Formula/Conversion Table

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\text{Horsepower} = \frac{\text{(Flow, gpm) (Head, ft.)}}{\text{(3960) (Efficiency)}}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Volume of Rectangle = (Length) (Width) (Height)

Volume of Cone = (1/3) (0.785) (Diameter^2) (Height)

Volume of Cylinder = (0.785) (Diameter^2) (Height)

Waste Milliequivalent = (mL) (Normality)

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

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

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 killowatts
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