



*The Professional's Choice
for Quality High Performance
UT Couplants*

Hydrogen Embrittlement of High Strength, Low Alloy Steels A serious concern in some NDT inspections

Hydrogen produced by corrosion readily dissolves and diffuses in metal crystals which can cause dramatic reduction in tensile ductility and strength causing premature failure of the part under static load. Hydrogen, with only one proton in the nucleus, is very small and migrates easily through the crystal structure of most metals and alloys. Hydrogen dissolved in the metal's crystal lattice can result in loss of ductility with subsequent brittle failure of the part. In addition, dissolved hydrogen may nucleate hydrogen gas, which can form brittle hydrides, and hydrogen can react with carbon in steel to degrade strength and ductility.

Hydrogen dissolved in the crystal lattice can induce cracking of high strength ferrous and nonferrous alloys under sustained loads. Hydrogen embrittlement of high strength steels is considered to be one of the more serious corrosion failure potentials. Corrosive damage to a metal part by hydrogen can be facilitated by NDT ultrasonic couplants that produce electrochemical corrosion or by cathode protection corrosion inhibitors.

Parts that are known to be vulnerable to hydrogen corrosion attack include: boiler tubes,

aircraft landing gear, high strength bolts and nuts, etc.

Hydrogen embrittlement is a particularly onerous problem with high strength steel parts in that it is not visible to the naked eye, the part can not be tested for hydrogen embrittlement while in service and as demonstrated by the details of the ASTM test below, major degradation of mechanical properties of the steel part occur in a relatively short period of time.

ASTM F519 Tensile Test for Hydrogen Embrittlement of High Strength Steel Procedure: Stress three notched-tensile specimens (ASTM F519 Type 1a) made of 4340 steel heat treated to 260-280 ksi), cadmium-plated or bare, in tension at 45 percent of ultimate load while in continuous contact with the couplant. A specimen that does not rupture after **150 hours** under load passes the test. The couplant is acceptable if none of the three specimens fail within 150 hours. If two specimens out of three fail, the couplant is not acceptable. If one specimen in three fails, a retest of three specimens is required. If one or more specimens fail this retest, the couplant is not acceptable.

Cont. on Reverse

Sonotech's ultrasonic couplant Ultragel II is approved to ASTM F519.



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High viscosity couplant in a unique applicator

Soundsafe HV (high viscosity) has been produced and supplied for specialty applications over the past decade and, due to its continued success, is now being added to Sonotech's catalog of standard products.

Soundsafe HV is available in standard packaging and a unique 3.2 oz. pump for thickness gaging. The non-refillable pump applies the couplant easily to overhead or hard to reach surfaces, can be emptied completely, does not require 'shaking' which induces air bubbles into the gel, and is easy to carry.

Free samples are available on line at www.sonotech-inc.com or by calling **800-458-4254**.

What infrastructure supports a "Sonotech Couplant"?

1. Breadth of product line: With over 40 NDT couplants, Sonotech offers a product to meet every need, from high performance to economical, extreme temperature (-60°F to 1100°F), humectant-free, water-free, fluorescent, high acoustic impedance, and products for immersion tank water conditioning. No other company matches Sonotech's product offering.

2. Quality: Sonotech has been assessed and registered as conforming to the requirements of the international standard, **ISO 9001:2000** – Quality Management Systems.

3. Dependability: Most couplants are constantly in stock; 95% are shipped the same day.

4. Management: Sonotech's organizational depth includes 14 full-time employees, many with advanced degrees or education and training beyond high school, including a full-time, degreed Quality Manager and a degreed Metallurgist with NDT level III (ultrasonic).

5. Experience: Some Sonotech couplants have been in use for **30 years** (Ultragel II, Echogel).

Millions of inspections have been performed by thousands of operators worldwide on virtually every material and part inspected ultrasonically with Sonotech couplants.

6. Chemicals: USP pharmaceutical grade humectants are used in Sonotech couplants. In the higher performance products (Ultragel II and Soundsafe), pasteurized, deionized water is used. Sonotech pioneered operator and environmentally benign couplants with no VOCs, harsh surfactants, dyes or fragrances.

7. Product Support: Free samples, literature and a Couplant Selection Training Guide CD are available to make certain the best product is selected for each application. Sonotech has a newly updated web site with product information, downloadable MSDS and data sheets and on-line ordering at www.sonotech-inc.com. Technical support is available by calling **(800) 458-4254**.

8. Fair pricing: Our products are priced to cover the infrastructure required to support the quality and reliability of Sonotech's product.

For over 30 years, **Sonotech** ultrasonic couplants have been a trusted industry standard. Sonotech couplants have been specified worldwide in aerospace, nuclear, and fossil fuel power plants.

Tell us about **your** couplant application, we will make a recommendation and send free samples. E-mail: mlarson@sonotech-inc.com or call 1-800-458-4254 (360-671-9121)



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