Advancion

CORRGUARD™ EXT

Multifunctional Amino Alcohol

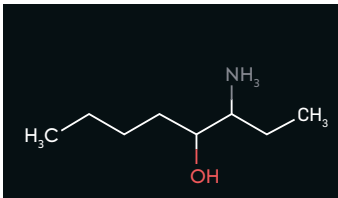
An Ideal Replacement for DCHA in Extended-Life Metalworking Fluid Formulations

CORRGUARD™ EXT (3-amino-4-octanol) is a multifunctional amino alcohol proven to enable formulation of longer-lasting metalworking fluids with improved pH stability, excellent corrosion control of ferrous metals, multi-metal compatibility and resistance to extraction by tramp oil. CORRGUARD EXT is a primary amino alcohol and is the formulary equivalent to dicyclohexylamine (DCHA), but with an improved environmental, health and safety profile.

CORRGUARD EXT offers several advantages in a full range of water-miscible metal removal and metal forming fluids.

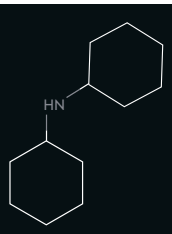
- Consistently improves fluid longevity when used in conjunction with a wide range of registered biocides, including the triazine and BIT
- Provides excellent corrosion / stain control with ferrous and non-ferrous metals
- Active material is shown to partition less into tramp oil than DCHA (Fig. 1)
- Can help lower overall surfactant demand in specific formulations

In addition, CORRGUARD EXT is a primary amino alcohol and contains less than 2.0% total secondary amines by specification. DCHA is a secondary amine.



CORRGUARD EXT

3-amino-4-octanol
pKa @ 25°C: 9.8
pH (0.5% aqueous): 11.1

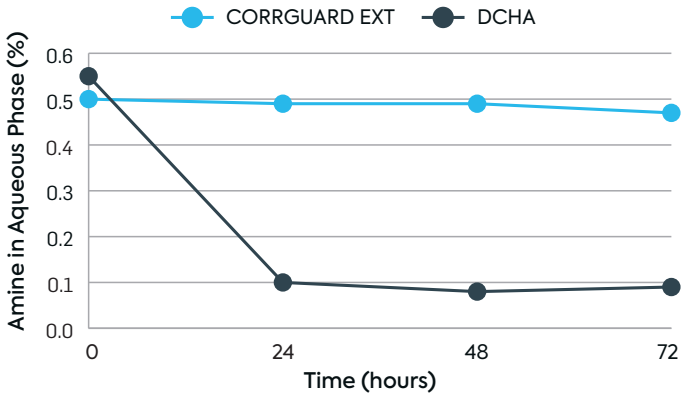


DCHA

Dicyclohexylamine
pKa @ 25°C: 10.4
pH (0.5% aqueous): 11.0

Resistance to Extraction by Tramp Oil (CORRGUARD EXT vs. DCHA)

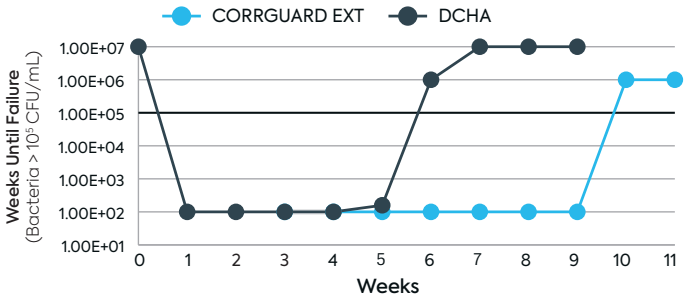
Fig. 1: Partitioning in Naphthenic Oil + Water



In laboratory evaluations, CORRGUARD EXT and DCHA were exposed to tramp oil in a simulated real-life environment. 0.5% of active solution was made in tap water and 0.5% Tergitol* 15-S-9 was added to the solution for better solubility in both samples (NOTE: the use of Tergitol is only required for the DCHA formulation). Next, 5% of Hydrocol* 100 napthenic base oil was added to the solution. The solution was agitated hourly for 8 hours and then left undisturbed for 16 hours. The water layer was then analyzed, and the procedure repeated for two consecutive days. The retention results for the 0.5% amine solutions are shown in Fig. 1 CORRGUARD EXT demonstrates an advantage over DCHA, with minimal amine loss.

