Autonomous and Configurable Energy Management System

Duvenage, Armand

A compact, self-analyzing energy management system that could monitor energy usage in an industrial or domestic environment was designed, built and tested. Peak-Power management and optimal usage of energy were key priorities in the design. Two development prototypes, followed by a stackable, miniaturized manufacturing prototype were designed and constructed. Three main aspects were tested to determine the feasibility of the system: 1) the ability to accurately monitor power consumption of circuits using current transformers and Hall Effect sensors; 2) the ability to switch circuits on and off using relays and triacs, either manually, via a web browser or automatically based on specified criteria; and 3) the ability to access current and historical data and to manage the system from a web browser. During testing in a home and a bakery, the system was able to accurately monitor the voltage, frequency and current consumption of each circuit on a Distribution Board and record it in a database. Current and historical data could be displayed graphically on a smart-phone, tablet or computer. The prototype included a time-based scheduler, current-based conditions and a flexible logic engine for advanced users. The logic engine interprets and evaluates user-defined mathematical conditions to determine whether circuits should be switched on or off automatically. The condition-based logic engine was able to utilize current and historical data to optimize the energy consumption profile of the specific installation. All engineering goals were met.

Awards Won:

Third Award of $1,000