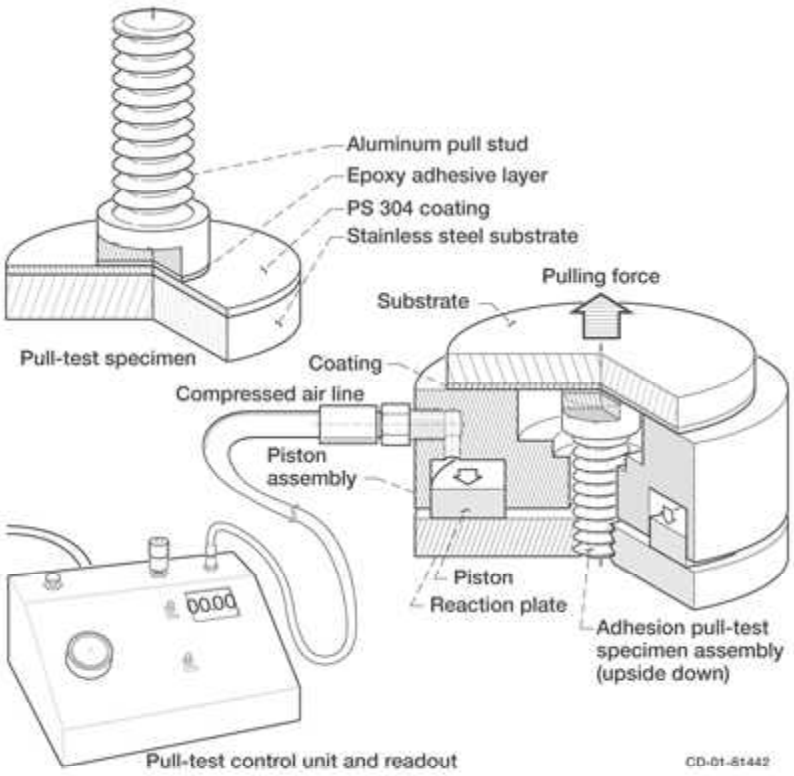
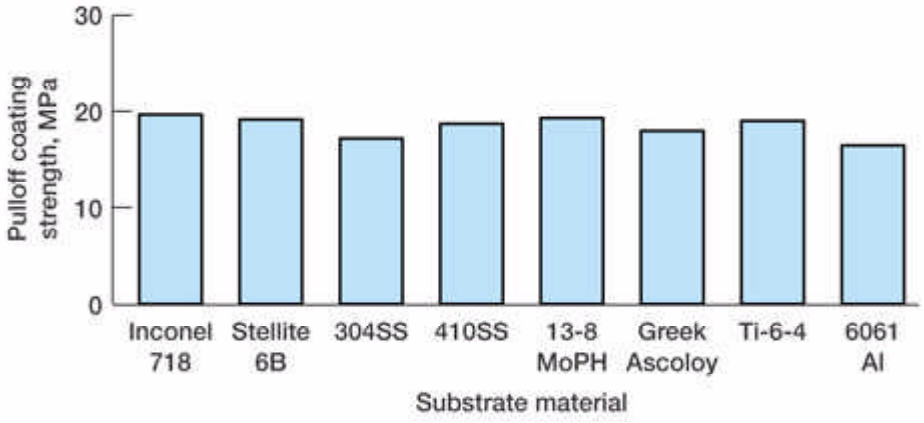
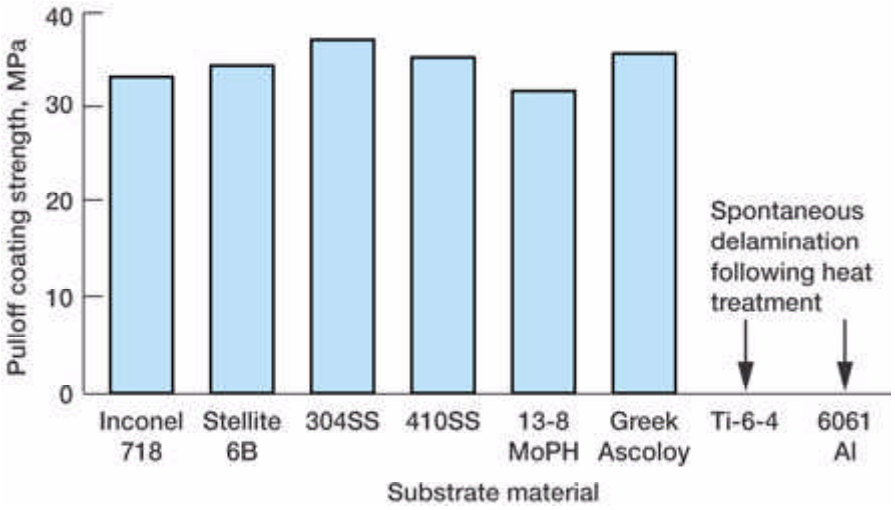
Transition of PS300 Solid Lubricant Coating Technology to Field Aided by Demonstration on Key Substrate Alloys



PS300 coating test specimens glued to pull stud for testing.
Long description of figure 1.



PS300 coating pulloff strength on various substrates in the as-deposited condition.



PS300 coating pulloff strength after air heat treatment at 650 °C for 100 hr. Strength nearly doubles.

PS300 is a high-temperature solid lubricant coating originally developed to lubricate nickel-based superalloy shafts operating against foil air bearings in Oil-Free turbomachinery applications. PS300 is a plasma-spray-deposited coating developed at the NASA Glenn Research Center. It is available for nonexclusive licensing and has found applications in aerospace and industry. PS300 reduces friction and wear from below room temperature to over 650 °C in both oxidizing and reducing environments. Early development centered on coating nickel-based shafts for use in turbomachinery. Potential industrial and aerospace customers, however, expressed interest in using the coating on a wide variety of substrates including steels, stainless steels, and nonferrous alloys like aluminum and titanium. To support this interest, a research program was carried out at Glenn in which nine different substrate candidate materials were evaluated for suitability with the PS300 coating. The materials were first coated with PS300 and then tested for coating strength and adhesion both before and after exposure to high-temperature air.

The results clearly showed that PS300 is a suitable coating for superalloys, steels, and stainless steels over a wide temperature range to at least 650 °C. When applied to aluminum and titanium, care must be taken. Exposure to temperatures above 500 °C on these alloys (which are not considered high-temperature materials) resulted in coating delamination. For all other substrates, PS300 properties are not affected by the type of substrate. This suggests that in many applications, lower cost substrates with PS300 coatings can be substituted for high-performance alloys without sacrificing tribological properties.

Find out more about Oil-Free Turbomachinery research http://www.grc.nasa.gov/WWW/Oilfree/.

Bibliography

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