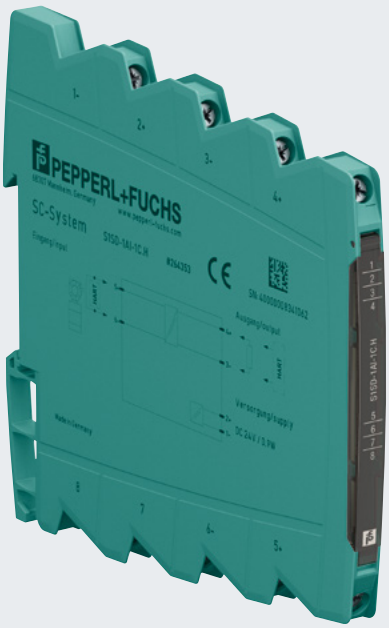
Biological Cleaning of Wastewater and Secondary Sedimentation Stage

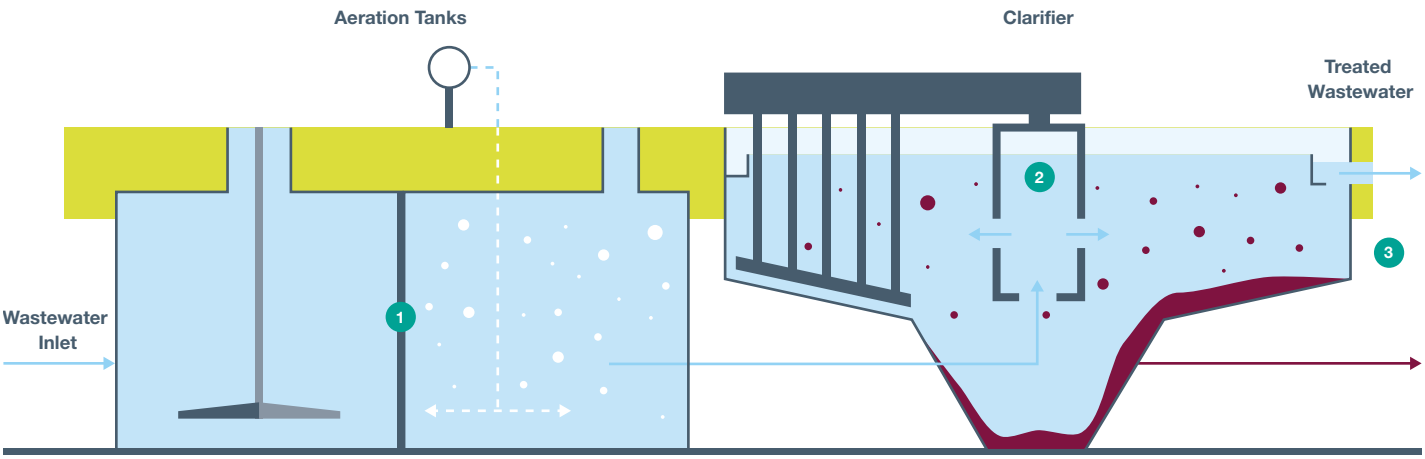
Controlling and monitoring biological processes in wastewater treatment plants



Application

The biological stage of a wastewater treatment plant combines an aeration tank with a secondary sedimentation basin. During the activated sludge process, microorganisms feed on and break down organic materials in the wastewater, which means that new sludge is constantly being created.

The activated sludge is then separated from the wastewater in a secondary sedimentation basin. The plant transports a small portion of the remaining sludge into the aeration tank as return sludge to preserve the concentration of microorganisms in the tank, while the larger portion enters the digestion tower as excess sludge for further treatment.



Schematic Diagram of the Biological Treatment Stage in Wastewater Treatment Plants

1. **Ventilation and Mixing of Wastewater and Return Sludge**
   Measured values: oxygen concentration, pH value, redox potential, temperature
2. **Water and Sludge Level**
3. **Controlled Discharge into the Environment**
   Measured values: oxygen concentration, pH value, temperature

Goal

The main objective of the biological stage is to break down organic components. Activated sludge is mixed with the wastewater from the mechanical cleaning stages and fed into the decomposition process. The environmental conditions of the organisms must be monitored and countermeasures may need to be initiated if these conditions are not maintained. To do this, information is collected on the oxygen concentration, pH value, temperature, and redox potential.

The water quality of the treated wastewater must be checked at the outlet of the secondary sedimentation basin before it is discharged into waterways. Included in the quality measurement of the water are parameters such as oxygen concentration, pH value, and temperature. The deposited sludge must be returned to the aeration tank in a controlled manner to ensure that the minimum concentration of microorganisms in the aeration tank is retained.

Solution

Signal conditioners from the K- or SC-Systems can be used as interface modules, as the biological stage and the secondary sedimentation basin do not pose a risk of explosion.

In the aeration tank, sensor signals with parameters relevant to the microorganisms are sent to the control panel by transmitter power supplies and signal converters.

Similarly, the sludge level data and the quality control parameters are transmitted from modules for analog input signals such as transmitter power supplies and signal converters.

Benefits

The K-System portfolio offers interface modules for all signals and applications, ranging from simple isolators to highly functional modules. The Power Rail provides the devices with supply voltage and optional collective error message. The Power Rail, which consists of a DIN rail with an insert, reduces wiring costs by making it easy to plug in the modules. The K-System has numerous global approvals, including up to SIL 3 for all signal types.

At only 6 mm wide, SC-System modules for analog and digital measuring signals offer a state-of-the-art circuit design with minimal power dissipation. With its compact housing, the SC-System is ideal for plant upgrades and installation in tight spaces between cable ducts.

At a Glance

- The biological treatment stage includes an aeration tank connected to a secondary sedimentation basin. Neither unit is located in an explosion-hazardous area.
- The K-System or the SC-System ensure that analog measurements—such as biological parameters regarding the quality and level of water—are transmitted reliably using transmitter power supplies and signal converters.