Manufacturing

NASA-427: A New Aluminum Alloy

With Improved Impact Toughness and Mechanical Properties

NASA's Marshall Space Flight Center researchers have developed a new, stronger aluminum alloy, ideal for cast aluminum products that have powder or paint-baked thermal coatings. With advanced mechanical properties, the NASA-427 alloy shows greater tensile strength and increased ductility, providing substantial improvement in impact toughness. In addition, this alloy improves the thermal coating process by decreasing the time required for heat treatment. With improvements in both strength and processing time, use of the alloy provides reduced materials and production costs, lower product weight, and better product performance. The superior properties of NASA-427 can benefit many industries, including automotive, where it is particularly well-suited for use in aluminum wheels.

BENEFITS

- **Strength**: Improvements in tensile strength and ductility result in high impact toughness
- **Light-weight:** a stronger alloy means less aluminum is required
- **Cost-effective:** requiring less material results in reduced materials cost
- **Energy-efficient:** shorter processing time saves energy and reduces cost
- **Corrosion-resistant:** meets or exceeds the corrosion resistance of other commonly used alloys at a lower cost

technology solution

THE TECHNOLOGY

The NASA-427 alloy, with its origins in the Ares rocket program, has high potential for use in a number of automotive applications, including cast aluminum wheels, control arms, steering knuckles, and other components.

Why it's Better

This technology uses precise chemistry to improve the mechanical properties of cast aluminum products, which demonstrate substantial increases in impact toughness due to the improvement in tensile strength and ductility. The steps necessary to complete the thermal coating process proceed more quickly using this new alloy — the heat treatment process is much shorter, and the aging process has been optimized in conjunction with the powder or paint-baked coating process. It also offers improved corrosion resistance — meeting or exceeding the performance of A356-T6 alloy, as well as offering significant cost-savings over forging 6016-T6 alloy when elongation is less than seven percent. Because of its superior tensile strength coupled with significant process improvements, choosing NASA- 427 yields energy and cost savings for both the manufacturer of cast aluminum components and the end-user.

FIGURE – NASA-427 may enable cast aluminum wheels with high strength, low weight, and less costly processing.

APPLICATIONS

The technology has several potential applications:

- aluminum wheels
- control arms
- steering knuckles
- brake calipers
- automotive cross members
- differential carriers

More Information

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