



Pool Chemicals

EMERGENCY RESPONSE AND FIRES





Scope

- More than 10 million swimming pools in the US (public and private).
- Pool chemicals injuries result in over 5,000 emergency room visits each year in the US.
- Almost half involved children or teens, and more than a third occurred at home.



Your Local Pool Store



Joke of the Day

Almost all of the pool chemicals have a warning that says keep away from water

- Run off from fires will kill ALL aquatic life



Wait....WHAT???

Types of Pool Chemicals

- Oxidizers
- Sanitizers
- Algaecides
- pH Balance
- Flocculants - to
- Stain Control
- Filter Cleaners



So many
chemicals...

Oxidizers

break down non-living organic
contaminants and waste
products



Leslie Spencer

Pool Chemical Oxidizers

Hypochlorites

- White solid material with an odor of bleach.
- Mixes with water.
- Salts commonly the sodium, calcium, or potassium.
- Toxic by ingestion and inhalation.
- Powerful irritants to the skin, eyes and mucous membranes.
- May cause ignition when in contact with organic materials.
- When involved in a fire they may accelerate combustion or cause an explosion.
- Gives off hydrogen chloride and chlorine

Chlorine

Complete combustion of methane
in air generates carbon dioxide and
water.

However, burned in a chlorine
environment, methane combustion
products are carbon tetrachloride
vapor and hydrogen chloride gas

TABLE OF ELEMENTS

Fluorine 18.998

17 Cl Chlorine 35.453



Pool Chemical Oxidizers

42.8% Potassium Peroxymonosulfate

- Causes severe skin burns and eye damage
- May cause respiratory irritation
- May cause an allergic skin reaction
- May cause allergy or asthma symptoms or breathing difficulties if inhaled
- Harmful if swallowed or if inhaled
- Gives off chlorine and hydrogen chloride



Pool Chemical Oxidizers

Sodium dichloro-s-triazinetriene dihydrate

- Solid is a white crystalline solid with an odor of chlorine.
- Noncombustible but if contaminated with a combustible material ignition can result.
- Accelerates the burning of combustible materials.
- Contact with ammonium compounds or hydrated salts can cause a very vigorous chemical reaction.
- It may vigorously react with small quantities of water releasing chlorine gas.
- Prolonged exposure to fire or heat of the material may result in the vigorous decomposition of the material and the rupturing of its containers.
- Material containing less than 39 percent available chlorine will undergo reactions as described above though it may be longer to initiate and the resulting reaction may not be as vigorous.
- Gives off chlorine, nitrogen oxides



Pool Chemical Oxidizers

Trichloro-s-triazinetriene

- A white slightly hygroscopic crystalline powder or lump solid with a mild chlorine-like odor.
- Said to have 85 percent available chlorine.
- Decomposes at 225°C.
- Moderately toxic by ingestion.
- May irritate skin and eyes.
- Risk of explosion on heating.
- Risk of explosion on contact with combustible substances or incompatible substances.
- Gives off explosive nitrogen trichloride
- Gives off chlorine and nitrogen oxides



Sanitizers

kill or inactivate disease-causing organisms and harmful pathogens

Vancouver Fire



Pool Chemical Sanitizer

Bromo-2-Nitropropane, Copper Sulphate

- Combustible
- Causes skin, eye, respiratory irritation
- Keep away from heat – may explode
- Gives off hydrogen bromide



Pool Chemical Sanitizer

Bromo-chloro-dimethyl hydantoin

- Pellets or powder
- Combustible
- Toxic
- Oxidizing material - Keep away from flammable and combustible materials
- Keep away from heat, hot surfaces, sparks, flames
- Gives off Hydrogen bromide, Hydrogen chloride, and Oxides of Nitrogen



Algaecides

60% Poly [oxyethylene (dimethylimino) ethylene-(dimethylimino) ethylene dichloride]

- Clear, light yellow to brown liquid
- Registered pesticide
- Causes skin, eye, respiratory irritation
- Gives off Chlorine, hydrogen chloride, oxides of nitrogen, and various chloramines



