



# ScaleWatcher for Oil & Gas Industries.

## 1. Introduction

Scalewatcher is the original manufacturer of electronic, de-scaling technology used throughout Europe, Asia, and Africa with assembly facilities in the Netherlands, S.E. Asia and the U.S. Scalewatcher offers an impressive list of benefits particularly for manufacturers of all types, municipalities, agriculturalists, and operators of refrigeration, air conditioning, heating, power generation, waste disposal equipment, golf courses and property managers. To date, Scalewatcher has enjoyed considerable success worldwide, and new applications are being discovered regularly.

## 2. Scope of Scalewatcher Application

Scalewatcher is able to prevent scaling and to remove existing layers. There are numerous examples in Industry with successful applications. Launching the product in 1989 initiated Universities to re-search this phenomenon which was at the time not really understood. Now the technology is widely accepted not only thanks to competitors who copied the concept but also thanks to managers of companies in Industry who in the early days, were not afraid being laughed at while evaluating the performance of Scalewatcher in the field. Physical water treatment has gained its place in Industry as a high tech and reliable means of mineral scale prevention.

## 3. Applications of Scalewatcher

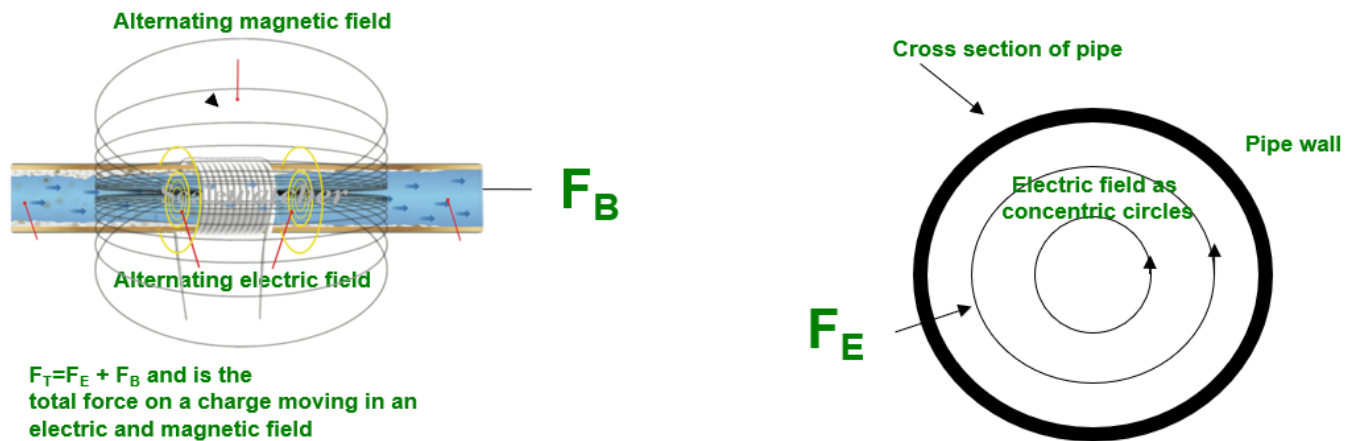
General equipment in Industry or Commerce where our physical water treatment can be used: -

- Cooling towers – Chillers
- Compressors
- Water boilers
- Fire tube steam boilers
- Plate heat exchangers
- Shell and tube heat exchangers
- Pipe lines
- Evaporators
- Condensers
- Aerators
- Air coolers
- Oil coolers



## 4. Technical Explanation for the working of Scalewatcher

Water contains dissolved mineral crystals and the mineral crystals itself. Among them are Calcium- and Carbonate ions, which are interacting to form an equilibrium with Calcium Carbonate crystals. Meaning that when crystals are dissolved other mineral ions will combine and form crystals again. This is a continuous process. The force of an electric and magnetic field of the right frequency and signal-shape influences this process, shifting the equilibrium towards much more crystals of smaller size and roundish shape. This is the base for the SW effect, as crystals with smooth surface do not stick to pipe walls.



