

# ELYSATOR



engineering water



MARITIME WATER TREATMENT



### The ELYSATOR Company

■ In 1971, Heinrich Rickenbach, a Zürich-based engineer, who had been working predominantly on cathodic corrosion protection for boilers and water storage facilities since the 1960s, founded a public limited company, ELYSATOR AG. The main impetus for setting up the company came from an innovative new technology that he had developed for corrosion protection in heating systems

■ In the early years, the ELYSATOR system had to establish itself against alternatives such as chemical water conditioning and the division of systems but, in the mid 1980s, its high operational reliability and relatively low running cost and maintenance ensured its big breakthrough in Switzerland.

■ In the 1990s, the company launched an innovative flushing system on the market that helped to solve silting problems in underfloor heating systems and is still regarded as a leading solution today. Since then, ELYSATOR Engineering AG has established itself as the market leader in Switzerland and supplies around 20 countries worldwide. Manuel Rickenbach, now joined by Rolf Frei, pursue the same goal every time: to provide specialists with a suitable water treatment device for every application.

### The Product Philosophy

■ By far the most important part of the ELYSATOR system is a corrosion protection device for heating and cooling systems that can be supplied in a full range of dimensions for everything from private homes to unit-type district heating systems and the largest ocean-going ships. Thanks to its long years of experience in water conditioning, the company's current and future range of products also includes many other options and products in the area of corrosion protection and the restoration of water systems.

■ The product philosophy behind the ELYSATOR is protection from corrosion as simply and reliable as possible. The simplicity and effectiveness of our products means that we constantly have to meet the challenge of being better and more reliable than our 'imitators'. This is a challenge that we have always successfully met and are eager to accept.

■ All our products are produced in Switzerland and comply with strict national and international safety and quality standards.

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### The Problem

- There are three major causes for corrosion in closed water circuits: Diffusion of oxygen, forming or entry of acids (low pH-value) and the content of salts in the water.
- Valves, threaded joints, recirculation pumps, control units, automatic bleed devices or defective expansion tanks are a significant source of potential oxygen ingress. The oxygen diffusing into the heating water leads to corrosion.
- A low pH and increased electrical conductivity in the system water also promote corrosion, leading to clogging of the system by the products of corrosion.
- In the past, the most common method of protecting against corrosion was to add chemical corrosion inhibitors. However, in many cases it was found that active protection was not achieved in cracks or under deposited dirt or rust and there was therefore no adequate solution to the problem. Moreover, monitoring the addition of the correct quantities of inhibitors is time-consuming and costly and, if the wrong concentration is used, they can lead to corrosion. The use of heat exchangers to separate the system into a heating circuit and a hot water circuit ultimately has the effect of merely dividing the problem into two without achieving active corrosion protection.

### The Solution

- The ELYSATOR corrosion protection system has been used to extend the life of water circuits made of metallic materials for over 30 years.
- In the ELYSATOR method, high-purity magnesium anodes in a Cr-Ni steel container are exposed to an electrolytically induced reaction process, not only re-acting to form their familiar oxides but also entering into neutralising compounds with various aggressive substances in the water and thereby reducing its corrosiveness.
- Colloids with a redox action are additionally formed from the anodes through controlled charge circulation via the ELYSATOR. As soon as these come into contact with the inside of the pipes in the rest of the system, they act as mobile microanodes. Through redox processes and slight alkalisation, they also promote the build-up of a natural protective layer in the pipe system.
- The ELYSATOR process has no known or theoretically conceivable negative effects on people the environment or machinery components. The ELYSATOR is recommended for new installations as well as for retro-fit applications.
- Good water treatment will lead to less energy consumption and longer life of the components involved.

**The ELYSATOR Non-Chemical Corrosion Protection System**

■ The ELYSATOR is a reaction tank equipped with a specially designed alloy of magnesium anodes. It is fitted into the water flow of any heating or cooling water circuit.

By means of a cathodic/anodic reaction with the sacrificial alloy, oxygen that entered the system is constantly bound. The elimination process results in the production of magnesium hydroxide that combines acids and raises the pH value.

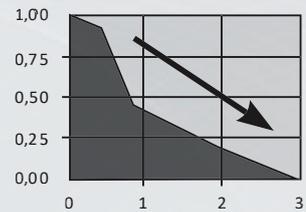
Dependent on the systems water composition, the electrical conductivity is lowered as dissolved salts react and settle in the built-in cyclone. The ELYSATOR produces alkaline water quality with a low salt content at a reduced oxygen level.

