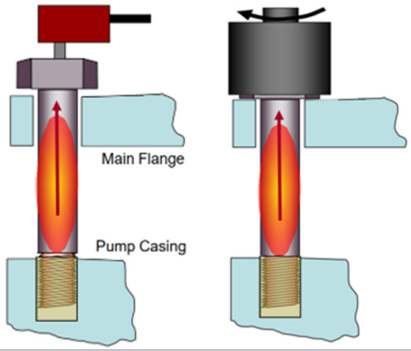
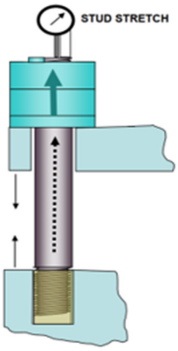
RCP Bolt Tensioning Upgrade

For PWRs in the United States

Nuclear Power Products and Services

Time to "Heat & Beat" Main Flange Bolts: **3 Days** *vs.* Time with HydraNuts & Studs: **2 - 4 Hours**





About

Several PWRs in the United States utilize the bolt heating method to tension reactor coolant pump (RCP) main flange bolts, a process that is incredibly time-consuming.

Challenge

Identify a simpler tensioning method that would allow plant personnel to tension RCP main flange bolts faster than the bolt heating method.

Solution

Curtiss-Wright introduced the HydraNut High-Temperature Hydraulic Nut to plants as a simple, innovative solution to reduce time and dose for this application.

Results

Using the HydraNut enabled the PWR plants to reduce RCP main flange tensioning time to less than one eight-hour shift.

Background

The traditional method for tensioning RCP main flange bolts -bolt heating- can take two to three days to complete per RCP, and is usually critical path. During this process, heat is used to stretch the bolt or stud, while the nut is tightened manually with hand tools. Elongation must be measured after the bolt or stud cools, making this method iterative and time-consuming. The cycle of heating, cooling, and measuring is repeated until the bolt is stretched within the specified limits. Any trim passes or adjustments further increase time and dose exposure.

Solution

HydraNut offers significant time (usually critical path time) and dose savings in the RCP application. Replacing the main flange bolts with HydraNuts and corresponding studs reduces tensioning to less than one eight-hour shift. Once the HydraNuts are installed on the studs, it takes approximately two hours to connect hydraulic hoses, tension the studs to the proper preload, and measure/verify stud elongation. Significant time and dose savings are also achieved during detensioning and any vendor-recommended in-service bolt/stud re-stretch activities.

Results

- Tensioning of all studs and hydraulic preload is achieved simultaneously, reducing the process to about 30 minutes. The process is highly accurate and requires minimal trim passes or adjustments to reach approved elongation.
- HydraNut restretch activities can be completed without removing RCP components or setting up scaffolding.
- HydraNuts do not require a fire watch. The preload is achieved through hydraulic pressure, not through bolt heating.
- Crew size can be three to four personnel and the pump operator can be located outside the RCP cubicle.
- Digital micrometers can be set up on top of each stud to measure the elongation in real time on each stud at one time. This reduces the elongation measuring time to 15 minutes, which is enough time to read the digital micrometers and record the measurements.

Some of the plants installed HydraNuts and studs without breaking the main flange seal by detensioning a subset of the bolts and installing the HydraNuts and studs in steps. The main drivers for this type of retrofit included uncertainty around existing RCP bolt preloads, preventing proper re-stretch or verification; active flange leaks; and upcoming pump removals or replacements.

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