Case study: Corrosion protection of brass internal geometries through tin-nickel coating

When ultrapure water becomes a problem

Customer

Manufacturer of water-carrying precision components made of brass for applications with deionised water (DI water).

The challenge

DI water is used in many technical applications because it is almost free of salts and minerals. Precisely this purity, however, can become a problem for brass components. The water has no natural buffering capacity and tends to absorb metal ions from materials. In addition, absorbing carbon dioxide from the environment can lower the pH value and increase the tendency to corrode.

For brass components, this means a considerable risk:

- Material attack by DI water
- Dezincification of the brass alloy
- Loss of strength and tightness
- Risk of leaks and component failures

The customer therefore needed a permanently effective protective layer for the internal water-carrying areas of the components.

The problem

The greatest challenge did not lie in the corrosion protection itself.

The surfaces to be protected were located inside complex pipe and angle geometries that are difficult to access for electroplating processes. Especially in narrow internal contours, the following often occur:

- uneven layer distribution
- insufficient layer thickness
- shadowing effects
- inadequate corrosion protection in critical areas

Protecting the outer surfaces alone would not have solved the actual problem. What mattered was the reliable coating of the internal water-carrying surfaces.

The SURPRO solution

SURPRO developed an electroplating process specifically tailored to the task.

The following were used:

- a corrosion-resistant tin-nickel coating,
- an electrolyte with good deposition even at low current densities,
- optimised process control for hard-to-reach internal areas.

By specifically adapting the process, even complex internal contours could be evenly provided with a protective coating.

The result

The coated components were analysed and evaluated in cross-sections.

This showed that the tin-nickel layer was present not only on the outer surfaces but also reliably reached the internal water-carrying areas. The cross-section documents the uniform silvery coating of the internal contours.

This proved that the developed process enables effective corrosion protection even in complex internal geometries.

Customer benefits

With the developed coating solution, the customer gained:

- ☑ Protection of brass components against dezincification
- ☑ Corrosion-resistant internal surfaces
- ☑ Increased operational reliability of water-carrying systems
- ☑ Protection even in complex internal geometries
- ☑ A reproducible electroplating process for serial production

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Why this project is special

Many coating processes achieve very good results on outer surfaces.

It is considerably more demanding to achieve effective corrosion protection inside angled pipes and water-carrying internal contours.

SURPRO’s real achievement therefore lay not only in the tin-nickel coating itself, but in developing a process that enables a uniform protective layer even where conventional processes reach their limits due to low current densities and complex geometries.

Conclusion

SURPRO developed a specially adapted electroplated tin-nickel coating for water-carrying brass components. By combining a suitable choice of electrolyte with optimised process control, an effective corrosion-protection layer was achieved even in complex internal geometries. The result is reliable protection against dezincification and a longer service life for components in contact with DI water.

When corrosion starts on the inside, SURPRO provides protection down to the last contour.