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Heat Exchanger Services and Tube Slewing

Hydraulic Expansion vs. Explosive Expansion

1. Although tubes have been explosively expanded into tubesheets as thin as 1/4", most experience with explosive expansion has been with 6" or thicker tubesheets.

Hydraulic expansion has been successfully applied to expand tubes into tubesheets as thin as 1/4" and as thick as 33".

2. Tube materials such as Titanium and austenitic stainless steels frequently must be explosively shot twice. Experience has shown that leakers may occur with only one explosive detonation.

Hydraulic expansion almost always seals on the first expansion. This is due to the repeatability and accuracy of the expansion pressures applied uniformly tube after tube.

3. Almost all explosive expanding is done on constructions where the primary seal of the tube to the tubesheet is by welding.

Hydraulic expansion is used consistently and successfully on both non-weld and welded joints.

4. There have been instances where explosive expanding caused measurable ligament movement with consequent ovaling of adjacent tube holes as well as cracked ligaments.

Hydraulic expansion does no cause ovaling or cracked ligaments.

5. It is advisable and customary to install ligament supports in surrounding tubes when setting off another explosive charge to seal a leaking joint.

Because of hydraulic expanding's fine control, it is not necessary to insert ligament supports in surrounding tubes when re-expanding.

6. Tube ends must be cleaned after explosive expanding, but a residue remains and there is some discoloration of the tube.

Hydraulic expanding leaves no residue and does not change the appearance of the tube ends because deionized water is used to expand the tubes.

7. Tube metal of tubes expanded into TEMA-width grooves (118"), appear to coin similarly to metal of mechanically rolled tubes. The edges of such grooves appear to be deformed.

Hydraulic expansion does not coin the tube metal in TEMA-width and wider grooves because uniform pressure is applied over the whole expansion zone. The shape of the metal deformed into the grooves is accurate.

8. Organizations that do explosive expanding must deal with government requirements for purchasing and using explosives. Special permits may be required to transport explosives across state lines.

Hydraulic is free of government regulation and requires no permits.

9. Special training and certification is required for technicians who perform explosive expanding.

Anyone can use hydraulic expansion with minimal training on the equipment.

10. The calculated appropriate explosive charge must be verified experimentally.

Proper hydraulic expansion pressure may be selected based upon consideration of the tube and tubesheet yield strengths and tube dimensions.

11. The noise level during explosive expanding requires hearing protection for technicians and others within hearing range.

Hydraulic expansion is quieter than most machines used in heat exchanger factories and in locations that utilize the heat exchangers.

12. It is generally unsafe to set off explosives on-site in chemical plants, pharmaceutical plants, and oil refineries because of the hazard of igniting volatile materials.

Hydraulic expansion can safely be done anywhere.

13. Depending upon the materials, tube diameter, gauge and tubesheet thickness, explosive expanding may be considerably more expensive than hydraulic expansion.

After the cost of the mandrels is borne, the cost of hydraulic expanding varies only modestly over the whole range of materials, tube diameter, and gauges and tubesheet thicknesses.