Systems with such water quality will not suffer from corrosion damages.

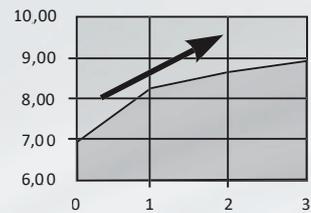
■ By means of the built in 300 micron suspended solids filter, the ELYSATOR traps and holds back corrosion particles, some dissolved and solid impurities, which are circulating in the system. The sludge can then be removed easily by draining the Elysator. It is recommended, for optimum results, that system water which has been treated with chemicals or contains a large amount of corrosion sludge should be thoroughly flushed before the ELYSATOR is installed.

■ The maintenance of the ELYSATOR is limited to occasional draining and the changing of the anodes once they are fully depleted, in average every two to three years. No environmentally unfriendly waste is left.

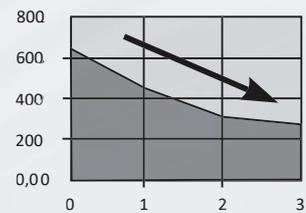
Oxygen absorbed O<sub>2</sub> mg/l



pH-value



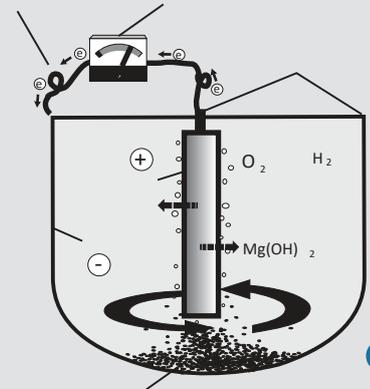
Electrical conductivity μS/c



Reduced oxygen + increased pH value + reduced electrical conductivity = increased corrosion protection.

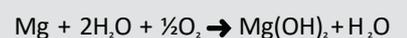
**Flow chart, simplified**

Electron flow      Gauging/Control      Electric potential difference steel/magnesium



Dirt is filtered by appropriate circulation

**Equation for total reaction:**



Magnesium, water and oxygen are combined into magnesium hydroxide (increased pH) and water.

The purpose of the Elysator system is to protect against corrosion and precipitation of sediments, which in turn grants a more economic, safer and more environmentally-friendly protection of the planet. And absolutely no chemicals are to be used!

**1. pH - Value**

■ Corrosion is also due to acidic water. (Low pH-value, water produced from sea water by evaporation, normally holds a pH at aprox. 5.5) The ELYSATOR system automatically regulates the pH value to approx. 9 to 10 (This is caused by splitting of magnesium hydroxide from the anodes).

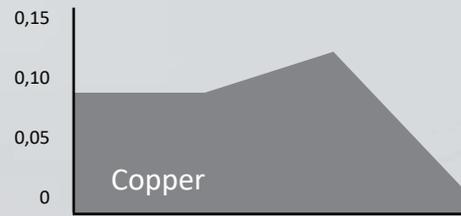
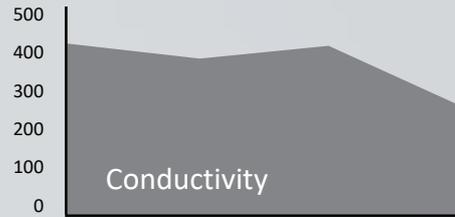
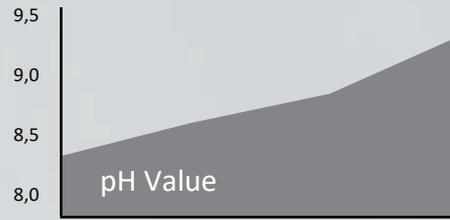
**2. Electrical Conductivity**

■ 100% pure water is non-conducting. It is important that electrical conductivity is kept as low as possible in order to avoid galvanic corrosion as well as to reduce the stress on pumps, gaskets, heat exchangers etc. The efficiency of the ELYSATOR is proportional to the conductivity which means that the ELYSATOR is regulating itself in accordance to the condition in the water. The more impure the water, the harder the Elysator will work itself.

