Intelligent Motor Control exploits the Connected Enterprise to deliver unseen levels of efficiency

Steve Pethick, Director – Components and Safety Business EMEA region, looks at how significant efficiencies can be gained by leveraging the information on offer from data-capable manufacturing operations

The new industrial revolution

Worldwide industry is in the grip of what is universally agreed to be a new industrial revolution; the primary protagonist in this instance being data. The collection, collation, deciphering, analysis and subsequent delivery of pertinent, real-time manufacturing and process data is giving key personnel and enterprise systems the ability to make far more impactful decisions – ones that can have an immediate and profound positive effect on a plant’s operations.

By leveraging a wider portfolio of manufacturing data sources to analyse physical processes and procedures, these decision makers – both human and cyber – can create models, simulations, dashboards and virtual copies of the physical world in order to make important decentralised decisions.

This “Smart Factory” approach relies on both the free flow of data and the so-called “Industrial Internet of Things” (IIoT). The IIoT allows multiple discrete and connected/integrated systems and associated adjacent systems to communicate not only with each other and line-side operators, but also software and personnel at the enterprise level.
It is this proliferation of smarter end points, data analytics, scalable computing, mobility and visualisation that is reshaping the future of industrial automation. By connecting the physical and virtual worlds, the IIoT has brought people, processes and equipment much closer together; not only deepening the understanding of plant-floor events, but also sharpening decision-making. But for this smart approach to be fully effective, optimal and complete data capture is vital; as is a network infrastructure that allows the free and unobstructed flow of this data.

The Connected Enterprise approach from Rockwell Automation is one such initiative that is both driving and exploiting this new data-driven industrial landscape. Gaining significant traction across multiple industries and applications in many different countries, the Connected Enterprise leverages a number of technological approaches to deliver multiple tangible benefits. These include faster time to market, lower total cost of ownership (TCO), improved asset utilisation and optimisation and enhanced enterprise risk management.

Core to this initiative – and vital to any data-driven philosophy – is an integrated suite of software and hardware platforms that can all communicate across a common network infrastructure... in this case EtherNet/IP™ – a standard Ethernet network that provides data flow from the smallest line-side device up to enterprise-wide ERP suites.

The importance of motors

From an industrial standpoint, the intelligent management, control and maintenance of electric motors is one key area where the fruits of a Connected Enterprise approach can make a real difference. Seen as the ubiquitous workhorse of any industrial operation, electric motors are reckoned to consume around 70% of all the energy used in industrial applications. They also form the lynch pin of many machines and processes, so their

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Source: IEEE Petro-Chemical Paper PCIC-94-01
operational performance and potential failure modes can have a profound effect on an entire facility. For these very reasons, any additional intelligence applied to a motor or motors’ operational parameters will see multiple benefits throughout the machine, line and enterprise – some tangible, such as reduced energy consumption, others less tangible, such as simply not failing. Indeed, 75% of motor failures can be prevented by deploying appropriate protective measures.

Using the Connected Enterprise approach, coupled to Intelligent Motor Control, plant owners and operators can exploit operational data from motors and motor-driven equipment to assess a huge variety of parameters, including – but not limited to – energy consumption, speed, torque and temperature, while also measuring vital signals relating to bearing failures or winding efficiencies.

**Purchase and operational costs**

Operators need to understand multiple facets relating to a motor’s expenditure and operation – all of which can be positively affected by a connected infrastructure. After an initial assessment as to the relative importance of a motor or suite of motors on overall operational effectiveness, the first thing to consider is cost. Cost plays a huge role, with motors typically consuming 10 times their initial purchase price and from an operational perspective, simply reducing the speed of a motor by 20% saves 50% in running costs. The cost of downtime must also be considered, in terms of loss of production, manufacturing scrappage, the engineering effort to identify and remedy the cause of failure (mechanical/electrical), safety-related issues and the resulting impact on other equipment and downstream processes.

Looking at failure modes, operators need to leverage integrated condition monitoring to measure temperature, phasing, bearing operation, rotor/stator condition and contaminants. They must also factor in the maintenance options available, including advanced diagnostics, proactive programs and planned downtime, in order to reduce maintenance costs.

By using an intelligent Connected Enterprise approach to motor control, users can exploit seamless communication and system visibility to increase performance and flexibility. As well as simplifying troubleshooting and reduced start-up times, they can also operate and maintain motor performance through intelligent equipment and networks, while reducing unplanned downtime with alarms and advanced diagnostic information. Sustainability targets can also be addressed, by measuring energy consumption. Finally, remote monitoring helps to keep personnel away from potential hazards.

**Connected security**

For any connected solution, including Intelligent Motor Control devices, security is a primary consideration, especially if remote access forms part of the infrastructure. For this very reason, any responsible automation vendor that offers remote capabilities must also provide peace of mind via contemporary security solutions. Rockwell Automation is already leading the field in this respect thanks, in part, to deep-rooted historic relationships with high-profile security and networking companies, backed up by its own impressive security hardware and software. This combination means users can monitor unwarranted tampering, while securing their infrastructure and content through hardware solutions, such as dedicated security products, managed switches and industrial routers and software packages that provide robust access control and policy management.

Safety is just as high on the agenda as security and Rockwell Automation is ideally placed to provide customers with a comprehensive portfolio of solutions, products, tools and industry-leading support services to help them deploy safety as part of a holistic and proactive productivity tool.

**The heart of any solution**

Now that all the edges and corners are in place, the last pieces in the intelligent-motor-control jigsaw are the products that actually connect to the Connected Enterprise. Rockwell Automation offers multiple products...
in this arena from simple fixed speed to complex motion control applications. One of the most capable – in terms of intelligence and connectivity – is the Allen-Bradley® E300™ Electronic Overload Relay. Delivering Intelligent Motor Control, the E300 relay sits at the heart of any IMC fixed-speed application. It offers scalable solutions thanks to a modular design that comes with a choice of different mounting options. The dual EtherNet/IP communication port allows for a perfect integration into a Logix architecture environment, meaning that diagnostics information can be shared easily with the controller and with the higher-level plant management software. Operating parameters that can be recorded include: voltage, current & energy; trip/warning histories; percentage thermal capacity utilisation; time to trip/reset; operational hours; and number of starts.

Low-voltage drives play an equally crucial role in motor control. The Allen-Bradley PowerFlex® range from Rockwell Automation is available in three primary variants, offering power ratings from 0.25 kW single-phase to 1.5 MW at 690 V. With a choice of entry level to fully featured, high specification models, users benefit from a standard control interface across the PowerFlex family, common setup and programming, seamless integration into control systems, EtherNet/IP communications and a raft of safety options. As part of an Intelligent Motor Control architecture, low-voltage PowerFlex drives enjoy Premier Integration within the Studio 5000® environment and automatic device configuration when integrated into a Logix-based control system. Productivity is also enhanced thanks to Safe Torque-Off and Safe Speed Monitoring capabilities and their ability to share safety information and signals over EtherNet/IP.

The end results of the deployment of an Intelligent Motor Control solution, are widespread. At the top of the tree is the ability to interrogate, maintain and control any motor-driven solution to a level never before available. Thanks to the integrated approach offered by Rockwell Automation over a single, standard EtherNet/IP network, users will see minimised downtime, simplified maintenance, no requirement for specialist knowledge or tools, the ability to easily adjust and download/upload parameters, faster commissioning/recommissioning processes and reduced downtime costs.

Additional Information
www.rockwellautomation.com