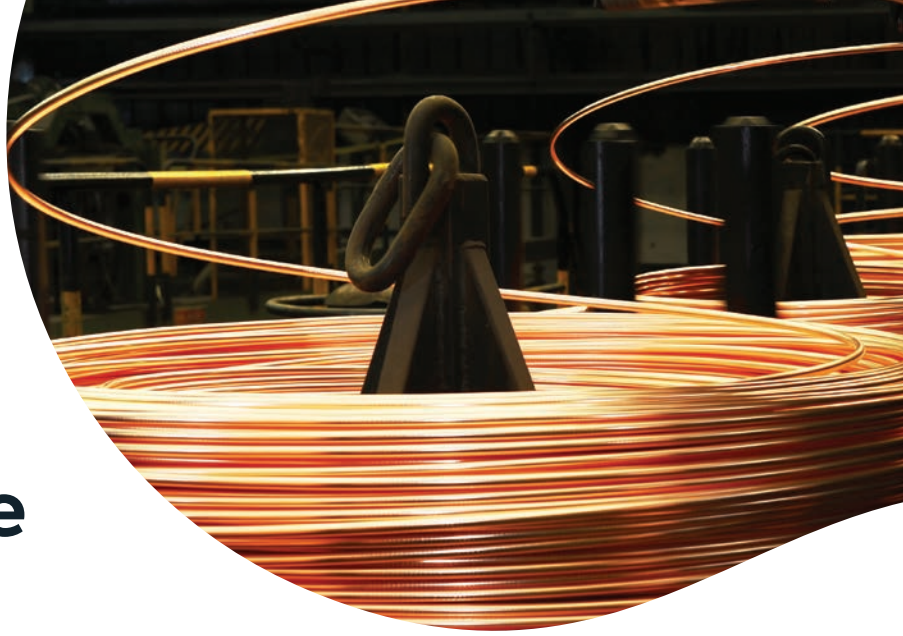
Advancion



Advancion multifunctional additives for wire drawing fluids

Enhanced wire drawing performance

Growing global demand for electric vehicles, and electricity generation, storage, and distribution are driving rapid market growth for copper and aluminum wires. Next-generation water miscible multi-metal wire drawing fluids provide enhanced performance and environmental benefits and are increasingly preferred for use with copper and aluminum wire drawing applications. Selecting the right amino alcohol package is a critical step in ensuring a balance of cost and multifunctional performance for these types of fluids.

Advancion evaluated the performance of different amino alcohol packages at 8-12% w/w, where triethanolamine (TEA), methyldiethanolamine (MDEA) and AEPD™ 85 were used both as a single amino alcohol as well as formulated together with additional CORRGUARD™ SELECT (3% w/w) and CORRGUARD™ EXT (2% w/w) multifunctional additives to reach a pH of 9.5. The benefits of incorporating CORRGUARD SELECT and CORRGUARD EXT in the total amino alcohol package together with AEPD 85 included:

- Improved multi-metal corrosion and staining protection
- Improved pH stability and extended fluid longevity
- Improved aluminum and copper lubrication performance

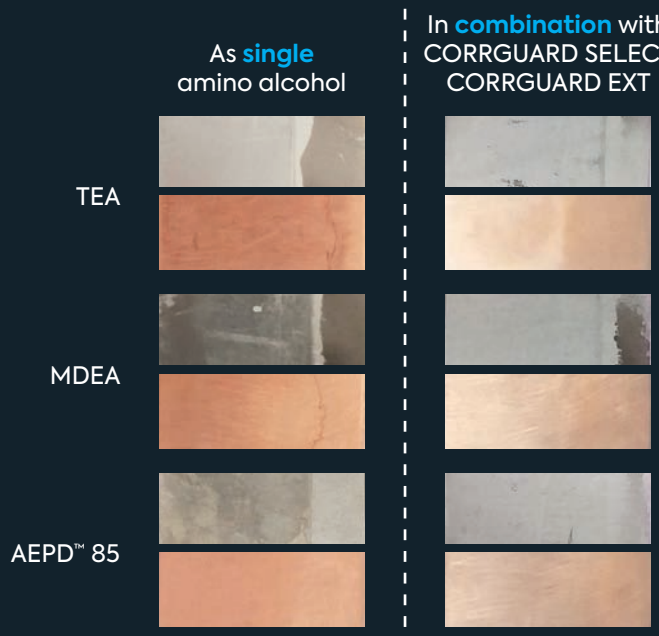
Improved multi-metal corrosion and staining

Fig. 1: Aluminum alloy 6061 coupons were partially immersed in 5% wire drawing fluid dilutions in a 200 ppm hardness water for 24 hours at 40°C. Copper coupons were partially immersed at 5% dilution in a 40 ppm hardness water for 72 hours at 20°C.

Semi-synthetic wire drawing fluids formulated with a single amino alcohol did not provide good aluminum staining protection.

The combination of CORRGUARD SELECT and CORRGUARD EXT improved the aluminum staining and copper corrosion performance.

While all products offer high compatibility with copper, only the combination of AEPD 85 with CORRGUARD SELECT and CORRGUARD EXT provided excellent compatibility with aluminum, both in the immersed phase and in the vapor phase.



Improved bio-resistance and pH stability

Fig. 2: pH stability over the microbial challenge test where 5% of semi-synthetic wire drawing fluid emulsions were prepared in 200 ppm hardness water.

