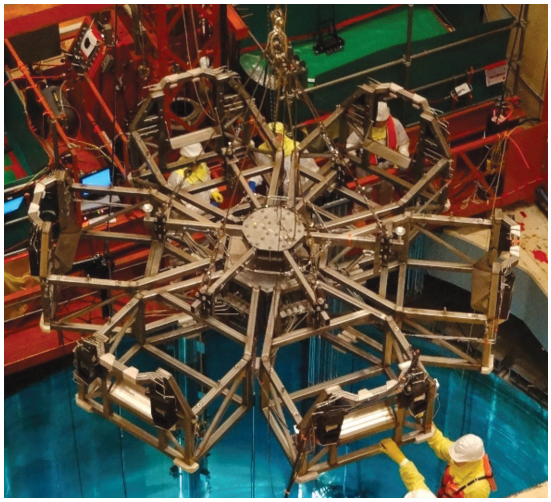
framatome

Clevis Bolt Replacement

Replacement Reduces Cost & Schedule

Framatome's innovative and field proven clevis bolt replacement solution, coupled with our extensive experience, provides proven schedule and cost savings while eliminating the inherent foreign material risk associated with traditional machining operations.



Challenge

As part of the nuclear industry's rigorous attention to safety, plant equipment is continuously monitored and inspected, and where necessary, repaired or upgraded. Based on recent guidance issued by the PWR Owners Group, a priority for utilities is clevis insert bolt inspection plans, followed by one of three options: proactive clevis insert bolt replacement, ultrasonic examination with bolt replacement contingency, ultrasonic examination with operability assessment contingency.

Solution

To meet the current challenges of failed bolts and recent inspection requirements, and to support our customers' need for clevis bolt replacement solutions, Framatome took lessons learned and made a significant investment to develop a comprehensive enhanced tooling package and process. We designed high strength tools to handle larger bolts, fabricated a frame to allow for a set carriage assembly at each clevis location and optimized our electrical discharge machining (EDM) process to incorporate one-step functions. A new digital video-based bolt alignment system uses higher resolution cameras, provides more accurate measurements and tool alignment and stores measurement images. We also maintain a complete set of clean tools for testing and training for increased efficiency on future bolts and reactor vessel internals replacements.

Customer benefits

- Extensive bolt experience and lessons learned utilized to optimize clevis bolt solution
- Experienced leadership and technicians
- Proven tooling and processes based on existing bolt replacement equipment used in over 8,900 previous applications worldwide
- All machining operations use EDM process to avoid foreign material concerns
- No welding required for installation as bolt is retained via a crimped feature
- Improved bolt designs – standard and contingency
- Framatome ownership of all refuel floor activities reduces schedule and financial risk

Components and Features

Modular Tool Platform (MTP)

- Motorized platform to allow XYZ positioning of tools with respect to clevis
- Robo-coupling for precise remote tool engagement
- Remote installation on X-Frame at desired clevis location
- Multiple MTPs may be used to perform work in parallel

EDM Threading & Removal

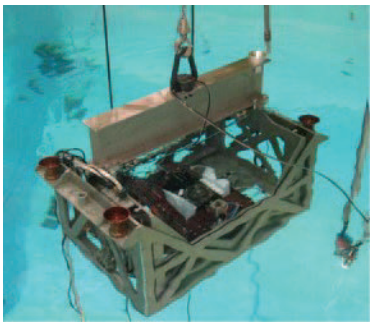
- Capable of plunge and rotational machining
- High rad camera integrated into EDM tool
- Swarf Sucker™ collects and ducts swarf, reducing dose and tool contamination
- Universal EDM tool for various applications

Bolt Removal Tool

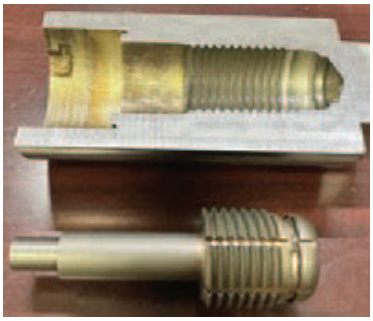
- Underwater impact driver
- Capable of removing bolts with 2500 ft-lbs. of removal torque
- Attaches to MTP for delivery to bolt location
- Variety of end effectors to address all removal needs

Bolt Installation Tool

- Chase, install and crimp in one tool
- Automated bolt installation
- Manual drive for final torque with 10:1 multiplier
- Pneumatic slide on base provides compliance for bolt installation

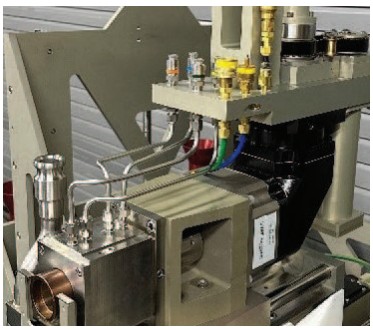


Modular Tool Platform



EDM Threading & Removal

Bolt Removal Tool



Bolt Installation Tool

The Framatome Difference

- 2013: Successful removal of 28 bolts and replacement of 23 standard and 5 oversized LRSS clevis bolts at a utility
- 2020: Successful clevis repair solution at a utility; implementation schedule proven on-site

Your performance
is **our** everyday **commitment**

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