

$$pH = -\log[H^+]$$



MORE ABOUT **pH**
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Overview

- WHAT AFFECTS pH?
- HOW TO ADJUST pH
- CHEMICAL SAFETY

Section 1

WHAT AFFECTS pH?

What affects pH?

- Want to maintain pH in an ideal range (7.4 to 7.6)
 - But pH changes over time
 - What's driving that?

What affects pH?

- Source water characteristics
 - Plaster pools
- Aeration (CO₂ escaping)
 - Bathers
 - Dust
 - Rain

What affects pH?

Biggest contributor is **Your disinfectant!**

- **Trichlor** drives pH **DOWN** ↓
- **Sodium hypochlorite** drives pH **UP** ↑
- **Calcium hypochlorite** drives pH **UP** ↑
- **Salt chlorine generator** drives pH **up slightly** ↑

Section 2

HOW TO ADJUST pH?
DOSING pH ADJUSTING CHEMICALS

Adjustment of pH

Main objective:

- Maintain pH in the required range 7.2 to 8.0 (7.4 to 7.6 ideally)
- Raise pH if it's low
- Lower pH if it's high

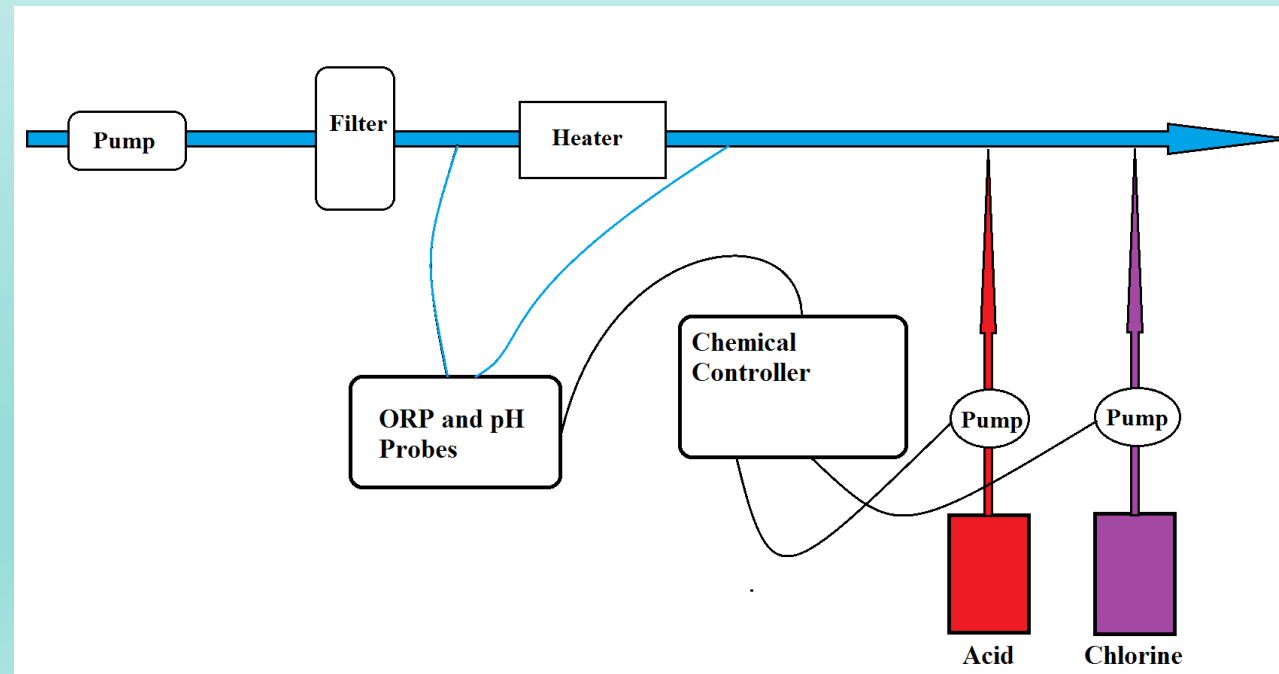
pH adjustment basics

- Know the volume of your pool
- Know the types of chemicals used
- Know the current pH and target pH
- Automatic or manual?

