

# 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. Absorption 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.

## 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 500 customers with more than 1,700 delivery locations globally. We supply 30% of the world's need for refined borates from our world-class mine in Boron, California, about 100 miles northeast of Los Angeles. We pioneer the elements of modern living, including:

- **Minerals that make a difference:** Consistent product quality secured by ISO 9001:2015 registration of its integrated quality management systems
- **People who make a difference:** Experts in borate chemistry, technical support, and customer service
- **Solutions that make a difference:** Strategic inventory placement and long-term contracts with shippers to ensure supply reliability

### 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 pre-ignition, and help to keep carburetors clean. There has also been renewed interest in adding borate esters to gasoline for improving fuel efficiency.

## About 20 Mule Team® products

20 Mule Team borates are produced from naturally occurring minerals and have an excellent reputation for safety when used as directed. Borates are essential nutrients for plants and key ingredients in fiberglass, glass, ceramics, detergents, fertilizers, wood preservatives, flame retardants, and personal care products.

### 20 Mule Team Borax products in industrial fluids:

Borax decahydrate  
Neobor® borax pentahydrate  
Optibor® boric acids  
Boric oxide  
Potassium pentaborate  
Potassium tetraborate  
Sodium metaborate 4 mol  
Sodium metaborate 8 mol