ABSRACT
This thesis focuses on the monitoring, fault detection and diagnosis of Wastewater Treatment Plants (WWTP), which are important fields of research for a wide range of engineering disciplines. The main objective is to evaluate and apply a novel artificial intelligent methodology based on situation assessment for monitoring and diagnosis of Sequencing Batch Reactor (SBR) operation. To this end, Multivariate Statistical Process Control (MSPC) in combination with Case-Based Reasoning (CBR) methodology was developed, which was evaluated on three different SBR (pilot and lab-scales) plants and validated on BSM1 plant layout.

INTRODUCTION. Statistical Process Control (SPC) concepts and methods have become very important in the manufacturing and process industries. Traditional methods for multivariate quality control (based only on the product quality measurements) are reviewed in Section 2. Some multivariate statistical projection methods (Principal Components Analysis (PCA) and Partial Least Squares (PLS)) which form the basis of new approaches to multivariate SPC (which use all the process data X as well as the quality data Y) are summarized and their similarities and differences. Sequencing batch reactors (SBR) or sequential batch reactors are a type of activated sludge process for the treatment of wastewater. SBR reactors treat wastewater such as sewage or output from anaerobic digesters or mechanical biological treatment facilities in batches. Oxygen is bubbled through the mixture of wastewater and activated sludge to reduce the organic matter (measured as biochemical oxygen demand (BOD) and chemical oxygen demand (COD)). The treated effluent may be suitable for discharge to