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Neutralizing nitric acid with sodium bicarbonate

I want to neutralize 100 gallons of 5% nitric acid and water solution with sodium bicarbonate, how much sodium bicarbonate would I need?

John Keaser
- Englewood, Florida

First of two simultaneous responses --

Pull out a chemistry book to check my recollection, but let's see. The reaction is probably:

$HNO_3 + NaHCO_3 \rightarrow NaNO_3 + H_2O + CO_2$

If this is correct then it takes one part of sodium bicarbonate to neutralize one part of nitric acid.

5 percent nitric is probably not a whole lot heavier than water, so 100 gallons equals 834 pounds of solution equals 42 pounds of nitric acid.

So the amount of bicarbonate you need is 42 pounds times the molecular weight of bicarbonate divided by the molecular weight of nitric acid. I figure about 56 pounds.

I assume that this is about the amount you calculated by scaling up from the beaker sized titration you did under a lab hood before you even began dreaming about working with 100 gallons of the stuff.

Ted Mooney, P.E.
finishing.com
Brick, New Jersey

Second of two simultaneous responses --

John,

The easiest way to answer your question would be to do a small scale experiment (1 gal, or so), then do the math.

Just a follow up point. I'm not sure what (if any) experience you've had at neutralizing. And, while 5% isn't

extremely strong, be careful...slowly add the Sodium Bicarbonate to your nitric to see what, if any, reaction you are going to get.

Marc Green
anodizer - Boise, Idaho

Hi Marc,

Your colleague Randal Fowler would have a heart attack (or his dawg would) if he heard YOU saying 'add the bicarb to the acid'. Tut, tut! Mind you ,laws and regs etc are made to protect the illiterati ... isn't there a saying LAWS ARE TO BE BLINDLY OBEYED BY FOOLS BUT ACT AS A GUIDE TO WISE MEN?

However, because the nitric was so weak, I, too, would have thought of carefully adding the bicarb to neutralize it.

Freeman Newton
- White Rock, British Columbia, Canada

We might be forced to passivate in place 80' of 4" SS tube in a dog food plant, may God forbid. We ain't qualified. But if it comes to pass I will have around 60 gallons of 25% nitric acid, 5% hydrofluoric acid to get rid of. Would the 1:1 sodium bicarbonate neutralization technique apply equally to this higher concentration as to the 5% solution originally queried above? What about the hydrofluoric - does it amount to a wild card?

I really hope we can get out of this..... we're just simple pipe welders, not chemists.

Mike Fitzpatrick
- St. Joseph, MO, USA

If you don't feel qualified don't do it. Nitric-hydrofluoric acid treatments carry risks and demand knowledge, skills, and protective equipment. Specialists like our supporting advertiser Astro-Pak can be contacted for projects like this.

Calculations are only a guide to give you a ballpark estimate of how much chemical to buy. Titrating a small volume and scaling up is the way to do it. But 25% nitric and 5% HF would mean you will need about six times as much neutralizer as for a 5 percent solution (I didn't do a real calculation, I just multiplied by 6).

Ted Mooney
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Brick, New Jersey

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