

ASSEMBLY TOOLS SOLUTIONS

AEROSPACE INDUSTRY

ADVANCED ASSEMBLY TOOLS MEET RIGOROUS AEROSPACE AND DEFENSE MANUFACTURING DEMANDS

The manufacturing of aerospace and defense parts and sub-assemblies requires maximum precision and quality in all areas of the assembly process. Meeting today's rigorous industry demands requires increased automation and consistent, reliable processes. Manufacturers need to maintain 100 percent accurate, efficient, and cost-effective operations. In addition, the entire assembly process needs to be reproducible and traceable to ensure quality and precision.

Aerospace manufacturers are always looking for ways to optimize production efficiencies. In order to keep up with an increasingly competitive landscape, it is imperative that aerospace and defense manufacturers anticipate ways to make their labor force more productive and reduce overhead costs.



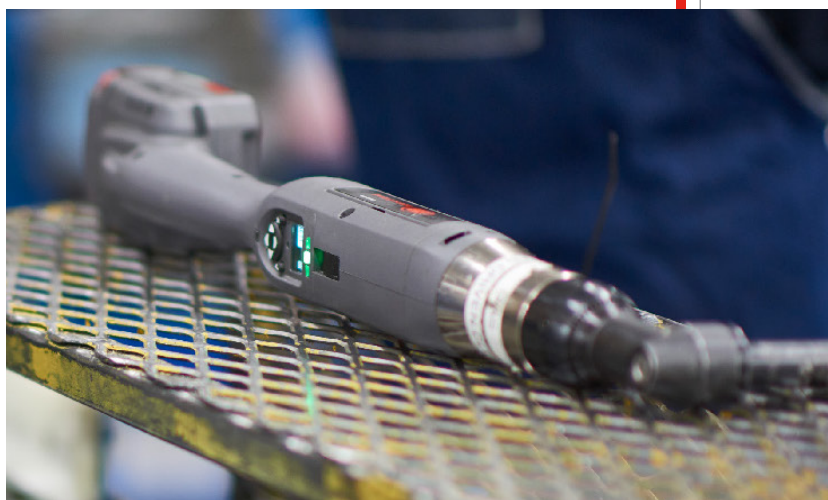
TOOLING CATCHES UP TO THE ADVANCED MATERIALS OF AEROSPACE AND DEFENSE

During the last decade, aerospace manufacturers have transitioned to advanced composite materials to make aircrafts lightweight and more structurally sound. The assembly of these materials requires fewer fasteners compared to metal-skinned planes. However, the precision and accuracy needed to work with these newer materials has only increased. Traceability is also becoming increasingly important in the assembly processes. In response, assembly tool suppliers, like Ingersoll Rand®, a global leader in reliable and innovative power tools, are providing advanced tools to make assembly operations more efficient, consistently reliable, and network-connected for collecting and analyzing valuable production data.

Today's advanced assembly tools are helping aerospace manufacturers produce ever-more complex products while maximizing productivity. Aerospace manufacturing is increasingly outsourced to tier-one, tier-two, and tier-three manufacturers and machine shops. These sub-suppliers know how important assembly tools are to their business' success. If they are unable to efficiently deliver precision-made components and sub-assemblies they will, at the very least, experience delays, costing them money and putting customer projects behind schedule.

Pneumatic air tools have been used in manufacturing for decades. In the 1990's, electric fastening tools became popular in assembly processes, offering more precision and accuracy.

Now, battery-driven tools are seen more often because they offer 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. The high cost of energy that produces compressed air to power pneumatic tools



and the anticipated energy efficiency goals set by the U.S. Department of Energy are motivating manufacturers to choose electric and battery-driven tools. Reducing energy costs can improve the bottom line and help companies reduce their carbon footprints.

Without question, these market dynamics confirm that aerospace and defense manufacturers will need to leverage advanced electric and battery tools to improve product reliability and consistency to support today's complex designs and diverse materials.

BUSINESS RISK AVOIDANCE

One of the best ways to lower labor costs, prevent lost productivity, and cut down on equipment failures is to eliminate errors in the assembly process and ensure accurate quality indicators are built in from the start. When a product fails, it can result in costly financial losses, and in this industry, failure is not an option. In this environment, product safety is paramount and the old-school approach to eyeballing a fastener simply won't cut it when developing crucial transportation systems.

