Finding the Balance

* **Water Chemistry of Pools**

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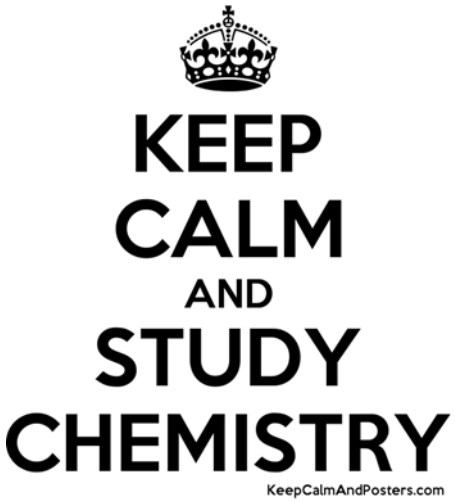
Disinfection



Recognized Disinfectants

- Chlorine
- Biguanide
- Bromine
- UV

Widely Used Disinfectant

Chlorine

- Most widely used disinfectants
- Good at a low concentration
- Acts as an oxidizer

Types of Chlorine

Solid Chlorine

* Calcium Hypochlorite

(Tablets or Granular Form)

70% Available Chlorine

Increase PH in pool

Reactive – Oxidizer*

Types of Chlorine

Liquid Chlorine

* Sodium Hypochlorite

(Yellow Liquid)

15% Available Chlorine

Unstable – Breaks Down Heat

*Small quantities better for this reason

Increase PH

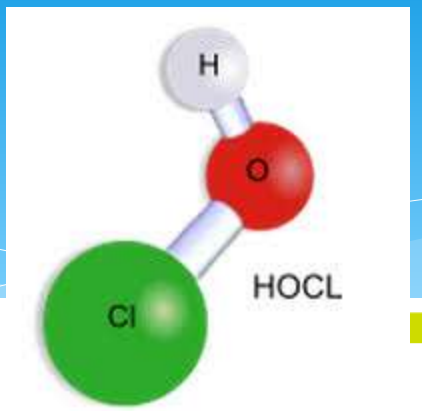
CHLORINE

$$Cl_2 + H_2O \longrightarrow HCl + HOCl$$

CHLORINE + WATER Hydrochloric Acid + Hypochlorous Acid

$$HOCl + H_2O \quad H^+ + OCl^-$$

CHLORINE



* HOCL (CHLORINE) OXIDIZING AGENT
* DURING OXIDATION PROCESS CHLORINE USED UP
* AMOUNT OF CHLORINE THAT MUST BE USED TO MAINTAIN A RESIDUAL IS CHLORINE DEMAND
* FREE RESIDUAL CHLORINE IS WHAT IS LEFT AND HASN'T BEEN USED YET (1.0 PPM)

COMBINED CHLORINE

* RESIDUAL CHLORINE COMBINES WITH NITROGEN
* (*SWEAT, URINE, SUNTAN LOTIONS)
* CHLORINE BOUNDS UP WITH THE NITROGEN FORMS CHLORAMINES
* POOR OXIDIZERS, 1/12TH EFFECTIVE
* RESULTS IN STRONG CHLORINE ODOR, EYE AND LUNG IRRITATION

BREAK POINT CHLORINATION

COMBINED CHLORINE CAN BE TESTED IN A DPD TEST KIT PIGGY BACKING FREE CHLORINE TEST

SUPERCHLORINATION IS RAISING THE CHLORINE TO 5-10 PPM DESTROYING THE CHLORAMINES

*GOOD VENTILATION IS IMPORTANT

PH ON CHLORINE

* HOCL FORMED IN A POOL IS DIRECTLY RELATED

HOCL	OCL	PH
100%	0%	5.0
78%	22%	7.0
50%	50%	7.5
21%	79%	8.0
1%	99%	9.0

CYA
CYANURIC ACID STABILIZER

* EFFECTIVE NO MORE THAN 40-60PPM
* ONCE ADDED REMAINS IN POOL – DRAINING/FILLING ONLY WAY TO MODIFY LEVEL
* CHECKED AT LEAST ONCE PER WEEK
* BE CAREFUL OVERSTABLIZED POOL
* DON'T USE CHLORINE PRODUCT CONTAINS STABLIIZER TO RAISE CHLORINE
* CHLORINE BYPRODUCTS BECOME TRAPPED

FIND BALANCE

* PH
* TOTAL ALKALINITY
* TEMPERATURE
* CALCIUM HARDNESS
* TDS – TOTAL DISSOLVED SOLIDS

* WITHOUT BALANCE

CORROSIVITY (LOW) – WALLS, METAL

SCALING (HIGH) PRECIPITATE OUT

LANGALIER INDEX

S.I. = PH + TEMP + CA + ALK + TDS (12.1)

S.I. – SATURATION INDEX

PH – PH OF WATER

TEMP – TEMPERATURE OF WATER

CA – CALCIUM IN WATER

ALK – ALKALINITY FACTOR

TDS – TOTAL DISSOLVED SOLIDS FACTOR

ACCEPTED RANGE 0.0 TO + .5

PH

* PH IS A MEASURE OF HYDROGEN IONS IN THE WATER
* ACIDITY OR BASENESS
* SCALE 1-14
* WATER NEUTRAL – 7.0

BELOW 7 > ACIDIC

ABOVE 7> BASIC MORE ALKALINE

* RANGE 7.2 – 7.8
* CAN BE AFFECTED BATHERS (URINE/SWEAT)
* RAIN (ACID)
* NEW PLASTER
* ALGAE
* LIQUID CHLORINE

ALKALINITY

* RANGE 80-120 PPM
* IF PH INCREASES WITH CHLORINE ADD MAINTAIN (80 – 100PPM)
* IF PH DECREASES WITH CHLORINE ADD MAINTAIN (100-120PPM)
* SODIUM BICARBONATE – GOOD RAISE ALKALINITY
* SODA ASH CAN BE USED BUT WILL INCREASE PH
* ACID – POWDER/LIQUID – LOWER ALKALINITY (*WATCH PH PLUMMET AND BOUNCE BACK)

