ELECTRICAL LOAD MONITORING

Educational Series: Why Test?

Why Monitor Electrical Loads?

Sometimes load monitoring is mandated by electrical inspectors, fire or building officials, or by other jurisdictional representatives in response to an application for facility expansion or renovation. As an example, the Office of Statewide Health Planning and Development (OSHPD), a California regulatory agency for hospitals, mandates that monitoring be performed before electrical load can be added to an existing panel. Load monitoring may also be performed where facility management is concerned that the utility is overcharging for power usage or where there may be overloads, load imbalance, load profile, harmonic problems, poor power factor or other operational issues relating to their electrical system. So whether it's to confirm the system has adequate capacity, develop the data needed to confirm the accuracy of utility metering, or to provide information required to solve operational or performance problems, the key feature of any load monitoring project is to measure load characteristics over a specified period of time.

What's Involved?

Load monitoring is performed by connecting instrumentation at the main supply switchgear or other key locations where load data is needed. Monitoring equipment measures current and voltage. For a typical three-phase system where the load is to be monitored at the main switchgear, three current probes and three voltage probes are attached to the three-phase conductors, and one voltage probe is attached to the neutral conductor. The other end of the probe lead wires are connected to a power recording instrument. These connections and the recording instrument must be connected at each location where load data is needed. For systems operating at 600 volts or more, this process may be a little more complicated. Direct connection to the facility electrical conductors may not be possible if the load current or system voltage exceeds the capability of the instrumentation. In these cases, potential transformers and metering current transformers may be used to provide current and voltage signals needed by the recorder.

Typically, the load monitoring equipment is connected and then left in place to periodically make measurements over a predetermined period, such as three days (the minimum required by OSHPD), seven days or 30 days. The recording period must be long enough to capture an adequate sample of data—enough to answer questions or provide the information required to fulfill the purpose of the monitoring project. If requested, harmonic current and voltage values can also be monitored. Circuit load values will be compared to National Electrical Code (NEC) ampacity tables and to equipment ratings. Any monitored circuits or equipment loaded at or above 80% of rating will be identified.

Why Do They Fail?

Current sensors fail because they are miswired or broken, or the solid state components have failed or are incorrectly programmed. Trip linkages fail because dust, hardened grease, corrosion, misalignment, or frozen or broken parts prevent operation (even though the breaker may be operated manually and therefore appear to operate properly). The current-carrying parts and main contacts fail because they have been damaged by fault interruption; operating springs have fatigued leading to inadequate opening or closing force; or internal connections have become loose. The case or insulation fails because it has cracked or been damaged. Common failures include: dashpots leaking, spurious tripping, linkage not adjusted, no tripping at all, broken cases exposing live parts, loose internal connections, defective or broken parts, metal fatigue, age, overuse or misapplication.