



ADAPTIVE MULTIVARIABLE CONTROL

Fraunhofer Water Systems Alliance (SysWasser)

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Biological Wastewater Treatment

The ever deeper insight into the ecological processes on earth prompts an increasing environmental awareness which is directed at precautionary loss prevention. The balanced preservation of both biological and chemical processes in the natural hydrological cycle requires limited and largely stabilized pollutant loads in the recirculated wastewater in the face of an increased withdrawal of water from natural resources.

The stable operation of communal wastewater treatment plants is the key factor for the achievement of this target. To eliminate pollutants from wastewater the purification process employs biological methods which correspond to accelerated natural cleaning processes.

Control Strategy

Modern biological plants remove both organic carbon and nitrogen compounds as well as phosphorous from the wastewater. The interaction between the individual biological conversion steps are used differently by various purification technologies by specially arranging the purification steps, recycling the water and feeding back the sludge. The difficulties related to dynamic operation are caused by the strong coupling of the sub-processes with each other and the strong nonlinear kinetic correlations between growth and degradation of the biomass between the consumption of nutrients and oxygen. Therefore the Fraunhofer IVI and its cooperations partners have developed a hierarchically structured control strategy which takes the complexity of the entire biological cleaning process into account. This solution ensures that the legally permitted discharge values are observed throughout the year, even under fluctuating hydraulic loads, whilst operating the system at a minimal level of energy consumption.