Pool Chemical Sanitizer

1,3-dichloro-5,5-dimethylhydantoin

- White powder with a weak chlorine odor
- Conflagrates at 414°F (turns brown)
- Chlorine gas evolves at temperatures > 410°F.
- Strong oxidizer
- Sensitive to exposure to light, air, and moisture. Reacts with water or steam to produce toxic and corrosive fumes
- Gives off Nitrogen oxides, Chlorine, Hydrogen chloride



Algaecides

Hexamethylene biguanide hydrochloride

- Serious eye damage
- Causes skin burns
- Very toxic to aquatic life
- Gives off nitrogen oxides and hydrogen chloride



Algaecides

kills existing algae and prevent new algae growth

pH Balance

Adjusts pH balance up or down

pH Balance

Sodium Hydrogen Carbonate (sodium bicarbonate)

- Odorless white crystalline powder or lumps.
- Slightly alkaline (bitter) taste.
- pH (of freshly prepared 0.1 molar aqueous solution): 8.3 at 77°F. pH (of saturated solution): 8-9.
- Non-toxic
- Used as Alkalinity Control
- Gives off carbon dioxide



pH Balance

Calcium Chloride

- White to off-white solid
- Sinks and mixes with water
- Deliquescent
- Adding calcium chloride to hot water causes violent boiling
- Causes skin, eye, respiratory irritation
- Used as water softener
- Gives off chlorine



pH Balance

Sodium Carbonate (soda ash)

- Causes serious eye irritation
- May be harmful if swallowed
- Prolonged or repeated contact may dry skin and cause irritation
- Gives off carbon dioxide
- pH >11
- Used as pH Up



pH Balance

Cyanuric Acid

- Odorless white hygroscopic crystalline powder
- Decomposes at >320°C
- This produces toxic fumes including nitrogen oxides and isocyanic acid
- Reacts with chlorine
- Generates explosion hazard under decomposition



pH Balance

Sodium Bisulfate

- White crystalline solid
- Water soluble
- It is corrosive to metals and tissue.
- Contact with metals may evolve flammable hydrogen gas
- Under heated conditions or on contact with acids will produce the toxic gas sulfur dioxide
- pH around 3
- Used as pH Down



pH Balance

Hydrochloric acid (aka muriatic acid)

- Colorless watery liquid with a sharp, irritating odor
- Sinks and mixes with water
- Produces irritating vapor
- pH <1
- Toxic and irritating vapors are generated when heated
- Gives off hydrogen chloride



pH Balance

Boric Acid

- Odorless white solid
- Melting point 171°C
- Sinks and mixes with water.



Flocculants

Polyaluminium Chloride

- CORROSIVE!
- Inhalation, ingestion or skin contact with material may cause injury
- Causes eye and skin irritation
- Mist and Vapor: Causes respiratory tract and mucous membrane irritation
- Gives off hydrogen chloride and aluminum oxides and hydroxides



Flocculants

Clears up severe cloudiness or murkiness quickly by binding tiny, suspended particles into larger, heavier clumps that then sink to the bottom of the pool

Flocculants

Aluminum Sulphate (Alum)

- Anhydrous aluminum sulfate is a white crystalline solid
- Noncombustible
- Nontoxic
- Corrosive
- Causes serious eye damage
- pH is acidic
- Gives off aluminum oxides and hydroxides and sulfur oxides



Flocculants

Poly Dimethyldiallyl Ammonium Chloride

- Water soluble
- Gives off Carbon oxides, Nitrogen oxides and Phosgene



Stain Control and Filter Cleaners

Stain Controls

- Phosphonic (phosphorous) Acid
- A white or yellow crystalline solid (melting point 70.1°C) or a solution of the solid
 - Contact may severely irritate skin, eyes, and mucous membranes
 - Toxic by ingestion, inhalation and skin absorption
 - Deliquescent
 - Absorbs oxygen from the air very readily to form phosphoric acid
 - Gives off phosphorous oxides



Handling and application

- Add powder to water, never the other way around: This prevents violent reactions and splashing.
- Always add chemicals with the pump and filter running: This ensures proper circulation and helps prevent dangerous reactions.
- Never mix chemicals: Mixing can create toxic gases or start fires.
- Wear protective equipment: Use gloves, eye protection, and a mask as indicated on the product label.
- Clean tools: Use separate, clean scoops for each chemical and wash tools after use.

