



The Professional's Choice
for Quality High Performance
UT Couplants
Q2 — 2008

The Ultrasonic Couplant Experts

Sonotech manufactures a broad selection of ultrasonic couplants with over 45 products. Sonotech UT couplants deliver dependable high performance over a wide range of test conditions and procedures.

ONLINE
www.sonotech-inc.com

 **SONOTECH**[®] INC
774 Marine Drive
Bellingham, WA 98225
www.sonotech-inc.com

In This Issue

Ultrasonic Couplants
and Ferrous Corrosion
Ferrous Corrosion
From Ultrasonic Couplants
Ferrous Corrosion Testing
of Ultrasonic Couplants
Ultrasonic Couplant
Quality and Reliability
Product Features
SonoGlide and SONO 1200+

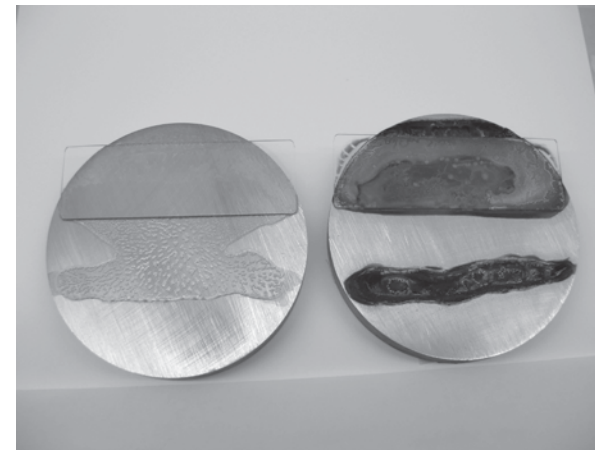
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NDT Newsletter: Featuring information on ferrous corrosion properties and testing of ultrasonic couplants, product features and much more!



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ULTRASONIC COUPLANTS AND FERROUS CORROSION



The photo to the left is an example of crevice and surface corrosion testing on 1018 steel coupons comparing a couplant with good ferrous corrosion inhibition characteristics on the left to a couplant with inadequate corrosion inhibition depicted on the right. The crevice corrosion condition is simulated by placing a glass microscope slide over the top bead of couplant on the coupon.

Do No Harm

Hippocrates most famous dictum is- *primum non nocere* - "first do no harm". The same message applies to Nondestructive Testing. As implied by the name, NDT is intended to have no detrimental effect on the part being inspected. In the field of ultrasonic flaw inspection and thickness gaging, the greatest possibility of causing harm is through corrosion. Ultrasonic couplants are often not completely removed after inspection. Thus, couplants must be selected such that they will not cause corrosion. Corrosion damage often requires a long time frame to fully develop, may not be obvious, and can cause catastrophic failure.

Critical Parts Inspections

Many metal parts in a broad range of applications are ultrasonically inspected using couplants. Examples include jet engine turbine blades during the manufacturing process and during routine maintenance, welds on ski lifts, ships, nuclear power plant components, helicopter rotors, amusement park rides, rocket engine casings, aircraft landing gear, automotive components, high strength bolts, oil pipeline welds and wall thickness, etc. The list of metals and alloys inspected is also broad and includes titanium, aluminum, composite materials and the ferrous metals cast iron and steel. Examples of use of these metals are: **cast iron** is commonly used on large and small engine blocks and wind turbine blades; **steel** is used in high strength bolts, boiler tubes, aircraft landing gear, aircraft engine fuse pins; **titanium** is used in jet engines, turbine blades and aircraft; **stainless steels** are used in nuclear power plants and nuclear submarines; **aluminum** is used in aircraft; and **composite materials** are used in fixed wing aircraft, helicopters etc.

Why is Corrosion Important?

Corrosion damage from ultrasonic couplants can take many forms, from reducing the useful life of the component, such as ferrous corrosion interfering with an applied coating or plating, to catastrophic failure of the part due to hydrogen embrittlement corrosion, stress corrosion cracking or deep pitting.

FERROUS CORROSION POTENTIAL FROM ULTRASONIC COUPLANTS

Ferrous metals are metals which contain iron. Ferrous metals may be pure iron (like wrought iron), or may be alloys of iron such as gray cast iron and steel, which are alloys of iron and carbon. Ferrous metals are usually, but not always, magnetic. Oddities exist, such as austenitic stainless steel which is

a ferrous metal that is non-magnetic while cobalt is magnetic but non-ferrous.

