

CATO  
COOL

# CatoCool

Water treatment for cooling systems





# Cooling Water

## Benefits and Challenges

Besides being widely available at a low cost, water is very efficient as a heat transfer medium. This makes it ideally suited for cooling water applications. However water also has properties that make it less ideal, and without a proper water treatment programme issues like corrosion, scale formation, fouling and bacteria growth can become problems that directly impact key factors such as heat transfer efficiency, equipment life and energy consumption.

### Corrosion

With the ability to dissolve many substances as well as gasses the cooling water can cause significant corrosion to the metal pipes.

### Scale

As the cooling water circulates through the system it will inevitably reach a concentration that exceeds the solubility of the dissolved minerals in the water, which results in scale forming in the system.

### Fouling and macrofouling

Foulants can come from external sources such as dust or fibres in the cooling air or from internal sources like by-products of corrosion. The build-up of suspended materials leads to deposits in the heat exchange equipment.

Macrofouling occurs in once-through systems and water intakes in lakes or rivers, where clams, mussels and other marine organisms enter the system and attach to the piping reducing water flow and increasing corrosion.

### Cooling water system

Since most of the processes involved in industrial production produce heat during operation, the ability to control the temperature of the process fluids is essential to ensure an efficient and continuous production. Cooling water systems achieve this by transferring heat from the hot process fluids to the cooling water which is then cooled before being reused or led away and replaced by fresh makeup water.

## The importance of treatment

With modern production being heavily reliant upon efficient heat transfer from the processes involved, it is clear that when a cooling system is unable to remove the heat, the entire production suffers and as a result the costs increase.

### BlowDown

It is important to treat the cooling water to avoid deposits and corrosion in the cooling system, this applies for both galvanised and stainless steel. To avoid scale deposits the water must be softened. To avoid corrosion the conductivity and chloride must be controlled by the blow down. The blow down which is a key factor in cooling water treatment, must lie at approx. 10-20 percent and the conductivity must be kept at a constant level through an automatic blow down process. It is not sufficient to discharge a bit of water occasionally. A correct blow down saves money and is environmentally friendly. Guldager monitors the blow down by a conductivity meter, which activates a blow down automatic, when the conductivity rises above a certain set point.

Three conditions are especially important:

- **Hardness**
- **The total content of salt**
- **The content of chloride**



# CatoCool P-E-A-K

## Complete solutions covering all needs

Guldager provides comprehensive cooling water treatment solutions including open and closed systems for sea and fresh water intake. Our experience in water treatment has taught us to understand the complexities of industrial water treatment, and we supply cost- and energy efficient solutions thus improving performance and operational effectiveness

CatoCool is Guldager's unique water treatment system for cooling water. A natural alternative to a chemical based treatment of water in open or closed cooling water systems. The concept is based on our "wise water treatment" strategy, which aims at reducing the use of and contact with chemicals and at the same time provide a positive impact on our customers' bottom line. The CatoCool system is delivered as a skid mounted plug & play solution. The solution is thoroughly tested, environmentally friendly and very cost-efficient.

The CatoCool system offers the following benefits:

- **Complete water treatment system**
- **Environmentally friendly**
- **Operationally streamlined**
- **Safe and comfortable working environment, no handling of chemicals**
- **Flexible to different treatment needs**

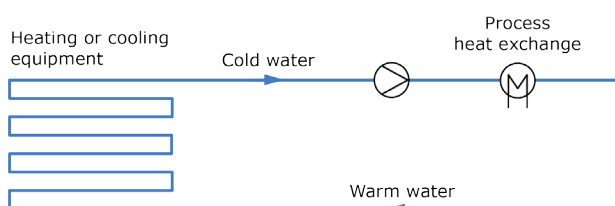
### CatoCool P - freshwater closed

In a closed recirculating system the same cooling water is used in a continuous cycle. Instead of having an evaporative cooling tower, the closed circulating system basically consists of two heat exchangers and a circulating pump.



The CatoCool P is a unique water treatment system for cooling water. CatoCool is Guldager's natural alternative to chemical based treatment of water in closed cooling water systems. The concept is based on a non-chemical solution.

