



TermoRens Offshore Service AS

April - 2015



Clean surfaces – Clean pipes – Clean water

- Corrosion removal from pipes and surfaces
- Removal of SCALE and LIME from piping systems
- Legionella prevention and bacteria protection aboard
- How to keep box coolers clean?
- Removes mussels from seawater
- Prevents clogging of vacuum systems

www.tros.as

Welcome to TermoRens Offshore Service AS



Thore Andreassen - Founder of TermoRens AS and TROS AS.

I am glad to welcome you at TROS AS which began its activity in spring 2014. The company is an extension of TermoRens AS, established in 1994 for the purpose of cleaning of all types of piping systems in order to restore the initial effect of heating and cooling systems.

Termorens cleaning fluid that is an environmentally friendly product has been used on land industry and helped our customers save millions both on energy and maintenance. Earlier, it was obligatory to replace pipes, boilers, radiators, heaters, heat exchangers etc. when their efficiency degraded, but after TermoRens has been introduced to the market the facilities lifespan became extended for many years.

Stainless fully welded heat exchangers nearly last forever if cleaned regularly.

Termorens (Systemrens) has quickly become popular and it drew attention of the offshore industry. The product has been eventually transformed into gel substance in order to enable effective cleansing of rusty surfaces. The first remarkable task has been accomplished at Statoil's Gudrun platform where its surface has been cleared from rust before the platform has been put into operation. Few more entities used our product and services, so we are currently employed by the majority of them. Our latest big project were Statoil's new Troll modules and Valemon that have been a great success. TROS AS has high expertise within the fields of surface treatment, chemistry, HVAC and legionella combatting. Our specialists have great experience in all the subject fields and can help our customers solve the majority of problems appearing within these areas.

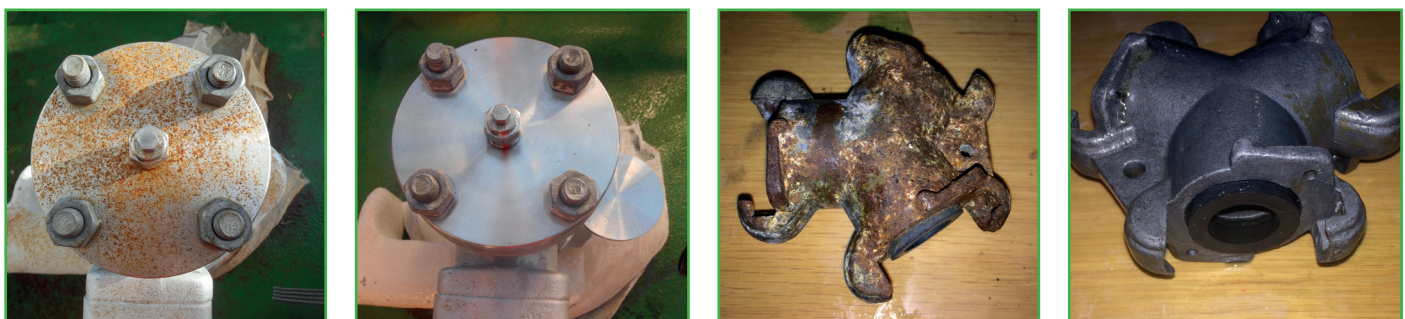
TROS AS has also great experience in legionella treatment and control. Our product and services are widely used by large entities onshore, such as Norwegian Directorate of Public Construction and Property, municipalities and counties, real estate companies and many other companies in order to prevent legionella from the HVAC systems. A number of shipping and offshore companies have also employed us and we processed numerous facilities for Sea Drill, PGS and others who have taken the legionella issue seriously. We can offer consulting, survey and monitoring of vessels and platforms. We also provide courses on the effective ways of preventing legionella.

Do not hesitate to contact us in case any further information is needed. We will be glad to help you saving money on maintenance.

Thore Andreassen CEO / HVAC Engineer

The problem of corrosion and scale is solved by using environmentally friendly and biodegradable products.

TermoRens GEL can substitute sandblasting, pigging and acid-wash, which today are methods largely used to remove rust. All these methods produce major environmental drawbacks. Both sandblasting and acid-wash require large areas to be closed off and produce contamination. Pigging method produces an extremely high and harmful level of noise that requires sufficient protective equipment both for the operators and other people in close proximity.



Before and after cleaning with Termorens, no dismantling or removal of gaskets is needed.