Automatic chemical controller/feeders

Automatic chemical controllers are used most often for:

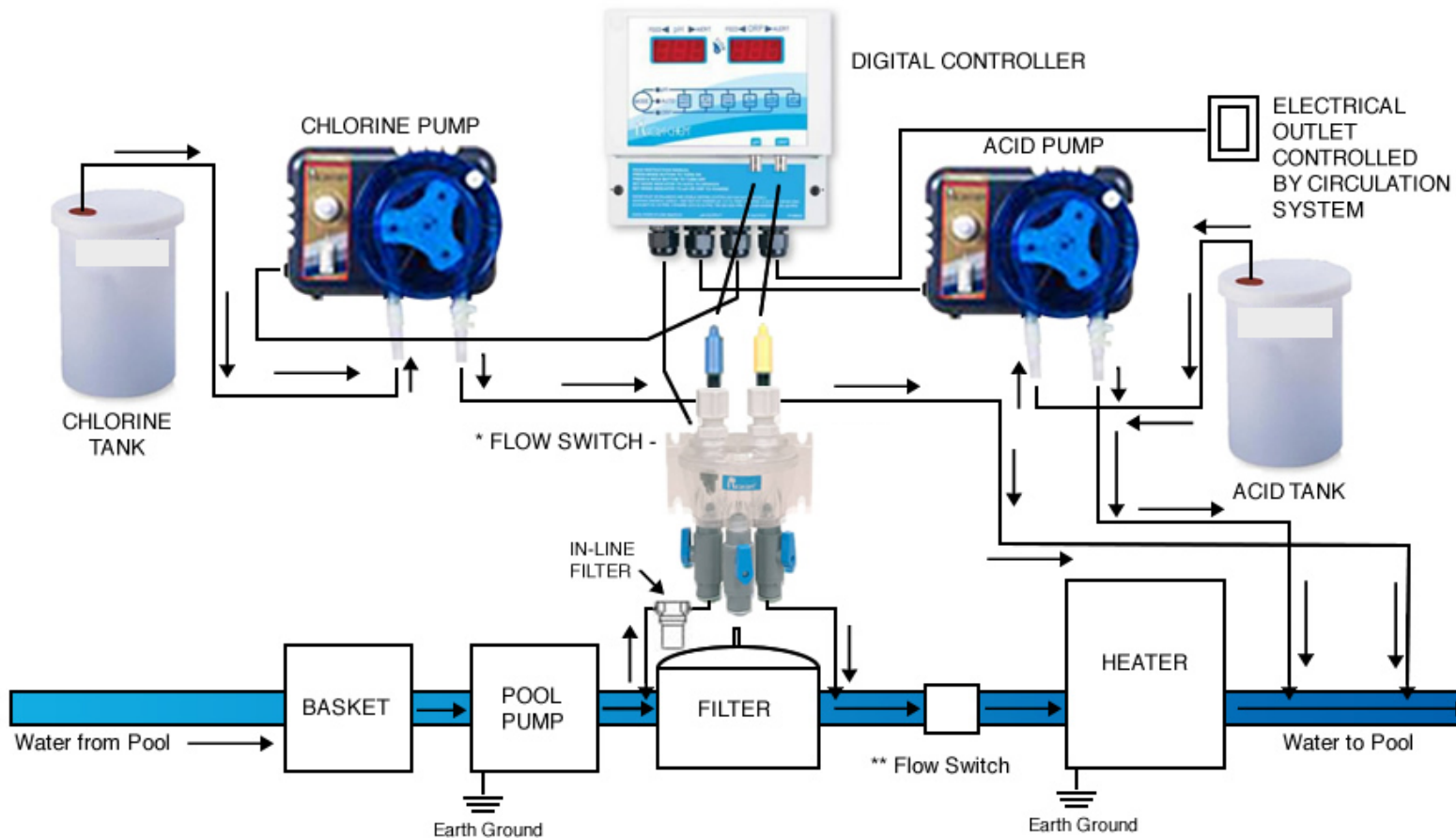
- Sodium hypochlorite + Muriatic acid (or CO₂ at a large facility)
- Calcium hypochlorite + Muriatic acid (or CO₂ at a large facility)



