Extend the Fatigue Life of Drill Stops by Over 10x

PROCESS BENEFITS:

- Arrests the growth of small cracks in holes
- Cost-effective alternative to redesign of the structure
- Installed bushing allows for positive visual inspection
- Simple and easy-to-use one-sided operation
- Reduces maintenance and inspection costs

Cold expanding bushings into drill stops for high performance bridge maintenance
**FATIGUE LIFE ENHANCEMENT OF DRILL STOPS IN METAL STRUCTURES**

Many fatigue cracks in bridge structures are drill stopped to repair the bridge. However, drill stopping may only stop a crack from growing for a short time. FTI’s StopCrackEX System cold expands a bushing into a drill stop, propping the hole and imparting residual compressive stresses around it, protecting it from cyclic loads. This large zone of residual compression around the drill stop greatly reduces or arrests crack growth, even when the drill stop misses the tip of the crack. Independent, third-party testing has shown that this repair method extends the fatigue life of the drill stop by over ten times.

StopCrackEX is based on FTI’s Cold Expansion System and products that are being used by virtually every commercial and military aircraft manufacturer worldwide to extend the fatigue life of holes in metallic structures. FTI’s 40 years of engineering expertise has lead us to become the world leaders in expanded products.

**WHAT IS COLD EXPANSION?**

Cold Expansion is accomplished by pulling a tapered mandrel through a pre-fitted, lubricated bushing (or sleeve) inside a hole in aluminum, steel, or titanium. The lubrication inside the bushing reduces mandrel pull force, ensures uniform radial expansion of the drill stop, and allows one-sided processing.

Cold expansion of a hole counteracts its fatigue-prone characteristics by creating a compressive residual stress field around the hole, effectively shielding the hole from the cyclic tensile stress loads that cause cracks to grow. Design engineers use cold expansion to reduce the stress concentration factor associated with a hole, thereby improving the fatigue and damage tolerance of a structure. These permanent compressive stresses surrounding the hole mitigate crack growth, extend the fatigue life, and improve the integrity and safety of the structure.

**STOPCRACKEX STANDARD KIT**

INCLUDED IN STANDARD KIT:
- Starting Drill Bit
- Starting Reamer
- 1/2" Diameter Bushings (Various Lengths)
- Combination Check Gage
- Mandrel
- Mandrel Gage
- Jaw & Nosecap
- Puller & Handpump *
- Small Toolbox & Durable Case

*Optional Electrical PowerPak Available
STOPCRACKEX INSTALLATION PROCESS

Drill and ream the drill stop

Place the bushing onto the mandrel and insert mandrel into puller unit

Insert the bushing/mandrel into the drill stop

Activate the puller unit and expand the bushing into the drill stop

Bushing is now installed into the drill stop

INDEPENDENT TESTING RESULTS

A third-party testing facility was contracted to conduct a series of independent fatigue tests investigating the effectiveness of the StopCrackEX process in stopping fatigue cracks in bridge steel.

The StopCrackEX process showed over a 60 times improvement for crack reinitiation and specimen life when compared with the crack arrest holes (CAH).

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Crack Length</th>
<th>Radius</th>
<th>Cycles to Break Hole</th>
<th>Cycles to Reinitiate Crack</th>
<th>Reinitiated Crack Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Crack Arrest Hole</td>
<td>0.298</td>
<td>0.05</td>
<td>17,500</td>
<td>230,000</td>
<td>0.145</td>
</tr>
<tr>
<td>#2 Crack Arrest Hole</td>
<td>0.265</td>
<td>0.05</td>
<td>6,000</td>
<td>250,000</td>
<td>0.14</td>
</tr>
<tr>
<td>#3 Crack Arrest Hole</td>
<td>0.264</td>
<td>0.05</td>
<td>7,000</td>
<td>440,000</td>
<td>0.149</td>
</tr>
<tr>
<td>#4 StopCrackEX</td>
<td>0.29</td>
<td>0.05</td>
<td>580,000</td>
<td>4,000,000</td>
<td>No Crack</td>
</tr>
<tr>
<td>#5 StopCrackEX</td>
<td>0.285</td>
<td>0.05</td>
<td>250,200</td>
<td>4,000,000</td>
<td>No Crack</td>
</tr>
<tr>
<td>#6 StopCrackEX</td>
<td>0.265</td>
<td>0.05</td>
<td>700,000</td>
<td>4,000,000</td>
<td>No Crack</td>
</tr>
<tr>
<td>#7 StopCrackEX</td>
<td>0.262</td>
<td>0.05</td>
<td>210,000</td>
<td>20,000,000</td>
<td>No Crack</td>
</tr>
</tbody>
</table>

*All lengths measured in inches
Fatigue Technology is the world leader in cold expansion technology. We have pioneered this science since 1969 and have advanced the cold expansion process to develop cost savings ideas for production simplification, manufacturing and maintenance time-saving, and improved aircraft structural performance. We offer our customers a full range of services to support their applications.

**THESE SERVICES INCLUDE:**
- On-site product support
- Technical training
- Engineering/design support
- Product and materials testing
- Research and development services
- Field repairs and upgrades

(Please contact us to discuss your current application.)

FTI's corporate headquarters and manufacturing plant is located just 5 minutes from the Sea-Tac International Airport and 10 minutes from downtown Seattle, Washington.

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