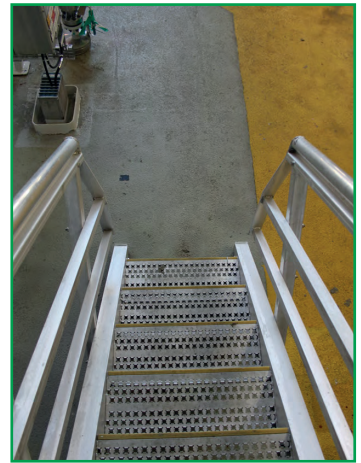
Termorens GEL is used for cleaning of painted surfaces covered with carbon particles that cannot be removed by normal degreasing products. When using our GEL that is non-toxic, environmentally friendly and biologically degradable, none of this is necessary. In addition, the GEL is very easy to use.



Cleaning of painted surfaces, repainting is avoided.



Clean indoor area is also important. Any surfaces that can handle water can be cleaned with Termorens.



Corrosion is removed from stainless pipes by using Termorens GEL



Items that has been submerged in Termorens over night.



Termorens effectively removes crevice corrosion and pitting.



Stainless pipe before applying Termorens GEL ...



Stainless pipe after applying Termorens GEL.



We have personnel working worldwide. Here in Haugesund.



Innovation Norway visiting our exhibition stand in Singapore, where we have offices, storage areas and service personnel.

Legionella and high bacteria levels is a serious problem aboard

Many struggle with high bacteria levels without quite knowing how to handle the problem.

There are many solutions, but few of them are good enough to keep bacteria constantly away.

TROS AS supplies all types of facilities for bacteria removal, but in terms of legionella combatting the anodic oxidation method has proved itself to be remarkable. This method was introduced to the Norwegian market in 2008 and quickly became successful. Real estate companies, hospitals, schools, institutions for elderly care, sport institutions etc. suffering from high bacteria level were among those who immediately started using this method. We got fast good results and today there are 400 systems installed in Norway. HVAC consultants describe

these facilities the following way: Bacteria are removed throughout the whole day, there is no need to add chemicals or heavy metals, and easy installation, and affordable and easy service.

In short, it's ideal for building owners whom are required by authorities to have a system for legionella control in place. TermoRens AS has not yet been brought to the shipping and offshore industry, but we believe it is a large market for our product and service. Many struggle with high bacteria levels and believes that

UV-radiation solves the problem. That's not true because such facilities don't affect bacteria deep inside the systems.

Anodic oxidation utilizes the waters natural salinity to create hypochlorite by means of electrolysis when water passes the titanium anodes inside the system. It prevents biofilm from settling on the pipeline walls, and it's within this biofilm bacteria growth takes place.

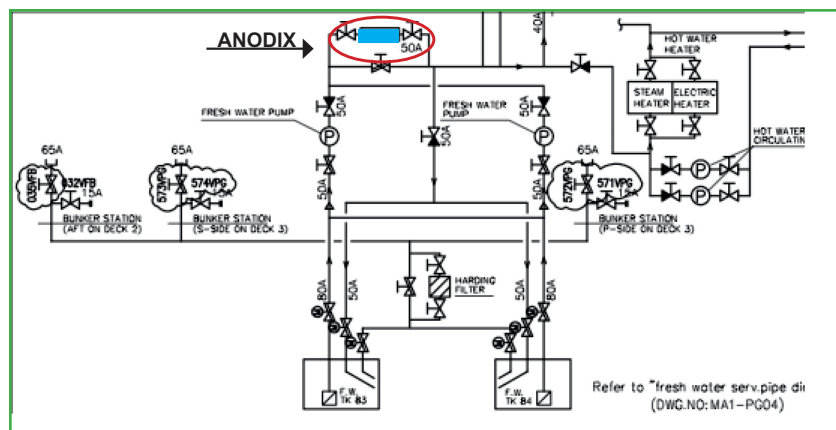
Anodix comes in various sizes and can be installed for affordable money, which is a affordable insurance against legionella.



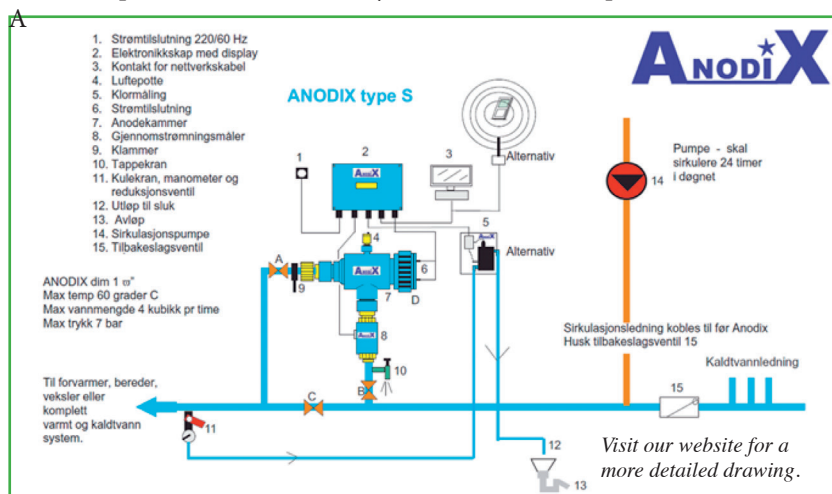
Two pieces of Anodix L are installed on the water tanks at Seadrills West Epsilon platform.



