



# NORTH METAL & CHEMICAL COMPANY

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## Technical Services Bulletin

## DEHA vs. Sodium Sulfite

### Oxygen Scavengers in Boiler Systems:

For industrial and commercial boilers, it is critical to minimize corrosion and deposits in boiler systems in order to maximize their energy efficiency and life expectancy. Typically, dissolved gases in water such as oxygen and carbon dioxide lead to corrosion—oxygen causes “pitting” and “rusting”, while carbon dioxide causes acid corrosion. These radical scavengers include a) inorganic compounds such as sodium sulfite and hydrazine, and b) organic chemicals such as carbonylhydrazide, Diethylhydroxylamine (DEHA), methyl ethyl ketoxime (MEKO) and hydroquinone.

#### Sodium Sulfite

Sodium sulfite has been widely used as an oxygen scavenger in low pressure boiler systems due to its low cost. It is non-toxic and relatively easy to apply. It can be used in either solid or liquid (sodium bisulfite dissolved in water) form. In low pressure systems it is generally recommended that sodium sulfite be maintained in an operating boiler at an excess of 20-40 mg/L. However, use of sodium sulfite adds considerable solids (sulfate salts) to the boiler water, which limits its use in systems utilizing high purity boiler feedwater. Sodium sulfite is limited to about 900 psi, beyond which it could decompose to sulfur dioxide and hydrogen sulfide. It does not promote passivation in feedwater or boiler water systems and its ability to minimize corrosion comes solely from its capability to remove oxygen from water. Sodium sulfite is also not volatile enough to protect the condensate loop and cannot be used to protect the steam condensate system.

#### DEHA:

DEHA was introduced as an alternative oxygen scavenger to hydrazine, offering the advantages of very low toxicity, metal passivating capabilities and the volatility of a neutralizing amine to provide complete system protection. The fact that DEHA is volatile represents an enormous advantage in condensate system treatment because most of it is transported and absorbed in the condensate system.

#### Distribution Ratio Comparison

- DEHA 1.3
- Hydrazine 0.1
- Sodium sulfite 0.0

#### Why Use DEHA?

- DEHA is recommended for use in medium and high-pressure steam boilers.
- DEHA protects condensate loops as well as boilers
- DEHA leaves no residue in boiler systems
- DEHA provides good efficiency (use 3:1 ratio DEHA:Oxygen)
- Increased blowdown rates/costs with sulfite to remove accumulated solids

### The Economics of DEHA vs Sulfite

The average cost of DEHA is ~ \$2.80/lb. and sodium sulfite is ~ \$0.48/lb. Typical boiler systems require about 6 times the amount of sulfite compared to DEHA

- **DEHA:** 0.36 ppm in feedwater x \$2.80 DEHA = \$1.00 per 1,000,000 gallons
- **SODIUM SULFITE:** 1.8 ppm in feedwater x \$0.48 = \$0.86 per 1,000,000 gallons

**Cost Differential:** \$0.14/lb. per 1,000,000 gals

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