

**pH neutral  
Rehabilitation Agent**

- inorganic
- chloride-free
- powder concentrate

**for Removal of  
biofilm and slime**



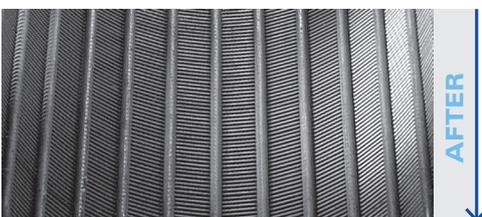
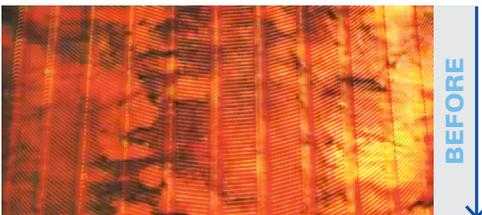
REHABILITATION AGENT AS PER GEOCHEMICAL ANALYSIS

# AIXTRACTOR® 7.0

**Biofilm – oxidation – non corrosive**

- Transformation of hydrogels in viscous suspension
- Application solution in pH range 5.0 - 7.0
- Non-corrosive impact on stainless steel, sealing gaskets and synthetic materials
- Purely inorganic components, no risk of biological contamination
- Short reaction time of 60 minutes per screen section
- Continuous process control and immediate result verification on site according to German technical standard DVGW W130
- Powder concentrate with corrosion protection
- Easy and environmentally friendly handling on site
- Re-establishment and confirmation of original water quality by means of easy measurement on site

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INCRUSTATION PROBLEMS!**



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## 1. DESCRIPTION

AIXTRACTOR® 7.0 is a purely inorganic fast reacting effective chemical agent for oxidising biofilm and slime in wells and water-containing systems. The working principle of the agent is based on the degradation of organic materials of microbiological origin by the formation of oxygen. AIXTRACTOR® 7.0 dissolves the structure of hydrogels transforming the organic material in a pumpable, slightly viscous suspension. The components of AIXTRACTOR® 7.0 are classified in Water Hazard Category 1 (Category 0 is non-existent). The working solution of AIXTRACTOR® 7.0 has a pH-value of 5.0 -7.0 and can therefore be used on all types of screen and well lining materials. It does not contain chlorides and as such may be applied on even the most sensitive surfaces, e.g. stainless steel, zinc-coated steel, copper, glued gravel wall and wooden screens etc. AIXTRACTOR® 7.0 may be used on site as a well rehabilitation agent without any environmental concerns. It is classified as environmentally harmless when compared to the relevant German Environmental Standards.

Prior to the application of AIXTRACTOR® 7.0 the well interior, the screen slots and the gravel pack should be cleaned using appropriate measures (e.g. gravel wash, gravel jetting etc). This will ensure the maximum effectiveness of the rehabilitation measure. As the spatial distribution of biofilm and / or incrustations within a well is often heterogeneous, inspecting the insides of the well using CCTV prior to the application of AIXTRACTOR® 7.0 is highly recommended. This will allow areas of thicker layers to be identified and these may then be selectively treated with longer application times during the rehabilitation procedure. In order to ascertain suitability of any rehabilitation agent for removal of incrustations of any kind, a sample should be microbiologically or geochemically analysed prior to any site activity. In all cases, the specific electrical conductivity of the groundwater is to be measured and recorded prior to the commencement of the rehabilitation procedure. Micro-organisms in biofilm and slime have a capability of becoming resistant to high dosages of oxidising agents. If the chemical treatment is not carried out as thoroughly as possible and remains of dead biomass stay on surfaces, a rapid microbiological recontamination can occur due to a selection of single resistant bacteria and the entry of new microorganisms.

## 2. PREPARATION OF THE WORKING SOLUTION

AIXTRACTOR® 7.0 is supplied as a ready-to-use powdered concentrate and should be mixed immediately prior to application. The agent should be completely dissolved in clean (ground) water with a concentration of 100 g AIXTRACTOR® 7.0 per litre total volume of borehole or system to be treated. AIXTRACTOR® 7.0 is very soluble up to a concentration of about 500 g/l water. A mixing ratio of 2 to 3 litres water to 1 kg AIXTRACTOR® 7.0 is recommended. Mixing chambers equipped with a lid and a circulation pump have proven useful for the preparation of the working solution. In order to completely dissolve the agent and prevent any coagulation, the powder should be added slowly to continuously stirred or circulated water, whereas an excessive turbulence with air is to be avoided. The solid material will dissolve in less than 30 minutes. A slight turbidity is normal, but no residue should be visible at the bottom of the mixing chamber prior to application. While mixing the working solution a good ventilation is necessary (mixing outside is the best). The development of slight odour is during the mixing process is normal. When mixing AIXTRACTOR® 7.0 with water, it is highly recommended to wear protective gloves, safety goggles and dust mask. In all cases, the guidelines set out on the ECU Safety Data Sheet are to be considered.

Under no circumstances is AIXTRACTOR® 7.0 to come in contact with or be dissolved in any form of acidic substance (e.g. hydrochloric or sulphuric acid) or lye. This would not lead to an increase in effectiveness but may cause the decomposition of the agent and the development of toxic gases.

## 3. ON SITE USE AND MONITORING

The rehabilitation of the well screen is conducted in sections at various depth intervals using an injection technique such as a gravel washer. The process of removing the biofilm begins at the top of the well and continues downwards towards the sump. When forcing the working solution through the screen slots into the surrounding gravel pack it is not recommended to apply compressed air. The prepared working solution of AIXTRACTOR® 7.0 is applied in 2 to 3 equal portions into the screen section to be treated. In order to prevent discharge of the working solution into the aquifer and to optimise the effectiveness of the process, the working solution should be kept in motion by means of a circulation pump.

