

Metering and IT

Modern electronic devices can help in total utility management

To a large extent, metering is still viewed as instrumentation at the end of a distribution line. This is understandable. For decades, the “reason for being” for meters has been measurement of the energy used. The old electromechanical meters, in any case, could not do much more than measure.

The advances in electronic metering have changed things. These meters provide higher and sustained accuracy and reliability. They are also good at detecting, recording and thus deterring theft. But, more importantly, they can record and store all kinds of usage data.

Therein lies the key difference between the old and the new metering. Most of the modern metering technology is dedicated to intelligence, not measurement. In fact, measurement forms no more than 10 per cent of the device. When you add this intelligence to the advances in communication technology, you end up with a very powerful package indeed.

Unfortunately, the state electricity boards (SEBs) in India (like the utilities overseas) have not really utilised this power. They need to look upon metering as more than just billing. They need to think of it as a key utility management issue. For, the real benefit of electronic metering comes not just from an intelligent device at the customers' premises but by effective IT an MIS systems operated by the utility.

Here is a brief write-up on the latest technologies in metering which extensively use the latest IT techniques.

Meter reading instruments

A meter reading instrument (MRI) is a data collector that retrieves usage information from the meter using optical sensors. Typically, the meter reader takes this instrument to the customer site and connects it to the meter. Data is transferred from the meter to the MRI. The meter reader brings the MRI to the billing station. The data is downloaded into the invoicing system.

There are several benefits from using MRI instruments. To begin with, there is less scope for SEB staff to fudge the reading. Besides, the actual process of meter reading is much faster because it relies on optical sensors. With the help of an MRI, 150 to 300 readings can be recorded in a day. There is also almost no time lag between reading the meter and billing. This is so because there is no paperwork involved. Information from the meter reader can be downloaded straight into the billing system and invoices can be generated right away.

Remote meter reading

In fact, the meter reader does not even need to visit the customer site to collect the billing information. If there are good communication facilities, the reading can be done automatically and remotely. The microprocessor in the meter sends the information to the billing computer that generates the invoice. Tampering and fraud are also curtailed. More importantly, the time between meter reading and billing is minimised. A typical automatic meter reader (AMR) system comprises several main components: meters, meters interface unit (MIU) or gateway device, and the host computer. In a typical AMR system, meter data is passed from the meter to a gateway, which is either integrated into or attached to the meter through power lines. From the gateway, data is transmitted over communications medium to either a mobile interrogator unit or a node on a fixed network. From the interrogator, the data is typically stored until the end of the day, at which point it is uploaded to a host computer via a telephone modem or serial port connection. AMR meter data can be transmitted over a variety of mediums, including telephone, power lines, satellite, cable and radio frequency.



Spot billing

The utilities can go one step further by attaching a printer, portable or otherwise, to the MRI. The bill can be generated on the spot by the meter reader. This can help cut down the billing cycle from a few days or weeks to a few minutes, and thereby expedite revenue collection.

Prepayment meters

These meters permit customers to consume only the amount of energy that has been paid for in advance. The payment is made at the collection station of the SEB or utility. The customer can turn on the supply by inserting a card into the meter. If the amount exceeds the prepaid amount, the supply automatically gets switched off.

The latest metering technologies can help a utility in many other ways than just billing of electricity consumed. The metering system can help in load management, distribution design, creation of usage database, etc.

Load management

One of the more important applications of the new metering technology is in load surveys and development of load profiles. In fact, this is not new. Load forecasting has always relied on metering information. This function used to be performed earlier by rather bulky and expensive logging equipment but can now be done by the tariff meter itself. With the new electronic meters, it is possible to get load surveys at regular time intervals (for example, every half an hour) for quite a length of time (two three months).

Bill delivery and payment via internet

Internet bill delivery and payment (IBDP), also called e-billing or EBPP, allows companies to send electricity bill and receive payments electronically and enables customers to receive and pay bills over the internet. The system streamlines billing practices, saves time and money and provides a valuable service for online customers. Online electricity bill payment is the foundation for IBDP, but the delivery of ebills is what differentiates it from home banking offerings. Instead of receiving paper bills and entering all the payment information on their payment website, consumers are able to view electronic versions of their bills online and click to pay. Interactive features such as online customer service are also available.

Load surveys are critical to planning, demand-side management and tariff management. Electronic meters, by providing easily accessible and reliable data, enhance the quality of information used to make important decisions.

The objective of load management application is to improve the load factor (the ratio of average load to peak load) and to shed selected load during emergency conditions. Most utilities have some form of load management. It can range from consumer guidance (voluntary) to complete control and metering of the consumer's load. It is the latter that requires more help from IT. One such load management system that is IT-enabled is the load curtailment system, which relies on automatic meter reading.

The load profiles stored in electronic meters are very useful in identifying peaks in generation. The utilities can use this information and devise time-of-day and other differential tariff strategies to regulate the load. These tariff strategies, enabled by electronic meters, not only increase revenues but also conserve energy.

Low power factor is a matter of serious concern for most electricity boards, as it is tantamount to losing power/revenue. The tariff structure should be such that either the consumer is made to pay for the reactive power or a penalty is imposed for power factor violations. This kind of discipline is power factor violations. This kind of discipline is possible only with the use of electronic meters.

Another application that is gaining popularity in other countries is switchable loads. The customer allows the utility to switch off certain loads of his without warning for short durations. This helps the utility in managing peak demand. In return, the consumer gets a rebate. Modern meters that are equipped with ripple control receivers can activate the switching off.

Distribution design

The design of distribution and sub-distribution systems is another area in which metering information is critical. These designs are based on estimation of the loads on feeders and transformers. This is especially important in urban distribution network. Modern meters can provide this information regularly and cheaply without a great deal of extra effort.

Overall distribution management

IT-enabled systems not only monitor and control the grid, but also improve operational efficiencies. Information technology plays a key part in maintaining the security of the transmission network. Electronic metering is thus a crucial element of an IT-enabled distribution management system.

Reference book:

Power Line Volume 5 No. 11

August 2001