

Energy Information: Electricity Submeters

Good information on your facility's energy use creates an excellent foundation for developing a successful ongoing energy management program aimed at cutting energy costs. As they say, "You can't manage what you don't measure." It is difficult to measure and track electricity use if the best tool at your disposal is the utility's meter. (This point also applies to natural gas submeters.) In order to build a measurable profile of your energy use, as a basis for improved efficiency, we recommend adding submeters for each building or separate production department. In addition, depending on your energy costs, you should also consider submeters for separate high-cost end uses such as chillers, air compressors, motors, and lights (see **Figure 1**).

In addition to providing energy-use data, submeters are available that are capable of gathering interval data for load profiling. Information from the submeters can be read man-

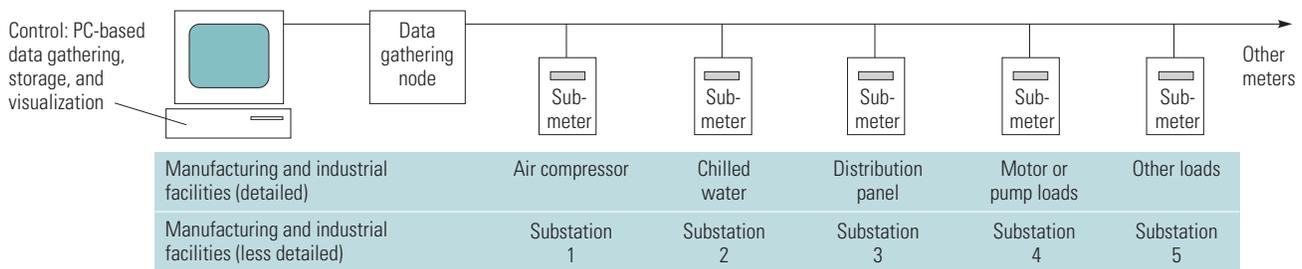
ually or gathered by automated meter reading systems and can be presented and analyzed through various software tools, which are either installed on a PC or accessed via the Internet. These systems can also be programmed to highlight potential problem areas and alert operators when energy use strays outside the norm.

The combination of additional submeters and load profiling data can help you to

- Understand your operating patterns,
- Increase operating efficiency,
- Identify malfunctioning equipment,
- Spot scheduling errors, and
- Reduce peak loads so that you can lower demand charges or participate in peak load curtailment programs. (See the "Foundry Within Fortune 500 Company" case study that follows.)

Figure 1: Electrical systems with submeters

For manufacturing and industrial facilities, the number and location of meters is more a function of the desired level of detail in tracking and reporting. Facilities that require rigorous detail should have one meter per air compressor, chilled water system, or other shared resource; a meter at each distribution panel; and one for each motor that is 100 horsepower or larger. For other facilities it may be appropriate to have fewer meters, located at substations. This approach would track overall electric energy use but offer less detail.



Submetering Case Studies

Boeing

There are 25 buildings at Boeing's Auburn facility in the Puget Sound region, and each one of them is essentially a separate manufacturing organization, responsible for its own energy usage. Until recently, these separate organizations did not know how much energy they were using. In the past several years a total of 138 submeters have been installed at the Auburn site. The facility installed Allen-Bradley Power Monitor submeters, which allow the collection of load profile data as well as energy use. The data from the submeters is communicated through the ethernet to Boeing's central energy-management data system, and the energy data is easily accessed by PCs at any of the facilities in the Puget Sound area.

As this energy information became available, facility managers of the various buildings were able to do a much better job of managing energy usage. According to David Michaelson, energy management engineer for Boeing's Puget Sound-region facilities, "The biggest hurdle was getting the production staff to realize that energy is not free." The energy information made available through the submeters now makes it much easier to see when a shop is in production and when the lights, air-handling equipment, machines, and auxiliary systems can be turned off, resulting in significant energy savings.

Due to their improved awareness about energy use, employees implemented changes—turning off equipment when not in use, adjusting settings, and other simple actions such as maintaining steam traps and fixing leaks in compressed-air lines—that enabled the Auburn facility to reduce its total energy consumption by more than 22 percent over the past two years (from 2000 to 2002).

Hoechst Celanese

The Hoechst Celanese Corp. implemented a system of electrical submetering at its facility in Greenville, South Carolina. Before acquiring the detailed energy-use data

submetering provides, the company's only source for measuring the facility's overall level of energy use was a single utility electrical meter. After installing submeters, overall energy use fell by 2 to 3 percent because of increased employee awareness of energy costs. Employees began voluntarily turning off lights and equipment when they were not needed. Because better energy data was available, Hoechst Celanese began to incorporate energy efficiency (energy use per pound of product) into the annual performance evaluations for plant managers. This resulted in further energy savings of 3 percent over the next two years, due to improved scheduling of equipment and installation of more-efficient steam traps and lighting. Overall energy savings of 5 percent are directly attributed to the company's submetering program.

Foundry Within Fortune 500 Company

A large industrial facility with an in-house foundry installed an E-Mon submetering system with demand profiling. The complete system with communications equipment and software, including installation, cost about \$9,700. By analyzing the load profile data provided by the submeters, the foundry was able to identify the source of a 250-kilowatt demand spike. Shifting this operation to off-peak hours reduced the monthly electricity bill by \$2,000, resulting in a payback period for the submeters and energy information system of less than five months.

Economic Benefits

Installing submeters for electricity could easily help your facility reduce its energy costs 2 to 3 percent by increasing employee awareness and accountability for energy usage. In addition, the improved information could be used to target the best areas for additional energy-efficiency improvements and to verify actual savings after projects are implemented. Electricity submeters with load-profiling capabilities are available for varying prices, beginning at about \$700 per meter.



(Coincidentally, some natural gas submeters can also be installed for around this price or slightly cheaper: about \$600 per meter.) The cost for the communications equipment and software varies considerably, depending on the sophistication of the software.

Other Benefits

Shutting equipment off when it is not being used can reduce maintenance costs and help prolong the operating life of equipment.

Requirements and Challenges for Implementation

Electronic meters that use current sensors (as opposed to electromechanical meters) do not require you to shut off the power during installation, so they greatly simplify implementation. Electronic meters also take up very little space.

Suppliers of Submeters and Monitoring and Communications Equipment

Allen-Bradley

tel 440-646-5800

<http://www.ab.com/pems>

DTE Energy Technologies

37849 Interchange Drive

Suite 100

Farmington Hills, MI 48335

Contact:

James Gariepy, Vice President

tel 248-427-2231

<http://www.dtetech.com/energynow/monitoring>

E-Mon L.P.

1 Oxford Valley

Suite 418

Langhorne, PA 19047

Contact:

Don Millstein, President

tel 800-334-3666

e-mail dmillstn@emon.com

<http://www.emon.com>

Measuring and Monitoring Services Inc.

620 Shrewsbury Avenue

Tinton Falls, NJ 07701

Contact:

Bob Lesch, Vice President

tel 732-530-3280, ext 17

<http://www.youtilities.com>

Siemens Energy & Automation Inc.

3333 Old Milton Parkway

Alpharetta, GA 30005-4437

tel 800-964-4114

<http://www.sea.siemens.com>