

## **CONTINUOUS BOD MONITORING IN THE EFFLUENT OF AN ACTIVATED SLUDGE TREATMENT PLANT**

**E. VAIPOULOU, P. MELIDIS and A. AIVASIDIS**

Democritus University of Thrace  
Department of Environmental Engineering  
Vas. Sofias 1, 67100, Xanthi, Greece  
e-mail: [vaiop@env.duth.gr](mailto:vaiop@env.duth.gr)

### **EXTENDED ABSTRACT**

During the last two decades more stringent effluent requirements under regard to the BOD and COD effluent values have been imposed by the legislation and the people's demand. In this way, real-time control of a unit's operation has become an economic reality. However, off-line BOD determination lasts five days and, thus, is a time-consuming procedure. As a consequence, different on-line monitoring systems have been developed, mostly on the basis of DO measurement. This paper presents the functionality and field application of a novel microbial sensor for continuous monitoring of BOD in an activated sludge treatment plant. The biosensor was applied to monitor the effluent of the unit. The basic working principle of the biosensor bases on the on-line determination of CO<sub>2</sub> concentration in the off gas produced during carbon compound degradation by the microbial respiration activities. It has been observed by previous laboratory work that the CO<sub>2</sub> concentration in the off gas under operation conditions (content oxygen flow, residence time and pH) is closely related to the extent of organic pollution in the wastewater (BOD, COD). CO<sub>2</sub> monitoring was carried out by an infrared spectrometer. Its output was connected through an interface to microcomputer, where the CO<sub>2</sub> concentration, time and pH were on-line depicted. The pH in the bioreactor was controlled at 6.3 by addition of an alkaline solution. The extent of organic pollution was determined off-line in the laboratory according to the conventional 5-day lasting BOD analysis. Off gas CO<sub>2</sub> analysis and off-line BOD measurements were strongly correlated allowing continuous on-line monitoring of the organic pollution and the early warning in case of toxicity. The microbial sensor was applied to monitor the effluent of the municipal wastewater treatment plant of Xanthi city, Greece. The results show strong correlation between the microbial respiration activity, characterized as CO<sub>2</sub> concentration in the off gas, and organic pollution level certified by current BOD in the effluent. Thus, the determination of a correlation equation between these two actually facilitates a unit's operator with continuous real-time data for on-line monitoring and controlling of wastewater treatment plants. The biosensor could also be used for incoming wastewater monitoring and, in terms of an early warning system, for on-line toxicity determination. The on-line monitoring and controlling of wastewater treatment plants promotes reliable on-line results avoiding the formation of hazardous by-products.

**Key words:** BOD sensor, continuous BOD measurement, on-line monitoring, organic pollution, wastewater treatment