Through the 1950's and 1960's, the most common ultrasonic couplants used for ferrous metals were petroleum based oils and greases. Petroleum based couplants provided superior corrosion inhibition, protecting machined surfaces and unprotected metal for very long periods of time. If the petroleum couplant was not abraded away and the part was stored out of the elements, corrosion inhibition would last for years. Inspectors could be confident that ferrous materials, such as machined parts, would not corrode between manufacturing operations as a consequence of ultrasonic inspection or thickness gaging.

Today, petroleum based oils and greases are seldom used due to environmental concerns, safety and fire hazard and operator skin dermatitis. Ultrasonic couplants must have a sophisticated balance of corrosion inhibition agents; uniformity of the couplant is critical to insure that each drop of couplant contains the same amount of corrosion inhibitors.

FERROUS CORROSION TESTING OF ULTRASONIC COUPLANTS

Some manufacturers conduct their own internal testing of NDT ultrasonic couplants for compatibility with the parts inspected. Most inspectors using ultrasonic NDT, however, rely on the couplant manufacturer to accurately state the known corrosion characteristics of the couplant.

One method of ferrous corrosion testing (as exhibited on the previous page) is to use 1018 low alloy steel and gray cast iron surface ground coupons as test metals and apply the couplant onto the surface, and under a glass plate to simulate crevice corrosion or "concentration cell" conditions. The corrosion "mechanisms of action" significantly differs for crevice corrosion and surface corrosion. Thus, a combination of both tests is a good predictor of the balance between cathode and anode corrosion inhibition in the ultrasonic couplant, and the negative effects of any chemicals or precipitates in the couplants which contribute to accelerated corrosion in a concentration cell. Concentration cells are formed by pitting corrosion (a self serving crevice), and by crevices formed from washers, overlapping metal parts, lifting paint chips or any type of mating surfaces. In a metal-ion concentration cell, the accelerated crevice corrosion occurs at the edge or slightly outside the crevice, while in an oxygen-concentration cell the accelerated corrosion usually occurs within the crevice between the mating surfaces.

ULTRASONIC COUPLANT QUALITY AND RELIABILITY

It is not possible to test each drop of ultrasonic couplant for chemical and corrosion properties, just as it is not possible to test drugs drop by drop, or pill by pill in the pharmaceutical industry. To accomplish and insure a homogeneous, reproducible ultrasonic couplant, the couplant manufacturing process must establish a high degree of assurance that, in producing a gelled or high viscosity product, the entire batch of product will be homogeneous.

Insuring product uniformity requires a quality management system to establish and maintain a controlled process, the key parameters of which include: documented raw material specifications, established purchasing and receiving inspection procedures, documented work instructions and procedures that define requirements for ultrasonic couplant manufacturing, labeling and packaging, documented final product test procedure, use of ISO compliant 3rd party testing laboratories as required; suitable production equipment, maintenance of suitable production environments and compliance with international standards applicable to quality management systems ISO 9001:2000.

To insure batch and product uniformity and reproducibility, Sonotech uses the same manufacturing process, type of equipment, facility and quality program to produce NDT ultrasonic couplants as is used to produce Sonotech's medical ultrasound couplants which are regulated and inspected by the

Food and Drug Administration. Thus, Sonotech's NDT couplant production equipment and process is in compliance with ISO 13485 and federal regulation 21CFR Part 820- Quality System Requirements for Medical Device Manufacturers.

PRODUCT FEATURE: SonoGlide

SonoGlide has been successfully used for years in the aircraft industry for both fixed wing and helicopter aircraft. Recently we learned of SonoGlide's use in high, ambient temperatures and high altitude environments such as Afghanistan and Columbia to test helicopter rotors. In this example, SonoGlide replaced a water-based couplant which evaporated quickly and did not provide adequate inspection time.

SonoGlide UP is recommended for use in non-ferrous metal ultrasonic flaw detection and thickness gaging on aircraft, turbine rotors, bar stock and forgings.

PRODUCT FEEDBACK REQUEST

Do you have a need for an economical couplant that contains a UV or visual light fluorescent tracer to either insure complete couplant removal or to track the transducer footprint to insure complete coverage? If so, please e-mail an overview of your application and product needs to mlarson@sonotech-inc.com

MAIL OR E-MAIL?

Sonotech currently mails a Technical Newsletter every Quarter. If you would prefer to receive this Newsletter electronically please send your e-mail address to Desirae Hill at dhill@sonotech-inc.com



NEW PRODUCT

Sonotech is pleased to announce that **SONO 1200+** has performed well in field trial evaluations and is being added to our line of Extreme Temperature UT Couplants.

SONO 1200+ provides coupling for thickness gaging and flaw detection from 700° to well over 1200° F. For samples and additional information, please e-mail mlarson@sonotech-inc.com or visit www.sonotech-inc.com.



To request free samples visit www.sonotech-inc.com or call (800) 458-4254.