

Connecting**Chemistry**



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WATER TREATMENT NORTH AMERICA

Phosphonates

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Phosphonates

Scale is a waterborne contaminant. Scale is the precipitation of soluble particles from water and the subsequent adherence of these particles to a surface – calcium carbonate, calcium sulfate, and barium sulfate are examples of scale.

Scale prevention is critical since scale deposits insulate and reduce heat transfer, increasing energy consumption and costs. Scale can also restrict water flow, again increasing energy costs.

Organophosphonates, or simply phosphonates, are key treatment components within the water treatment industry. Many other industries rely on phosphonates in products or processes that involve mineral control to optimize performance.

Phosphonate mechanisms for scale and corrosion control:

- **Threshold Inhibition:** The distortion of a crystal structure preventing the formation of a scale; occurs at the first point of scale formation
- **Crystal Modification:** The disruption, alteration, or weakening of the formation of a crystal structure
- **Sequestration:** The ability to form a soluble complex preventing precipitation of scale from water

Industries and applications using phosphonates for scale control:

- Cooling water
- Boiler water
- Detergents and cleaners
- Oil field
- Pulp and paper
- Reverse osmosis
- Swimming pools

Phosphonates Ranking

■ ■ ■ ■ = Excellent ■ = Poor

ABBREVIATION	CHEMISTRY	CaCO ₃	CaSO ₄	BaSO ₄ /SrSO ₄	CORROSION CONTROL	THERMAL STABILITY	HIGH CA TOLERANCE	IRON TOLERANCE	CHLORINE STABILITY
ATMP	Aminotri (methylenephosphonic acid)	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
Na ₅ ATMP	Penta sodium salt of Aminotri (methylenephosphonic acid)	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
BHMT	Bis (HexaMethylene Triamine Penta (Methylene Phosphonic Acid))	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
DETPMP	Diethylenetriamine penta (methylenephosphonic acid)	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
Na ₅ DETPMP	Partially neutralized Diethylenetriamine penta (methylenephosphonic acid)	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
HEDP	1-Hydroxyethylidene-1, 1-diphosphonic acid	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
Na ₄ HEDP (liquid and powder)	Tetrasodium sale of 1-Hydroxyethylidene-1, 1-diphosphonic acid	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
HEMPA	N-(2-hydroxyethyl)-N, N-di (methylenephosphonic acid)	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
K ₆ HMDTMP	Hexapotassium salt of hexa-methylenediaminetetra (methylenephosphonic acid)	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	N/A	■ ■ ■ ■	■ ■ ■ ■
PAPEMP	Polyamino Polyether Methylene Phosphonic Acid	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
PBTC	2-Phosphonobutane-1,2,4-tricarboxylic acid	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■

