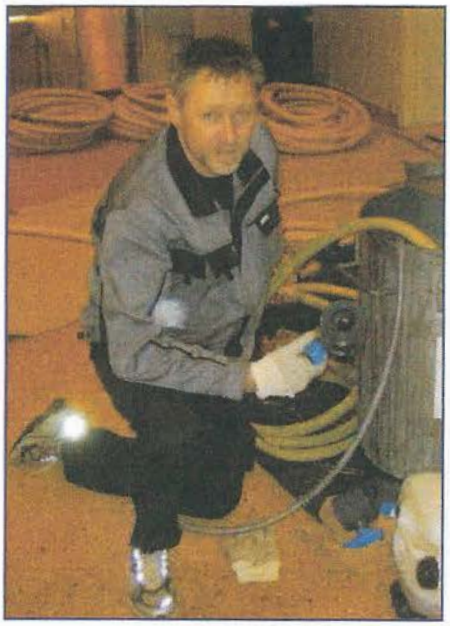
The problem is known and ignored, but must be taken seriously. Most people do not care until the system is clogged up and by then it is often too late. Many boats have been docked to have their main pipes replaced as the ship's vacuum system is completely clogged. Urine salts is building up over time, it looks like lime but slightly more porous. It builds up everywhere, so that valves eventually do not open and toilet paper gets stuck and cannot be flushed through.

What do you do then when disaster hits?
Many ships dock to have their pipes replaced. A very expensive and unnecessary solution. With Termorens or Systemrens the boats entire vacuum system can be cleaned in an easy way, if lime etc. has built up. This is done by circulating the cleaning liquid that completely dissolves the urine salts back into liquid form.

The work is done in zones so that you do not have to block out the whole toilet system. Therefore, if the worst happens on e.g. a cruise ship, a part of a deck can be cleaned while everything else is running. A good emergency solution. The rest of the system is then easily cleaned through with proper planning.

Prevention is important
To avoid such events from happening, it is important to prevent this by proper use of soaps and proper chemicals to keep away from that level of build-up. We have developed a special soap that is used to both clean toilets and clean the pipes. When you flush it down after washing it also removes a little of the build-up inside the piping.

This is perfect to use on the new boats. For older constructions TermoRens Descale should be used. This can be dispensed into the plant via a timed pump or by adding a drop into the toilet when it is cleaned. In this way you avoid such problems.a

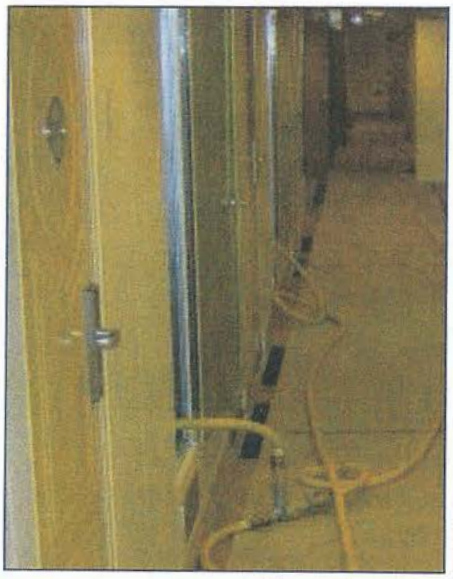


Terje from TermoRens AS dispensing cleaning liquid to remove urine salts on a deck of a cruise ship.

Pipe connections on the back of a vacuum toilet.

The cleaning fluid used is environmentally friendly and does not wear the pipe walls, seals or other components in the system. After use, it can therefore go straight into the drains.

TermoRens produces several types of products for removing urine salts.



Hoses are connected to toilets and to the part of the system that is closed.

This is what it looks like when urine salts are left to build up.

New product saves companies millions

TermoRens has managed to create a product that is as effective on the outside as it is on the inside of the piping. After several years of product development and testing the products Termorens Gel and Systemrens Gel were finalised in the beginning of this year. The product is applied on outside surfaces affected by corrosion and in the course of one day all of the corrosion is gone.

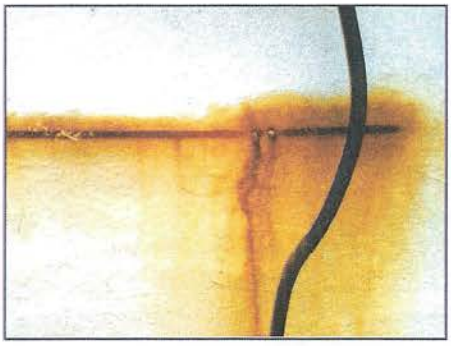
TermoRens operators in Haugesund.

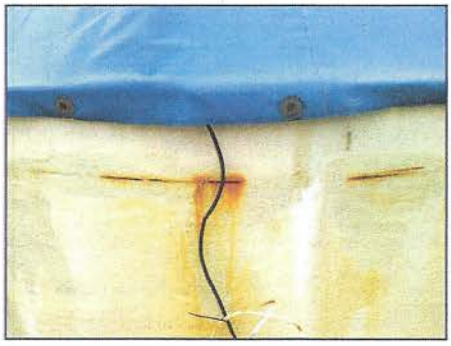
Flair Bridge on the platform before and after the use of Systemrens Gel.