The main effect of the treatment is that smaller and many more crystals with a rotundas shape are formed in the bulk of the water, which will not adhere to pipe walls as long as the water flows. The flowing water will remove old scale layers by sheer mechanical force. The treatment therefore needs flowing water to be effective.

Non-flowing water systems are problem areas for this type of treatment, such as dishwashers in restaurants or hospitals and humidifiers in museums or paper factories and evaporators in the sugar Industry, where the juice is concentrated by evaporation. There will be remaining scale, however this will be less and softer so will be easier to clean.

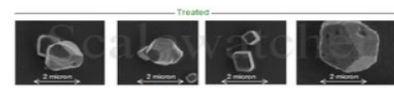
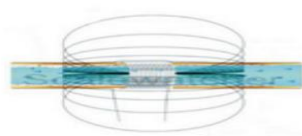
Fire tube steam boilers in the food Industry where it is not allowed to use any chemicals will benefit from the installation of Scale watcher. The boiler will not be kept scale free for ever as not much water is flowing. However, scale will be softer and it takes longer to form.

The pictures below show the way crystals grow in non-treated and treated water.

Pictures taken by an electron microscope



822 x magnified  
Water containing dissolved minerals and mineral crystals with sharp edges. Easy to adhere to pipe walls.



Water containing less dissolved minerals, smaller and many more mineral crystals with a rotundas shape. They will not stick to pipe walls when there is sufficient flow.



## 5. Problems caused by minerals in crude oil

1. Mineral scaling
2. Wax forming
3. High viscosity
4. Corrosion

1, 2 and 3 cause low throughput to the point that pipes have to be cleaned.

4 causes early replacement of pipes

## The effects of magnetic and electric field on crude oil

### Paraffin-base oil

A magnetic field has the most effect as paraffin is permeable for magnetic fields.

### Asphalt-base oil

Asphalt is less sensitive to a magnetic field but has a high dielectric constant and is therefore more sensitive to an electric field.

Mixed crude oil containing paraffin and asphalt: -

It makes sense to use here an alternating magnetic field which will create an electric field also. In all cases duration and amplitude of magnetic and electric fields are important.

In short, all matter in crude oil which has a magnetic permeability or is dielectric will position itself in line with the magnetic or electric field. This will allow nearby particles to cluster together forming less, but bigger particles. It is known that bigger particles lower the viscosity of a liquid.

The drop-in viscosity is temporary and will revert to its original value within about 8 hours.

If the flow velocity is  $v$  m/s and we take an average of four hours than the distance covered is  $d=v*4*3600$  m or  $d=14.4*v$  km.

Treatment should be repeated every 30 km for a flow velocity of 2 m/s.

This will only work when there are charged particles in the crude oil and the oil is saturated or super saturated with wax. Under influence of the Lorenz force ( $F_t=Feb.$ ) wax ions in the oil will attach to the charged particle so wax precipitation is promoted in the bulk of the oil. Therefore, there will be fewer wax ions available to adhere to pipe walls. Of course, this will reduce the saturation level so it is possible that existing wax layers will be dissolved and removed by the flow.

Scalewatcher was installed on a down hole hydraulic power oil system in Texas. Each year the holding tank had a buildup of hard paraffin of 4 to 5 ft thick. After the installation the paraffin started to soften.

The consistency of the softened paraffin was that of pudding which was easy to remove. After one month the tank contained only 18 inches of wet soft paraffin which was easily removed. Again, one month later the layer was only 7 inches.



## 6. Results being Delivered

An amazing side effect of the product on iron pipes with oxygen containing water is that rust is no longer formed; it will be removed and replaced by a very thin black protecting layer, called Magnetite.

