

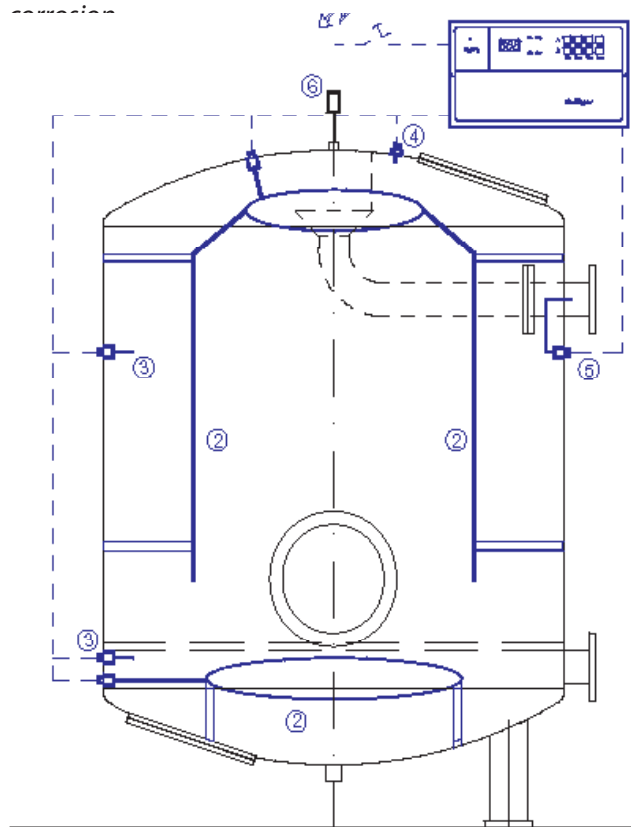
ANOPERM-F/B

Cathodic protection of steel filters / boilers

The cathodic protection against corrosion in steel-filter vessels has proved to work in swimming-pools and industrial filter plants. What makes it so special, is that it also works in plants operating with ozone as disinfectant. These extremely corrosive mediums sooner or later destroy rubber coatings and other corrosion preventive layers.

A reparation on site is very expensive and usually not as lasting. It doesn't matter whether the filter is new or already in need of reparation. Whole or partly still existing layers and rubber coatings do not need to be removed. Rusty surfaces are roughly cleaned with spatula and steel brush. Sandblasting is not necessary.

Sandfilter with Anoperm F cathodic protection against corrosion



1. automatic electronic control unit
1. titanium mixed-oxide inert anodes
2. Ag/AgCl reference electrodes
3. security level guard
4. pipe flange inside protection
5. automatic aeration

Function of the cathodic protection

Mixed oxide titanium anodes are built in to the filter vessel with a space between each other and also to the side of the vessel. This enables a regular current distribution onto the vessel parts that are in contact with water and therefore must be protected. Special leadthroughs, which are mounted to the side of the vessel, enable the flow of the current to the anodes. The positive pole of the DC-current source is connected to the lead-in bolt of the titanium electrodes. Therefore they become anodes. The negative pole is connected to the vessel. This means it becomes the cathode.

The DC supply voltage is usually between 2 and 12 volt, the current density lies between 100 and 500 mA/m² cathodic surface depending on the consistency of the water. A DC-current flows in the water from the inert anode to the inside wall of the vessel (cathode). This current flows towards the corrosion current appearing on the metal surface and compensates it, this means the vessel is cathodic protected in the field of the current distribution.

In oxygenous water (drink or bathing water) two single electrode reactions occur depending on the water consistency and the current density at the cathodic polarised sides of the vessel.

1. Cathodic reduction of the oxygen dissolved in the water

$$\text{O}_2 + 2 \text{H}_2\text{O} + 4 \text{e}^- \rightarrow 4 \text{OH}^-$$
2. Cathodic reduction of the water itself

$$2 \text{H}_2\text{O} + 2 \text{e}^- \rightarrow 2 \text{OH}^- + \text{H}_2$$

Both electrode-reactions deliver hydroxyl ions that increase the pH-value of the water in immediate proximity of the cathodic polarised metal surface on the so called diffusion boarder, a cathodic alkalization of the vessel side is developed. However, a measurable increase of the pH-value in the water does not occur. The cathodic alkalization of the vessel side leads to a disruption of the lime-carbon dioxide-balance and therefore to the development of calcium carbonate. This forms a cathodic protection layer on the metal surface and increases the potential. The current is reduced automatically with the Guldager-potential-control, which is why the protection layer remains optimally thin.

The potential control

The patented Ag/AgCl silver reference electrode makes the small but vital difference to similar products. It enables a reliable measurement of the off-potential (current is disconnected) of the inner vessel surfaces over years.

In connection with the electronic control, the required protection current is newly calculated and automatically regulated every 60 seconds. This means there is always enough, but never too much current, which would lead to calcination.

In order to meet the different requirements of the constructive and installation specific filter- and water relations, Guldager uses a potential dependent electronic control unit.

The current that is necessary for the cathodic protection is fed into the vessel via an iridium mixed-oxide layered titanium anode and is regulated every minute by a full electronic Guldager control unit, which is tested in conformity with Euro-norm.

Maintenance of the installation

The maintenance of the installation is limited to a weekly reading of the control instruments by the operator. The protection installation is additionally checked annually and if necessary adjusted by Guldager, on the bases of a service-contract.

During the regular revisions of the filters, they are inspected and examined by a Guldager technician. The Guldager group has profound experience with the cathodic protection of vessels and filters.

Advantages

The Guldager group has successfully solved the problem of corrosion in steel filter vessels, whether they're sandfilters, reaction vessels and active carbon filters. The main characteristics of this system are effective and controllable protection against corrosion, economical in maintenance and easy mounting. In small filters the mounting of the anodes can be done without removing the filter filling.

Filters that would have to be replaced if using customary methods of protection, can be saved in many cases with the cathodic protection against corrosion.