Filter Cleaners

Alkaline Salts

- Highly basic
- Very corrosive
- Causes skin, eye burns



Storage

- Store in a cool, dry, well-ventilated area: This prevents gas buildup, especially from chemicals like muriatic acid.
- Keep chemicals in their original containers: Ensure lids are always tightly closed when not in use.
- Store chemicals separately: Do not store different types of chemicals next to each other; separate acids from disinfectants.

Pool Chemical Safety Rules



Spill Response

Spills

- Solids
- Sweep up
 - Keep dry
 - Put in plastic containers
- Liquids
- Use inert absorbents
 - Sweep up
 - Keep dry
 - Put in plastic containers



Geauga Lake



Improper Mixing



Improper Mixing



Fire response

Frisco, TX



Bio Labs 1 2004
Broken sprinkler head
Chlorine measured 100 miles down wind

2004



Bio Labs Fire 3 2020
Happened right after LA fire

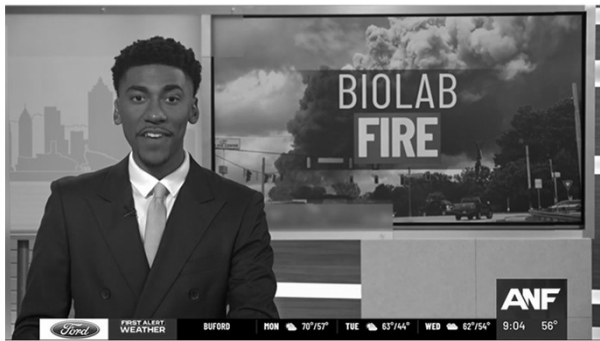
Bio Labs Fire 2 2020
Louisiana

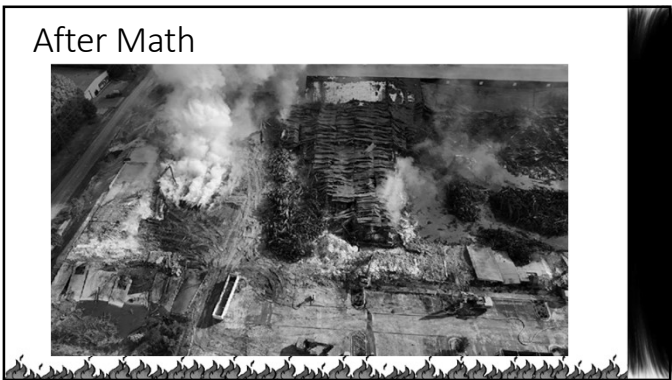


Bio Labs Fire 4 2024
Georgia
1 million+ lbs TriChlor
Hurricane Laura
Interstate 10 closed for 28 hrs
17,000 people evacuated



Louisiana Fire





Fire Response

Pre Plan

Know the hazards

Store managers should maintain an accurate inventory and know the location of all stored chemicals

They must have up-to-date Safety Data Sheets (SDS) for all products

Strategy and Tactics

Small fire

Large fire

Has it exploded yet

Pre Plan

Visit and Inspect

- Storage of incompatibles
- Storage of flammables

Strategy and Tactics

Is water my friend

Structural Problems

Fire in a building

- Warehouse
- Corner store
- Structure of Bldg
- Collapsed roof

Reactive Chemicals

Standard firefighting tactics can worsen the situation and create toxic gas clouds or explosions

Strategy and Tactics

Prioritize a defensive posture

An aggressive interior attack should be delayed or avoided entirely until the chemical hazard is assessed

Strategy and Tactics

Better get some HAZMAT people

Detection and Monitoring

Evacuation

Establish a large perimeter

Evacuate the area immediately downwind of the fire to protect against toxic fumes

Strategy and Tactics

PPE?

Strategy and Tactics

Confirm chemical hazards

- Gather information
- What chemicals are involved
- Where are they stored
- Compatibility of chemicals

Strategy and Tactics

Attack from a distance

Master streams

Copious amounts of water

Strategy and Tactics

- Don't use dry chemicals
- Could contain ammonia salts
 - Generates nitrogen chloride (BOOM)

Strategy and Tactics

Tear it apart and smother it

Strategy and Tactics

- Control run off
- Gets in water ways – everything dies
- Control fumes
- Try to knock down fumes – prevent down wind impact



Strategy and Tactics

- Tear it apart
- Put it out in small drenching quantities of water