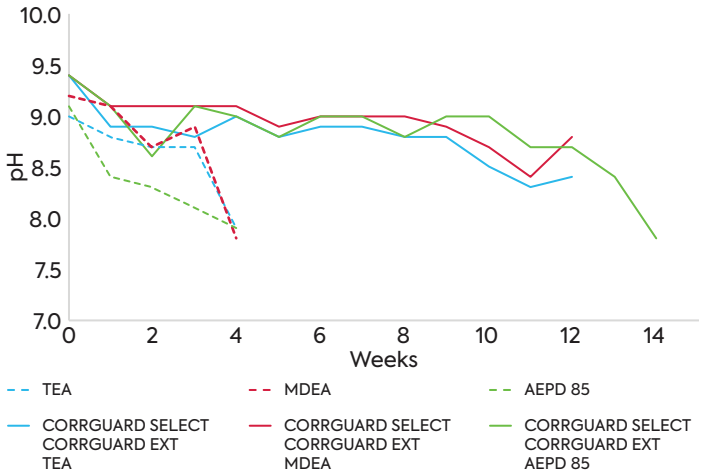
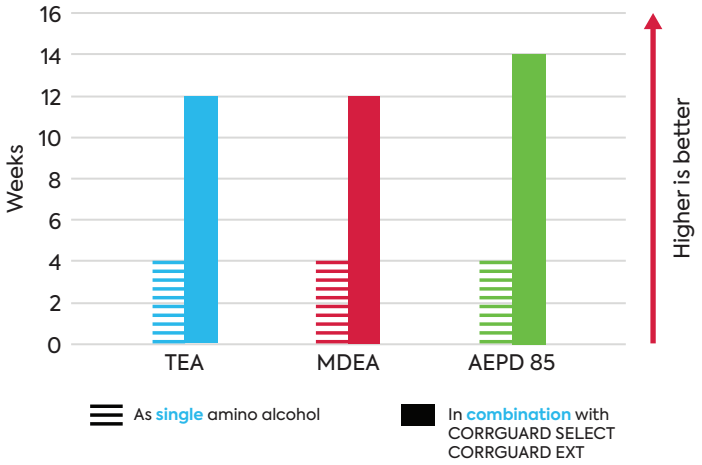


Fig. 3: 5% semi-synthetic wire drawing fluids containing 1% BIT as biocide in 200 ppm hardness water and mixed with copper powder at 20°C. Each fluid is treated weekly with a bacteria and fungi cocktail to measure its bio-resistance.



The combination of CORRGUARD SELECT and CORRGUARD EXT used together with other standalone amino alcohols enhanced pH buffering and stability of the wire drawing fluids and extended fluid longevity, helping to improve service time and overall operational efficiency.

Improved aluminum and copper lubrication

Fig. 4 Reichert lubrication test on aluminum

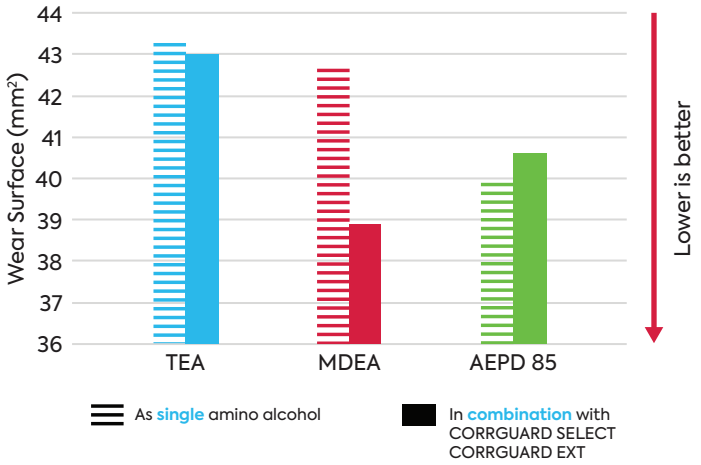
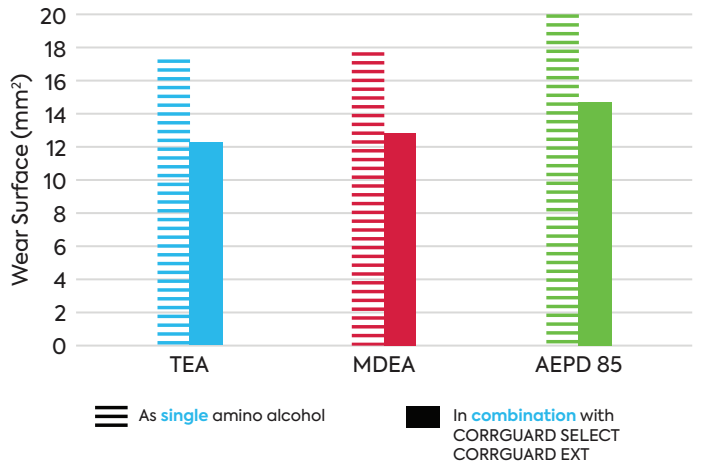


Fig. 5 Reichert lubrication test on copper



Lubricity testing was conducted on a Reichert machine at 23°C with 1.5 kg weight on aluminum cylinder and 1.0 kg on copper cylinder. 5% semi-synthetic wire drawing fluid emulsions were prepared in 200 ppm hardness synthetic water. At the same target pH, AEPD 85 offers the best lubrication efficiency on aluminum as a standalone amino alcohol. When formulated with 3% CORRGUARD SELECT and 2% CORRGUARD EXT significantly improves copper lubrication for all amino alcohols, but shows the most significant improvement on aluminum when used with MDEA.