Automatic chemical controller/feeders

What the machine needs to know:

- Pool Volume
- Type of chemical
- Correct feed rate
- pH set point



Automatic chemical controller/feeders



pH probe needs to be in good repair. Your device may or may not:

- Auto-calibrate pH probe
- Test the probe for defect (disconnected/broken)
- Allow pH sensor to be tweaked

Regardless of above, make sure to:

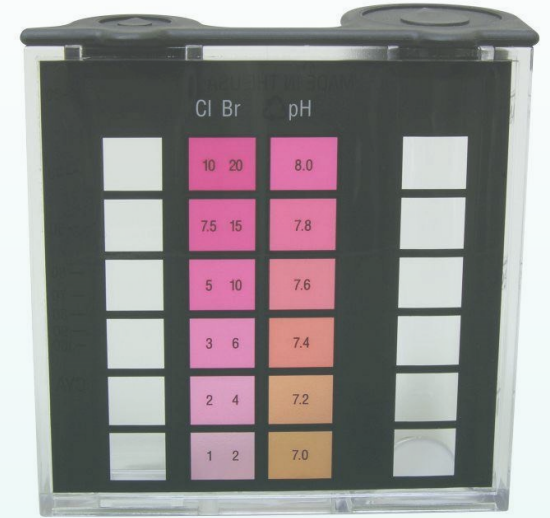
- Test water with reliable manual test kits
- Clean probe to remove oil and chemical deposits
- Replace chemical pump, feed tube, and probe as needed

Manual adjustment of pH

Manual pH Adjustment Process:

- Test the water first with a reliable manual test kit
- Adjust alkalinity first before adjusting pH (adjusting alkalinity may automatically correct pH)
- Perform acid/base demand test (This is just one way) to dose chemicals correctly

Performing Acid/Base Demand Test



Perform **Acid** Demand Test if pH is high (e.g., Taylor Test Kit)

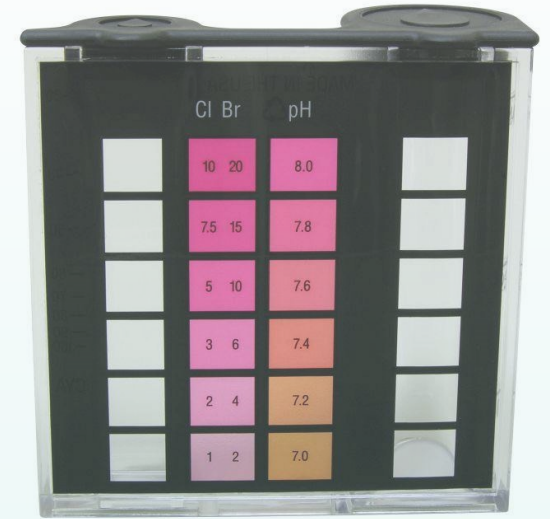
- Add Acid Demand Test Reagent (R-0005) into the sample with phenol red in it already, and count the drops until the sample reaches the desired color (pH)
- Use the table below for correct dosing of Muriatic Acid (31.45% HCl strength liquid)

