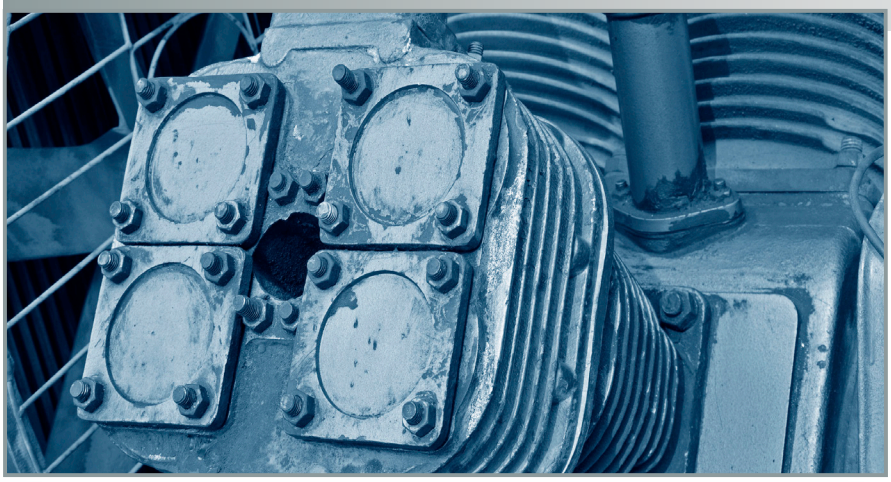
Improved Cast Stainless Steel Alloys

UT-B ID 200100911



Technology Summary

At high temperatures, currently available cast stainless steel alloys used for engine component applications do not have the long-term stability of their original castings and are lacking in their ability to resist deformation and cracking from extreme temperature changes. Researchers at ORNL have developed cast stainless steel alloys that are stable in the long term and resistant to corrosion, deformation, and heat. These new alloys will greatly enhance the quality and durability of combustion engine components used in a wide range of applications.

The alloys developed at ORNL will provide benefits to both manufacturers and consumers. A goal for many manufacturers (and a plus for consumers) is expanding the warranty coverage for their products. At a cost comparable to currently available alloys, the enhanced properties of these new alloys will enable manufacturers to do just that by producing parts that can operate at high temperatures and extreme temperature changes while providing superior performance, reliability, and durability. These alloys will also help manufacturers meet emission regulations for diesel, turbine, and gasoline engine applications. A significant benefit to consumers is that manufacturers will be able to reduce the weight of engines by using designs that are thinner than those used for conventional materials, resulting in increased fuel efficiency. In addition, although these alloys are aimed at the production of engine components, they could be used for other applications as well.

To develop these superior alloys, researchers altered the weight percent of various elements of the tested alloys and conducted tests at a temperature of 850°C with a stress load of 110 MPa (megapascals). More conventional alloys lose many of their desired qualities at temperatures higher than 600 to 700°C. Several features provide these alloys with their overall strength: less than 0.15 weight percent sulfur provides high-temperature strength without reducing ductility from cracking, increased nitrogen solubility enhances strength at all temperatures, and manganese also improves nitrogen solubility, providing additional strengthening.

Advantages

- Provides previously unattainable long-term stability even after aging
- Provides resistance to corrosion and deformation at high temperatures as well as to extreme changes in temperature
- Assists in meeting emissions regulations
- Allows for increased warranty coverage for products
- Allows for increased fuel efficiency through reduced engine weight

Potential Applications

- Chemical/petrochemical production systems
- Larger land-based gas turbine engines
- High-performance alloys
- Gas-turbine markets
- Exhaust component markets

Patents

Philip J. Maziasz, Tim McGreevy, Michael James Pollard, Chad W. Siebenaler, and Robert W. Swindeman. *Heat and Corrosion Resistant Cast CF8C Stainless Steel with Improved High Temperature Strength and Ductility,* US Patent 7,153,373, issued December 26, 2006. *Heat and Corrosion Resistant Cast CN-12 Type Stainless Steel with Improved High Temperature Strength and Ductility,* US Patent 7,255,755, issued August 14, 2007.

Inventor Point of Contact

Philip J. Maziasz
Materials Science and Technology Division
Oak Ridge National Laboratory

Licensing Contact

Nestor Franco
Commercialization Manager
Technology Commercialization
UT-Battelle, LLC
Oak Ridge National Laboratory
Office Phone: 865.474.0534
E-mail: francone@ornl.gov

To view this and other ORNL inventions, visit ORNL Partnerships at
http://www.ornl.gov/connect-with-ornl/for-industry/partnerships/technology-licensing/available-technologies