OMICS Group Conferences
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2nd International Conference on
Hydrology & Groundwater Expo
August 26-27, 2013 DoubleTree by Hilton, Raleigh, NC, USA

An intelligent energy management system for waste water treatment plants

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This study introduces an intelligent energy management system (iEMS) via information and communication technology for waste water treatment plants. The iEMS provides three main functionalities as follows: electricity consumption monitoring, fault diagnosis, and energy efficiency management. For the electricity consumption monitoring, critical power equipment and devices are installed with electricity meters that have wireless transmitting capabilities. Accordingly, the meters could pass their measured data to a main receiver through a specified protocol called Zigbee to solve the cabling cost issue. Each receiver communicates with a PC server via Ethernet or Wi-Fi computer networking techniques. Moreover, a software platform is developed on the server to collect data from receivers and write them to pre-established databases. The electricity baseline of each process unit in a plant is thus constructed to determine the operation strategy for power equipment. In point of fault diagnosis, this work principally considers the problems of a motor/pump fault such as shaft misalignment, unbalanced stator and rotor, and some unusual conditions caused by improper installation or damage. Similarly, the detected data are transmitted backward through Zigbee protocol. Here a fuzzy-neural network is employed to decide whether a motor/pump faults or not. For the energy efficiency management, the efficiency is evaluated by comparing the operation state of a motor with its characteristic diagram, and the ratio of the resulted mechanical energy over the electric power consumed. Experiment results demonstrate that the power equipment achieved efficient use in energy while the presented system was active.

Biography

Hsin-Yu Liu was born in I-Lan, Taiwan. He received the Ph.D. degree in electrical engineering from National Central University in 2012. He is currently a researcher of the Green Energy and Environment Research Laboratories, Industrial Technology Research Institute, Chutung, Taiwan. His research interests are fuzzy systems, automatic control and the algorithms with applications to energy management of buildings. His resent works focus on energy efficiency using information and communications technology.

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