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**Corrected
Copy****NASA TECH BRIEF**

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Degreasing of Titanium to Minimize Stress Corrosion**The problem:**

Cleaning agents such as trichloroethylene, methanol, methyl ethyl ketone and acetone have been used as degreasing agents in the processing of titanium. Use of trichloroethylene and high purity (>98%) methanol have been found to cause severe stress corrosion on titanium and some of its alloys. Even residual traces of trichloroethylene can promote appreciable stress corrosion, especially when the metal is subjected to high temperatures. Other liquids may potentially affect titanium due to reactivity of titanium. Even perspiration from the hands deposited on titanium also contributes to stress corrosion at higher temperatures.

The solution:

Limited experience indicates that stress corrosion in titanium is lessened by using methanol diluted with at least 2% distilled water as a cleaning agent. This is not to imply that problems will not arise from the use of these cleaning agents. The mechanism which produces stress corrosion in titanium from various cleaning agents is not thoroughly understood. It is, therefore, recommended that the possible degradation of titanium and its alloys be investigated prior to selection of a cleaning agent by performing pre-flawed sustained load tensile tests in the cleaning environment. The specimen containing a crack-like flaw should be loaded to the operating stress for the service structure at the highest temperature in the service environment. Clean cotton gloves should be worn when handling the metal and its alloys.

Notes:

1. Exposure of titanium and its alloys to fumes of trichloroethylene (from nearby degreasing areas) should be avoided whenever these metals are to be processed.

2. It should be noted that the stress corrosion susceptibility of titanium alloy varies considerably from alloy to alloy.
3. Additional information on titanium stress corrosion is contained in NASA CR-65586, *Investigation of the Flaw Growth Characteristics of 6Al-4V Titanium used in Apollo Spacecraft Pressure Vessels*, March 1967. This report is available from the Clearinghouse for Scientific and Technical Information, Springfield, Virginia 22151, \$3.00 each; microfiche, \$0.65.
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No patent action is contemplated by NASA.

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