Technical Guidance

Corrosion of Brasses - Dezincification

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Brass components (valves & fittings) are widely used in all types of water distribution systems within buildings.

Brass is a generic term that refers to a wide range of copper and zinc alloys, the most basic categorisation can be by grouping all brasses into two main categories,

- Category I alloys
  - these contain less than 15% zinc and are deemed resistant / immune to dezincification due to their chemical composition. These are commonly known as ‘bronze’ and ‘gun metal’.

- Category II alloys
  - These alloys do not meet category I and are deemed to be susceptible to dezincification although some will still prove to be resistant to dezincification according to the British Standard dezincification test (BS EN 12163:2016).

Dezincification is a process which selectively removes zinc from an alloy, leaving behind a porous, copper-rich structure that has little or no mechanical strength remaining. Since corrosion is a surface phenomenon this process is initiated at the contact surface and gradually makes its way inward. This effect can show itself in a variety of ways depending on the water composition and may eventually result in leakage or even fracture of the product.

It is also possible for the water ways to be partially or totally blocked by a soft white ‘meringue’ corrosion product containing basic zinc carbonate and can be easily distinguished from lime scale deposits.

Examples

Surface Corrosion / Layering Dezincification

Image 1

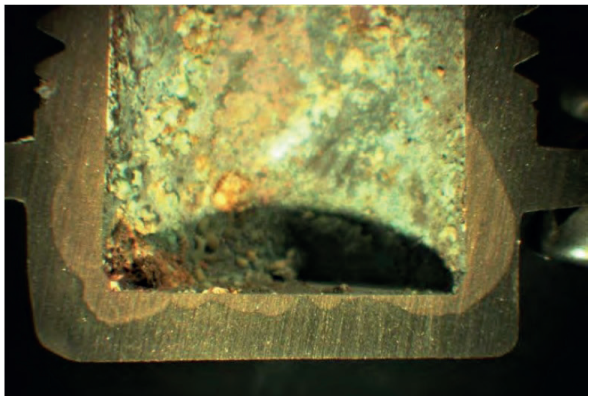
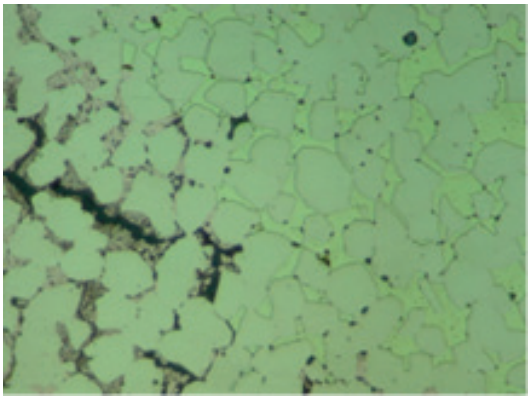


Image 2



Images kindly provided by Midland Corroson Services

Image 1 shows meringue type dezincification. The normal yellow colour of the brass becomes a more reddish colour. Voluminous corrosion products within the fitting can cause blockages. The brass fitting becomes mechanically weak and will eventually fail.

Image 2 shows the dezincification attack taking place along the grain boundaries between alpha & beta phases of the brass.

Some common water conditions that will contribute to Dezincification of brass are:

- Water hardness and the acidity or alkalinity of water away from a pH of 7
- Temperature - the higher the temperature the greater the risk
- Water flow - less flow equals greater risk
- Polluted atmosphere (external corrosion)
- Brine or brackish water
- Corrosive soils such as acid peat, salt marsh, waterlogged clay, etc.
- High concentration of chlorides
- High chlorine treatment levels
- Etc.

An elevated temperature and coupling to a more noble metal can increase the dezincification as a result of natural ‘galvanic corrosion’. If brass pipe-connection bosses are used on copper hot water cylinders, the combined effects of the high water temperature and coupling to a large area of copper can give rise to significant dezincification even in waters that normally would not cause problems.

Avoiding and mitigating dezincification failures in aggressive water is probably best accomplished by use of dezincification-resistant brass alloys.

Dezincification Resistant Brass material (DZR) has been developed for use with pipe fittings and valves in potable water, and also other aggressive water situations.

The composition of DZR Brass, along with the DZR manufacturing process, means that not only is it resistant to dezincification or dealloying, but also has increased strength.

In broad terms, DZR Brass has a higher copper content, lower Zinc and Lead content, with different heat treatment processes, to that of more standard copper / zinc alloys giving DZR grades these superior qualities.

Products carrying the above marking shows that they have been manufactured to be dezincification resistant and will satisfy the requirements of the British Standard dezincification test (BS EN 12163:2016).

Important note
Whilst DZR grades are more resistant to de-zincification they are not immune.

Where a more corrosive environment exists careful consideration must be given to alternative material products, and the use of higher copper (less zinc <15%) content brasses

- Bronze (CuSn)
- Aluminium Bronze (CuAl)
- Cupronickel (CuNi)
- Copper (Cu)
- Monel
- Stainless steel

About Albion Valves (UK) Ltd

Albion has been supplying valves and fittings to the building services and industrial markets for the past 40 years.

Albion was created with the sole purpose of providing quality products at an affordable price. With a growing reputation for quality and reliability, Albion is now an established brand providing the industry with a trusted alternative to premium-priced products.

Our commitment to setting the highest standards in all areas of our business means, if you're looking for quality, service, delivery and choice — you'll find it's all at Albion.

Quality

Whatever you need, you can rest assured that if it comes from Albion it has been designed and manufactured to deliver optimum performance and is accredited with the necessary approvals. Our in-house quality department are always on hand too!

Service

We pride ourselves on our customer service – we have even won awards for it! Our cradle to grave approach means you will never be on your own!

Delivery

We know that time is money, and when a priority project depends on a part you can trust Albion to deliver – next day for all orders placed before 4:00PM.

Choice

We may have started out with a single brass ball valve, but our range has grown substantially since and we now consider ourselves to be a 'One Stop Shop' with our comprehensive range. It is becoming more and more apparent to the industry, that it really is all at Albion.