**3. Deposits**

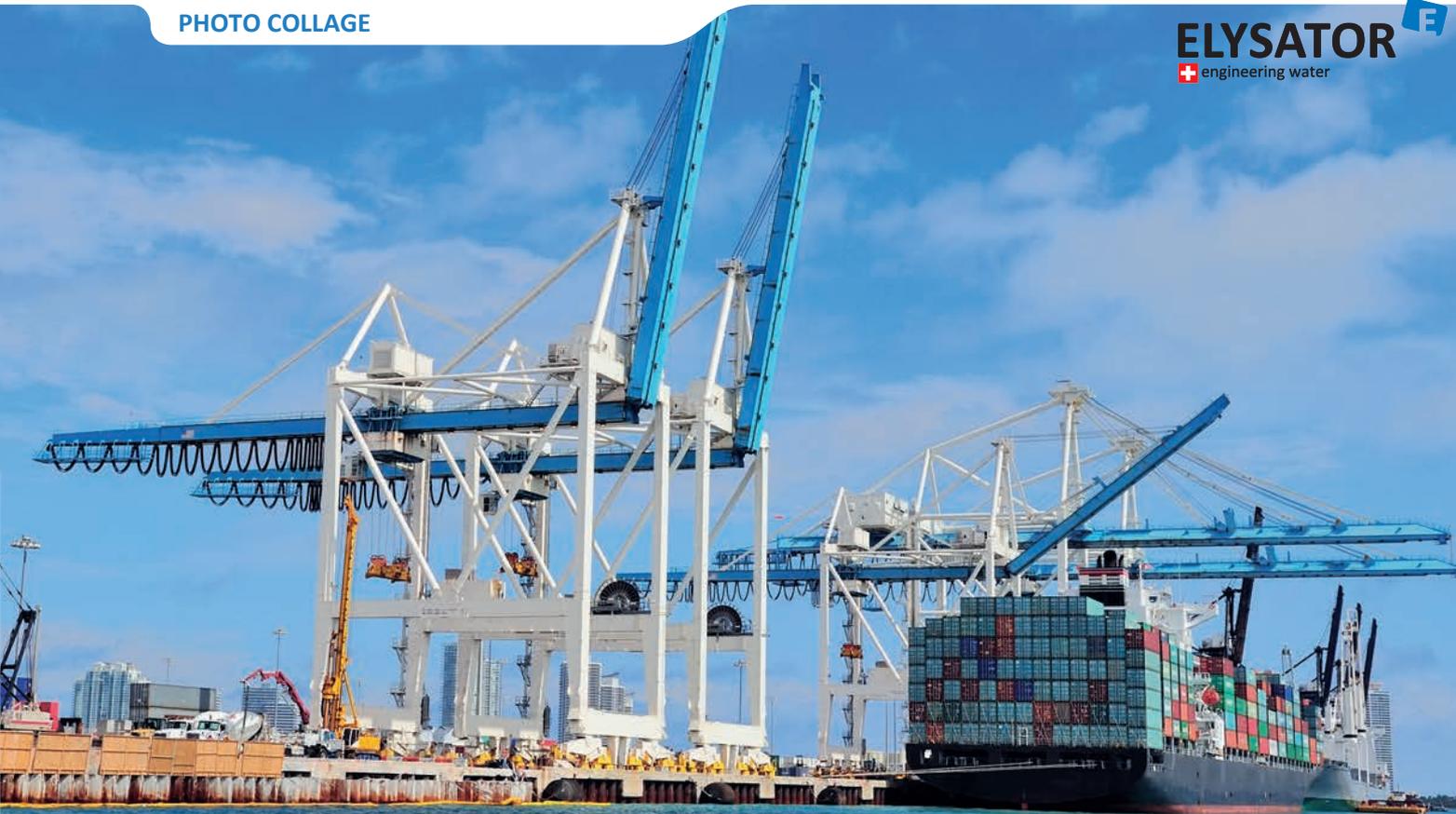
■ Major parts of the deposits are oxides of iron and other common metals. They are a result of corrosion due to an oxygen surplus, low pH or a galvanic current. The amount of dissolved metal is a measure for the ongoing corrosion process in your system. Through the ELYSATOR the water will be neutralised and metallic surfaces stabilised. Corrosion is therefore stopped and the water stays clear, clean and without sediments. The deposit sludge is simply removed by draining the Elysator.

■ The ELYSATOR system is an efficient replacement for the traditional chemical pH & oxygen treatment systems. The installation is easy and can be done with a minimum of cost and time. We advise that the systems are preferably drained down prior to starting up the Elysator treatment; otherwise its function may be in conflict with existing chemical additives.



