Al-Li alloy tank dome is friction-stir welded, spin-formed

A friction-stir-welded, spin-formed aluminum-lithium (Al-Li) alloy dome for a liquid-propellant fuel tank recently made its debut at NASA Marshall Space Flight Center, Huntsville, Ala. It is said to be the first full-scale friction-stir-welded and spin-formed dome designed for large liquid-propellant tanks.

“Two of our wide plates were joined via friction-stir welding,” says Harry Kiskaddon, Alcoa Rolled Products, Alcoa Inc., Pittsburgh, Pa. The plates were produced on “the widest hot-rolling mill in the world” at Alcoa’s works in Davenport, Iowa. “The tank dome proves the viability of friction-stir welding to reliably and cost-effectively join large aluminum-lithium plates for high-strength applications,” states Kiskaddon. The joined plates were then transformed into the round, symmetric, 18 ft (5.5 m) in diameter dome by spin forming, a net-shape process.

Marshall Space Flight center managed the prime contract and conducted key material testing of the dome and dome weld. Lockheed Martin collaborated with Germany’s MT Aerospace on the development, and subcontracted MT to manufacture the dome. Langley provided program oversight, and Alcoa provided the 2195 alloy. NASA believes that this new technology could reduce the weight of future large liquid-propellant tanks by 25%. Production costs could also be reduced by the elimination of manufacturing steps such as machining.


Lead processing technology eliminates smelting

A technology for producing lead that promises to reduce all air, land, and water releases by nearly 99% has been unveiled by Doe Run Co., St. Louis. It replaces high-temperature smelting, the traditional process.

The proprietary technology is based on a wet chemical process that selectively dissolves lead concentrates into solution, then extracts lead from the solution with an electric current. The “electrowinning” process is similar to the technology that extracts zinc from concentrates, but has never been applied in primary lead production. As a self-contained process, the activating solution is recycled back into the process indefinitely.

Doe Run is currently running a demonstration plant in southeast Missouri, completing a detailed feasibility study on the new technology, and evaluating possible locations for a commercial-scale plant. To take the project from a demonstration plant to a commercial operation, investments of more than $150 million are expected to be required.

Doe Run Co., St. Louis, Mo.; 314/453-7100; contact@doerun.com; www.doerun.com.

Software simulates mold filling in RTM

A user-friendly software package that simulates resin transfer molding (RTM) processes has been developed by the Institute for Materials Technology & Plastics Processing (IWK), Rapperswil, Switzerland. It is available at no charge (even for commercial use).

RTM is being increasingly used for the production of high-quality fiber-reinforced structural components. In the process, low-viscosity liquid resin is injected directly into a dry preformed reinforcing fabric, which itself is placed in the enclosed cavity of the mold, which gives the finished shape of the component. To ensure reproducible manufacturing, it is essential to be able to simulate the mold-filling process. However, currently available simulation software packages are said to be impractical for small- and medium-size com-
Swagelok welding power supply wins Golden Gas Award

In recognition of its contributions to gas systems technology, Swagelok Co., Solon, Ohio, has been honored by Gases & Instrumentation International, a MetaWord Inc. publication, with one of its 2010 Golden Gas Awards. The Swagelok welding system M200 power supply received the Gold Award in the Welding category. This is the third year in a row that a Swagelok product has been honored with a Gold Award.

The M200 power supply offers easy-to-use touch-screen operation for orbital welding applications. “It’s designed to enhance welder efficiency and accuracy,” says John Glessner, product manager. Users can choose from three forms to enter weld programs, including automatic weld schedule programming. The M200’s automatic shielding-gas control simplifies set-up, and no separate flow meter is required. A recent software upgrade improved system capabilities in tracking live weld progress and recording weld data.


Tantalum surface prevents corrosion of stainless substrate

Corrosion-resistant parts can be fabricated by growing a tantalum surface on a metal (typically stainless steel) substrate. In the Tantaline process, tantalum atoms are actually grown into the substrate creating an inseparable surface alloy. During the 700 to 900°C (1290 to 1650°F) furnace process, tantalum metal is chemically reacted and vaporized, creating conditions suitable for solid-state diffusion and alloy bonding at the atomic level.

Further processing creates a tantalum metal surface 50 μm (0.002-inch) thick. The surface is 100% dense, ductile, and not susceptible to chipping, spalling, or delamination. The gas-phase process is geometry independent, so both internal and external surfaces of complex parts such as valves, fittings, process equipment, and instrumentation can be treated.

The result, says Tantaline, is parts having the corrosion resistance of tantalum at a price (thanks to the availability of stainless steel) comparable to those made of titanium, nickel alloys, and zirconium.

Tantaline Inc., Waltham Mass; 888/268-2586; america@tantaline.com; www.tantaline.com.

Titanium alloy ATI 425 is laser welded

Titanium alloy ATI 425 could be used in place of standard Ti-6Al-4V for a variety of lower-cost structural solutions, according to a paper to be presented at AeroMat 2010. Demonstration of its fusion weldability with laser welding is of particular interest because it is a near-net-shape process capable of high welding speeds, which would further enable lower cost manufacturing options.

In this presentation, Boeing engineers report that 2.5 mm thick butt joints of the ATI 425 alloy could be successfully welded by means of a fiber laser at speeds over 3 m/min. Microstructural, microhardness, and tensile properties were evaluated on the resulting welds. A 15% hardness increase in the weld was found, and the strength of the joints was within 2% of base metal properties.

The presentation is titled “Laser Beam Welding of ATI 425 Alloy.” It was prepared by Paul Edwards, Todd Morton, and Gregory L. Ramsey of the Boeing Co. AeroMat 2010 will be presented June 21-24 in Bellevue, Wash; www.asminternational.org/aeromat.