#### Closed recirculating system



Common problems:	Examples:	Water consumption:
Corrosion Fouling Leakage Bacteria	Diesel engine jackets Automobile radiators Chilled water systems	Negligible

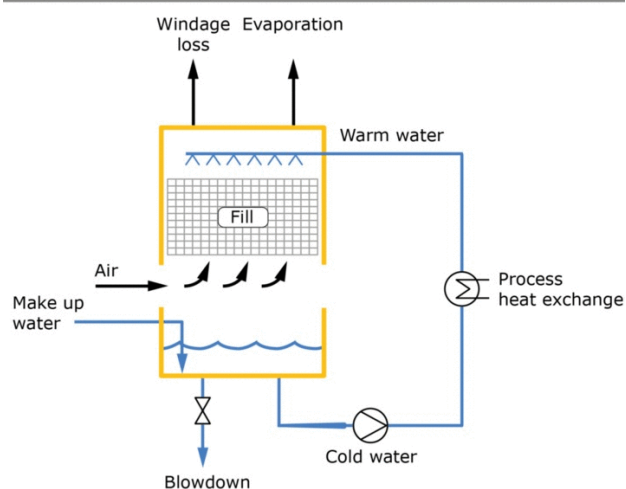
### CatoCool E - freshwater open

This design is the most widely used in industrial cooling. Basically it consists of a cooling tower, heat exchanger and a pump. The pump circulates the cooling water through the heat exchanger, where the heat from the process fluids is transferred to the cooling water. The warm water is pumped through spray nozzles in the cooling tower where the heat is released from the water through evaporation.



Guldager's many years of experience within electrolysis and filtration of water, have led to the development of CatoCool. By replacing complex chemicals with electrolysis based on aluminium and simple sodium chloride, we have created a unique system which carefully protects open cooling systems.

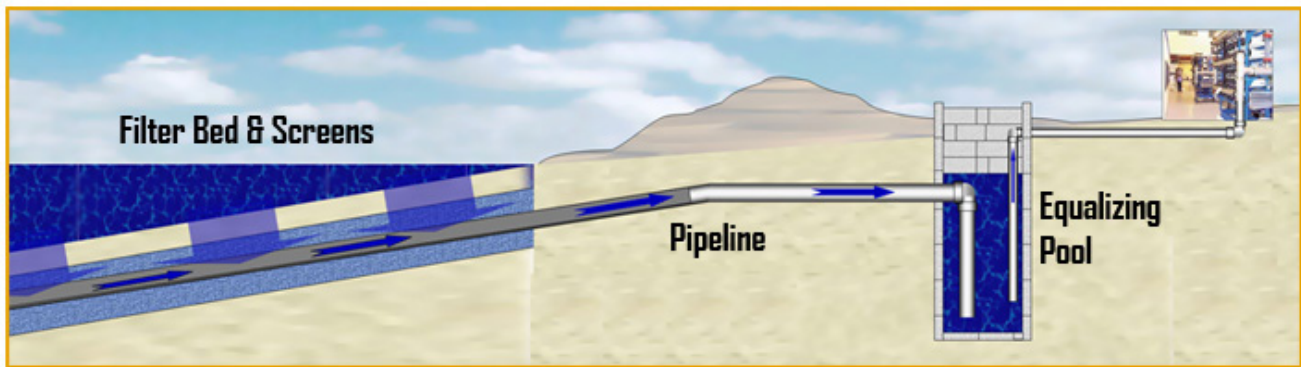
#### Open recirculating system



Common problems:	Examples:	Water consumption:
Corrosion Fouling Scale Bacteria Wood decay	Cooling towers Spray ponds Condensers	Moderate

# CatoCool A

## Seawater Intake



### CatoCool A - seawater intake

Much less common than fresh water, salt water and wastewater are still being used as sources of cooling water because of both cost and availability but also due to environmental considerations. However, using these sources of water in a cooling system without any kind of water treatment would cause the cooling capabilities of the system to decline very rapidly.



### Filtration

Our side-stream filtration protects equipment and ensures continuous efficiency of the cooling water system. The filter is an independent disc filter. The pump will circulate the cooling water through the disc filter modules which will prevent filth from entering the cooling channels. Backwash procedures will start automatically. Safety features and alarm relays ensure continuous operation of the filter. Conductivity control for monitoring and maintaining the cooling water conductivity is optional.