The following is achieved:

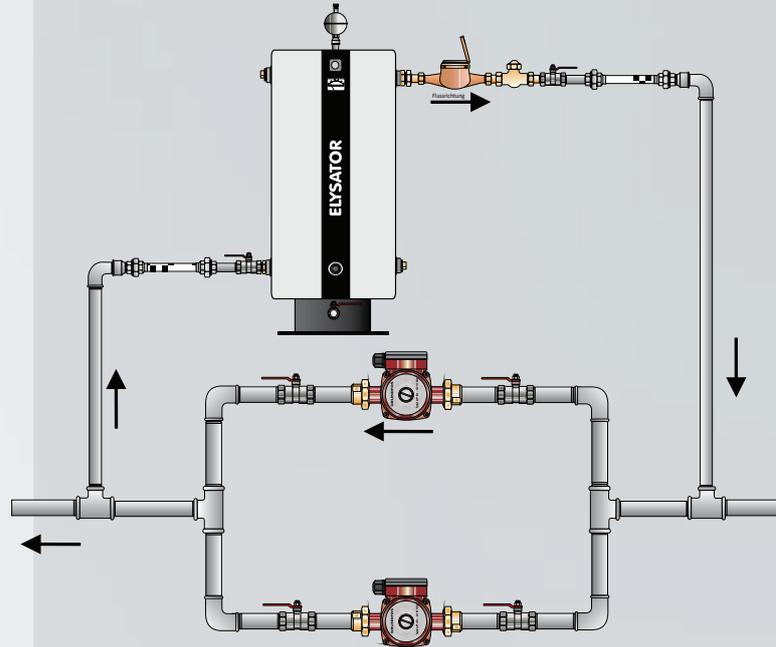
- |                                    |  |
|------------------------------------|--|
| Increased pH value (aprox. 8,5-10) | → Magnesium hydroxide                    |
| Precipitation of sludge            | → 300 µm suspended solids filter, magnet |
| De-aeration (oxygen consumption)   | → New water H2O                          |
| Protective layer                   | → Oxide incrustation                     |
| Low conductivity (50-200 uS/cm)    | → Sulphate & chloride sedimentation      |



**Closed systems  
(FW cooling, heating etc)**

■ The Elysator shall be mounted as shown in the illustration in a by-pass position preferably over the main pumps; a line from the common discharge of the pumps is connected to the inlet of the Elysator (bottom). The outlet from the Elysator (Top) is connected to the common inlet of the pumps. The inlet/outlet not in use on the Elysator are to be plugged. The water flow needs to be adjusted with the regulating valve after the flow meter, while the ball valve on the inlet remains full open. Mild steel pipes with a diameter not less than 1" should connect the Elysator to the system. Actual size of pipe is given for each Type of Elysator. It has to be installed as close as possible to the connection point, and as low as possible in the system.

**Principle closed systems**



For Type 15 to 260 there should be about 1 meter clear space above the top of the Elysator for removal of anodes for maintenance purposes. Elysator Type 500 and 1000 should have 1 meter clearance in front of the belly to enable removal of anodes for maintenance.

**New buildings/shipyard**

■ We must strongly underline that the Elysator does not replace any traditional conservation liquid, antifreeze or/and flushing liquid during the building period and start up of the machinery prior to delivery. It is entirely the shipyard / shipbuilders property and responsibility to perform this procedure. When all machinery is prepared to be taken over, the Elysator can then be taken into use with "non" chemical water, and the maintenance to be followed.



**Boiler water treatment**

■ The Elysator should be located preferably as shown on the illustration (fig. 14-1). Both suction and discharge line are to be connected beneath the level of «low level alarm» to the hotwell. A separate circulation pump pushing water over the ELYSATOR has to be installed with suction from the hotwell as low as possible.

■ The water flow needs to be adjusted with the regulating valve after the flow meter, while the ball valve on the inlet and outlet remains fully open.

Mild steel pipes with a diameter not less than 1” shall connect the Elysator to the system or as per the size specified for each type of Elysator.

■ We underline the importance that the Elysator should be located as low as possible in relation to the hotwell (preferably on the deck below the hotwell). The idea is to have the normal water level in the Hotwell above the top of the Elysator to get a net positive head and to avoid build-up of an air pocket in the Elysator.

