Cut Your Production Costs with an Energy Measuring Station

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By Ron Auvil, Fluke Corporation

Many of my clients are looking at reducing operational costs of their production equipment. By evaluating the energy at each piece of equipment, they can make decisions regarding operational patterns of the equipment. One of the more exciting projects I have worked on in a long time is an energy measuring station, or "energy cart."

What the customer wanted was a portable station on wheels that could be easily moved between production machines. The cart would carry a central laptop computer and various data-gathering devices that could be used to measure different conditions at each piece of equipment. The laptop would collect data from the devices and store it in a usable format, such as a SQL database.

The Measuring Situations

Electrical. Electrical monitoring and metering includes current and voltage of all phases. Any imbalances or faults are recorded as well. The electrical metering information is collected and stored on the laptop for retrieval later.

Compressed air. Many industrial machines and processes use compressed air. This compressed air can be very costly in a manufacturing environment. The energy cart will include sensors that will record pressure and/or flow over time. Again, the data will be collected at the laptop and evaluated at a later date.

Tower water. The cooling tower rejects heat from the chiller system. This is heat that is picked up from the industrial processes. The water pressure and gallons per minute are picked up at the energy cart with the use of flow meters attaches to the water lines. Please note that new ultrasonic flow meters can be attached to the waterline without actually needing to be installed inside the water line.

Chilled water. Many industrial machines use chilled water for cooling. The pressure and flow of the chilled water can be measured and recorded by the devices on the energy cart. The data is stored on the laptop and combined with other data to give an idea how much energy of any type is being consumed by the machine.

Fume removal and exhaust cubic feet per minute (CFM). Production machinery often needs to have contaminated air released outside the building. The exhaust fan uses electrical energy to exhaust the air. The energy cart can record the exhaust air flow amount at each machine. As with the other sensors the laptop stores the data for later evaluation.

Temperature and humidity. For the both the production machinery and also human comfort the energy cart can record the local temperature and humidity at each machine.

Light level. The energy cart will record the light level present at each machine during the sample period. If the light level is higher than needed, electrical energy may be wasted. Excessive lighting levels also impose a larger cooling load on the mechanical equipment, costing even more energy.

Hot or cold spots. Many production machines and processes are temperature sensitive. Hot or cold spots may indicate energy waste, possible equipment failure, and defective products. You can detect these problems with an infrared (IR) thermometer. The energy cart will store the results of the IR thermometer for evaluation at a later time.

Use of the Energy Cart

The energy cart will be left at a particular machine for a shift, a day, a week, or even longer. The data will be measured and stored on the laptop. The data is then removed and stored on a system server PC. The data is then formatted in an easy-to-use spreadsheet for presentation purposes.

An engineer or technician will then evaluate the data and assign utility costs to each of the measuring points.

Management will then use the data to make real-time decisions about which machine is more efficient to run under specific conditions. The data can also be used to drive capital budgets for updating or replacing older machines with newer, more cost-efficient models.

Components of the Energy Cart

- Heavy duty trades cart with locking cabinet
- Laptop personal computer with appropriate software, today usually Windows 7 with SQL Server software for data collection and storage on an IT-grade platform
- Tower and chilled water flow: Ultrasonic flow meter with clamp-on sensors that attach to the exterior of the pipe without shutting down the system. They have 4-20mA outputs.
- Power quality: Fluke 1735 Three-Phase Power Logger™ »
- Supply and exhaust air: Fluke 922 Airflow Meter/Micromanometer ™ »
- Compressed air flow and pressure: For flow, a clamp-on flow sensor with two probes that project into the pipe. For pressure, a standard pressure sensor.
- Temperature and humidity: Fluke 975 AirMeter™ »
- Light meter
- Hot or cold spots: Fluke 568 Infrared and Contact Thermometer »

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1547 N. Trooper Road • P. O. Box 1117 • Worcester, PA 19490-1117 USA
Corporate Phone: 610-825-4990 • Sales: 800-832-4866 or 610-941-2400
Fax: 800-854-8665 or 610-828-5623 • Web: www.techni-tool.com