Anodix L is installed on the water tank on board PGS-ship Ramform Challenger.



Anodix is placed in a fresh water system on board (two pieces of tanks)

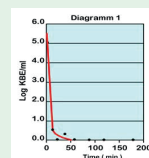


A well-known throughout Europe Applied Scientific Research Organization TNO in Zeist (NL) work together with German institutes. It proved to be predestined for the survey. It also performs testing and investigations of products from national and international food manufacturing consortiums.

In accordance with KIWA (the Dutch organization corresponding DVGW - the German association for gas and water industry) and with the approval of the Ministry of Public Health, the microbiological studies were completed in the end of June, 2000 showing excellent results. Three tanks, each with 700 liters of water, interconnected in the test laboratory of TNO Nutrition and Food Research Zeist, Netherlands. 100 000 legionella bacteria per 1 milliliter of water were cultivated, after which ANODIX was connected to the circuit and initiated.

These tests were carried out as follows:

1. Test for the Pseudomonas bacterium at 20 degrees C
2. Test for the Legionella bacterium at 23 degrees C
3. Test for the Legionella bacterium at 42 degrees C



The diagram 1 shows that all bacteria were killed within 55 minutes.

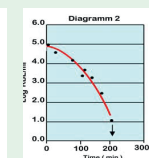


Diagram 2 shows that all bacteria were killed within 200 minutes.

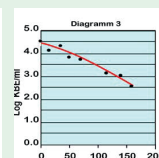


Diagram 3 shows that all bacteria were killed within 300 minutes.

TNO institute came to a conclusion that: Anodix is a good alternative for Legionella removal instead of heating the water up to above 60 C. Basis for all performed tests has been sent to the National Public Health Institute in Oslo.



PGS and Seadrill take the legionella problem seriously.

WATER – not as clean as you think it is

If you think that tap water is clean – think once again!

In autumn 2010 NRK focused on water quality in Norway. It is mostly believed that water in Norway is the cleanest in the world, as it is taken from high mountains and deep valleys of Norway's beautiful nature. Unfortunately, the reality is totally different. Water pipes more than 100 years old are covered with rust, humus and carbon, which are the ideal environment for dangerous legionella and other bacteria.

The documentary in Norwegian TV has clearly demonstrated it and we only have to agree that this is the bitter truth. Recently TermoRens AS has been dealing with the increasing amount of water piping systems contaminated by legionella.

The pictures below show the facilities that in its operators' opinion were quite clean.

No wonder they were amazed! It's the same almost everywhere we are cleaning.



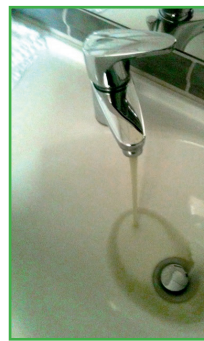
**Legionella?
NO THANKS!**



Legionella.



Cleaning of a facility with iron oxide ...



...and calcium oxide.



Facility with lime contamination.

TERMORENS CLEANING FLUID

- Restores full effect of heating and cooling systems.

Cleaning fluid for removal of lime, magnetite, oxides (rust), humus, salt and other sediments.



Water pipe before and after cleaning



Water pipe with humus, oxides and lime



Vacuum pipe with urine salt

Product description:

Termorens is a biodegradable non-toxic fluid. It is composed of citric acid, phosphoric acid, inhibitor and water. It's an easily mixable yellow-brown fluid with no specific smell. Its density - 1,3 and pH -1,5.

Instructions for use and dosing

Pipeline systems with poor circulation as a result of long-term usage require cleaning to reinstate its original capacity. When cleaning with Termorens, internal contamination is dissolved back into fluid and the facility regains its full capacity.

Termorens is injected into the system by using its own pump. For heating facilities use 10% of the facilities capacity. For cooling facilities use 15%. The cleaning process is most efficient when heated up to 40-60 degrees C. Cold cleaning is also possible if glycol is added.

