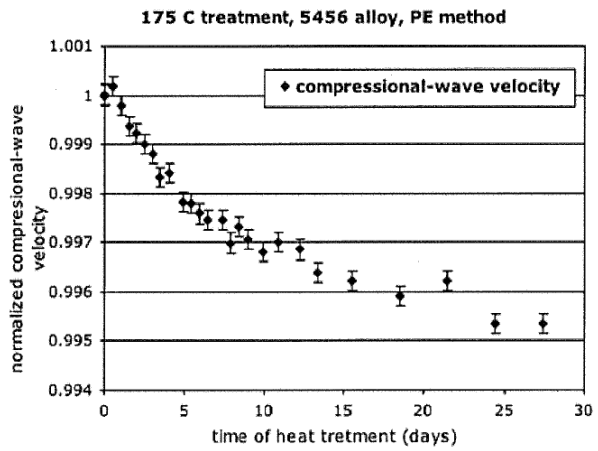
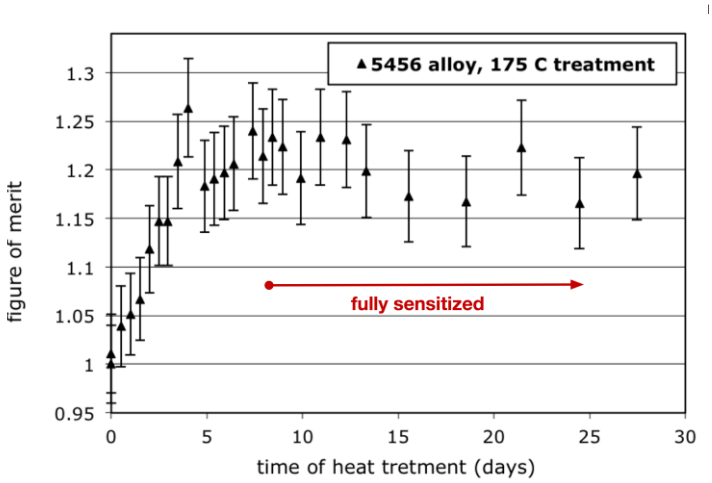
Ultrasonic Sensor for Determining the Degree of Sensitization in Alloys

The sensitization of aluminum alloys used in marine applications is a problem of enormous economic significance for both the private and the defense industries. In particular, Mg-rich aluminum alloys (5xxx-series, high-strength and corrosive-resistant) become sensitized when exposed to heat from the sun or from on-board sources. Sensitized aluminum is vulnerable to corrosion, exfoliation, and stress-corrosion cracking. Ultimately, structural failure becomes imminent if the material at high-stress points is sensitized. The current method of determining the degree of sensitization is the NAMLT test, a test that is destructive, requires large specimens, and is time consuming. Two existing alternative techniques (both currently in development) use eddy currents inspection and electrochemical surface corrosion, respectively. Both suffer from a very weak dependence of the measured parameter on sensitization. Researchers at the University of Louisiana at Lafayette (UL Lafayette) have invented a novel method of determining the degree of sensitization with a much larger sensitivity. This new method is nondestructive, as it employs ultrasonic waves generated and received by the same probe. Both the attenuation and the velocity of the wave are affected by the degree of sensitization, with the attenuation yielding a high resolution measurement, of a 20% change for full alloy sensitization, compared to the reported 0.05% for the eddy-currents method.





KEY ASPECTS OF THE CURRENT TECHNOLOGY:

- Nondestructive test to determine sensitization level
- Testing is performed on site
- Highly sensitive test with a 20%-spread in the measured parameter over the full sensitization range
- Multiple indicators (attenuation and velocity) to be used concurrently for an increased precision in the sensitization level determination
- Based on Patent Pending Technology

UL Lafayette specializes in Research for a Reason. We recognize that the current technology may be brought into practical use for public benefit and may yield economic value. Consequently, we are currently seeking a commercial partner interested in the commercial development of this technology via licensing and/or collaborative research partnerships. To learn more about this research and/or partnership opportunities please contact Seth Boudreaux, Associate Director of Innovation Management, via the info provided below.

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