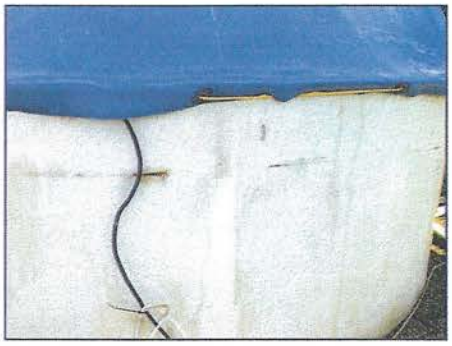
The product can replace sandblasting, pigging and acid washing, which currently are the most commonly used methods for removing rust. All of these methods have major environmental drawbacks. For both sandblasting and acid washing larger areas needs to be closed off and there is noticeable contamination. Pigging causes very high and often harmful noise levels that require good protection for those performing the work as well as the people in the vicinity. With the use of a gel that is non-toxic, environmentally friendly and biodegradable all of this can be avoided. In addition, the gel is very easy to use.

It is sprayed onto the surfaces and then steamed off after 24h.
At the Statoil Gudrun project in Haugesund this method is used with remarkably positive results.

In total there have been about 40 men from TermoRens working on this and about 35,000 litres of Systemrens Gel have been used. The total value of the contract was approximately 8 million NOK. The savings for the client was more than double that amount on this project.

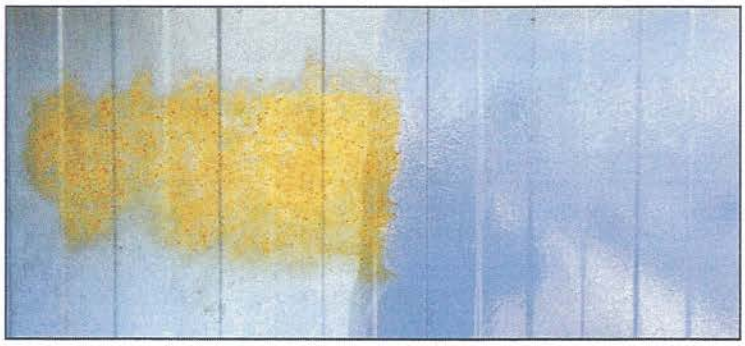






Here is the product used on fiberglass tanks that previously have been cleaned with other substances. The result of the gel is seen in the picture on the right.

Cleaned "wreckage" becomes as good as new and can be reused.



Rust elimination on a painted surface. Here gel was applied and then washed off the next day.

Are you safe against Legionella aboard ships and platforms?

Do what Sea Drill and PGS have done: Install Anodix system for the water processing on board. Quickly and easily removes all types of bacteria, 24 hours a day. Easy installation of water tanks or hot water systems. See our website.

Anodix comes in four different sizes. On ships and platforms Type L, as in the picture, is the most commonly used.

Sea Drills platform West Epsilon has Anodix installed on board.

PGS installs Anodix on all of their seismic ships. On new vessels this is done by Mitsubishi Yard in Japan, on older vessels by TermoRens.

www.termorens.no

TermoRens ensures clean water offshore

A world innovation removed legionella on board West Epsilon

West Epsilon

North Sea is very important when you want healthy workers to perform complex operations. Then, an outbreak of Legionella in the water system would cause a lot of problems. TermoRens has now entered the offshore market with the Anodix solution.
Anodix is based on anodic oxidation in which the entire volume of water passes through a pipe-in-pipe anode of titanium and platinum. Oxygen radicals are formed on the surface of the pipes, which kill all bacteria, viruses, fungi and algae. Hypochlorite is formed (<3mmg / l) and removes the biofilm that the bacteria depend on to live and grow. Up until this spring the system had been installed in a number of places, such as schools, hotels and hospitals. In May they then won a contract with Seadrill I.

- West Epsilon has struggled with too high bacterial counts and indications of legionella in the drinking water facility for some time. This has been fought with hyper chlorination and purification of the plant, which worked at the time. But unfortunately, after some time, we again detected high bacterial count on water samples, recalls Operations Engineer Tom Espen Føleide of the Rigging association Offshore.no. In May, the potable water system was cleaned and Anodix installed, with great success

It was thought it would take up to three months before the plant was cleared of all traces, but it turned out taking only a month before the plant was clean. Now as the system has been installed, the water will be clean and safe in the future as well.

- Since then, water samples have been taken every 14 days, and submitted for analysis, and we now have no indications of legionella, and we have also detected significant reduction in the bacterial count in the drinking water, Føleide confirms.
So far approximately 400 Anodix-systems have been installed, most of them on land. But TermoRens is now focusing on going into the shipping and offshore market on a full scale.

