

Chromate Coatings - Hexavalent vs. Trivalent

A challenge facing many industries is the ability to reduce the use of toxic chemicals in manufacturing processes. While zinc plating has long been used as a successful sacrificial coating on fasteners, international trends are likely to lead to an increasing need to reduce the use of toxic chemicals and find a suitable non toxic alternative.

Hexavalent (Cr6+)

When a fastener is zinc plated it would quickly turn whitish and ugly if it was not dipped into a chromate solution for a short time at the end of the plating cycle. The chromate reacts on the surface to stabilise the zinc, which after washing and drying, provides improved anti-corrosion properties. The longer it is left in the chromate the more it reacts and the darker the surface. Unfortunately the reaction produces small quantities of a dangerous by-product called hexavalent chromium.

Hexavalent chromium is a highly toxic material as well as a suspected carcinogen. Its use poses a danger to human health as well as to the environment. Hexavalent chromium can escape the plating line through spills, leaks, in discarded baths, rinses and in a form of mist with hydrogen bubbles generated during plating operations.

Trivalent (Cr3+)

Trivalent chrome occurs naturally and is not a carcinogen or as toxic as hexavalent chromium. Unfortunately in its present development used on straight zinc it is not as protective as existing technology. However trivalent on zinc alloys, particularly zinc nickel, offers better protection. Experts have been attempting to develop a long-term replacement for hexavalent chromium but have had limited success. In recent times more focus has been placed on trivalent chromium as it closely resembles the characteristics of hexavalent chromium, it is also said to be a suitable alternative.

Cost to change

As with many changes to existing practices, there will be a cost to clean existing tanks to make the conversion. The trivalent (Cr3+) chemicals are currently more expensive but should come down in cost as they become more readily available. There will also be significant costs to the users to manage inventories, change drawings, and manage certifications and traceability. There are many other costs such as new part numbers, information technology (IT) and meeting legal requirements that also must be considered.

Hitech Fasteners are presently investigating the implications of converting from hexavalent, including protection, application performance, appearance and costs. Hitech Fasteners intends to progressively replace existing hexavalent stocks with trivalent. If you would like more information on this new plating process or are interested in investigating custom trivalent plating, contact the team at Coventry Fasteners.

