Integrating energy meter data easily

With the introduction of Time of Use tariffs which include inbuilt incentives to use electricity efficiently and the recent emphasis on demand side management and environmental standards more and more companies are realising the value of measuring and reporting on energy consumption.

Far too often the integration of valuable energy data from energy meters into existing SCADA, PLC and management reporting systems is ignored due to complexity or perceived expense. However, it is only when the data is conveniently retrieved, analysed and distributed that one realizes the costs and focuses on efficiency (for example, it currently costs approx R130 000 to R150 000 to run a 100 kW motor 24 hours a day for a year). In addition, accurate account auditing is essential as in our experience energy supplier billing mistakes are not as rare as most customers assume.

While most meter manufacturers offer software which is able to retrieve data from their meters, these packages typically do not provide for the easy integration of this data into production monitoring and control systems or billing reporting systems resulting in the “islands of information” problem. Also if more then one meter type is present, then more then one package needs to be purchased, operated and understood. Standard reporting becomes difficult as each meter has its own protocol, set of registers and addresses.

Having witnessed the rapid rise of use of open standards within the process control industry, players set about designing and developing an open, flexible, robust and easy to use meter reading application with drivers for various meter manufacturers’ energy billing meters.

The live measurements, billing accumulators (e.g. monthly peak, standard and off-peak kWh and maximum demands), logged consumption profile data, meter status and engineering values contained within an energy meter is most useful in the following forms:

- Logged robustly and accurately into a database for web based or other management and billing reporting systems.
- Displayed, trended and alarmed in a SCADA system with/without production data.
- Viewed on demand from the electrical manager’s desktop PC.
- Utilised in a PLC system for intelligent demand control or power factor control.

End client requirements for the display and distribution of this data differ. Some benefits that should be derived from an energy metering system investment include being able to:

- Easily and accurately audit a monthly electricity supplier account or to provide and distribute an account for supply authorities.
- Display, trend and alarm energy readings and consumption data within control room SCADAs, e.g. phase volts, power factor, kVA and kW demand, peak, standard and off peak or total kWh and use these measurements for max demand control, load scheduling and power factor correction alarming.

If this energy data is combined with production data in databases or SCADAs more useful daily or monthly reports are available. For example daily tons produced by a section can be compared with cost of energy to produce those tons. Instantaneous demand can be trended with motors running feedback or furnace temperatures to get a feel for energy efficiencies. However, in most South African companies this energy information is available only in the substation by scrolling the display of the meter which is rarely done.

The integration of energy data from multiple types of electronic meters into SCADA based automation systems and database based reporting systems to provide timely decision empowering tariff based information from an energy metering or check billing system can become far easier and cheaper through the use of widely used open standards; namely OPC for live data and ODBC for logged data.

OPC is an extremely successful and widely used open data exchange standard within the process control and automation industry. An OPC server is a single, re-usable, PC application which can communicate with a field hardware device (such as an energy meter) and expose the readings contained within the device as OPC Tags in the memory of the PC. These OPC Tags can be used within one or more OPC clients, a control or monitoring PC application (such as a SCADA). All reputable modern SCADAs and industrial reporting packages (such as Adroit, Opus, InTouch, Archestra, Industrial SQL, RSView32, iFix, Citect, Cimplicity) can use data from OPC servers. For more information on the OPC standard visit www.opcfoundation.org

Fig. 1: Energy measurements trended in a SCADA showing night time vs. daytime consumption.

- Gain an understanding of the company load profile against the supplier tariff structure to detect inefficiencies, i.e. unnecessary loads during peak and standard times when energy is far more expensive or during maximum demand times.
- Develop strategies to optimise a business’s energy use by determining the cost savings from possible actions such as switching to another tariff, power factor correction, demand control and load time shifting.
- Generate departmental or sub billing on actual use rather then on “guessestimates” such as floor space.
- Conduct tariff impact studies on a load profile as the electricity supply industry undergoes major changes.
under Windows. A printer driver (similar to a field device OPC Server) is supplied and installed on the PC operating system and shared over the network allowing applications such as spreadsheet and word processor programs (similar to OPC clients) to print to that printer without knowing the specific printer communication details.

ODBC is a database interface standard which allows generic database commands to be issued from an application to a database connection which get interpreted by the relevant ODBC driver to allow storage and retrieval of database records. Simply put, regardless of the underlying database or its location on the network the application is able to store and retrieve data. Almost all reputable relational databases support ODBC including Microsoft SQL Server, Oracle, Access, dBase, mySQL.

PowerSmart OPC is essentially an intelligent, automatic meter reading (AMR) application, SCADA driver (OPC server) and a database data logger (ODBC driver) for a number of reputable manufacturers energy meters over a number of possible transmission mechanisms - cell (GSM) / landline or radio modems and Ethernet or RS485 Networks.

Currently supported energy meters are:
- Elster Kent (formally ABB metering) A1700
- Strike Enermax
- Landis and Gyr Dialog
- Netelek DM200 and Supercon

The possibility of incorporating other meter types on request from clients or meter manufacturers also exists.

Live meter registers such as instantaneous measurements (demands currents, voltages, power etc), billing accumulator data, meter status and engineering values are retrieved by the application and exposed via user friendly OPC tags (e.g. SiteA.Meter1.PeakKwh) which can be read by any OPC clients (including SCADA and data reporting packages) on networked PCs. The server includes system OPC tags which allow you to monitor and control communication and modems, synchronise meter clocks and reset billing accumulators to all the meters from any networked PC with an OPC client.

It also fetches all the kWh and KVarh half hourly profile data important for billing purposes and event data (phase failures, over currents, power downs) stored in the meter and logs this robustly into any ODBC database. The end client can even define the table and field names allowing easy integration to web based or other reporting packages including but not restricted to PowerSmart EM package where the data is combined with supplier tariff information for energy billing reporting and analysis.

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**Fig. 2:** Display and alarming of meter readings in SCADA.

**Fig. 3:** Consumption half hourly profile use for billing purposes logged into SQL Server database.