

Formula/Conversion Table

$$\text{Acid Feed Rate} = \frac{(\text{Waste Flow}) (\text{Waste Normality})}{\text{Acid Normality}}$$

$$\text{Alkalinity} = \frac{(\text{mL of Titrant}) (\text{Acid Normality}) (50,000)}{\text{mL of Sample}}$$

$$\text{Area of Circle} = (0.785) (\text{Diameter}^2) \text{ or } (\pi)(\text{Radius}^2)$$

$$\text{Area of Cylinder} = [(0.785) (\text{Diameter}^2)] + [(\pi)(\text{Diameter})(\text{Height})]$$

$$\text{Area of Rectangle} = (\text{Length}) (\text{Width})$$

$$\text{Area of Triangle} = \frac{(\text{Base}) (\text{Height})}{2}$$

$$\text{Chemical Feed Pump Setting, \% Stroke} = \frac{(\text{Desired Flow}) (100\%)}{\text{Maximum Flow}}$$

$$\text{Chemical Feed Pump Setting, mL/min} = \frac{(\text{Flow, MGD})(\text{Dose, mg / L})(3.785 \text{ L / gal})(1,000,000 \text{ gal / MG})}{(\text{Liquid, mg / mL})(24 \text{ hr / day})(60 \text{ min / hr})}$$

$$\text{Circumference of Circle} = (3.14) (\text{Diameter})$$

$$\text{Composite Sample Single Portion} = \frac{(\text{Instantaneous Flow}) (\text{Total Sample Volume})}{(\text{Number of Portions}) (\text{Average Flow})}$$

$$\text{Detention Time} = \frac{\text{Volume}}{\text{Flow}}$$

$$\text{Digested Sludge Remaining, \%} = \frac{(\text{Raw Dry Solids}) (\text{Ash Solids})(100\%)}{(\text{Digested Dry Solids}) (\text{Digested Ash Solids})}$$

$$\text{Discharge} = \frac{\text{Volume}}{\text{Time}}$$

$$\text{Dosage, lbs/day} = (\text{mg/L}) (8.34) (\text{MGD})$$

$$\text{Efficiency, \%} = \frac{(\text{In} - \text{Out}) (100\%)}{\text{In}}$$

$$\text{Feed rate, lbs/day} = \frac{(\text{Dosage, mg / L}) (\text{Capacity, MGD}) (8.34 \text{ lbs / gal})}{(\text{Available fluoride ion})(\text{Purity})}$$

$$\text{Feed rate, gal/min (Saturator)} = \frac{(\text{Plant capacity, gal / min})(\text{Dosage, mg / L})}{(18,000 \text{ mg/L})}$$

$$\text{Filter Backwash Rate} = \frac{\text{Flow}}{\text{Filter Area}}$$

$$\text{Filter Yield, lbs/hr/sq ft} = \frac{(\text{Solids Loading, lbs / day})(\text{Recovery, \% / 100\%})}{(\text{Filter operation, hr/day})(\text{Area, ft}^2)}$$

$$\text{Food/Microorganism Ratio} = \frac{\text{BOD, lbs / day}}{\text{MLVSS, lbs}}$$

$$\text{Gallons/Capita/Day} = \frac{\text{Gallons / Day}}{\text{Population}}$$

$$\text{Hardness} = \frac{(\text{mL of Titrant})(1,000)}{\text{mL of Sample}}$$

$$\text{Horsepower} = \frac{(\text{Flow, gpm})(\text{Head, ft})}{(3,960)(\text{Efficiency})}$$

$$\text{Hydraulic Loading Rate} = \frac{\text{Flow}}{\text{Area}}$$

$$\text{Mean Cell Residence Time (MCRT)} = \frac{\text{Suspended Solids in Aeration System, lbs}}{\text{SS Wasted, lbs / day} + \text{SS Lost, lbs / day}}$$

$$\text{Organic Loading Rate} = \frac{\text{Organic Load, lbs BOD / day}}{\text{Volume}}$$

$$\text{Oxygen Uptake} = \frac{\text{Oxygen Usage}}{\text{Time}}$$

$$\text{Population Equivalent} = \frac{(\text{Flow MGD})(\text{BOD, mg / L})(8.34 \text{ lbs / gal})}{\text{lbs BOD / day / person}}$$

$$\text{Reduction in Flow, \%} = \frac{(\text{Original Flow} - \text{Reduced Flow})(100\%)}{\text{Original Flow}}$$

$$\text{Slope} = \frac{\text{Drop or Rise}}{\text{Distance}}$$

$$\text{Sludge Age} = \frac{\text{Mixed Liquor Solid, lbs}}{\text{Primary Effluent Solids, lbs / day}}$$

$$\text{Sludge Index} = \frac{\% \text{ Settleable Solids}}{\% \text{ Suspended Solids}}$$

$$\text{Sludge Volume Index} = \frac{(\text{Settleable Solids, \%})(10,000)}{\text{MLSS, mg / L}}$$

$$\text{Solids Applied, lbs/day} = (\text{Flow, MGD})(\text{Concentration, mg/L}) (8.34 \text{ lbs/gal})$$

$$\text{Solids Concentration} = \frac{\text{Weight}}{\text{Volume}}$$

$$\text{Solids Loading, lbs/day/sq ft} = \frac{\text{Solids Applied, lbs / day}}{\text{Surface Area, sq ft}}$$

$$\text{Solids, mg/L} = \frac{(\text{Dry Solids, grams})(1,000,000)}{\text{mL of sample}}$$

$$\text{Surface Loading Rate} = \frac{\text{Flow}}{\text{Area}}$$

$$\text{Velocity} = \frac{\text{Flow}}{\text{Area}} \text{ or } \frac{\text{Distance}}{\text{Time}}$$

$$\text{Volatile Solids, \%} = \frac{(\text{Dry Solids} - \text{Ash Solids})(100\%)}{\text{Dry Solids}}$$

$$\text{Volume of Rectangle} = (\text{Length}) (\text{Width}) (\text{Height})$$

$$\text{Volume of Cone} = (1/3) (0.785) (\text{Diameter}^2) (\text{Height})$$

$$\text{Volume of Cylinder} = (0.785) (\text{Diameter}^2) (\text{Height})$$

$$\text{Waste Milliequivalent} = (\text{mL}) (\text{Normality})$$

$$\text{Waste Normality} = \frac{(\text{Titrant Volume}) (\text{Titrant Normality})}{\text{Sample Volume}}$$

$$\text{Weir Overflow Rate} = \frac{\text{Flow}}{\text{Weir Length}}$$

Conversion Factors:

1 acre = 43,560 square feet

1 cubic foot = 7.5 gallons

1 foot = 0.305 meters

1 gallon = 3.79 liters

1 gallon = 8.34 pounds

1 grain per gallon = 17.1 mg/L

1 horsepower = 0.746 kilowatts

1 million gallons per day = 694 gallons per minute

1 pound = 0.454 kilograms

1 pound per square inch = 2.31 feet of water

1% = 10,000 mg/L

Degrees Celsius = (Degrees Fahrenheit - 32) (5/9)

Degrees Fahrenheit = (Degrees Celsius) (9/5) + 32

Abbreviations:

BOD	Biochemical oxygen demand
Ft	Feet
gpd	gallons per day
gpg	grains per gallon
gpm	gallons per minute
lbs	pounds
mg/L	milligrams per liter
MGD	million gallons per day
mL	milliliter
MLSS	mixed liquor suspended solids
MLVSS	mixed liquor volatile suspended solids