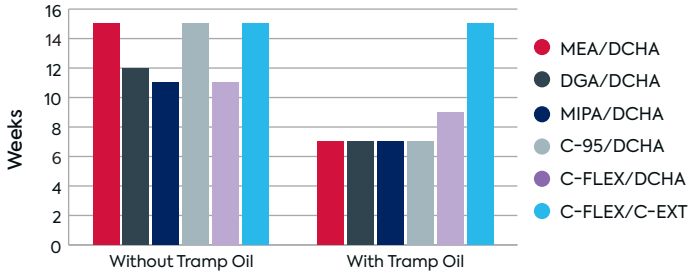
Resistance to Extraction by Tramp Oil (CORRGUARD EXT vs. DCHA)

Fig. 2: Tramp Oil Effect on Fluid Life: Bacterial Resistance with BIT



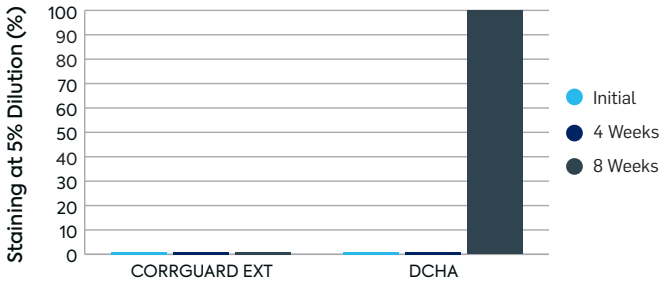
In a laboratory evaluation, a 5% of hydraulic oil was added to a diluted low-oil, semi-synthetic fluid containing 180ppm of BIT and 3000ppm of both CORRGUARD EXT and DCHA at the dilution. Testing was performed to determine degree of microbial growth both in the DCHA- and CORRGUARD EXT-containing formulations. The CORRGUARD EXT formulation shows excellent bacterial resistance performance compared to the DCHA formulation in the presence of tramp oil.

Fig. 3: Tramp Oil Effect on Fluid Life with Triazine



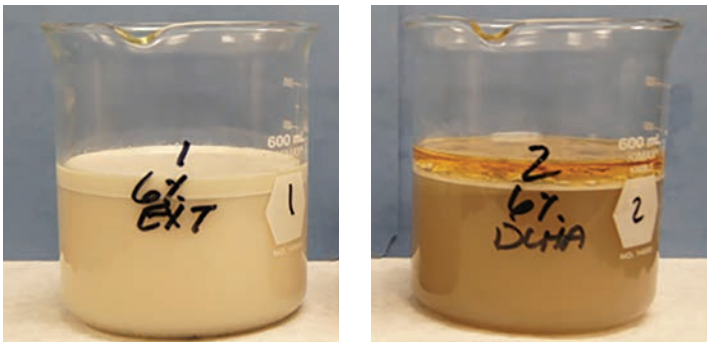
In a similar experiment to that shown in Fig. 2, results were collected across a variety of amine combinations. The fluid utilizing CORRGUARD EXT showed no loss in performance in the presence of tramp oil, while all the fluids containing DCHA were negatively impacted.

Fig. 4: Tramp Oil Effect on Microbially Aged Fluids: Cast Iron Corrosion Control



A corrosion test was also performed during the microbial challenge experiment. The results of the corrosion test for each formulation were virtually identical until the fourth week. At 8 weeks, we see the DCHA formula completely fail while the cast iron chips in the CORRGUARD EXT formula have not shown any corrosion.

Fig 5: Appearance After 7 Weeks Microbially Aged Fluid with Tramp Oil



The emulsion containing DCHA turned a brownish color whereas the CORRGUARD EXT-containing emulsion is still milky white after microbial challenge testing involving tramp oil.