Volume of Water in Gallons							
	400 gal	1,000 gal	5,000 gal	10,000 gal	20,000 gal	50,000 gal	100,000 gal
1 drop	0.37 fl oz	0.92 fl oz	4.58 fl oz	9.16 fl oz	1.15 pt	1.43 qt	2.86 qt
2 drops	0.73 fl oz	1.83 fl oz	9.16 fl oz	1.15 pt	1.15 qt	2.86 qt	1.43 gal
3 drops	1.10 fl oz	2.75 fl oz	13.7 fl oz	1.72 pt	1.72 qt	1.07 gal	2.15 gal
4 drops	1.47 fl oz	3.67 fl oz	1.15 pt	1.15 qt	2.29 qt	1.43 gal	2.86 gal
5 drops	1.83 fl oz	4.58 fl oz	1.43 pt	1.43 qt	2.86 qt	1.79 gal	3.58 gal

Performing Acid/Base Demand Test

Perform **Base** Demand Test if pH is low (e.g., Taylor Test Kit)

- Add Base Demand Test Reagent (R-0006) into the sample with phenol red in it already, and count the drops until the sample reaches the desired color (pH)
- Use the below table for correct dosing of Sodium Carbonate (100% Na₂CO₃ powder)



Volume of Water in Gallons							
	400 gal	1,000 gal	5,000 gal	10,000 gal	20,000 gal	50,000 gal	100,000 gal
1 drop	0.21 oz	0.51 oz	2.56 oz	5.13 oz	10.3 oz	1.60 lb	3.20 lb
2 drops	0.41 oz	1.03 oz	5.13 oz	10.3 oz	1.28 lb	3.20 lb	6.41 lb
3 drops	0.62 oz	1.54 oz	7.69 oz	15.4 oz	1.92 lb	4.81 lb	9.61 lb
4 drops	0.82 oz	2.05 oz	10.3 oz	1.28 lb	2.50 lb	6.41 lb	12.8 lb
5 drops	1.03 oz	2.56 oz	12.8 oz	1.60 lb	3.20 lb	8.01 lb	16.0 lb

Section 3

CHEMICAL SAFETY SURROUNDING pH?

pH Chemicals are **Harsh** Chemicals

- Read the label instructions!
- Proper Training
- Safety Data Sheets
- Handle with care (Goggles, Gloves, Scoop, Mask, Ventilation, Lighting?)
- L&I (OSHA) Requirements
- Fire Departments
- Proper Storage

Cautions when adding pH adjusting chemicals to pool

Ensure that:

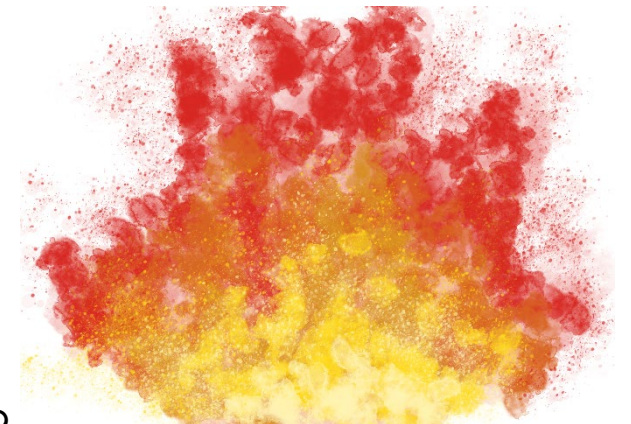
- There are no bathers in the water or on the deck (preferably no one in the facility)
- Ventilation functioning in indoor pools
- Operator has proper PPE
- Label may require that:
 - Chemical be diluted first before adding to the pool
 - **Always add chemical to a bucket of water (Not water to chemical)!**
 - **Use a tool to stir (Not your hand)!**
 - Chemical be broadcast directly from the package
 - **Watch out for wind!**
 - **Keep the package close to the water and away from your face!**

Mixing incompatible chemicals

- Acid and chlorine product (any chlorine-based disinfectant) will produce chlorine gas! More on this later.



- Acid is an oxidizer. Strong acid mixed with other chemical will produce heat!



Questions for the 1st Segment?



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