When the fluid is added, it circulates with the facility's own pump. Be

sure that all valves are open so that the fluid can reach all areas.

If it is just needed to clean exchangers, simple heat exchangers, simple radiators, coils, condensers or other equipment without its own circulation system, an external circulation pump shall be used.

Time required for cleaning depends on the amount of contamination and its density. Normally you regain full effect within one day. For cleaning of individual items only, the process takes just few hours. Solid coating such as lime, rust etc., is dissolved into liquid and rinsed out of the system after cleaning. Flush out all fluids after the cleaning process.

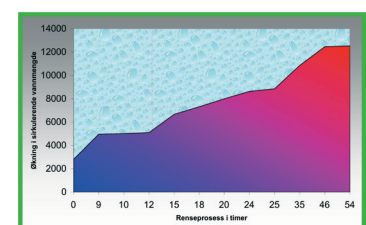
Termorens can be applied to all types of plastic and metal materials without harming them. It neither damages gaskets or bushings.

Facilities cleaned gains full system efficiency, resulting in cost savings due to reduced energy consumption and unnecessary shutdowns.

Areas of application:

- Heating and cooling facilities
- Floor heating systems
- Ceiling cooling systems
- Boilers and water heaters
- Condensers and evaporators
- Heating and cooling batteries
- Heat pumps
- Radiators in car and boat engines

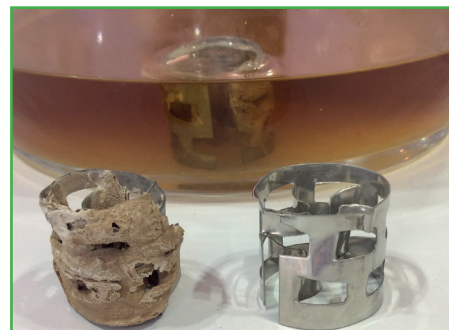
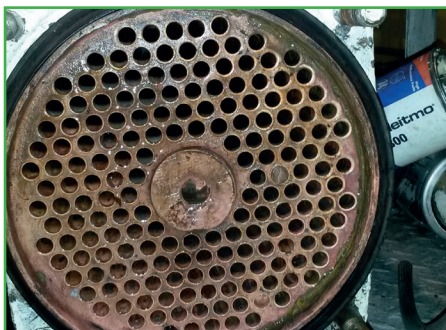
Also effective for facilities placed in glycol-, sea and saltwater.



Development Chart, showing cleaning of heat exchangers.

Our product effectively removes lime, mussels and corrosion from piping systems, tanks, seawater intake and box coolers.

- Box coolers
- Plate coolers
- Seawater-intake
- Sea water pipes
- Fresh water pipes
- Delusj sprinklers
- Cooling Condensers
- Cooling towers
- Heating and cooling exchangers



Pipelines, coolers, etc., are cleaned simply by pouring Termorens into the system and apply circulation from 6 hours to one day. Repeated if necessary. By applying heat the time required is shorten. Rust, scale and other contamination are dissolved and rinsed out of the system. Termorens also removes inner biofilm and kills all bacteria.

Mussels are also a big problem. Visit our website for further information: www.tros.as and watch the video showing how simple mussels can be removed from the pipelines.

Urine salt in vacuum systems is a nightmare

Not much can be worse on a boat than a clogged sewerage system. One easily forgets that urine salts gradually accumulates inside and it always ends in blockage and breakdown of toilet system.

The problem is well known, but often ignored. However it should be taken seriously. When it's blocked its often too late. Many boats have had to dry dock due to main pipes on vacuum system got contaminated and needed to be replaced. Urine salt gradually accumulates inside systems and it looks like lime, but it's more porous. It accumulates in such a way that the valves eventually cannot open and paper gets stuck inside and can't go through.

What shall be done when such a disaster already has taken place?

Many go to dock and replace their pipes – quite expensive and unnecessary solution.

By using Termorens or Systemrens the vessels vacuum system can easily be cleaned. It is done by circulating the cleaning fluid inside the vacuum system, dissolving urine salt and transforming it into liquid. The cleaning process can be carried out area by area, to avoid disabling the whole sewerage system during the cleaning process.

If breakdown happens offshore, for instance on a cruise boat, a part of the system can be cleaned while the other ones remain in operation. This is a practical solution. With proper planning the remaining system is cleaned. The cleaning fluid is environmentally friendly and it doesn't harm the pipeline, gaskets or other components in the sys-

tem. After cleaning simply dispose it in to the sewage tank.

