ETHERNET/IP NETWORK ENABLES ENERGY-AWARE DEVICES

A network-connected, energy-aware device has the ability to either measure or derive its energy usage based on its native consumption or generation of energy, or report a nominal or static energy value. As shown in Figure 3, this device contains the objects and services needed for basic energy awareness.

ODVA’s plan for the Optimization of Energy Use (OEU) leverages the core competency of ODVA’s information and communication technologies, which are grounded in its media independent network protocol – the Common Industrial Protocol or CIP™. For OEU between processes and other systems in the production domain, ODVA seeks to include energy-oriented objects and services within CIP that permit the transparent and seamless flow of energy information and enable systems to perform energy metering and management. In the long term, OEU envisions demand-response mechanisms that will allow the industrial consumer to exchange energy with the grid in a dynamic energy consumption-production environment.

ODVA’s vision of optimization of energy usage will emerge as the natural sweet spot to help industrial consumers meet their overall business objectives and achieve greater societal goals for sustainability. ODVA’s energy approach will offer broad situational awareness of energy consumption and enable control strategies to optimize energy usage throughout the industrial ecosystem from the plant floor to the grid. This approach will enable businesses to improve productivity and thus profits while concurrently benefiting people and our planet through better utilization of energy resources.

Because the object-oriented approach of CIP allows for scalability in implementation, an EtherNet/IP Energy Aware device may support other more advanced functions for control of energy, aggregation and reporting of energy information or dynamic demand-response. Optimization of Energy Usage (OEU) services in CIP will allow systems to monitor energy usage and manage energy for efficient energy consumption through dynamic control of energy state and analysis of energy information. Protocol neutral energy attributes allow for flexibility in the propagation of energy information via multiple protocols to facilitate an e-business model such as capturing energy requirements as a line item on production bills of material or to implement demand-response mechanisms for dynamic energy transactions.

**Figure 3: Information and Communication Model of an OEU-enabled Asset**
OEU in Practice: Realizing the Natural Sweet Spot of Sustainability

OEU views and treats energy as a shared resource within and between each domain of the industrial ecosystem. Within the production domain itself, where the majority of energy is consumed, energy information needs to be available at all three layers – assets, systems, process – where it is moved, presented, controlled and managed using a hierarchical organization. OEU is first realized when efficient consumption of energy is made possible through the energy integration of the process with energy systems for metering, management, and delivery. Ultimately, OEU will enable an optimized energy deployment and consumption approach that makes it possible to transact energy for the best result.

In practice, as an energy aware device or a self-contained machinery sub-system, an OEU-enabled production asset will communicate its energy information up to the system level. Where a non-OEU-enabled asset is a key energy consuming component in a system, the OEU approach allows energy information to be communicated through an ODVA-enabled energy meter or translated from non-CIP protocol for aggregation and assimilation of energy information from an entire system. Aggregated energy information from the asset level is presented at the system level for further aggregation and/or assimilation. The result is that energy information can be consumed and manipulated more easily by systems such as PAC and SCADA where visualization and control decisions are made through the application of process-based decision rules.

Application Example: OEU-enabled Air Compressor

Typically a big energy consumer, an air compressor can be viewed as both an asset and a system. As an OEU-enabled system, the compressor knows its overall energy footprint by virtue of its ability to aggregate the energy data from all of its native energy aware assets or through energy data metered by an external device. Through integration of its energy information with the facility and process systems and automation of manual systems, a compressor can optimize energy usage through the implementation of best practices – such as adjusting operating parameters to reduce energy consumption while still maintaining adequate air output and pressure. When energy information is consolidated from the production domain and propagated back to the enterprise, business analytics can be used to plan when to operate the compressor to take advantage of lower tariff rates or avoid peak demand penalties while still meeting production targets.

The same actions of communication of energy information and its aggregation, visualization, or control can be applied throughout the production domain at any level in production - the common data model is the key! This model reduces integration costs as energy information is moved through the production levels and is integrated with facility and process systems and the other industrial domains. The dynamic approach of OEU, further enabled by an IP-enabled communication model, allows processes to be optimized for efficient energy consumption while still balancing the key production goals of operator and product safety and operational efficiency. For more information, visit the ODVA website.