



Economic and Performance Comparisons for Aries 100 and Alternative Alkalis

Comparison basis	Hydrated lime <i>calcium hydroxide</i>	Soda ash <i>sodium carbonate</i>	Caustic soda <i>sodium hydroxide</i>	Aries 100 <i>magnesium hydroxide</i>
Product form	powder- Ca(OH) ₂ available as slurry to 35% solids	powder -Na ₂ CO ₃ available as 15% solution	50% solution - NaOH	59% solids slurry - Mg(OH) ₂
Raw material cost (ton per ton basis)	least expensive	about half the cost of magnesium hydroxide	fluctuates widely with supply; often more expensive than Mg(OH) ₂	generally competitive with caustic soda; pricing consistent
Alkali requirement: √ per ton H ₂ SO ₄ √ per ton HCl √ per ton HNO ₃	1511 dry lb. 2032 dry lb. 1175 dry lb.	2160 dry lb. 2900 dry lb. 1683 dry lb.	1630 dry lb. 2190 dry lb. 1270 dry lb.	1190 dry lb. 1600 dry lb. 921 dry lb.
Consumption vs. Mg(OH)₂	27% more	82% more	37% more	
Capital investment	high due to solids handling and slaking; also regular maintenance of system due to calcium deposits	least expensive; costs associated with solubilizing the powder, controlling foaming, and metals carryover	cost associated with safety considerations; no agitated tank required; freeze protection needed for 50% caustic	agitated storage tank required
Residence time	moderately fast acting to complete neutralization	moderately fast acting to complete neutralization	extremely fast acting to complete neutralization	moderately fast acting to 95% of neutralization; more controllable process
Salt in effluent: √ per ton H ₂ SO ₄ √ per ton HCl √ per ton HNO ₃	3510 lb. (insoluble) 3040 lb. 2603 lb.	2900 lb. 3210 lb. 2698 lb.	2900 lb. 3210 lb. 2698 lb.	2460 lb. 2610 lb. 2349 lb.
Maximum pH in overtreatment	12	>11	14	9
Sludge produced	heavy sludge containing calcium sulfate (gypsum) if neutralizing sulfuric acid	high volume, gel-like with heavy metals	high volume, gel-like with heavy metals	dense, low volume with heavy metals; easier to dewater
Safety	moderately hazardous material	moderately hazardous material	hazardous material requiring rigorous safety procedures	nonhazardous material
Environmental	can overshoot desired pH	sodium ion discharge	<ul style="list-style-type: none"> • sodium ion discharge • can easily overshoot desired pH 	buffers at pH 9

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