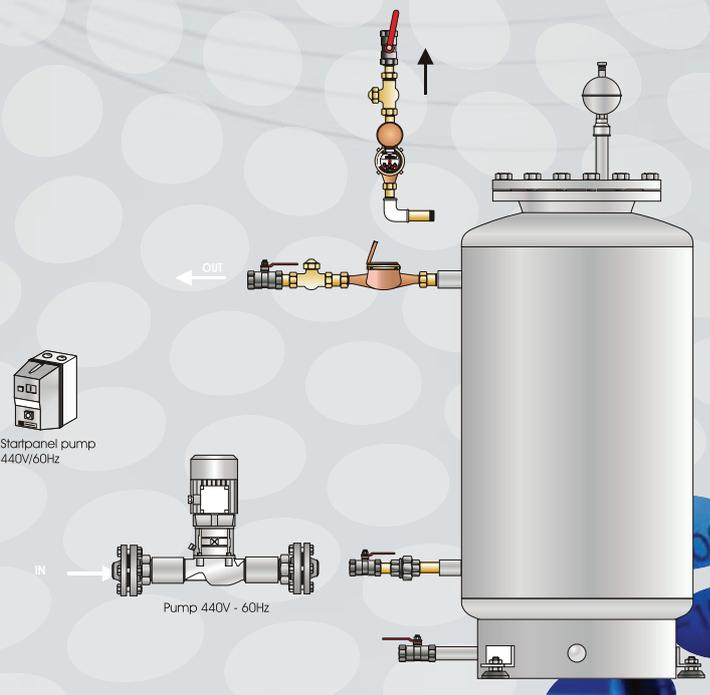
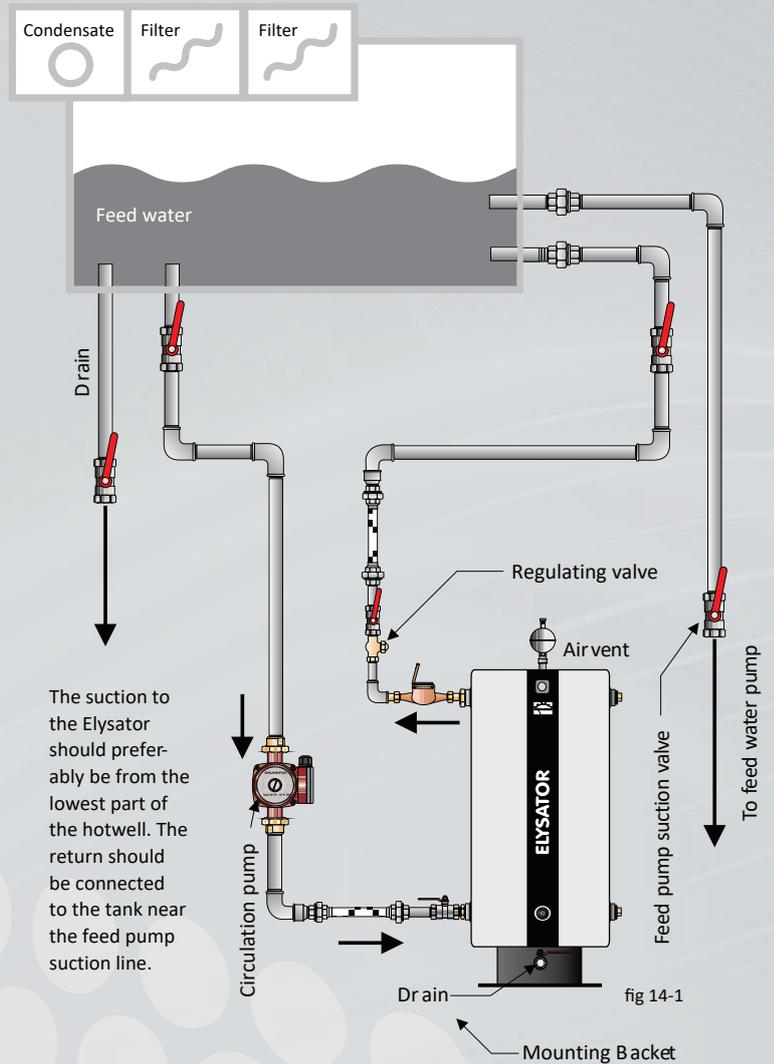
■ Should the top of the Elysator be approximately the same height as the normal water level in the Hotwell, a gooseneck should be made on the discharge line of the Elysator, to avoid build up of an air pocket in the Elysator. The height of the gooseneck should be at least half a meter above the top of the Elysator.

