

## ULTRA-S3: COMPETITIVE TECHNOLOGIES

	Hydrogen Peroxide (H <sub>2</sub> O <sub>2</sub> )	Sodium Chlorite	Sodium Hypochlorite	Sodium and Calcium Nitrate	Ferric or Ferrous Chloride	Potassium Permanganate
<b>Cost</b>	Costs are generally higher than quoted, because H <sub>2</sub> O <sub>2</sub> will also oxidize more than just H <sub>2</sub> S	Moderate to high cost	Moderate to high costs	Moderate to high costs (especially in preventative mode)	Can be volatile depending on the source	High cost
<b>Dose</b>		High doses are needed to suppress downstream odor generation	High doses are needed to keep odor from reforming downstream		High doses may cause solids carry-over from clarifiers	
<b>Reaction/Residence Time/Shelf Life</b>	Limited Reaction Time		Relatively short shelf life	Requires long residence time (~2-3 hours)		
<b>Byproducts</b>		Can react with other chemicals to form chlorine dioxide gas	Forms VOC by-products	Resultant nitrogen gas (or residual nitrate) may present problems downstream at the wastewater plant	Produces a large amount of solids – needs to be filtered out	Produces a large amount of solids – needs to be filtered out
<b>Limitations</b>	Expensive to ship due to hazard status	May inhibit further downstream biotreatment if overdosed	Chlorine odors are emitted if overdosed	Increases nitrogen levels in the wastewater	Can form films on pipe walls	
		May inhibit further downstream biotreatment if overdosed	May inhibit further downstream biotreatment if overdosed	Costs increase in streams with high BOD levels	Sulfide can be back re-enter the waste stream if pH drops	Labor intensive feed systems
			Consumed by ammonia if present in wastewater		Very messy to handle	Provides only short-term H <sub>2</sub> S control