HOW TO INCREASE MANUFACTURING QUALITY

Leverage Data Insights from Plug-and-play Tool Controllers

New technology innovations are transforming manufacturing facilities into digitally-driven factories. By utilizing the power of data and its derived insights, manufacturers can increase productivity, improve quality, optimize performance and lower costs. Connected devices are growing exponentially, and the Internet of Things (IoT) is now a significant factor in most industries, including manufacturing. IoT is ushering in a new wave of smart manufacturing, using analytics and insights drawn from data produced by network-connected equipment, including assembly tools and controllers.

Factories rely on a number of technology suppliers and partners, whose systems work together, to provide significant benefits for manufacturers. Connected assembly tools and controllers are one part of this vital ecosystem. Industrial networks use programmable logic controller (PLC) platforms to connect and communicate with equipment, machines and tools. To integrate effectively with PLCs, tool controllers must be simple to connect, as well as collect and analyse data in a secure manner.

Connected tools with plug-and-play controllers help manufacturers optimize their assembly processes and create a higher capital return on their tool investments, as well as be more competitive in the marketplace. Manufacturers experience real benefits and value by leveraging digital technologies as solutions to improve factory operations. The Ingersoll Rand® INSIGHTqc™ controller helps manufacturers who require advanced fastening strategies to take control of their critical assembly processes quickly. The controller powers Ingersoll Rand QE Series™ and QM Series™ direct current precision assembly tools (DC tools) and collects data that manufacturers can act on to improve production.

Innovation begets innovation

When plants integrate assembly tool controllers into a factory digital ecosystem, manufacturers can access the data from the tool to get a better understanding of how assembly processes are working. With this information, manufacturers can make changes and adjustments to improve the assembly process, by making it faster, improving product quality, running it more efficiently and saving costs by eliminating rework. These benefits are the reason manufacturers rely on tool controllers, but in doing so, manufacturers face two primary challenges.

Integrating controllers with existing networks and PLCs

A plant-wide system with connected tools and controllers benefit a facility in many ways. These systems provide vital information that multiple stakeholders can access in real-time, including operators on the line, quality control personnel and plant managers. However, integrating these systems is not without complications. A networked manufacturing facility requires close communication and coordination between multiple departments, from the operators on the factory floor, to the line supervisors, manufacturing engineers, and plant control personnel analyzing the data results in the front office.

A manufacturing facility may have multiple devices from different suppliers, each with their own communication protocols, making it difficult for a tool controller supplier to support all the various protocols. The INSIGHTqc controller supports many communication protocols and is easy to integrate and manage. Its plug-and-play hardware and software can integrate with any industrial communication protocol. It's web-based software is compatible with smartphones, tablets and other Internet-based devices. The controller features easy line integration, integrated logic controls and helps reduce line rebalancing costs. It is also easy to upgrade the controller's hardware and software to meet any tightening control requirements.

Think about how Apple® forever changed the smartphone market with a simple and intuitive interface. Today, simple and intuitive web interfaces are changing the way factories are using controllers. The INSIGHTqc controller is simple to set up, and its easy-to-

use web interface decreases the time it takes to integrate a controller into a manufacturing line by 50 percent. And if the controller fails, the recovery time to set up a new controller is 80 percent faster. Ingersoll Rand makes the recovery process quicker by designing the controller's high-capacity hard drive so it can be quickly removed and easily installed on a spare controller in minutes. This can decrease downtime for manufacturers.

Using analytics to gain insights

The real advantage of connected assembly tools is getting the fastening data. But, collecting data is not where the value lies. The value lies in the data analysis and using it to gain insights into how to improve production processes and product quality.

A digital factory is only as valuable as the people who understand how to analyse the data and take appropriate action from the insights obtained. Manufacturers can differentiate themselves from their competition by taking advantage of the insights they acquire from the controller's analytics. The key to accomplishing this is training the workforce so they can leverage the data and analytics, and understand how best to use the insights they've gained.

A successful controller implementation involves a system that is simple to use

so both technically savvy and non-technical users can take advantage of its benefits. To start, it is essential to develop a list of data and analytic parameters the system needs to gather, and then articulate how each organizational department will use the insights.

Manufacturers rely on controllers to collect data provide the capability for analysis and incorporate indicators to notify operators, line supervisors and other personnel when a tool exceeds a fastener's threshold. Tool controllers provide a standard set of data, with factors like actual torque reached, the angle result, the time and date when the fastening occurred and which tool and station were used to tighten a screw or bolt. Manufacturers then associate this data with a variety of parameter targets. For example, if the tightening result was 10, what were the targets or limits? Analytics can show why a target parameter is not met, or why the target is exceeded. It can also show what a tool tried to do, what the tool did, when it was done and which tool did the work.

After an engineer sets a predictive threshold on the controller, they can then use a third-party application, or better yet, use a controller like the INSIGHTqc with built-in Statistical Process Control (SPC) to monitor the percentage of completions for a particular fastening cycle. If the number of uncompleted actions goes above a 5 percent threshold, the controller notifies a line supervisor with an email alert showing the station and that the fastener tightening has gone over the maximum threshold. Since the controller stores the data internally, line supervisors and quality control personnel can review and analyze the data and see the tightening curves. With this information, they can make adjustments to the program, investigate the components or correct a process to address the problem.

The power of the connected factory

Manufacturers are finding ways to work smarter to remain competitive. Smart manufacturing occurs when a factory increases quality control over their assembly lines by collecting and analysing production data. A cost-effective measure of predicting process performance is through an SPC. When assembly tool controllers integrate with an SPC, manufacturers can monitor their production processes and identify the cause of a failure by using data from connected electric and battery-driven tools.

