

Oxygen for water treatment

The most important and more frequently used oxidation agent in the course of water treatment is oxygen. Groundwater from deep layers with very low oxygen content is described as reduced water.

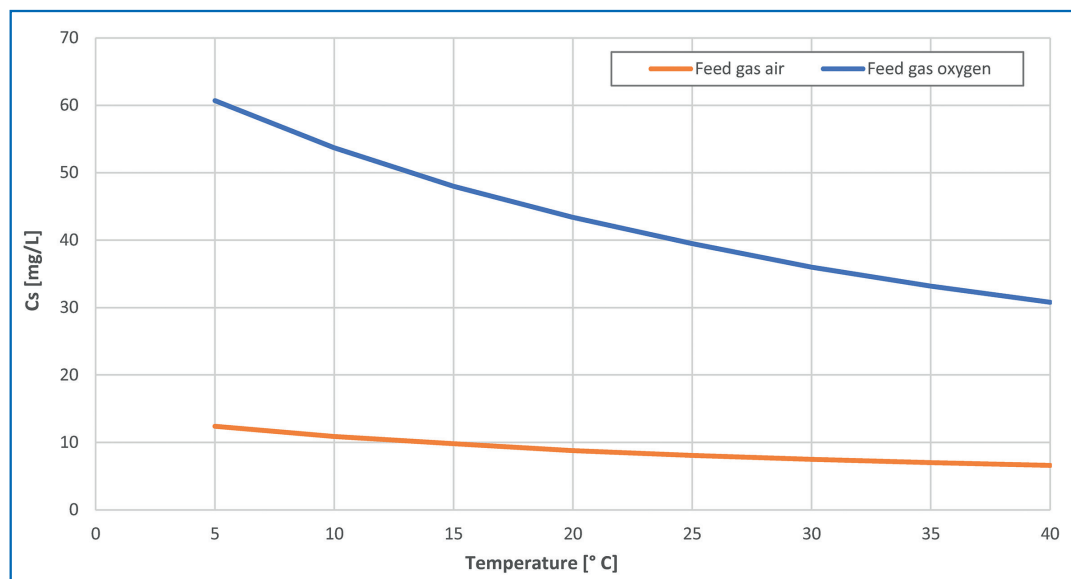
Characteristic for reduced water is its increased content of dissolved iron, manganese, arsenic and ammonium as well as carbonic acid and hydrogen sulphide. Oxygen is used here for oxygen enrichment and for oxidation before filter stages.

Oxygen content Sufficient oxygen content is also decisive for the drinking water quality and relevant for the stability and for corrosion avoidance in the network. In order to form a sufficient protective coating (limescale protective coating) in pipeline systems, the oxygen concentration of the water should not fall below 5-6 mg O₂/l.

Air Depending on the height above sea level, air contains a maximum of approx. 21 % oxygen, 78 % nitrogen and 1 % other gases. Because of gravitation each of these gases develops its own pressure, the partial pressure. The result of the sum of partial pressures is the overall pressure of the gas mix. An air pressure of 1 bar is thus the sum of the partial pressures of oxygen (approx. 0.21 bar), oxygen (approx. 0.78 bar) and other gases (approx. 0.01 bar).

Oxidation with air During the aeration of water (air oxidation), the gases oxygen and nitrogen compete with each other because of different partial pressures. Depending on the temperature, the maximum oxygen saturation is therefore limited to approx. 12 mg/l (8 °C) or 10 mg/l (15 °C) (the higher the temperature, the lower the oxygen saturation).

Saturation concentration



Achievable saturation concentration of dissolved oxygen in water at 1 bar

Pressure aeration With aeration under pressure you can reach higher oxygen saturation concentrations. However, in this case all process-relevant components such as oxidizers and filter vessels, have to be designed for the corresponding nominal pressure which results in much higher costs. The costs for energy and system maintenance also increase (components subject to inspection).

Oxidation with oxygen When using oxygen (LOX = liquid oxygen) or oxygen technically produced on-site with 93-95 % concentration (1 bar)

- A 4.5- to 4.8-fold O_2 saturation can be reached,
- Energy-intensive mixing systems and large oxygen tanks can be omitted,
- Better oxidation is reached,
- The aeration system can be dimensioned significantly smaller since no nitrogen must be removed,
- The CO_2 content in the water also remains unaffected.

With small systems and low oxygen deficit, air oxidation or pressure aeration can be sufficient. With high oxygen demand (in particular for ammonium) and large systems, the usage of oxygen is preferred and as a rule also more economical. Oxygen is always the preferred choice with circulation water treatment in atmospheric pressure range, e.g. aquaculture.

Oxygen generators Using oxygen generators, technical oxygen is generated directly on-site in high quality. The generated highly concentrated oxygen-gas mixture only contains a low amount of nitrogen. It is extremely finely filtered via multiple density filters and has food-grade quality. Dosing in the right quantity takes place via mass flow controllers. Oxygen generators are also used for the generation of oxygen for ozone generation.

Gas entry systems Different systems are possible to dissolve the oxygen gas as completely as possible in the water. Highly efficient mixing is possible with our Venturi/injector units. The systems for oxygen enrichment can be positioned before oxidizers or before filter systems, before reaction basins or for pre-aeration in open circuits.

