World Leaders in Expanded Products
COLD EXPANSION EXPERTS

All of FTI products are based on our cold expansion technology. Our engineers have advanced this science to develop innovative fastener, bushing, and fitting products for metal, composite, and hybrid structures. These products are specifically engineered to provide cost savings for structural optimization, manufacturing and maintenance time-savings, and improved aircraft structural performance.

Installation of expanded products into composite laminate was adapted from the same principles used to expand bushings and nut plates into metal structures. Each product is radially expanded from an initial clearance fit to yield it into the structure and provide uniform interference with the hole surface. Though the expansion level is lower in composites than in metals, the expanded product outperforms similar options without damaging the composite structure.

How does cold expansion work in composite structures?

- Improved electrical conductivity through fastened joints and grounding locations
- Reduced arcing and laminate damage caused by lightning strike
- Improved open hole compression strength
- Faster product installation and joint assembly
- Hole protection in areas where bare holes can wear
- Ease of repair
- Better open-hole fatigue life
- Improved joint durability
The aerospace industry is constantly changing. New aircraft programs are coming online with complex design and manufacturing logistics, while older aircraft are in need of modernization and retrofit solutions to keep them flying longer. FTI’s technology of cold expansion is a process applied to holes in metals that induces a beneficial zone of residual compressive stress around them. The process radially expands the hole, typically using a tapered expansion mandrel pulled through the hole, which yields the surrounding material. The resultant reactive force leaves a large zone of residual compressive stress around the hole. This compressive stress zone shields the hole from the effects of cyclic tensile loads which causes fatigue cracks. FTI pioneered this technology with the Boeing Company in the 1960's and continues to work with industry partners to adapt and optimize the cold expansion process for today’s new aerospace materials and structural requirements.

Simplifying Production and Modernization Programs

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FTI PRODUCTS WORK IN BOTH OF THESE AREAS BY:

1. Improving Producibility
2. Reducing Life-Cycle Costs
3. Reducing Structural Weight
4. Increasing Fatigue Life
5. Increasing Load Improvement Factors
6. Improving Aircraft Structural Performance
7. Reducing Maintenance Cost
8. Reducing Manufacturing Time

FTI GUARDIAN

S-N Curves for 2024-T851 Aluminum


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Coordinate Measuring Machines generate SPC data for quality/manufacturing consistency. Finite Element Analysis is used in support of product validation. Statistical Process Control is an integral part of our manufacturing excellence.

On-site training is an integral part of FTI's customer service.

Making a Difference in the Aerospace Industry

Over 40 Years of History
As a pioneer of the cold expansion process, FTI helped develop this technology back in 1969. Since that time, we have continued to grow along with the aviation industry. Our commitment is to provide practical solutions to aircraft manufacturing, rework, and structural fatigue related problems.

Innovation
FTI employs a motivated and experienced staff who work closely with our customers. We utilize the most sophisticated tools available including a fully equipped testing facility, CAD/CAM, and finite element analysis technology.

FTI maintains an extensive library consisting of thousands of technical documents and test reports that quantify the effectiveness of our systems. We have also developed and maintain over 40 U.S. and international patents.

Our engineers apply a hands-on, practical approach to researching and developing new methods and refining existing processes to support our customers’ needs.

Materials Testing
Since 1980, FTI’s Materials Testing Facility has provided an industry requirement for independent testing services, specifically environmental and mechanical tests of metallic and composite materials. Our testing capabilities support internal research and development of our systems and validates their effectiveness.

Manufacturing
To ensure the highest quality and timely delivery of FTI products to our customers worldwide, we have established a state-of-the-art manufacturing facility. FTI parts are created by experienced machinists on modern CNC equipment.

Reliability is designed into the manufacturing capability with backup equipment available for every machine and operation. FTI uses statistical process control procedures that ensure tooling and products are processed, manufactured, and tested to exacting tolerances that meet or exceed industry standards. Our quality system is certified to AS 9100.
Outstanding Customer Service

FTI strives to provide the very best for our customers. We have won numerous awards over the years from the top OEM producers in the world because of our legendary customer service. Our expert staff is available to answer any of our customer’s technical questions within 24 hours. Even after shipment, we continue to support our customers by providing on-site training and installation technical assistance. FTI also offers product installation services for our customers. Our service teams are highly trained and can expertly install our products on customer’s aircraft on-site, or in our facility for smaller applications.

WORKING WITH CUSTOMERS TO CREATE INDUSTRY-CHANGING PRODUCTS

ForceMate Bushings and the B-52

Our ForceMate bushing installation process came about back in 1983 when the maintainers of the B-52 had serious issues with their standard shrink-fit bushing installations on the engine pylon. FTI worked closely with them and provided engineering support, testing services, and manufacturing expertise to create a better method of installing a bushing using cold expansion technology. The ForceMate system provided a faster installation with a high interference-fit bushing that resisted the most strenuous migration and rotational forces.

Today, FTI’s ForceMate system delivers superior fatigue and mechanical performance in critical locations on thousands of commercial, military, fixed, and rotary-wing aircraft worldwide.

ForceTec Rivetless Nut Plates Invented for the F-14

In the late 80’s, the F-14 was experiencing cracking on its rear fuselage longeron due to metal fatigue associated with the satellite holes of its riveted nut plates. After going on-site and working closely with the F-14 support engineers, FTI invented a rivetless nut plate that would eliminate the fatigue prone rivet holes and improve the overall performance of the nut plate assembly and the parent structure.

ForceTec is now the industry standard rivetless nut plate used by commercial OEMs and military operators to not only increase their aircraft’s structural fatigue life, but to also increase production rates, reduce structural weight, and reduce the overall costs of the aircraft.

FTI products are the basis of hundreds of Service Bulletins and Technical Orders for aircraft repair solutions.
FTI creates kits per our customer’s requests that include all the necessary tooling required to support their application.

A Complete System of Tooling and Kitting

FTI also specializes in working with our customers to design kits comprising all of the necessary tools to perform an application for greater convenience and work flow efficiency. These kits typically include a complete system of tooling for all our processes. Depending on the application, this system may include drills, reamers, check gauges, mandrels, and other assemblies; puller units, power packs, and the final product to be installed. The whole system is designed to provide ease of installation and optimal product performance.
On a major USAF program, 260,000 ForceTec retainers were installed with zero defects on over 80 aircraft sets.

The cold expansion process locks the TukLoc blind nut into the structure for use with common aerospace screws that are installed to finish the fastened joint.

ForceTec Lite offers a factory-installed nut and rapid one-step installation process.

The cold expansion process typically improves the fatigue life of a metal hole by 3 to 10 times.

FTI provides an integrated complete system of tooling for all processes.
FTI Products are approved and used worldwide by virtually every airplane and helicopter OEM.

MARKETS SERVED: Aerospace, Medical, Railroad, Transportation/Infrastructure