Coast Guard ship W322 Andenes.

This article is taken from: Offshore.no and was written by John Økland.

Important rules and guidelines

- Municipal Health Service Act
- Regulations regarding environmental health with changes from 01.01.08 concerning the spread of Legionella via aerosols
- Infection Control Act, Planning and Building Act, Working Environment Act
- Regulations for aquatic facilities, pools and sauna etc. with requirements for prevention of legionella proliferation of spa bath and shower facilities
- New guidelines for the prevention of legionella infection from Norwegian Institute of Public Health: www.fhi.no from 01.01.09 (revised)
- European guidelines published by EWGLI (European Working Group against Legionella Infections), www.ewgli.org

Risk assessment

All aqueous systems shall be identified and risk assessed with respect to growth and spread of legionella bacteria.

– Familiarise yourself with the facility!

Criteria for a plant at risk

- Atomisation of water
- Good temperature
- Biofilm formation in the water system
- Inadequate maintenance and cleaning routines
- Water systems that have not been used for some time,
- Facilities with "blind pipes" or where parts of the conduction system are not a part of the water circulation
- Possibility of spreading to numerous people - and/or make people sick

Risk assessment

1. Identify installations that could generate growth of legionella bacteria
2. Identify areas of the installations, which could provide growth of Legionella ("mating" of the system)
3. Identify areas in the installations that can create formation and dispersion of aerosols into the environment
4. Make a probability assessment of the occurrence of Legionella
5. Evaluate potential exposure (severity)
6. Document the actions taken to prevent legionella infection and the effects of these

Legionella?
NO THANKS!

We will help you witha full mapping ofconstruction and follow-up that you can follow on our customer website.

WATER – not as clean as you think

If you think that the water from the tap is clean, think again!

In the autumn of 2010, NRK started to focus on the water quality in Norway. Most people think that we have the cleanest water from the high mountains and deep valleys of our beautiful nature. Unfortunately the reality is completely different. More than 100-year-old water pipes overgrown with rust, humus and lime makes a great basis for the dreaded Legionella bacteria and other nasty things.
The program from NRK clearly showed this and we can confirm that it is just that, sadly enough.

In the last few years, TermoRens AS has received an increasing amount of projects cleaning water pipes where there is evidence of legionella.

Here are pictures of some plants, which the users believed to be clean. No wonder they were amazed! This is what it looks like almost everywhere we go in and clean.

Legionella.

Plant with Iron oxide during cleaning.

...and Copper oxide.

Plant with dissolved lime deposits.

TERMORENS CLEANING

– turns heating and cooling systems back into full efficiency

Water pipe before and after cleaning

Water pipe with humus, oxides and lime

Vacuum pipes with urine salts

Cleaning for removal of lime, clogged up pipes, oxides (rust), humus, salt and other deposits.

Product description:

TermoRens is a biodegradable liquid that that contains no toxins. The liquid is composed of citric acid, phosphoric acid, inhibitor and water. It is an easily solvable, yellow-brown liquid with a characteristic odour. Density 1.3 and pH 1.5.

Instructions and dosage

Piping systems with a poor flow after some time of use must be cleaned in order to maintain their power. By cleaning with TermoRens, all coatings are dissolved easily and go back into liquid form and facility regains full performance.

Termorens enters the facility via its own pump. For a heating system calculate 10% of the plant's volume. For cooling systems calculate 15% of the plant's volume. The cleaning process is the fastest when heated to about 40-60 degrees C. You can also clean with a cold mixture if it is mixed with glycol.

When the liquid is mixed in it circulates with the plant's own pumps. Be sure to have all valves open so the liquid can reach everywhere.
If you want to clean exchangers, simple heat exchanges, single radiators, coils, capacitors or other parts that does not have their own circulation, a pump is used.
The time required depends on how much build up there is in the system and its consistency. Most facilities typically want full power back within a day. For individual components the cleaning process often takes only a few hours.

Resistant build-up such as lime, rust etc. is dissolved into liquid form that is flushed out of the system after cleaning. Rinse out all the liquid in the plant after cleaning.

TermoRens can be used on all types of plastics and metals without causing damage. It does not damage seals and bushings in the system.

Cleaning gives a plant back the optimal conditions that save money in the form of lower energy consumption and unnecessary and costly downtime.

Applications:

- **Heating and cooling systems**
- **Floor heating**
- **Cooling ceilings**
- **Boilers and water heaters**
- **Compensators and Evaporators**
- **Heating and cooling batteries**
- **Heat pumps**
- **Cooling in car and boat engines**

Also efficient on glycol-, sea- and saltwater based plants.

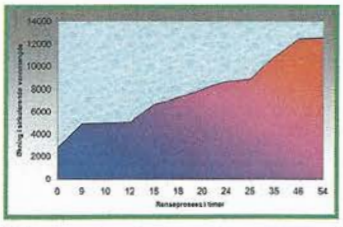


Diagram showing the effect when cleaning of a heat exchanger

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