



Newsletter, Volume 8

pH Treatment Chemicals

Have you ever wished you could readily compare the strengths of different pH treatment chemicals? I've been asked, for instance, "My pH is being treated OK with sodium hydroxide, but I'd like to add a bit more alkalinity to my water – how much soda ash solution would I need to add to do the same job?" Or, "How much concentrated sulfuric acid would it take to replace the muriatic acid I'm using now?" If you don't ask or hear questions like these, perhaps you're just curious about the relative strengths of different acids and bases.

Direct comparisons can be made using a relationship chemists call Normality. This factor uses molecular weight and valence to equate six of this to a half dozen of that. A One Normal Solution of sulfuric acid will exactly neutralize a One Normal Solution of sodium hydroxide, or for that matter a One Normal Solution of soda ash. Acid and base strengths are usually expressed in percentage of concentration. You can convert this concentration to Normality if it is called for. See [Relative pH solution Strength & Normality Conversions](#) for the formulas.

In the table below, I've compared some common water treatment pH chemicals. I've listed the common name, chemical name and formula, comparison concentration, Normality and relative strength. If any of this isn't clear, please give us a call.

pH Treatment Factoids

These numbers will undoubtedly vary because it's *your* water, or because of buffering, solids, temperature or other factors. But it should give you a starting point.

1 gallon of 5 % soda ash solution, when added to 1000 gallons of water, will raise the water's pH by **1 unit**.

1 gallon of 25 % sodium hydroxide solution, applied to 7,500 gallons of wastewater, will raise the water's pH by **3 units**.

1 gallon of 98 % sulfuric acid, put into 25,000 gallons of wastewater, will lower the water's pH by **3 units**.

pH Treatment Chemical Comparisons

Common Name	Chemical Name Formulas	Percent Concentration	Normality	Tim's Relative Strength
Soda Ash	Sodium Carbonate Na ₂ CO ₃	2.5*	0.25	1*
		5	0.5	2
		10	1	4
Caustic Soda	Sodium Hydroxide NaOH	5	2	8
		10	4	16
		50	20	80

*By weight, a 2.5 % soda ash solution contains ¼ pound of soda ash in one gallon of water. Since this has the lowest Normality and is the weakest solution in the chart, I have assigned it a “Tim’s Relative Strength” of one, so the strengths of the other chemicals can be compared to it and to themselves.

White Vinegar	Acetic Acid C ₂ H ₄ O ₂	5	1	4
Citric Acid	Citric Acid C ₆ H ₈ O ₇	20	1	4
Muriatic Acid	Hydrochloric Acid HCl	18	5	20
Phosphoric Acid	Phosphoric Acid H ₃ PO ₄	75	13	52
Sulfuric Acid	Sulfuric Acid H ₂ SO ₄	98	36	144