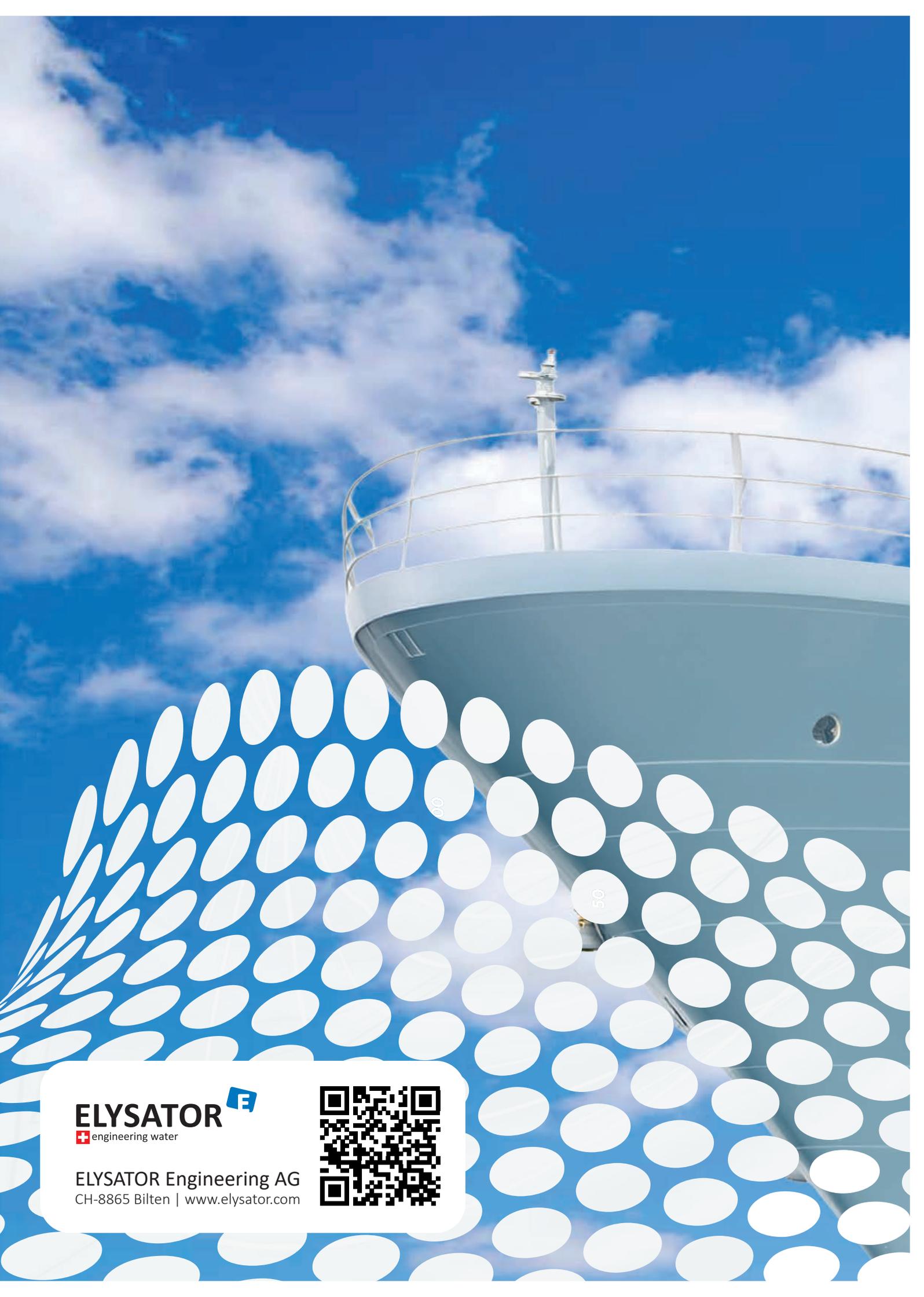
■ Also when starting the Elysator the circulation pump should be started with both the inlet and discharge valves fully open, but the flow regulating valve should be fully closed. At this time ensure that the automatic air vent on top of the Elysator is open. When water starts to come out from the air vent (after all the air in the Elysator tank is vented), then slowly open the flow regulating valve till the desired (recommended) flow is achieved.

■ The hotwell temperature should be kept above 80 deg C to minimise the oxygen content.

■ When the boiler is idle preferably should be kept under some small steam pressure (about 3 bar). If the boiler is not under pressure then the Elysator circulating pump can be fitted with a recirculating line to the boiler filling line with a valve and back from the boiler drum, thereby keeping the boiler always full, with treated water circulating through it. Of course the Elysator is to be run constantly during this time.

**Installation principle for hot well**





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