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UMS Guide to Automatic Meter Reading

Introduction

Automatic Meter Reading (AMR) is not a new phenomenon, it has been around in the commercial and industrial sector since the mid-1990s following the introduction of Code of Practice 5 meters for the above 100kW market.

With the development of single and three phase smart meters, AMR has now extended to the single phase domestic market, although not without significant problems because the electricity companies could read all of the different types of meter initially put onto the market.

In the commercial and industrial sector there are significant numbers of meters on private networks being used for billing sub-tenants and for energy monitoring and targeting and here the use of AMR enabled meters and meter reading systems offer significant benefits.

In addition to electricity meters, AMR solutions can collect readings from all sorts of utility meter and in particular to gas, water and heat meters.

Benefits of AMR include:

1. Safety – Meters can be read without the need to enter hazardous areas such as electrical switch rooms or water pits.
 2. Reliable and accurate readings – readings will be taken at the same time every day and with the removal of human error, they are more reliable and precise.
 3. Improves efficiency – no need to spend time taking manual readings and processing spreadsheets.
 4. Far more information is available – most AMR systems will provide half hourly consumption information in the form of graphs and CSV files. This means 48 readings per day that will show when and how much energy is being consumed. This provides an essential tool for businesses to identify and reduce waste energy and carbon emissions.
 5. Real time information - Some of the more sophisticated systems will allow you to see information such as voltages, currents and power in the case of electricity meters, So you can see the immediate benefit of switching off unnecessary loads.
 6. Fault monitoring – the AMR system will be able to show fault codes generated by for example heat meters, when temperature probes or flow meters fail. This can be invaluable when maintaining large quantities of meters.
- #### Elements of an AMR System
1. A meter is needed with an output that can be read remotely such as a pulse, serial connection or a bus output such as Modbus.
 2. A local data collection device such as a pulse counter to which a pulse meter or a number of pulse meters can be connected
 3. A local device that can gather data from a chain of meters that are Modbus enabled (or similar).
 4. A communication device that links the local data collection equipment to the data collection server and reporting software. This can be a modem, router or via the local data network.

5. Data collection and reporting software. This software is usually located on a server and will automatically collect and store the data ready for consumption reports and files to be generated and circulated.

Types of AMR meters

1. Meters with a pulsed output

Since the 1980s sub-meters have been available with a pulsed output representing an amount of energy or quantity consumed. In the case of electricity meters you can usually specify the value and duration of each pulse generated. For example, a pulse might represent 1 kWh and last 40mS. It is essential that the AMR system is adjusted to take account of these details so that the system accurately records consumption.

It is important that once a pulse meter is set up on the system a calibration reading is taken from the meter and entered into the monitoring system. A second reading taken a few days or a few weeks later can be used to confirm that the system is recording consumption accurately and that the meter is scaled correctly. Basically, the reading on the meter should match the reading on the computer screen.

In the case of many mechanical meters such as water and gas, the pulsed outputs will be fixed so it is important that the supplier or installer provides this information so that each meter can be set up correctly.

2. Half-hourly electricity meters with serial communications

Since the opening up of the electricity market, all boundary billing meters above 100kW have been equipped with internal data storage and serial communications. These meters are also widely used of private networks and will be able to communicate with AMR systems.

Because the meters are able to store many days or months of data, short term losses in communications will not lead to data losses or loss of data continuity.

Half-hourly, single phase, "Smart Meters" are now available and are primarily being used for the domestic market

3. Modbus or other bus enabled meters

Modbus has become the de-facto standard for electricity sub-meters and as the number of electricity sub-meters out number other utility meters in most buildings, Modbus is becoming commonly available in other devices such as heat meters.

The benefits of Modbus enabled meters:

- Very low cost option and usually available as standard on most electrical sub-meters.
- Low cost and easy to wire. Meters are just daisy chained together rather than having to provide a dedicated cable for each pulse meter.
- Technically a robust form of communication. Although the standard suggest a maximum of 32 devices daisy chained together, generally many more meters can be connected. We have seen examples of over 50 meters on a single chain that are working well.
- Allows access to many parameters, not just energy values. Voltage, current, power and other parameters can be viewed and logged.
- Fault codes are often available allowing problems to be identified and resolved.
- Importantly because the actual meter registers are being logged the meter readings should always be in sync with the meter display. This not always the case with pulse meters.