BROCHURE

Borates in industrial fluids

Borates are well established and widely used in the manufacture of industrial fluids such as antifreezes, lubricants, brake fluids, metalworking fluids, water treatment chemicals, and fuel additives. Borates' function in these fluids are:

- Corrosion inhibition
- Buffering action
- Freezing point reduction
- Boiling point elevation
- Lubrication
- Stabilization of thermal oxidation
- Prevention of sludge formation
- Reduction in moisture sensitivity

Applications

Antifreezes (engine coolant)

Glycol-based antifreezes can oxidize to produce corrosive organic acids in automotive coolant systems. The buffering action of borates keeps the pH above 7—preventing acid formation and inhibiting corrosion.

Lubricants

Borate polyols and polyamines in lubricants form an extremely resilient film on metal load-bearing surfaces. This film improves load capacity and protects from wear and tear. Potassium borates are used in high pressure lubricants due to their stable dispersion of microspheres.

Brake fluids

Brake fluids are moisture sensitive. Absorbtion of water by the system reduces the boiling point of the fluid and can cause vapor-lock. Borate esters in brake fluids act to prevent vapor-lock.

Metalworking fluids

Borates act as bacteriostatic agents in metal cutting emulsions. They are also corrosion inhibitors. Boric acid esters have led to high quality water-miscible cutting fluids with longer emulsion charge life.

Water treatment chemicals

In heat exchange devices, any corrosion of metals or alloys can result in diminished heat transfer and, consequently, shorter service life. This is particularly true of central heating systems, cooling towers and circulating water systems. In the presence of oxygen, borates can promote the formation of a passivating layer (ferric oxide film) which prevents further oxidation.

Fuel additives

Borate esters have been used as gasoline additives to prevent preignition, and help to keep carburetors clean. There has also been renewed interest in adding borate esters to gasoline for improving fuel efficiency.

About U.S. Borax

U.S. Borax, part of Rio Tinto, is a global leader in the supply and science of borates—naturally-occurring minerals containing boron and other elements. We are 1,000 people serving 650 customers with more than 1,800 delivery locations globally. We supply around 30% of the world's need for refined borates from our world-class mine in Boron, California, about 100 miles northeast of Los Angeles.

About 20 Mule Team products

U.S. Borax produces the *20 Mule Team*® borates family of products from naturally occurring minerals and have an excellent reputation for purity and safety when used as directed. Borates are key ingredients in a number of industrial applications including fiberglass, glass, ceramics, batteries and capacitors, wood preservatives, and flame retardants.

High quality, high reliability, high performance borate products. It's what we're known for.

borax.com