



RESEARCH REPORT MINIMIZING CORROSION

We often hear questions like how long will TFT equipment last under corrosive conditions.

- **Is TFT equipment OK in saltwater service?**
- **Can I screw a brass nozzle onto a TFT monitor??**

A simple answer cannot be given since equipment lifespan is **highly** dependent on service conditions. In our user's manuals we say things like;

- **Do not connect aluminum to brass or brass to aluminum.** Dissimilar metals coupled together can cause galvanic corrosion that can seize the joint or cause complete loss of engagement. If dissimilar metals must be coupled together, the effects of corrosion can be greatly delayed by various coatings on the metal such as powder paint, hard anodizing, or silicone grease.

- **Use with salt water is permissible provided the equipment is thoroughly cleaned with fresh water after each use.** The service life of the equipment may be shortened due to the effects of corrosion and may not be covered under warranty.

Eventually every metal refined from ore is destined to revert to its original condition, which is that of being a metal oxide. Iron Oxide, Aluminum Oxide etc. In the long run Mother Nature *always* wins. The only question is; will the equipment meet the expected service life or not?

Service life depends on factors like; the alloys selected, the surface finishing techniques, the duration of exposure (intermittent versus 24/7 wetted), water quality, exposure to dissimilar metals, temperature (rates increase with higher temperatures). We have seen our aluminum alloys and finishes outperform stainless steel and brass products in some conditions, and vice versa in others.

TFT products are primarily of aluminum construction. Our aluminum is always hard anodized and sealed which gives excellent results. Hard anodizing is an aluminum oxide nano-structure that is grown out of the aluminum. In a way it's like fingernails because a hard surface was grown from, and is an

integral part of the softer body. It cannot ever peel or flake off. TFT's anodizing is per military standard MIL-8625, type 3, class 2 which requires 336 hours of 5% salt spray exposure to test ASTM B117. We've conducted multiple test series at 336 hours, which were extended to 1000 hours, and then 2000 hours. We typically found minimal corrosion that rarely if ever caused functional problems.

Wrought (bar stock) aluminum alloy parts receive hard anodizing & seal, whereas all TFT aluminum castings receive an additional layer of protection by fusing and curing a layer of polyester-urethane powder "paint" onto the hard anodizing. This finish is applied using a heat fusing process to fuse the material to the hardcoat surface. The finish is applied to both the exterior as well as the interior waterway surfaces. The finish is tested for adhesion, and has been shown to be permanently fused into the nano-structure of the hard anodizing.

All rubber seals and joints are further protected by high-quality silicone grease. Silicone grease is far better than petroleum grease because silicone absorbs nearly zero moisture, has negligible vapor pressure so it won't evaporate over many years, has superior wash-out resistance, and exhibits self-healing ability by wicking into the anodized nano-structure. These traits have proven extremely beneficial in retarding corrosion.

As a summary; With TFT you get a product that is lightweight, strong and capable of rough fire service use. But how long it lasts once it leaves our factory is completely up to the user. Service life depends on each of these factors;

- Permanently wetted 24/7 service (corrosion is time dependent)
- Water pH outside the range of 5.5-8.3 (aluminum is naturally passive within this range)
- Heavy concentrations of electrolytes (like 20,000 PPM Chlorine)
- Creating galvanic corrosion by joining dissimilar metals whose voltage potential is more than ¼ volt, especially if that metal

is BRASS which is especially harmful to aluminum.

- Galvanic interactions where the wetted area of the aluminum (anode) is far smaller than the other exposed metals (cathode). Corrosion rates increase when the cathode to anode ratio increases.

- High average temperatures (chemical reaction rates roughly double for every 10 degrees C)

You can expect great service life when only one of these detrimental factors is in play. But service life dwindles when products are expected to simultaneously endure two or more factors.

When used in worst-case scenarios, the expected service life can drop to less than a year. The factors interact with each other in ways that can rapidly accelerate corrosion. We find that close communication with the end users insures people avoid service conditions that can drastically limit service life.

When used in best-case scenarios, like intermittently wetted conditions of loose equipment on a fire engine, the user can expect a service life of TFT equipment to be indefinite and more dependent on care and use than actual calendar age.

Dedicated field support staff and knowledgeable dealers are the key to users obtaining the best service life. When end users know the ground rules, then they can expect, and get great service life. When they don't, then unexpected things happen and users of the equipment are disappointed with the results achieved. Avoiding this situation up-front is always best. Sometimes the user can change the service conditions. At times the best advice is to use a product that is better suited to the conditions present. The ultimate goal is to help the end user/customer achieve their desired results. When used in the right conditions our aluminum fire fighting equipment has been proven to give excellent service life and value when compared with competing equipment made from other metals.

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