

# TIGHTENING THE SCREWS ON PRODUCT FAILURES

As technological advances have impacted virtually every facet of life, innovations have created an evolution in the assembly tools of manufacturing, as well. Pneumatic air tools have been used in manufacturing for decades. In the 1990's, electric fastening tools became popular in assembly plants, offering more precision, accuracy and the ability to have multiple functions available on a single tool. Recently, battery-driven tools have become commonplace on the assembly line because they provide freedom from cords and wires, improve safety and ergonomics for workers, and offer many of the same benefits as electric tools at a lower cost.

Without question, industry trends show manufacturing plants are taking advantage of electric and battery tools in new plant build outs. Many existing plants that are adding new product lines or upgrading facilities are acquiring new electric and battery-driven tools, while others simply need to replace pneumatic air tools on an as-needed basis. The high energy costs of producing compressed air to power pneumatic tools and anticipated





energy efficiency goals from the U.S. Department of Energy are also motivating assembly manufacturers to choose electric and battery-driven tools more often since reducing energy costs can help the bottom line and help companies reduce their carbon footprints.

The largest market segment for electric and battery tools is automotive manufacturing. However, due to the cost ramifications of product failures, other industries are adopting the automotive policies with capabilities such as traceability, accuracy and accountability. We are now seeing the expanded use of these products on many other assembly lines, such as aerospace, recreational transport (ATVs, watercraft, motorcycles), appliances, heavy agriculture, electronics, construction equipment and general assembly applications that need greater quality control and assurance.

## Business Risk Avoidance

One of the best ways to lower maintenance costs, prevent lost productivity and cut down on equipment failures is to eliminate errors in the assembly process. Preventing failures can be done by building reliable, consistent and accurate quality indicators into the assembly line.

There are several reasons why manufacturing plants are predominately choosing precision electric and battery tools. When it comes to improving product safety, quality control, and reducing costs, the old school mindset of “tighten to torque” simply won’t cut it. When a product fails and the manufacturer is then faced with product recalls, warranty claims, or litigation due to injuries or deaths, the repercussions can be devastating. A single lawsuit

can cost tens of millions of dollars in legal fees and losses, let alone the negative impact on a brand.

These challenges are driving manufacturers to get greater quality control over their assembly lines by collecting and analyzing their production data. A cost effective measure of predicting process performance is through Statistical Process Control (SPC). Manufacturers use SPC as a means to control their production processes to prevent errors. Engineers can identify the cause of the failure by utilizing the data from electric and battery driven tools. The data can then be used to correct and improve the production process and eliminate the failure.

One way to detect and analyze failures is with network-connected tools that provide a data-driven perspective. For safety, multi-purpose functionality and quality-critical applications, a plant-wide network

enables greater plant productivity as network connected tools ensure a highly accurate, repeatable and traceable fastening process. The data collected and stored from each tool within the assembly line is critical to delivering this capability.

## Manufacturers Have Many Assembly Tool Choices

Electric and battery driven systems are more efficient, with error-proofing capabilities and they are able to adjust to multiple torque conditions through simple programming. Manufacturers that are improving their quality control are rapidly deploying electric and battery assembly tools that offer greater accuracy, flexibility, control and can be equipped with integrated networking capabilities for traceability.



Electric and battery-powered tools offer several advantages that make for a worthwhile investment. For instance, cordless tools from the Ingersoll Rand® QX™ Series line feature a multi-function display module that allows for quick setup and feedback on every tool. Each QX Series tool supports eight user-programmable configurations for torque, angle and speed (RPM), allowing one tool to do the work of eight. QX Series tools have a closed-loop transducer that delivers precise torque and accurate, traceable results that can be sent through the wireless communication option to a plant-wide hub. The data each tool provides can be tracked, stored and analyzed to discover and correct errors.

Each configuration can be customized to regulate the rotation speed of the tool's spindle while tightening the fastener. This becomes very important when securing fasteners that have varying substrates and/or compositions. The quality and consistency of a fastened joint can often rely on how fast the tool is running during all



stages of the fastening cycle. If the tool is running too fast, it can sometimes lead to galling, stripped threads, dimpled panels or joints that are not properly relaxed. If the tool runs too slowly, the station's takt time may not be met, torque reaction may be too strong for the user, or the battery life can be shortened. Programmable speed control allows the technician to optimize the speed for each application. Most clutch tools do not allow for speed customization, thus lacking consistency and repeatable performance.

## Precision Tools Create Precision-built Products

Battery driven or wireless precision assembly tools bridge the feature and price gap between pneumatic air and electric tools. Battery tools can be integrated into a plant-wide network to improve performance, accuracy and provide traceability. These cordless tools give assemblers the ability to reach fasteners in confined areas without worrying about air hoses or electric cords. Battery tools support quality initiatives by providing programmable torque control and reducing variance so that fasteners are consistently inserted at the right speed and at the right torque. They provide a closed-loop transducer system that can operate independently or can be wirelessly integrated with the plant control system.

The use of precision assembly tools improves quality assembly processes and helps eliminate errors while providing data that makes errors analyzable. The Ingersoll Rand QX Series software automatically counts fasteners as they are tightened, monitoring and recording that they have been secured correctly, ensuring traceability and reducing liability issues. If a fastener is missed or incorrectly installed, the tool notifies the user and the

issue can be addressed before it becomes a systemic quality issue.

Case in point, an American appliance manufacturer was using shut-off torque control tools to tighten freezer lids on upright appliances. Shut-off torque control tools will run until they reach the desired torque, but they lack the angle monitoring capability that would identify stripped screws. When the tool stripped a screw, workers were forced to spend more time drilling out and replacing it on the production line. Additionally, shut-off torque control tools are susceptible to drops in compressed air pressure. If the required air pressure is not being delivered to the tools, the tools may shut-off before they hit the torque required for accurate assembly.

Ingersoll Rand helped that customer develop an overall assembly solution and replaced the shut-off torque control tools with the QX Series cordless precision screwdriver with advanced torque control capabilities, transducer control and angle inspection for monitoring. These features eliminated the torque over-shoot issue, and the on-board pass/fail indicator provided immediate feedback if an angle failure occurred.

By replacing the shut-off torque control tools with the QX Series battery tools, the customer was able to reduce the re-work required on the top panel by more than 50 percent. With the increased uptime and improved production rates, the customer expects to recoup the new tool investment in less than three months.

## New Tool Technology Improves Assembly Quality

Business losses due to poor quality from inconsistent assembly invariably lead to warranty claims, recalls and customer dissatisfaction. While these problems continue to plague manufacturers, they present an opportunity to improve plant assembly processes.

Technology advances have made assembly tools lighter, quieter and more durable. Beyond the ergonomic, economic and environmental advances, technology has made these tools smarter, with the ability to automate torque control and angle; and data driven, to provide manufacturers greater control with verifiability over their assembly processes.

Manufacturing plants may need lighter pneumatic air tools that have fewer moving parts. They may want a single electric or battery tool that can handle various types of fasteners and sockets that can be changed quickly to improve throughput to keep the line moving smoothly. Or, perhaps the requirement is to network-connect the assembly line and use the tool's data to store, analyze and correct errors.

Fortunately, there are many options to choose from. Whether it's pneumatic air, battery or electric assembly tools, manufacturing plants have a variety of solutions available to meet their needs and help them get the job done right.

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