

## APPLICATION STUDY

### AEROSPACE - JET ENGINES FASTENER SOLUTION

*Due to the sensitive nature of our customer relationships, Ingersoll Rand® has chosen not to include the names of our clients in these case studies. Ingersoll Rand provides products, services and solutions that enhance our customers' energy efficiency, productivity and operations.*



### JET ENGINE MANUFACTURER USA

Taking control of your fastening process doesn't have to be complicated. Our comprehensive QX Series™ family of fastening systems deliver simple, flexible and capable solutions for all of your assembly requirements. No matter the industry or application, you can lean on Ingersoll Rand® as a trusted partner to help you get the job done right.

### THE OPPORTUNITY

Particularly in aerospace manufacturing, locking inserts are used to provide a safety 'lock' to the fastener to prevent it from loosening on its own which could lead to catastrophic failures during flight. These locking inserts, if installed correctly, ensure that the fastener not only has the proper clampload, but is mechanically 'locked' in place on the threads with the insert. While this is effective, it significantly varies the amount of friction that the fastener experiences during the tightening process.

This varying friction on the threads of the fastener directly affects the required amount of torque

to be applied by the assembly tool in order to achieve the proper clampload on the fastener, as a variation in friction means a variation in torque to overcome this prevailing torque caused by the additional friction while still applying the same level of clampload to the fastener.

In these cases, the locking insert is critical and required for safety, but so is applying the proper clampload on the fastener which is the whole point of using a threaded fastener in the first place. The varying friction means that the applied final torque must also vary with each fastener, depending on how much friction is caused by the locking insert on the fastener.



As a result of this, aerospace manufacturers have traditionally only used manual wrenches and processes to ensure the following: 1) The locking insert is actually in place and locked 2) the amount of prevailing torque that the locking insert is adding through friction on the threads is measured and 3) that the final torque applied to the fastener compensates for the measured prevailing torque, while still achieving the required torque for proper clampload of the fastener. This is a very manual process and is a real challenge for the operator to do this accurately and maintain high productivity.

## **THE INGERSOLL RAND® SOLUTION**

The Tare Compensation feature from Ingersoll Rand is available on our QX Series™ cordless fastening system & our corded DC systems. If enabled, it will measure the average torque of the last 360 degrees of rotation of the prevailing torque zone and add it to the target torque, high torque limit, and low torque limit of the final torque step. This will 'compensate' for the amount of additional torque/friction experienced during the tightening, and ensure the amount of torque necessary to deliver the proper clampload is still applied to the fastener. This all happens on the fly, automatically in ONE TRIGGER PULL. The operator doesn't have to wait for it and likely wouldn't even notice it happening! This algorithm is similar to how you would 'tare' a

scale when weighing some material in container. You would first weigh the container and then 'tare' out the weight of the container so that it is not included in the final measured weight with the material in it. This gives you the true weight of just the material, not the container. This is why we call it 'tare compensation'.

This is physically IMPOSSIBLE to do with a battery clutch tool or a click wrench. You must have a tool with the ability to dynamically measure torque and angle, and has an algorithm to make the calculations and adjustments on the fly. In the market, the QX tool is uniquely positioned as one of the only battery assembly tools that can perform this function with or without a controller connected. Certainly, we are the most affordable.

Additionally, using QX with tare compensation eliminates manual calculation errors and drastically increases productivity, when compared to an operator performing this process manually with a dial wrench. In addition to the ability to automate their data collection process and remove manual errors, one aerospace customer was able to realize an 80% increase in their productivity by using QX with tare compensation. The diversity of the QX Series™ lineup offers a simple, flexible and capable solution for any fastening need.

Ingersoll Rand® has worked with many of the world's leading manufacturers for more than 100 years and understands the interface between the tool and operator. Ingersoll Rand applies this experience to ensure the accuracy, flexibility and durability of its products.

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