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In our effort to become a greener company, the Nuts & Bolts newsletter is now published as a e-newsletter. Below is one of the articles published in our November issue. We encourage you to sign-up for our full newsletter via our website.

Hydrogen Embrittlement & ASTM B633

Zinc Plating Requirements

Written By: Tony Tipton, Chief Metallurgist

Recently a customer submitted two fractured studs for failure analysis. The studs were zinc plated low alloy steel heat treated to a hardness of approximately 40 HRC. Investigation revealed the root cause of the fractures to be hydrogen embrittlement. The subject studs had been baked per drawing requirements for 3 hours at 190°C to remove hydrogen after zinc plating per the requirements of ASTM B633-98. However, in 2007 ASTM B633 was extensively revised and the hydrogen embrittlement relief baking parameters were eliminated from the specification. The new 2007 edition of ASTM B633 specification requires that hydrogen embrittlement relief baking of zinc plated components be performed per the requirements of ASTM B850. The hydrogen embrittlement relief baking parameters per ASTM B850 are dependent on component ultimate strength levels and for the subject studs would be 190-220°C for 14 hours. According to ASTM, the changes made to ASTM B633 in 2007 were the result of a history of hydrogen embrittlement failures with the previous specification requirements and to make the hydrogen embrittlement treatments in ASTM B633 consistent with ASTM B849 and ASTM B850. The present customer was unaware of these changes and if the plating suppliers were aware of the changes they did not bring it to their attention. It is likely that a number of users of ASTM B633 zinc plating are unaware of these major changes made in the past couple of years regarding the ASTM B633 specification.