A side effect that was to be expected is the fact that bacteria counts in process water will dramatically be reduced due to the cleaning effect of Scalewatcher. The breeding ground of bacteria disappears, so will the bacterium. This effect is noticeable particularly in cooling towers. Field reports are available showing no scaling, no algae growth, bacteria count of zero and less corrosion.

In the civilized world Industry has to pay for its disposal of water. Blow down of steam boilers or cooling towers are examples. As most of this equipment uses automatic blow down based on the electrical conductivity of water, it is easily seen why water can be saved. The longer it takes before a certain conductivity level is reached the fewer blow downs. This level can be set higher with Scalewatcher treatment. Savings of 50 to 80 % in water usage is possible. The total savings on water usage and cost of water disposal gives an extremely quick return on a one-time investment.

The treatment can be used for:

- Removing and Preventing scale deposits, rust, barnacles, slime
- Preventing settlement of zebra mussels.
- Reducing bacterial count in cooling towers amongst others
- Reducing or completely inhibiting algae growth.

## Duanda Oil Field

**Pipe length 9.8 km, pipe material carbon steel 159x5, carrying crude oil**

**Kind of scaling: Carbonate, Sulphur, Silicate**

**Descaling method: pulling balls through the pipe**

| Before   | After  |
|--|--|
| Scale layers extremely hard.   | A thin layer is present at the end of the pipe. Raising the pressure will remove it. |
| Descaling necessary every week.  | Descaling every 3 weeks.   |
| Mechanical cleaning by heavily hammering.                                    | Hammering not necessary.   |
| Dragging ball through the pipe start 8 AM (ball in) and end 6 PM (ball out). | Descaling time from 8 AM to 2 PM.  |
| Balls were seriously deformed and broken.                                    | Ball not deformed as before.   |
| Scale forming rate very high.  | Scale rate build up 1/10 <sup>th</sup> compared with "before".                       |



