



e Products Eqpt Comparison Services Int'l Agents VSR Physics PWHT Risks Library Con

WE INVENTED THE VSR PROCESS

Thermal Stress Relief (TSR) / Post-Weld-Heat-Treating (PWHT) Risks & Limitations

Although PWHT of most commonly used alloys, such as the various forms of mild steel, is effective, two broad categories of steel alloys run the risk of physical property loss, crack initiation, are not recommended outside the temperature range of -50 to 800 F / -46 to 426 C, suffer reduced abrasion resistance, or can undergo unwanted phase transformations (e.g. sigma-phase in stainless alloys), if thermally stress relieved.

These include:

- Numerous grades of low carbon, high strength alloys, including T-1, ASTM 514 and HY80
- Austenitic stainless alloys, which includes 300 series stainless steels

In addition, welded Ti-6Al-4V titanium alloy has been shown to suffer reduced fatigue life, if PWHT processed. In the work, *Assessment of Structural Integrity of Titanium Weldments for U.S. Navy Applications**, Mohr reports that:

"The no PWHT specimens performed on average better in fatigue than the PWHT specimens, running about 50% longer under the same loading."

* This work can be found in our VSR Technical Library.

Such negative side effects can be avoided by using an alternative form of stress relieving, such as vibratory stress relief.

The risk of hydrogen embrittlement of welded T-1 that had undergone thermal stress relief was discovered by Dr. C. Mel Adams, an MIT metallurgist and co-founder of the Welding Research Department at MIT. Dr. Adams also served as the expert witness in the legal proceedings involving such structures that had suffered cracking and structural failure. Although the steel manufacturer was eventually acquitted, the engineering community worldwide took note of these events: Steel plate specification guides, such as that of Arcelor Mittal, have referenced footnotes attached to the specifications of numerous low-carbon, high-strength steel alloys, bearing warnings of the risks to their physical properties, if thermally stress relieved.

For a list of the low-carbon, high-strength steels that can suffer materials degradation, press the button below.

