EJOT® AppliTEC

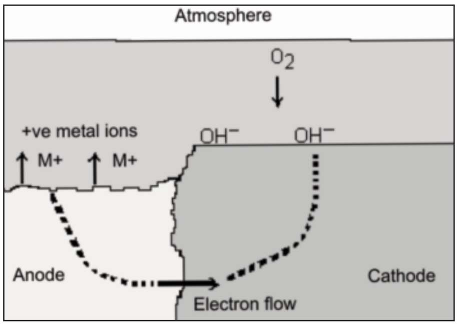



Meeting fastener corrosion head on

Brian Mack is Technical Manager of EJOT®'s AppliTEC testing & development centre in the UK. His team has invested much time researching how the correct choice of fastener material and coating can maximise the life expectancy of an application.

A key aspect, all too easily overlooked when specifying the right fastener for a specific application, should be the corrosion risk created between the fastener material and the application's unique properties.

It's fact that different metals corrode at different rates regardless of how 'safe' it appears to begin with. Fasteners are no different and there are two key influences specifiers should be aware of. Our study deals with the metal to metal relationship of the fixing in its applied environment, and also the natural life cycle of the fasteners own composition.

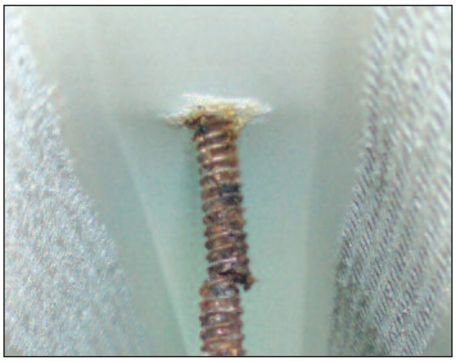


Bimetallic Corrosion

Bimetallic corrosion occurs when two differing metals are in electrical contact with each other and where an electrolyte (e.g. water containing acid, combustion materials or salt) is bridging the two metal components. Current flows from the anode (Less noble: Electronegative) to the Cathode (Nobler: Electropositive) with the less nobler/electronegative metal suffering from greater corrosion.

Galvanic Tables are a guide, but…

The level of corrosion is dependant upon the electrode potential of the metals. It can however be misleading to rely on galvanic series tables as many of these refer to the metals in their raw state and do not take coating processes and the nature of the environment into account.



Minimising the potential for bimetallic corrosion and natural corrosion of fasteners is generally aided by the addition of protective coatings. These coatings can range from a passivated zinc coating applied to austenitic stainless steel bi-met fasteners, through to a combination of zinc and organic corrosion-resistant coating applied to carbon steel fasteners.

EJOT®'s own expertise and experience in coating is drawn from a wide range of fields including automotive, electronic and industrial components. Therefore years of accumulated application test data shows that effective protection against corrosion can be achieved.

Correct and proven value-added processes can also aid the protection of the fastener. These include the addition of an integral nylon head to the fastener or painted powder coatings. The addition of a nylon head encapsulates the metal head of the fastener, thereby retaining the protective properties of its original coating system. These heads can therefore be added to carbon steel and stainless steel fasteners.

Powder coatings also provide good aesthetics, but there is more to consider in their selection. The process of powder coating a fastener involves cleaning the head of the fastener to provide a key for the powder. This cleaning process therefore reduces the original protective coating which the new powder coating simply cannot restore. However, the powder coating used on stainless steel fasteners can retain its life expectancy because of the base material's natural properties. In contrast, a carbon steel fastener's corrosion resistance can be markedly reduced.

In short, the specification of a powder coated fastener should consider not only its ability to enhance the aesthetic qualities of an application, but also the life-cycle responsibility of its performance. EJOT® Super-SAPHIR® powder coated FR range stainless steel fasteners meet this requirement as well as giving a long life expectancy in service.

Corrosion and environment

As far back as 1985, EJOT® launched a product development programme in the UK and on the continent, designed to consider the effect that hazardous atmospheres have on the life cycle of a fastener. Typical problem areas include leisure centres with large indoor swimming pools, tunnel building, and environments that combine high humidity and hazardous substances.

The traditional option of choosing a fastener formed from either A2 or A4 stainless steel has always been more about limiting corrosion and stress induced chlorine corrosion. The resistance provided by these materials is governed directly by how much isolation from the atmosphere can be allowed by the application itself, and so certainty can only be limited.

As a direct result of this exploration, EJOT® has developed a self-tapping fastener range specifically for use in atmospheres with a known risk of high corrosion. Working alongside our sister AppliTEC centre in Germany, we have created a modified grade austenitic steel :

1.4529: X1NiCrMoCuN25-20-7 (UNS 08926); DIBt Approval Z-14.1-4 (DIBt: Deutsches Institut für Bautechnik) Extensive testing has shown the material to have a significantly higher resistance to corrosion and now provides the first proven option with the ® JA1 and JZ1 fasteners ranges.