ALKALINITY

* ALKALINITY IS TOO HIGH – RESIST PH CHANGE; CLOUDY WATER
* ALKALINITY TOO LOW – RAPID CHANGE IN PH, CORROSION OF PIPES/PLASTER, STAINING OF POOL

CALCIUM HARDNESS

* HIGH CALCIUM – HARD WATER
* LOW CALCIUM – SOFT WATER
* TOO LOW – ETCHING OF POOL SURFACE, REMOVAL OF GROUT
* TOO HIGH – DEPOSITS ON EQUIPMENT/PIPING

TEST KITS

* OTO - ORTHOTOLIDINE (YELLOW)
* CHLORINE/PH
* NOT ACCEPTED FOR PUBLIC POOLS (NOT FULL TEST KIT)
* DPD – DIETHYL-P-PHENYLENE-DIAMINE (PINK)
* CHLORINE, PH, CALCIUM, ALKALINITY, CYA

TEST KITS

* READ INSTRUCTIONS
* CLEAN TEST KIT AFTER EACH TEST
* WATER SHOULD BE TAKEN 12-18 IN BELOW SURFACE
* SAMPLES SHOULD NOT BE IN FRONT OF RETURN LINES
* IF TUBES ARE NOT CLEAR AND CANNOT CLEAN PURCHASE ANOTHER
* USE THE CAPS WHEN TESTING
* DOCUMENT,DOCUMENT, DOCUMENT
* REC EVERY 2-4 HOURS CHLORINE/PH

POOL RECORDS

* THERE IS NO SUCH THING AS TOO MUCH INFORMATION
* REQUIRED/BEST PRACTICE
* LEGAL DOCUMENTATION
* DAILY, WEEKLY, MONTHLY

* FREE CHLORINE
* COMBINED CHLORINE
* PH
* # POOL PATRONS
* WATER TEMP
* WEATHER FACTORS
* WATER ADD
* FLOW METER READING
* MAIN DRAIN CHECK
* WATER CLARITY
* POOL CLEANING (GREASE TILE, SKIMMERS, VACUUM)
* BACKWASHING (PRESSURE BEFORE AND AFTER)
* ADD CHEMICALS, ADJUSTMENT DOC BEFORE AND AFTER

TROUBLESHOOTING CHEMISTRY OR EQUIPMENT MALFUNCTION

* WATER CHEMISTRY CAN CAUSE IMBALANCE, DISCOLORATION
* MALFUNCTIONING EQUIPMENT CAN ALSO BE SOURCE
* CAN ALSO HAVE A COMBINED EFFECT WITH BOTH CHEMISTRY/EQUIPMENT

CLOUDY GREEN WATER

PROBLEM

* ALGAE GROWTH

* HIGH CHLORINATION
* MAINTAIN FREE CHLORINE RESIDUAL

GREEN WATER

PROBLEM

* DISSOLVED IRON
* USE OF BROMINE OR IODINE

* HIGH CHLORINATION (*FORCE IRON PRECIPITATE OUT OF WATER COLUMN)
* VACUUM/FILTERED

RED/BROWN (CLOUDY) WATER

PROBLEM

* IRON

* PRECIPITATE THE IRON OUT OF THE WATER
* VACUUM/FILTER AFTER
* (*IF ADDING A PRECIPITATING AGENT KEEP FILTER TURNED OFF – OVERNIGHT)

MILKY CLOUDINESS

PROBLEM

* IF A DIATOMITE FILTER – DIATOMACEOUS EARTH IN THE POOL
* EXCESS DIRT OR CALCIUM COMPOUNDS PRECIPITATE
* HIGH TOTAL ALKALINITY
* CHECK/REPAIR FILTER
* FILTRATION/CHLORINATION SHOULD RESOLVE
* ACID TO LOWER ALKALINITY

GREEN HAIR

PROBLEM

* COPPER IONS IN WATER

* DISCONTINUE USE OF COPPER BASED ALGAECIDES
* MAINTAIN PH IF USING COPPER PIPING ON SYSTEM

TURBIDITY

PROBLEM

* LOW CIRCULATION
* FILTRATION

* CHECK FLOW METER FOR CIRCULATION RATES
* BACKWASH MORE OFTEN IF NEEDED
* CHANNELING (SAND FILTER)
* DE FILTER (TOO LITTLE PRECOAT)

TURBIDITY

PROBLEM

* ALGAE GROWTH
* AIR LEAKS (BUBBLES IN WATER)
* EXCESSIVE DUST
* PRECIPITATION AFTER ADD OF SODA ASH
* IRON

* HIGH CHLORINATION
* CHECK PIPING
* MORE VACUUMING,KEEP POOL COVERED
* KEEP CIRCULATING
* ADD WATER,ALUM SULPHATE, SUPERCHLORINATE

What is the most important chemical reading on a pool?

REFERENCES

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