## Before and After installation of ScaleWatcher Visual Analysis Summary

20<sup>th</sup> March 2019



2<sup>nd</sup> June 2019

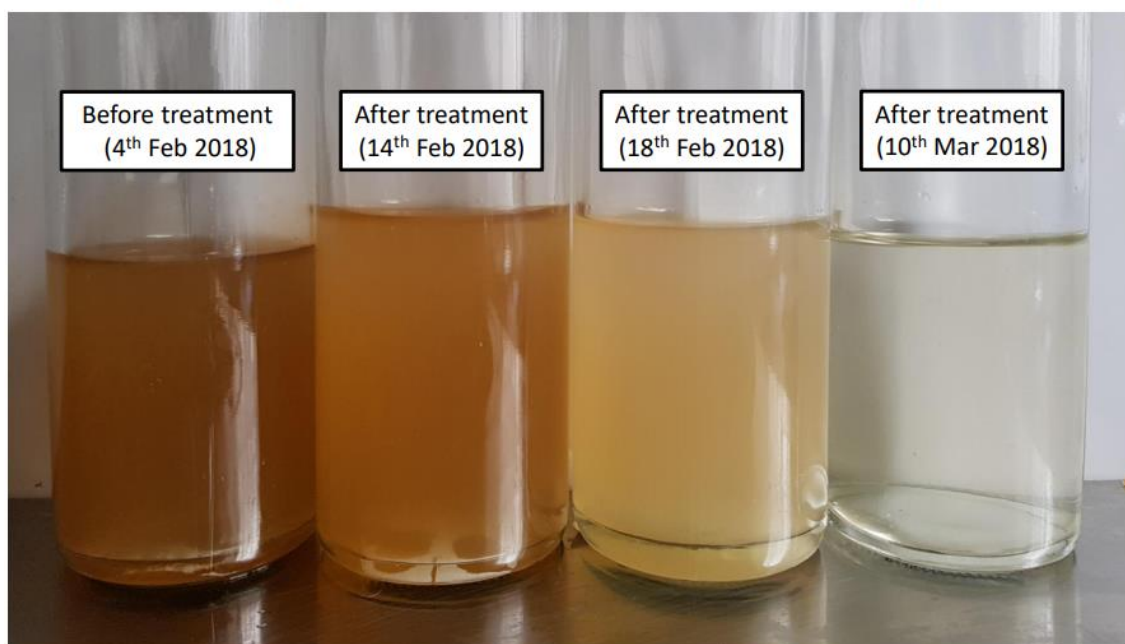


27<sup>th</sup> June 2019



**Before & After results of SW on Chiller System within a month of installation**

### Change in colour of water sample







## RO plant 2 pump

Before treatment (September), as shown in the image, the surface of the pump is covered with thick scale layers present on it



5<sup>th</sup> September 2020

After treatment (November), the image shows slight improvement in reducing scale layers.



25<sup>th</sup> November 2020

After treatment (January), the image shows significant improvement in reducing scale layers as shown in the image almost all white scale layers are being removed.



18<sup>th</sup> January 2021

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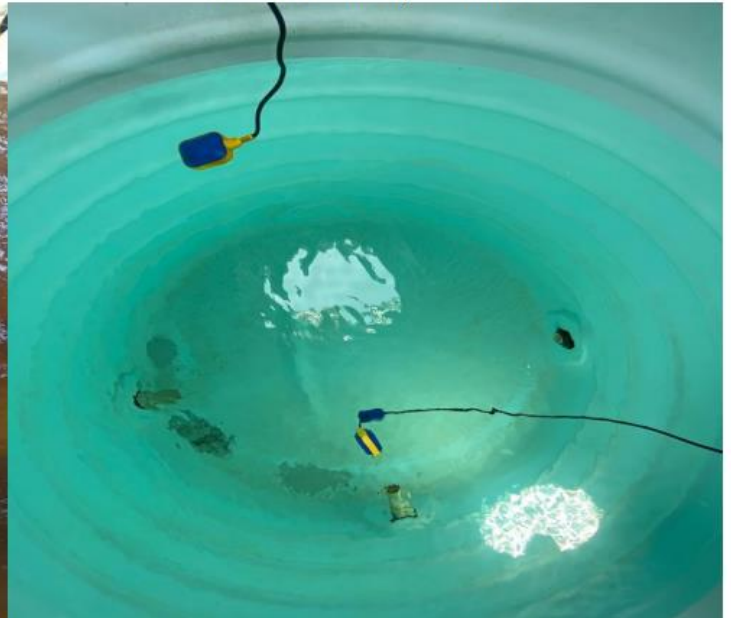


## Bore well storage tank

After treatment (October), the image shows all the rust from bore well pump was cleaned and was pushed to storage tank. The tank became brown due to too much rust content



After treatment (January), the image shows all the rust from tank was cleaned and now the water is crystal clear and tank is same as new without any sediments.







## pH Test

Before Treatment  
27<sup>th</sup> November 2017



After Treatment 7<sup>th</sup> December 2017  
You can observe that the water has changed from acidic to basic, this is due to decrease in algae there is decrease in Carbon dioxide level in water (As carbon dioxide is acidic in nature)







## Effect on corrosion in pipe lines



- Rust is common in iron pipes. With this treatment rust will disappear.

Courtesy of SKA LTD, Japan

## Effect on corrosion in pipe lines



- Within two to three weeks rust disappears and is replaced by a black insulating layer, protecting the iron pipe. (Magnetite). This layer is very thin and will not grow with time and has very good heat transfer properties.



## ATTACHMENTS

Please refer the attachments for detailed and board case studies. The number of attachments is as follows: -

1. Research 1 A study of magnetic effects on the physicochemical properties.
2. Research 2 Mechanism of Magnetic Field
3. Research 3 Precipitation of Wax
4. Research 4 Study of the influence of Magnetic Field
5. Experience Report
6. Wax from bore hole in Alabama
7. ROI Reports
8. Dealership certificate