### CatoCool E/P/A - a total treatment programme

Guldager's CatoCool systems E/P/A each consist of four individual systems; Softening, filtration, corrosion protection and bacteria control. The softened water reduces the calcium and magnesium hardness in the make-up water and thereby prevents scale deposits. Our side-stream filtration protects equipment and ensures continuous efficiency of the cooling water system. Catolysis (corrosion protection) will form a protective layer on all surfaces in contact with water. And finally, one of our solutions to bacteria control prevents the formation of legionella bacteria. In combination these four elements provide optimum protection and efficient operation of the cooling system. The CatoCool system is customized to meet the exact needs of our customers.



## Service

In our opinion, any capital investment should be considered on the basis of the life-cycle-costs. A constant focus on minimizing the life-cycle-costs is a strong parameter in Guldager's products and product development and thus also in the CatoCool system.

A CatoCool cooling water solution for your cooling system is not just a comprehensive end-to-end solution in an environmental and technical perspective, it is also an end-to-end solution in a life-cycle perspective. The CatoCool solution is highly automatised and designed to reduce operating and maintenance costs to a minimum.



# CatoCool

## A total treatment programme



### Softening

Scale deposits have several unfortunate effects. Scale encourages bacterial growth and reduces the heat transfer efficiency in the cooling system. By using softened water as make-up water, scaling in the cooling system can be avoided. The prevention of scale deposits also reduces the formation of Legionella bacteria in the system. The need for drainage of the water is minimized with softened water. Thereby, the solution is both economic and environment friendly.

When the water has a certain hardness, we use softened water as make-up water. If the make-up water has a hardness above 1 °dH, the water should be softened. For softening the make-up water we use a simple cation exchange plant. The softening will remove the hardness in the water which contributes to the formation of scale deposits in the cooling water system.

It is important to mention, that there are still considerable amounts of salt in the water after softening. These salts will be concentrated when the water is evaporated in the cooling tower/evaporation condenser. Therefore a blow down will still be necessary.

### Corrosion protection

As inhibitor we use aluminium cathodically dissolved as aluminate. The Catolysis module is mounted in a side stream of the cooling circuit. The aluminate will form a protective layer on all surfaces in contact with water.

The presence of aluminium as aluminate in the circulating cooling water will minimize surface corrosion in the system. Aluminate also works as flocculation and will in this way work together with the filter. This is done by the aluminate collecting the particles into flocks that can easily be removed in the side stream filter. Guldager's corrosion protection is free of chemicals.

### World wide service and after market support

We supply solutions all over the world. In order to ensure and maintain the performance of your solution and avoid expensive downtime, we provide a full portfolio of services. Our worldwide service includes spare parts availability, maintenance, repair and modernization.



# Water Treatment

## More solutions to one problem

### Bacteria Control

For prevention of bacteria in the cooling system, the Guldager programme offers three solutions.

### Chlorine dioxide

Our well-proven LegioControl adds small amounts of chlorine dioxide to the cooling water. Thereby removing the formed biofilm which encourages the growth of bacteria, algae and biologic fouling. Chlorine dioxide is a strong oxidizing agent and during the process, it will either remove the bacteria/biofilm or decompose to basic sodium chloride and disappear with the blow down.

