



NASA's Ultrasonic Stir Welding Process for Handheld Solid State Welding



As NASA prepares for a return to the Moon and creation of a lunar outpost, it is developing the tools needed to build and repair space-based structures. Engineers at the Marshall Space Flight Center (MSFC) are working on a solid state welding device that uses ultrasonically heated stir welding. This process reduces the loads needed by conventional friction stir welding and is the foundation of future handheld solid state welding for NASA. NASA is seeking partner companies interested in jointly developing its ultrasonic stir process for various welding applications.

Benefits

This technology offers advantages over friction stir welding and fusion welding:

- Portable, which enables use in field repair, robotics, and tack welding
- Applicable to varied materials, thicknesses, and weld geometries, including high-temperature alloys that are hard to weld using conventional processes
- Capable of tack welding and repair
- Lower plunge force, power requirements, and tool life versus conventional friction stir welding
- Improved mechanical properties and a high-quality weld and surface finish as a result of solid state process

technology opportunity



For More Information

If you would like more information about this technology or NASA's technology transfer program, please contact:

Sammy A. Nabors
Commercialization Manager
Marshall Space Flight Center
Phone: 256.544.5226
Fax: 256.544.4810
E-mail: sammy.nabors@nasa.gov

www.nasasolutions.com

National Aeronautics and Space Administration
Marshall Space Flight Center
Huntsville, AL 35812

www.nasa.gov
MFS-32105-DIV

FL-2007-05-68-MSFC
05.11.2007

The Technology

NASA's ultrasonic stir welding process is similar in nature to friction stir welding in that it uses a rotating pin. The heating, however, is not generated via friction but is created by ultrasonic energy instead. Thus, unlike friction stir welding that requires significant forces and countering support, the NASA process does not need reactive tooling and can be used for manual or robotic welding.

In conventional friction stir welding the support shoulder is coupled to the stir pin, and thus the rotations per minute (rpm) of the pin tool (1) controls the performance of the coupled pin tool and shoulder, and (2) controls the pressure of the shoulder. These are key variables in the welding performance and resulting quality of the weld joint. Therefore, another advantage over conventional friction stir welding is that the NASA process does not rely on a single unique rotation or rate of revolution to control the coupled stir pin and shoulder, shoulder pressure, and heat input, resulting in better control and quality.

Opportunity

NASA has filed several patent applications that relate to ultrasonic stir welding and handheld solid state welding, and would like to build on its investment in the development of these technologies with a commercial partner who sees commercial value in the technologies for welding applications. NASA is flexible in its agreements, and opportunities exist for joint development, patent licensing (exclusive, non-exclusive, and field-of-use), or other mutually beneficial relationships.

Commercial Applications

- Aerospace fabrication and repair
- Automotive fabrication
- Shipbuilding
- Building construction
- Railway car fabrication

