



Power and Energy Logging



Monitoring power and energy usage in a facility or installation can often identify hidden issues that affect both operational and environmental quality, can pinpoint the reason for higher than desired energy costs, and can reveal the causes of more frequent equipment repair and replacement.

Julian Grant, General Manager for Chauvin Arnoux UK looks at the instruments available to the engineer and maintenance staff, designed specifically to help identify these problems and costs.

The fundamental piece of kit required here is a **Power and Energy Logger (PEL)**. Whether for troubleshooting a known problem, or proactively seeking opportunities to optimise power distribution systems, PELs, and their accessories, should be as common in a building maintenance technicians' arsenal of tools as a multimeter or thermometer.

Nowadays, energy service industry professionals are making good use of power and energy logging equipment, and are discovering both the significance and benefits of short-term diagnostic monitoring for plant maintenance and expansion.

So what are Power and Energy Loggers?

Modern portable power and energy loggers are compact, lightweight, battery or mains powered, electronic monitoring instruments used for collecting electrical data without the need for operator intervention or presence. They can be installed in distribution panels or around the facility without difficulty, and removed as easily without the need to shut down the installation or office building first. They are capable of storing tens of thousands to several million readings, and can be programmed to collect data on a sub cycle basis or store averages at user programmable aggregation periods. They are available with or without displays and can transmit their recorded data locally or remotely.

PELs gather electrical data such as current and voltage, power and energy and are also able to indicate phase angle $\cos \phi$,

$\tan \Phi$, power factor THD and harmonics. The most versatile loggers employ separate sensors for each parameter to be recorded and will automatically recognize those sensors and set the ratio and measurement parameters accordingly.

Multi-channel data loggers will collect data from several input types simultaneously. So, for example, a six or eight channel logger may be set up to collect measurements from three or four voltage and three or four current inputs providing the ability to monitor three-phase power systems. Mathematical capabilities provide the ability to calculate power and energy, as well as the cost associated with that energy consumption.

Remote access to the data collection process from the office, or at remote locations with wireless or Internet access, provides the ability to track several consumption points around the facility, or multiple facilities, without the expense of travel to retrieve the data.



Many energy management systems in place today provide logging, however, they are often installed with only a limited amount of memory and will only capture summary data. They tend to be permanently installed devices and will only monitor data from one point in the facility, making it difficult to troubleshoot problems around the entirety of the site. Portable power and energy loggers overcome these limitations, providing the ability to locate problems and provide information vital to improving energy consumption.

To fully understand what is happening on an electrical installation with regards to energy consumption, etc. requires some form of data analysis software giving a picture of the monitored data over time and the ability to download to a computer for analysis. Most software packages are capable of displaying in line graphs often referred to as X/T plots with time on the X axis and amplitude on the Y axis.

When evaluating harmonic data, it is often easier to view it in a bar graph format rather than a line graph. The ability to look at several channels of data on the same graph such as three voltage phases or three current phases provides a convenient way to easily troubleshoot power systems. Also, the ability to zoom in and analyse smaller time sections or compare this week's data to last weeks is an invaluable tool.

In the energy game, you can't manage what you can't measure. Energy consumption takes place over time and therefore should be recorded over time. PELs increase the technician's ability to manage energy by providing the tool to measure and analyse that energy over time.

Energy waste is an ongoing issue and is often undetected. Installing an energy logger on equipment that uses large amounts of power or in electrical panels can provide clear and revealing information about energy use when the facility is in a non-operating state. There is a tremendous opportunity to save on energy costs by reviewing this information.

Energy managers usually track monthly utility bills to understand a building's energy use and demand. This helps managers understand when energy use or demand has increased or decreased. Although good energy reviewing practices will sometimes indicate that a problem may exist, it does not always help in understanding where, at what time, and why the increases are occurring, or whether they are correct. The use of power and energy loggers along with energy reviewing practices provides the missing information necessary to properly evaluate energy problems. Power and energy loggers can help identify and document when in time and where energy waste is occurring, which allows the technician and manager to proactively make improvements and cost savings.

Energy managers can often find it difficult to propose changes in equipment and/or procedures to upper management that require investment because of the lack of data to support their recommendations. PELs and their analysis software provide energy managers a clear, documented way to graphically present specific data on activities in the facility that increase or decrease energy use. This clear information based on measured data can help document the need for operational changes and procurement of more energy efficient machinery.

They also provide the ability to record and document the savings by monitoring the energy usage after the changes have been made, and comparing this with the information recorded prior to those changes.

Benefits for Plant Maintenance Staff and Service Contractors

Performing preventive maintenance alone is not always enough. No matter how well technicians maintain equipment, if it operates inefficiently, or more often than needed, energy waste will occur. The cost of not paying attention to operational issues along with the maintenance issues can be significant.

Many studies performed in recent years indicate that most energy saving opportunities are operational in nature. Energy savings as much as 20% of the annual energy cost can be realised through low-cost improvements, with operating improvements accounting for a good portion of the savings. Internal facility staff, maintenance personnel, and service contractors, can assist the building management more effectively by addressing operational, as well as equipment maintenance, issues.

Measuring and recording the performance of energy-using equipment over time is the only way to verify whether the equipment or system performs optimally. Use here of power and energy loggers will prove invaluable to service technicians and will increase their ability to locate costly building operation problems quickly. Periodically, monitoring critical machinery and high energy consuming building equipment to ensure proper operation should be as important as periodically performing other maintenance tasks such as cleaning coils, lubricating motors, or changing filters. Power and energy loggers allow facility staff and maintenance contractors to expand their preventative maintenance programs to also include pre-emptive operation tasks.



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