Oxygen Measurement in Sewage-Treatment Plants

In the aeration tank of a sewage-treatment plant, a sufficiently high oxygen content (1 – 2 mg/l) is necessary to ensure the cleaning process by the microorganism. Figure 1 illustrates GO oxygen sensor in the application of a sewage plant.

The GO oxygen sensor of is very useful to control the management of these oxygen aeration. For this purpose the oxygen content in the aeration tank was measured in a range of 0 – 10 %. The point of the cleaning of the jet nozzle becomes apparent in figure 2. The blue line of the graphs in figure 2 shows the propter functional check of the jet nozzle cleaning, every day at 12:00 am. Thus, the supply of oxygen is ensured and prevents a sealing of the jet nozzle.

Figure1: GO oxygen sensor in the application of a sewage-treatment plant

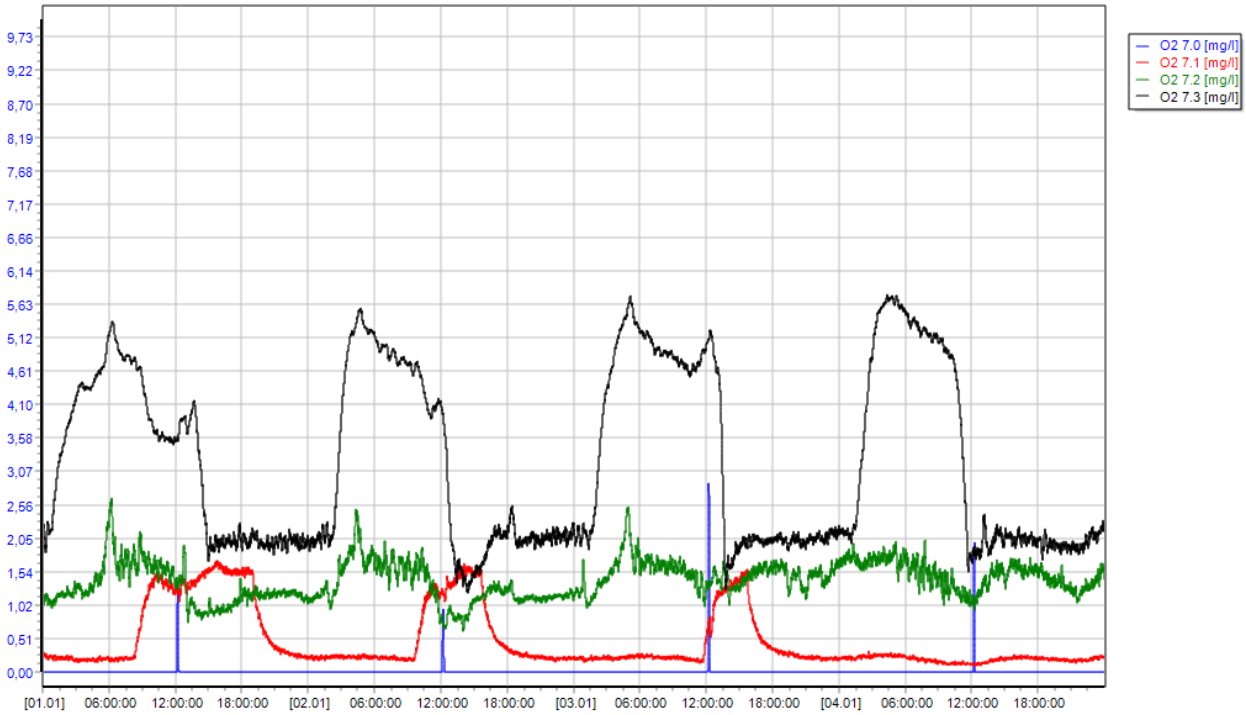

Figure 2: Functional check of the jet nozzle cleaning

After a trial period of two years it could be established that the oxygen sensors of GO-Systemelektronik led to much more stable control variables in the supply of oxygen, as the previously used optical sensors (in this case optical sensors of Hach and Lange were used). The oxygen sensors used by GO-Systemelektronik work according to the electrochemical galvanic principle.