Smart assets, like connected tools and controller systems, give sight to an otherwise blind operation. Data management and analytics have been used widely in business IT systems, such as enterprise resource planning (ERP), supply chain management (SCM) and customer relationship management (CRM) to improve business operations. Now, industrial devices, tools and machinery with controllers, sensors and actuators are taking

advantage of data and analytics to improve factory operations.

To successfully incorporate tool controllers requires seamless integration with hardware and software platforms that are easy-to-use and intuitive to set up. These systems need to be secure, run backups and restore data quickly, as well as store reports. Quantifying the cost savings, or the return-on-investment, of a controller can be difficult to measure. For aerospace and vehicle or heavy equipment manufacturers, using controllers with data analysis to improve assembly productivity increases product quality and eliminates rework to lower costs. But, these industries gain even greater value by using this data to reduce product failures that could have put someone's safety at risk.

High-capacity storage

High-capacity local storage on a controller provides a built-in data backup in the event of a network outage. It also offers an extensive sample for conducting effective data analysis, while protecting users that don't save their data on a server. Having a short recovery saves valuable time and prevents lost productivity. The INSIGHTqc controller stores up to 50,000 records of cycle data and 50,000 tightening traces onboard the device – one of the largest storage capacities of any controller on the market and 50 times more than the previous Ingersoll Rand model.

Connectivity

Tool controllers need to be flexible and interoperable, and they need to connect with all communication protocols easily. This is where a plug-and-play controller that supports many protocols and features multiple configurable ports has an advantage.

A factory with multiple PLCs from different suppliers may use multiple communication protocols, such as PROFIBUS, PROFINET and others. Data archival systems handle the bulk acquisition of data and storage for long-term use. A Manufacturing Execution System (MES) tracks and documents data in real time, helping manufacturing decision makers understand conditions on the plant floor and assess if changes are necessary.

A controller with multiple configurable Ethernet ports offers the flexibility to access it using multiple Ethernet schemas. This kind of controller can be connected to an MES system for data collection, and accessed for programming and servicing simultaneously over different networks.

Security

A robust cybersecurity strategy provides the confidence engineers need when integrating controllers into their network without the risk of a data breach or unauthorized access. Having an audit trail of all modified settings and created data provides traceable evidence to protect the data and a means to resolve security issues.

Implementing security methods can be complicated. This is where a controller with a simplified web interface can mask the underlying complexities. It provides administrators with easy-to-implement access control and allows users to securely login from any location that has an Internet connection via a desktop computer, laptop, smartphone or tablet.

The digital factory is a competitive advantage

Controller platforms for a digitally connected factory with simplified device connectivity, data analytics, and process optimization, are here. The ability for manufacturers to differentiate themselves by using
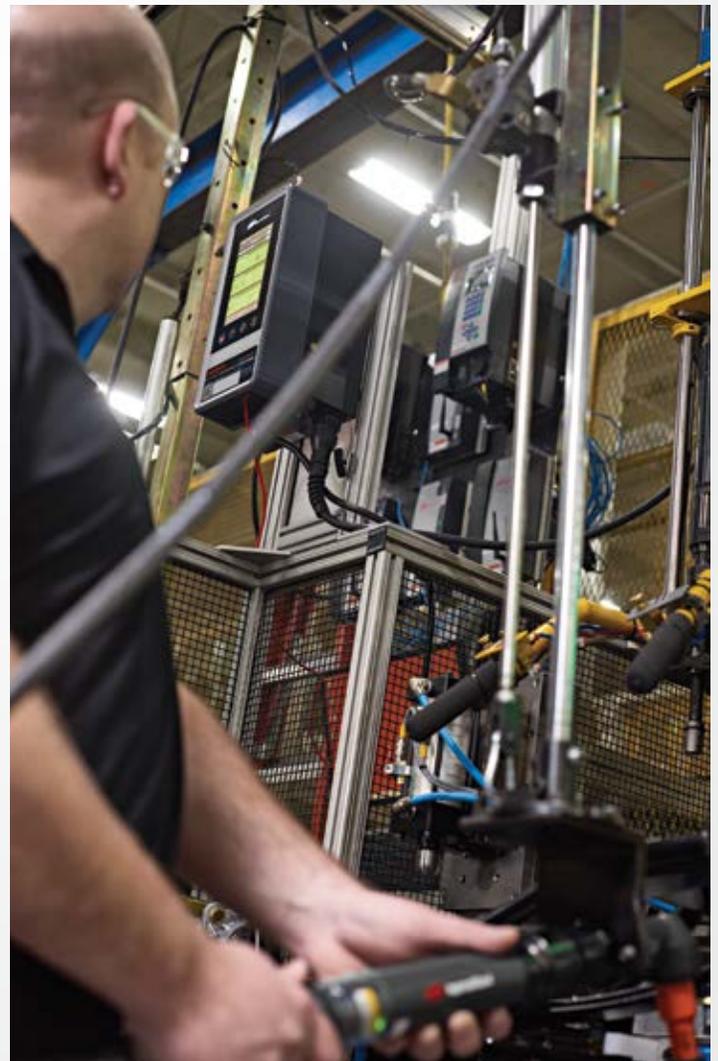
the power of data analytics is for the taking thanks to the Internet, easy-to-use interfaces, and data management platforms that provide insights to improve manufacturing processes.

For more information about the Ingersoll Rand INSIGHTqc controller visit irtools.com/insightqc.

By: Jeff Lowe
Global Product Manager
Ingersoll Rand, Advanced Assembly Tools