Importance of preventative measures

In order to prevent the abovementioned situation it is important to use proper chemicals to keep the scale away. We have developed a special soap that can be used for cleaning both toilets and the sewage pipelines. By flushing the toilet after cleaning, some of the contamination inside the pipe will be dissolved. This is a practical method on new vessels. For older vessels Termorens Descale is recommended. The fluid is injected into the facility through a dosing pump or poured into the toilets while cleaning.



Dosing in the cleaning fluid



Hose connected to Vacuum toilet



This is how it looks like when urine salt accumulates in the system.

With our own qualified personnel, equipment and always product on stock we are able to mobilize efficiently on short notice.

- High pressure pumps 68:1
- High pressure washers w/steam 200 bar
- EX-proof High pressure equipment 0-1200 bar with up to 80 liters per minute
- Spinners
- EX-proof Dehumidifiers
- Circulating pumps
- Dipping bath container
- Heating coils
- Hoses, flanges and connectors
- Storage facilities for PPE equipment
- Mechanic workshop



Equipment storage facilities.



Flushing Unit of 1000 liters pr. min.



Dosing / Circulating pump

Product news from TROS

Newly-developed EX-proof Dehumidifiers that improves economy/operation and climatic conditions in the field of surface treatment profession.



Our dehumidifiers keep relative humidity level below 40% regardless of weather conditions, avoiding the steel to start corroding before applying paint. This maintains virtually zero operational downtime.

It's well known that in the offshore surface treatment profession the humidity level is often at its limits, compared to onshore where dehumidifiers have been used for more than 30 years.

With our newly developed EX-proof equipment it's now possible offshore as well.

It is known that this affects the quality of work performed and the lifespan of the coating, in consideration to the warranty period one has towards customer.

We believe that we can improve the surface treatment professions quality level. We have long experience in using dehumidifiers.

Ex-proof high-pressure washers with a working pressure of 100-1200 bar, and water flow of 15 to 80 liters per min.



High pressure pretreatment with H-pressure washer in combination with TermoRens GEL and Concentrate for corrosion removal. This means that we puncture the corrosion points with high pressure cleaning, and then spray Termorens GEL that dissolves the corrosion. Then we clean with fresh water and the corroded area can be treated/painted. Internally we use the same principle for upgrading of corrosion in tanks, by using Termorens concentrate.

Using this system we can take control over all types of corrosion: iron corrosion, galvanic corrosion, crevice corrosion, point corrosion (pitting), selective corrosion etc.

With this pretreatment method we avoid using sandblasting, grinding & chipping of corrosion.

An environmental friendly alternative that enables workers to work in a better environment regarding exposure and stress.

We consider HSE in the field of surface treatment.

Product news from TR

Pump: TR-JP5 proff



A pump specially designed, based on experience of cleaning onshore and offshore for the past 21 years. This pump we can supply purpose built upon request. The standard pump is JP5 type of stainless material 316. 3 or 5 kW heating coil. Built-in wheel for easy transportation.

Can be obtained only from TROS AS.

Environmentally friendly paint removal: Termorens IPS 300

We have developed an environmental friendly paint remover for vessels and platforms. This product is in the process off HOCNF approval and will be registered in NEMS-database within March-April, 2015.



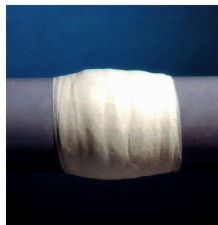
Applied for 4 hours.



Final result: clean surface.

Tett-It

Stops leakages without applying heat or using tools. Withstand pressure of up to 20 bars and heat up to 480 degrees. Produced in sizes: 5 x 150 cm and 10 x 450 cm



Aquamax dosing pumps



Evolution series: a new way of understanding cleaning and dosing pumps

All pumps from Evolution series are equipped with a special leak-proof cap (own patent) made of shock-proof stainless material. It covers the top part of the pump with hoses and prevents cleaning fluid leakage or spilling inside a service car, storage facility, etc.

In this way the pump is simple and clean to use.

All pumps from EVOLUTION series are also equipped with a new Powerflux valve that enables to direct the flow of fluid in any direction.

We have our own production & competency to handle large and smaller projects; in addition we have production of special designed products upon request.

We are offering the following qualified personnel:

- HVAC engineers
- Chemists
- Mechanics
- Surface treatment engineers
- FROSIO certified inspectors
- Rope access personnel

**Our HOCNF data sheet can be obtained from NEMS database for:
Termorens - SAP No. 585501
Termorens GEL - SAP No. 845489**



Trykk: Atles Trykkeri AS, Porsgrunn

TermoRens Offshore Service AS

Kokstadflaten 29, 5257 Kokstad

Tlf: +47 555 40 534 - post.tros@termorens.no - www.tros.no