These goals are driving manufacturers to pursue greater quality control over their assembly lines by collecting and analyzing production data. A cost-effective measure of predicting process performance is through Statistical Process Control (SPC).

Manufacturers use SPC as a means to monitor their production processes to prevent errors. Engineers can identify the cause of the failure by utilizing the data from network-connected electric and battery-driven tools. The data can then be used to correct and improve the production process and eliminate failures in the future.

For example, Ingersoll Rand® QX Series™ tools control the torque, angle, and speed (RPM) of each action and store records for up to 1,200 fastenings, which can be downloaded to a computer via a USB cable, or wirelessly transferred to a dedicated Process Communication Module (PCM). Reliable data is then available for review, analysis and record-keeping at any time, replacing the dated guesswork of manually recording torque goals with paper and pencil in the field.

AEROSPACE AND DEFENSE

MANUFACTURERS HAVE ASSEMBLY TOOL CHOICES

Electric and battery-driven systems, with their multi-faceted capabilities, are highly efficient. These tools offer several advantages that make for a worthwhile investment. Ingersoll Rand® QX Series tools feature a multi-function display module that allows for quick setup and feedback on every tool. Each tool supports eight user-programmable configurations for torque, angle and speed, allowing one tool to do the work of eight. The 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.

Each configuration can be customized to regulate the rotational 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 are often determined by how fast the tool is running during all stages of the fastening cycle. If the tool is running too fast, it can damage or stress

the material, strip threads, and dimple 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 and thus lack consistency and repeatable performance.

Battery-driven, wireless precision assembly tools bridge the feature and price gap between pneumatic air and electric tools. These cordless tools give assemblers the ability to take the tool to the aircraft without the worry of reconfiguring hoses or compressors, as well as reach fasteners in confined areas. Battery tools support quality initiatives by providing programmable torque control and reducing variance, allowing fasteners to consistently be inserted at the right speed and at the right torque.



PRECISION TOOLS CREATE PRECISION-BUILT PARTS

The aerospace and defense industries are looking for new ways to improve productivity while maintaining strict quality standards required for critical assemblies, such as fuselages, wing panels, tail assemblies and other aircraft components. Many manufacturers are investing in various forms of automation. However, the required precision and tight tolerances, as well as low production volumes, make automation a challenge for aerospace and defense manufacturers. Many are taking a hybrid approach, using manual assembly processes alongside robotic automation.

Precision fastening tools can bridge the automation gap by enabling workers with many automated functions built into their precision fastening tools. These tools integrate automation with manual assembly processes using software that automatically counts fasteners as they are tightened, while monitoring and recording that they have been secured correctly, ensuring traceability. 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.

If an aerospace manufacturer is using shut-off torque control tools to tighten a section on an aircraft sub-assembly, and a shut-off torque control tool runs until it reaches the desired torque, it will lack the angle monitoring capability that would identify stripped screws. When the tool strips a screw, workers are 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, they may shut-off before they hit the torque required for accurate assembly.

This problem can be solved by replacing shut-off torque control tools with transducerized screwdrivers that have advanced torque control capabilities and angle inspection. These features will eliminate the torque over-shoot issue, and the on-board pass/fail indicator will provide

immediate feedback if an angle failure occurs. These tooling improvements can significantly reduce the rework required on the sub-assembly. With the increased uptime and improved production rates, a manufacturer can expect to recoup the new tool investment within a few short months.

NEW TOOL TECHNOLOGY IMPROVES ASSEMBLY QUALITY & LOWER COSTS

After it's clear that product quality goals are being met, sub-assemblers can look at how to apply tooling solution to lowering costs. Reducing the number of assembly tools used on a project can save tens of thousands of dollars. A single QX Series tool can replace many of the tools aerospace manufacturers currently rent. For example, if a tool can deliver a wide band of torque level and eight programmable settings, it can replace multiple clutch tools. For an assembly plant with dozens, or even hundreds of assembly workers, the savings can be significant, as a single clutch tool rental can cost more than a thousand dollars a year.

Time is money. Aerospace and defense manufacturers need precision assembly tools that can handle various types of fasteners and sockets and can be changed quickly to improve throughput to keep the development schedule running on time. Cordless precision tools allow aerospace and defense assembly workers the mobility they need to be efficient and highly productive. When these tools are network-connected, they help manufacturers get the job done more economically and with greater precision and safety.

For more information about the QX Series visit www.IRTools.com/AssemblyMag.

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