



Cryogenic Treatment of Al-Li Alloys for Improved Weldability, Repairability, and Removal Residual Stresses



Objective

This effort will evaluate the effects of deep cryogenic tempering of Al2195 plate, welds, and weld repairs. If successful, the process would provide improved machinability and properties in the Al2195 plate, improved weldability and repairability, and provide an improved alternative technique for the removal of residual stresses in repaired welds. Lower processing costs would be achieved by reducing the number of in-process repairs required for the manufacture of hardware. This process has been proven on steels and other aluminum alloys and should provide significant benefit in Al-Li Alloys as well. The goal would be accomplished through a series of cryogenic treatments on Al2195 plate, welds, and repairs, followed by metallurgical test and evaluation of the resulting material.

Why Needed

The purpose of this project is to evaluate the potential benefits of cryogenic tempering Al-Li alloys. This type processing has been proven in industry to provide significant benefits in strength and dimensional stability for steels and other aluminum alloys such as Al6061. It has also been shown to reduce brittleness, improve toughness, and relieve residual stresses. For NASA, the process could be applied to the External Tank program hardware and any future flight vehicles utilizing welded aluminum structures, for improvements in weldability and weld strength coupled with a reduction in repairs, resulting in a significant reduction in the cost to manufacture this kind of hardware. Improved strength, toughness, fatigue life, machineability, formability, and corrosion resistance could also be achieved in unwelded plate products for use throughout industry where a high strength to weight ratio is required. This would include many potential applications in the commercial aerospace industry and the automotive industry as well.

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