Plating of Fasteners

A Warning To Users of Plated Fasteners

High Strength Industrial Fasteners including precision grade Socket Screws and other products in this brochure are used in a wide range of applications and environments. In many case they have to be protected from these environments to prevent corrosion by electroplating the screw with zinc or cadmium coatings.

Too often, fasteners (Socket Screws) are plated by the user disregarding adequate precautions and this results in fastener failures either in storage, on assembly tightening or after a short period in service. These failures can be catastrophic not only in terms of capital cost of damaged machinery, but also in human life. Interestingly, most of these failures occur at stress levels below the ultimate tensile strength of the fastener.

Investigations have proved these failures to be due to HYDROGEN EMBRITTLEMENT. Hydrogen produced during the electroplating process diffuses into the steel and embrittles the structure. Another common source of hydrogen is found prior to electroplating in cathodic cleaning and acid pickling. These cleaning processes generate hydrogen.

The greater the concentration of hydrogen in the steel, the more susceptible to embrittlement the fastener becomes.

Improper plating can lead to HYDROGEN EMBRITTLEMENT and disastrous fasteners failures.

Be sure your plating process complies WITH

Unilok

recommendations

High Strength Socket Head Cap Screws are particularly prone to hydrogen embrittlement failure because of its high strength (above 1240 N/mm^2) and greater the strength (or hardness) of the fasteners, the greater the susceptibility to hydrogen embrittlement.

Because of this, it is imperative that post-plating de-embrittlement baking is carried out. The baking process enables the hydrogen in the steel to diffuse out of the metal and eliminate the embrittlement tendency.

The baking must be carried out as soon as possible and not later than 4 hours after electroplating. Baking should be done prior to passivation. High strength socket head cap screw, socket low head cap screw, socket countersunk cap screw, socket button head cap screw must be baked for 6 hours and socket set screws must be baked for 8-12 hours at a temperature between 190° C to 230° C.

Another important aspect to be noted while plating fasteners is dimensional changes. When a rod or bar is plated, the increase in diameter is twice the plating thickness, but when a screw thread is plated, the pitch diameter will be increased by FOUR TIMES THE PLATING THICKNESS e.g. A plating thickness of 0.008 mm increase the pitch dia. by 0.032 mm. This is shown/explained in figure below:-