After the injection a reaction time of 60 minutes is sufficient. Leaving the working solution on the screen for longer will not increase its effectiveness and may be counter-productive. An increased amount of reaction products may migrate into the aquifer and a longer pumping time may be necessary to remove them. The rehabilitation process can be observed and regulated through the continuous measurement of the process parameters during the course of the reaction.

The parameters which need to be monitored to determine the effectiveness of the rehabilitation process are the specific electrical conductivity and the concentration of reaction products analogous to the prior analysis which are found in the return flow of the working solution. These need to be recorded throughout and after the reaction process. Simple measuring equipment and/or cheap analytical test strips have proven sufficient. Measuring the process parameters will help determine if further treatment of obstinate incrustations may be necessary. By monitoring these parameters it may also be possible to reduce the total amount of working solution during treatment time based on their development during the process. Any significant migration of the working solution into the aquifer can be observed by monitoring the electrical conductivity of the solution during the reaction time of in each screen section.

An efficient ventilation of the well shaft, pipes or plant has to be secured due to the formation of carbon dioxide during the oxidising process.

## 4. REMOVAL OF THE WORKING SOLUTION

Following the treatment process the remnants of oxidised biofilm should be removed from the well and the surrounding gravel pack by abstracting water at a high rate. The abstraction pump should be placed as low as possible within the treated screen section of the well and operated at a rate, which roughly corresponds with the maximum capacity of the whole well. The rate of abstraction and the duration of pumping to fully remove all dissolved incrustations per treated screen section should be noted.

During the abstraction stage the process parameters, electrical conductivity and concentration of reaction products should be measured and recorded in the abstracted water every 10 minutes. The concentration of the process parameters determines when abstraction can end for any one section of screen. When the electrical conductivity has reached its pre-rehabilitation level and the analytical test strips measuring the concentration of the reaction products record zero for at least 30 minutes the abstraction procedure for that section of the well may be considered complete. An exact period of time for the duration of the abstraction process cannot be given in these instructions, as it varies considerably from well to well.

After completion of the whole rehabilitation procedure for any given well a thorough cleansing of the well sump is recommended. The working solution has a higher density than water and may have accumulated during the rehabilitation process. To ensure the complete removal of reactants from the well, it is recommended to pump the well overnight after treatment.

## 5. DISPOSAL

No chemically or microbiologically critical secondary substances or reaction products are created during the rehabilitation process. Reaction products comprise only of sodium hydrogen sulphate (NaHSO<sub>4</sub>), oxidised biofilm and oxygen. Due to its chemical characteristics the original agent is able to react completely within the reaction time, so that no residue will be found in the water being extracted during the final abstraction procedure.

The exhausted working solution has, as with any other type of rehabilitation agent, an increased salt content, which has to be disposed of after application in an appropriate manner. The salt content is influenced not only by the quantity of the rehabilitation agent applied but also by the volume of the pumped water (dilution). It can be determined by measuring the electrical conductivity of the working solution.

After the rehabilitation measure the exhausted working solution is chemically pH neutral, thus neutralisation with lye solutions is not necessary. Mechanically loosened particles, e.g. sand and ochre, can cause some turbidity. The process parameters of the solution (the electrical conductivity, turbidity and remnants of the reaction products) may be measured with simple instruments on the well site (measuring equipment, analytical test strips). Since AIXTRACTOR® 7.0 contains no organic substances microbiological contamination is not an issue.

When the rehabilitation process is being undertaken on a potable water well the applied and later exhausted working solution should not be disposed of within the SPZ of the well. In accordance with the the local authorities the water waste can be discharged in the sewage or disposed of by a soakaway system provided that it is located far enough from the SPZ and a permission has been obtained from local authorities. Frequent monitoring of the electrical conductivity is to be undertaken. It is recommended that the electrical conductivity be maintained at a concentration of less than 3000 µS/cm, a level not considered to be harmful by the FAO.

After a rehabilitation measure on a non-potable water well it is also not recommended to allow the untreated working solution to be disposed of directly into the surrounding soil for security reasons as it cannot always be predicted which reaction products have been created by oxidising organic materials. The water waste may be disposed of by a soakaway system provided that it is located more than 50 m away from the non-potable well and a permission has been obtained from local authorities.

Due to the reducing characteristics of the unused working solution there may be issues with its disposal as in high dosages it can disturb oxidising processes (e.g. de-ironing) in sewage plants. However, this property of the working solution will quickly cease once the solution is brought into contact with the atmosphere as any dissolved iron and manganese will immediately precipitate.

## 6. MONITORING SUCCESS

### Well capacity:

When evaluating pumping tests the original capacity of the newly built well should be taken as 100% to make the results comparable. Intermediate pumping tests enable the determination of the effectiveness of each working step.

### Condition of well in well interior:

It is highly recommended to inspect the inside of the well prior to and after rehabilitation using CCTV as an examination of the structural condition of a water well can only commence once oxide incrustations have been removed.

### Condition of well outside screen:

Comparative examinations by means of borehole geophysics extend the success control down to the otherwise invisible sand and / or gravel pack surrounding the well casing. Oxide incrustations reduce the pore volume and increase the density of the sand and/or gravel pack so geophysical methods providing data on the porosity and the degree of density have proved successful in the past in monitoring success.