CALIFORNIA Water Boards

State Water Resources Control Board

Edmund G. Brown Jr. Governor

Matthew Rodriquez Secretary for Environmental Protection

UNITS AND CONVERSION FACTORS

1 cubic foot of water weighs 62.3832 lb
1 gallon of water weighs 8.34 lb
1 liter of water weighs 1,000 gm
1 mg/L = 1 part per million (ppm)
1% = 10,000 ppm
ft^2 = square feet and ft^3 = cubic feet
1 mile = 5,280 feet (ft)
1 yd^3= 27ft^3 and 1 yard = 3 feet
1 acre (a) = 43,560 square feet (ft^2)
1 acre foot = 325,851 gallons
1 cubic foot (ft^3) = 7.48 gallons (gal)
1 gal = 3.785 liters (L)
1 L = 1,000 milliliters (ml)
1 pound (lb) = 454 grams (gm)
1 lb = 7,000 grains (gr)
1 grain per gallon (gpg) = 17.1 mg/L
1 gm = 1,000 milligrams (mg)
1 day = 24 hr = 1,440 min = 86,400 sec
1,000,000 gal/day ÷ 86,400 sec/day ÷ 7.48 gal/cu ft = 1.55 cu ft/sec/MGD

CHLORINATION

Dosage, mg/l = (Demand, mg/l) + (Residual, mg/l)

(Gas) lbs = Vol, MG x ppm or mg/L x 8.34 lbs/gal

HTH Solid (lbs) =

$$\frac{\text{(Vol, MG) x (ppm or mg/L) x 8.34 lbs/gal}}{\text{(\% Strength / 100)}}$$

Liquid (gal) =

$$\frac{\text{(Vol, MG) x (ppm or mg/L) x 8.34 lbs/gal}}{\text{(\% Strength /100) x Chemical Wt. (lbs/gal)}}$$

PRESSURE

PSI = $\frac{\text{(Head, ft.)}}{\text{2.31ft./psi}}$ **PSI =** Head, ft. x 0.433 PSI/ft.

lbs Force = (0.785) (D, ft.)^2 x 144 in^2/ft^2 x PSI.

VOLUME

Rectangular Basin, Volume, gal =
(Length, ft) x (Width, ft) x (Height, ft) x 7.48 gal/cu. ft.

Cylinder , Volume, gal =
(0.785) x (Dia, ft)^2 x (Height, Depth, or Length in ft.) x 7.48 gal/ft^3

Time, Hrs. =

$$\frac{\text{Volume, gallons}}{\text{(Pumping Rate, GPM, x 60 Min/Hr)}}$$

Supply, Hrs. =

$$\frac{\text{Storage Volume, Gals}}{\text{(Flow In, GPM - Flow Out, GPM) x 60 Min/Hr)}}$$

SOLUTIONS

Lbs/Gal =

$$\frac{\text{(Solution \%)}}{100} \text{ x 8.34 lbs/gal x Specific Gravity}$$

Lbs Chemical =
Specific Gravity x 8.34 lbs/gallons x Solution(gal)

Specific Gravity =

$$\frac{\text{Chemical Wt. (lbs/gal)}}{\text{8.34 (lbs/gal)}}$$

% of Chemical in Solution =

$$\frac{\text{(Dry Chemical, lbs) x 100}}{\text{(Dry Wt. Chemical, lbs) + (Water, lbs)}}$$

GPD =

$$\frac{\text{(MGD) x (ppm or mg/L) x 8.34 lbs/gal}}{\text{(\% purity) x Chemical Wt.(lbs/gal)}}$$

GPD =

$$\frac{\text{(Feed, ml/min. x 1,440 min/day)}}{\text{(1,000 ml/L x 3.785 L/gal)}}$$

Two-Normal Equations:

a) $C_1V_1 = C_2V_2$ $\quad \frac{Q_1}{V_1} = \frac{Q_2}{V_2}$

b) $C_1V_1 + C_2V_2 = C_3V_3$

C = Concentration V = Volume Q = Flow

PUMPING

1 horsepower (Hp) = 746 watts = 0.746 kw = 3,960 gal/min/ft

Water Hp =

$$\frac{\text{(GPM) x (Total Head, ft)}}{\text{(3,960 gal/min/ft)}}$$

Brake Hp =

$$\frac{\text{(GPM) x (Total Head, ft)}}{\text{(3,960) x (Pump \% Efficiency)}}$$

Motor Hp =

$$\frac{\text{(GPM) x (Total Head, ft)}}{\text{(3,960) x Pump \% Eff. x Motor \% Eff.}}$$

"Wire-to-Water" Efficiency
= (Motor, % Efficiency x Pump % Efficiency)

Cost, $ =
(Hp) x (0.746 Kw/Hp) x (Operating Hrs.) x cents/Kw-Hr

Flow, velocity, area

Q = A x V Quantity = Area x Velocity

Flow (ft^3/sec) = Area(ft^2) x Velocity (ft/sec)

$$\frac{\text{MGD x 1.55 cuft/sec/MGD}}{\text{.785 x pipe diameter ft x pipe diameter ft}} = \frac{\text{cu ft/sec}}{\text{sqft}} = \text{ft/sec}$$

General

**($)Cost / day =** lbs/day x ($)Cost/lb

Removal, Percent =

$$\frac{\text{(In - Out)}}{\text{In}} \text{ x 100}$$

Specific Capacity, GPM/ft. =

$$\frac{\text{Well Yield, GPM}}{\text{Drawdown, ft.}}$$

Gals/Day = (Population) x (Gals/Capita/Day)

GPD =

$$\frac{\text{(Meter Read 2 - Meter Read 1)}}{\text{(Number of Days)}}$$

Volume, Gals = GPM x Time, minutes

SCADA = 4 mA to 20 mA analog signal

$$\frac{\text{(live signal mA - 4 mA offset) x process unit and range}}{\text{(16 mA span)}}$$

4 mA = 0 20 mA full - range