OXYGEN GENERATION FOR THE OZONATION OF PROCESS AND DRINKING WATER

O_2

CASE STUDY

PURITY IS IN THE AIR

Ozonation can help remove chemical elements such as iron or manganese as well as organic substances and bacteria from the untreated water. The oxygen needed for this is produced using special oxygen generators.

Water is possibly the most important asset there is. However, untreated water is usually contaminated with various substances and has to be treated before it can be used as process water in the industry or as drinking water. A common application in the treatment of drinking water involves the oxidation of untreated water that exhibits elevated levels of iron and manganese. Iron and manganese are often found in deeper-lying ground water with a low oxygen content. According to the drinking water ordinance, the limits of iron (0.2 mg/l) and manganese (0.05 mg/l) must not be exceeded as very high quantities can negatively impact people's health and cause technical damage to the system components of water supply companies and pipework systems.

Ozone biofiltration is a proven method for water treatment.

Environmentally friendly processing

The use of ozone, so-called ozonation, enables a sustainable and near-natural removal of these iron and manganese compounds from the water. Ozone is a strong oxidising agent, which when added to water causes the compounds to oxidise into iron hydroxide and manganese dioxide. The oxidised substances are poorly soluble and separate on the surface of the multi-layer filter. When it comes into contact with waterborne contaminants, the ozone breaks down into atomic oxygen (O), which causes the strong oxidising or disinfecting effect, and into molecular oxygen (O_2), which increases the amount of oxygen in the water. Viruses and bacteria, which are also frequently found in untreated water, are also killed by ozonation in this way.

As a specialist in the field of water treatment, Hydro-Elektrik offers various ozone processes and corresponding systems for drinking and process water production. The systems and processes are precisely attuned to the needs of the customers and encompass filter systems as well as the necessary ozone and oxygen generating units. At different stages of the process, such as flocculation, oxidation, filtration and biological mineralisation, the untrea-

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ted water is cleaned of iron, manganese and germs as well as of arsenic, hydrogen sulphide, ammonia and nitrate. Enhanced methods of ozonation even permit the removal of long-lived chemicals such as organochlorine substances or crop protection and pesticides as well as the treatment of water with high levels of humic matter, which arise during the conversion of dead organic matter. The advantage of the ozone method lies in the high oxidising and disinfecting effect and above all in the high degree of environmental compatibility. The compounds broken down by the ozone are therefore biologically degradable. The ozone itself breaks down after the decomposition reactions or also into O_2 if unused.

Oxygen from ambient air

Ozone is generated in the ozone water treatment systems of Hydro-Elektrik with the aid of ozone generators. Oxygen with a purity of > 90% is used as a process gas for this. The oxygen needed for this process is produced with the aid of Inmatec oxygen generators. To this end, ambient air is passed into the valve block of the oxygen generator at the required pressure. From there, the air automatically arrives in two adsorption vessels in alternation. These vessels are filled with a zeolite molecular sieve and switch successively from filter to regeneration mode. In this way, the nitrogen and carbon dioxide molecules contained in the air are adsorbed by the sieve in one vessel, while the sieve in the second vessel regenerates under compressed air relief. The oxygen obtained by these means is passed to a product tank; the filtered nitrogen is discharged to the open air via a pipe. This method of pressure swing adsorption (PSA) ensures a constant flow of oxygen in the volume required.

The oxygen generators from Inmatec deliver oxygen quantities of up to 8.1 Nm3 / h.

The Inmatec oxygen production units used at the customer consist of an air compressor (7.5 bar), a refrigeration dryer for treating the air, and an air vessel. Depending on the process and system, the Inmatec oxygen generators used supply quantities of oxygen of between 1.1 and 3.5 or 8.1 Nm^3/h. The O_2 purity is 92 to 93%. To ensure the necessary fail-safe nature of the system, redundant lines of two or more oxygen generators are installed in parallel.

Compressed air is required to produce oxygen.

Facts for decision-makers

- A common application in water treatment is the oxidation of raw water, which has an increased iron and manganese content.
- The use of ozone, so-called ozonation, enables these compounds to be removed from the water in an environmentally friendly manner.
- In order to produce the ozone required for this, oxygen is necessary, which can be obtained directly from the ambient air with the help of generators.