	Galvanic oxygen sensor	Optical oxygen sensor (LDO-Principle)
Function	• Electrochemical principle of a fuel cell • The surrounding medium of the sensor contains dissolved oxygen. This passes into the sensor through diffusion and gets electrochemically reduced at the working electrode. • At the same time, the backing electrode is oxidized • Through the chemical reactions an electric current results. This current is proportional to the available oxy-gen concentration of the surrounding medium.	• Operated on the principle of LDO (Luminescent Dissolved Oxygen) • The LDO principle is based on the physical phenomenon of luminescence. • Luminescence is the optical radiation of a substance which occurs when this gets stimulated previously e.g. with light. • By the right choice of luminophore and wavelength of the stimulated light, the oxygen concentration of the surrounding material affects both, the intensity and the temporal decay of the luminescence
Components	• Inside the sensor, an electrolyte, in which a working and a backing electrode are provided.	• Sensor cap with luminophore (on transparent substrate) • Sensor body with LED for stimulation of luminescence

Table 1: Comparison of oxygen sensors based on the galvanic and optical functional principle

Over the entire trial period extensive parallel measurements were performed with portable measuring instruments for oxygen content determination which were calibrated in the laboratory before. These confirmatory measurements include in addition to the samples from the aeration tank also measurements in a “zero-medium” which was generated by depletion. These measurements showed that the sensor used by GO Systemelektronik achieves a very good accuracy in a range of 0 – 1 mg/l oxygen and, above all, very low concentrations of dissolved oxygen (0.1 mg/l) were detected for long periods.

Thus achieved higher accuracy up to 0.1 – 0.3 mg/l, and especially the long-lasting stability of the oxygen measurement enable to control the input variables for regulating the aeration more effectively. So savings in terms of electrical energy required for aeration of the medium can be immensely increased.

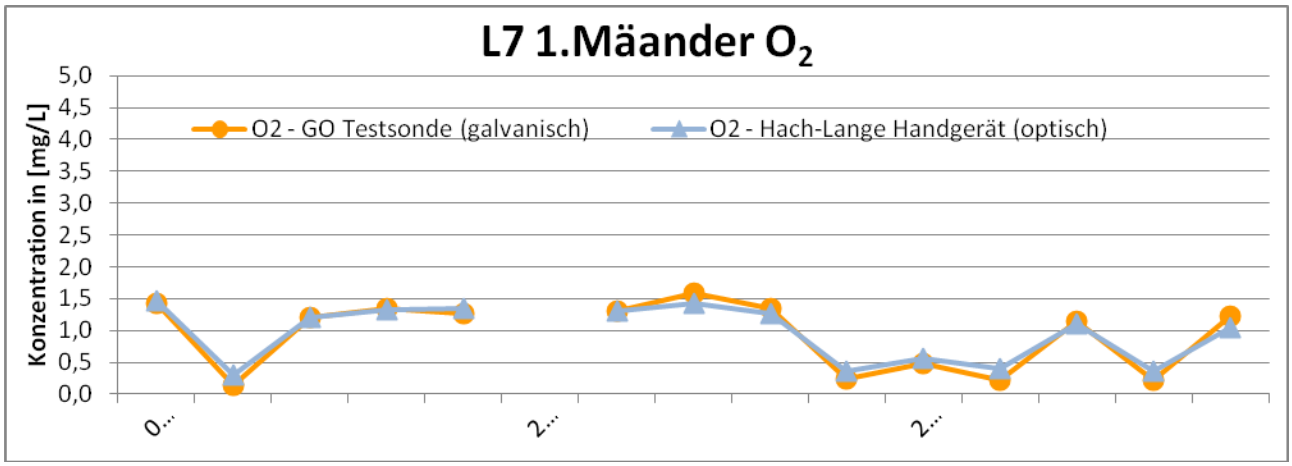

Figure 3: Comparison of the GO test sensor (galvanic) and the Hach Lange Sensor (optical)

Figure 3 confirms the results of measurements graphically. A very good agreement between the different types of sensor can clearly be seen.
Why is the sensor of GO Systemelektronik more stable and more sensitive in the resolution as otherwise designated maintenance free optical oxygen sensors?

Features of the GO oxygen sensors:

- The sensor works according to the galvanic principle. The measured variable in this case is a tension, so that the oxygen is not reduced during the measurement. So the sensor is completely independent of any incident flow.
- Due to the ideal signal adjustment the oxygen signals are recognized with high sensitivity and stability.
- The integrated temperature sensor allows direct offsetting of the saturation function in the system.
- The choice of material of the membrane is based on about 30 years of experience, thereby stability of the membrane against pollution, environmental factors and aging could be achieved.
- The used materials are so inert that the sensor has allowed service and high stability during long service intervals.

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