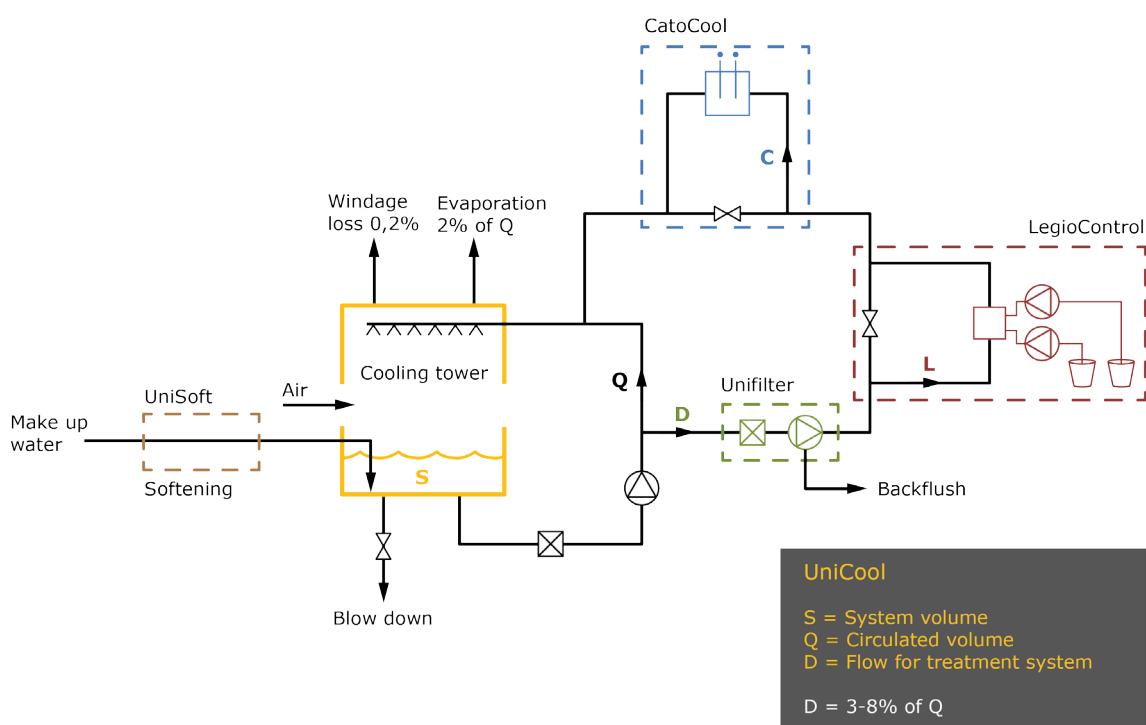
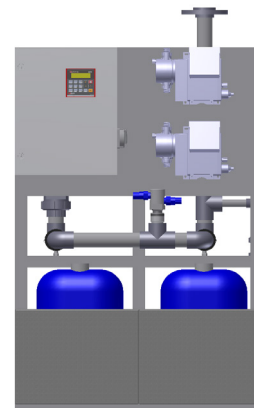
### UV and electrolytic dissolved copper and silver

Our second solution is called LegioFree. The plant is a combination of UV disinfection and electrolytic dissolved copper and silver.

The UV disinfection works as a barrier at the entrance to the system and due to its physical function it only works where the light is pointed. To remove legionella/biofilm in the rest of the system we dose very small amounts of copper and silver. Actually, the amounts are that small, that it lies below a factor 10 of WHO's recommended value for drinking water.

### Hypochlorite

Electrolytic production of hypochlorite is based on a basic salt dissolution. The salt dissolution is in principle the same, which we use for the regeneration of softening units, consequently, this solution is very inexpensive to run. By dissolving a little bit of salt in the water, using an electrolytic cell (LegioCell) with an impressed current, hypochlorite can be produced. This on-site production of the disinfectants on demand minimizes operating costs and maintenance times.



# Chemical solutions

## For closed and open cooling towers



To meet all needs for water treatment for cooling towers, Guldager also provide an extensive range of high performance chemical treatment products.

By adding chemical inhibitors to the cooling water, it is possible to avoid or minimize the four main issues in cooling systems, namely corrosion, scale, fouling and bacteria growth.

To ensure such cooling systems are correctly maintained and operate at optimum efficiency it is essential that the correct cooling water conditions are established and then maintained at all times. This can be achieved using carefully selected cooling water treatment chemicals.

### Chemical inhibitors

In order to maintain the cooling capabilities of the system and thereby maximizing the value of the cooling system as well as improving the environmental profile, it is vital to perform proper water treatment and preventive maintenance.

By adding chemical inhibitors to the cooling water, it is possible to avoid or minimize the four main issues in cooling systems, namely corrosion, scale, fouling and bacteria growth

### Chemical corrosion inhibitors

Chemical inhibitors reduce corrosion by interfering with the corrosion mechanism, and can affect the reactions at either the anode or the cathode. General corrosion inhibitors protect both anodic and cathodic surfaces by coating all metal surfaces in contact with water with a film.

#### Chemical scale inhibitors

Since most minerals are more soluble at a lower pH, adding acid to the cooling system can keep the common scale forming minerals dissolved and prevent the start of the crystallization process. This is also called threshold inhibition. Kinetic inhibitors modify the crystal structure of the scale greatly reducing the growth speed of deposits.

### Chemical fouling

The purpose of the chemical fouling inhibitors is to keep the foulants suspended in the water flow thereby preventing them from settling on the metal surfaces. This can be accomplished in two ways. Firstly by a chemical process known as charge reinforcement, where the electrical charge of the foulants are increased thereby causing them to repel one another. Secondly wetting agents can be used to reduce the surface tension of the water, in a sense making the water wetter.

Keeping the suspended materials in the water flow mean that they can more easily be removed from the system either through blowdown or filtration.



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