WASTEWATER TREATMENT CONVERSION FACTORS AND FORMULAS

CONVERSION TABLE

AREA
1 Acre = 43,560 Sq Ft
1 Sq Ft = 144 Sq Inches

TEMPERATURE
$°F = (°C \times 1.8) + 32$
$°C = (°F - 32) \div 1.8$

FLOW
1 MGD = 694.5 GPM
1 MGD = 11.57 GPM
1 MGD = 1.55 CFS

TIME
1 Minute = 60 Seconds
1 Hour = 60 Minutes
1 Day = 24 Hours
1 Day = 1,440 Minutes

LENGTH
1 Foot = 12 Inches
1 Yard = 3 Ft
1 Mile = 5,280 Ft
1 Mile = 1,760 Yds

VOLUME
1 Cu Ft = 7.48 Gallons
1 Cu Yd = 27 Cu Ft

POWER
1 hp = 0.746 Kilowatts

WEIGHT
1 ml Water = 1 Gram
1 Gal. Water = 8.34 Pounds
1 Cu Ft Water = 62.4 Pounds
1 Ton = 2,000 Pounds

PRESSURE
1 psi = 2.31 Feet
1 Ft Water = 0.433 psi

AREA (SQ FT)   VOLUME (CU FT)

	AREA (SQ FT)	VOLUME (CU FT)
Circle	$(\pi)(Radius)^2$ or $(0.785)(Diameter)^2$	n/a
Cube	n/a	(Length)(Width)(Height)
Cylinder	n/a	$(\pi)(Radius)^2(Height)$ or $(0.785)(Diameter)^2(Height)$
Rectangle	(Length)(Width)	(Length)(Width)(Height)
Square	(Length)(Width)	(Length)(Width)(Height)

Circumference = (π)(Diameter) $\pi = 3.14$

BASIC FORMULAS (PONDS)

Population Loading, Person/Acre = $\dfrac{Population\ Served,\ Persons}{Pond\ Surface\ Area,\ Acres}$

Organic Loading, Lbs, BOD/Day/Acre = $\dfrac{(Flow,\ MGD)(BOD,\ mg/l)(8.34)}{Area,\ Acres}$

BASIC FORMULAS

Pounds of BOD or TSS = Flow, MGD x Concentration, mg/l x 8.34

BOD, mg/l = $\dfrac{(Initial\ DO\text{-}Final\ DO) \times BOD\ Bottle\ Vol,\ ml}{Sample,\ ml}$

Population Equivalent = $\dfrac{Flow,\ MGD \times BOD,\ mg/l \times 8.34}{0.17\ Lbs,\ BOD/Person/Day}$

Detention Time (Hours) = $\dfrac{(Tank\ Volume,\ Cu\ Ft)\ (7.48\ Gal/Cu\ Ft)\ 24\ Hrs/Day}{Flow,\ Gal\ Per\ Day}$

Detention Time (Days) = $\dfrac{Volume,\ MG}{Flow,\ MGD}$

FM Ratio = $\dfrac{Flow,\ MGD \times BOD,\ mg/l \times 8.34}{Lbs\ MLVSS\ in\ Aeration\ Tank}$

or = $\dfrac{BOD,\ mg/l \times Flow,\ MGD \times 8.34}{MLVSS,\ mg/l \times Vol\ in\ Aeration\ Tank,\ MG \times 8.34}$

Hydraulic Loading or Surface Loading, GPD/Sq Ft = $\dfrac{Flow,\ GPD}{Surface\ Area,\ Sq\ Ft}$

Aerator Loading, Lbs/BOD, Day = Flow, MGD x BOD, mg/l x 8.34

Organic Loading, Activated Sludge = $\dfrac{Flow,\ MGD \times BOD,\ mg/l \times 8.34}{Volume\ in\ A.T.,\ 1,000\ Cu\ Ft}$

Organic Loading, Tr. Filter = $\dfrac{Flow,\ MGD \times BOD,\ mg/l \times 8.34}{Volume\ of\ Filter\ Media,\ 1,000\ Cu\ Ft}$

Organic Loading, RBC = $\dfrac{Soluble\ BOD,\ Applied\ Lbs/Day}{Surface\ Area\ of\ Media,\ 1,000\ Sq\ Ft}$

M.C.R.T., Days = $\dfrac{Lbs,\ MLSS\ in\ Secondary\ System}{Lbs/Day\ SS\ Wasted + Lbs/Day\ SS\ in\ Effluent}$

Weir Overflow Rate, GPD/ft = $\dfrac{Flow,\ GPD}{Length\ of\ Weir,\ Ft}$

Oxygen Uptake Rate (OUR) Mg O_2/1/Hour = $\dfrac{(DO1,\ mg/l - DO2,\ mg/l)}{(Time2,\ Min) - (Time1,\ Min)} \times 60\ Min/Hour$

Specific Oxygen Uptake Rate (SOUR)Mg O_2/Hour/Gm = $\dfrac{O_2\ Uptake,\ mg/l/Hour \times 1000\ mg/gm}{MLSS,\ mg/l}$

BASIC FORMULAS (SLUDGE & SOLIDS)

Suspended Solids, mg/l = $\dfrac{(W2) - (W1)}{ml\ Sample} \times 1000 \times 1000$

Volatile Suspended Solids, mg/l = $\dfrac{(W2) - (W3)}{ml\ Sample} \times 1000 \times 1000$

Where W1 (Dish), W2 (Dish & Dry Solids), W3 (Dish & Ash)

Volatile Solids, Lbs = $\dfrac{Dry\ Solids,\ Lbs \times Raw\ Sludge,\ \%\ VS}{100\%}$

Aerator Solids, Lbs = Tank Vol, MG x MLSS, mg/l x 8.34

Solids Applied, Lbs/Day = (Flow, MGD + RSF, MGD)(MLSS, mg/l x 8.34)

Solids Loading, Lbs/Day/Sq Ft = $\dfrac{Solids\ Applied,\ Lbs/Day}{Surface\ Area,\ Sq\ Ft}$

Sludge Volume Index (SVI), ml/gm = $\dfrac{SSV_{30},\ ml/l \times 1000\ mg/g}{MLSS,\ mg/l}$

Sludge Age = $\dfrac{Lbs\ TSS\ in\ Aeration\ Basin}{Lbs/Day\ TSS\ in\ Influent}$

Reduction on Volatile Solids, % = $((In - Out)/(In-(In \times Out))) \times 100$

Percent Removal = $((Inf - Eff)\ /\ Inf) \times 100$

Dry Solids, Lbs = $\dfrac{Raw\ Sludge,\ Gal \times Raw\ Sludge,\ \% \times 8.34}{100\%}$

Return Sludge Rate, MGD = $\dfrac{(Total\ Flow,\ MGD)(Settleable\ Solids,\ \%)}{100\%}$

Volatile Solids Loading, Lbs/Day/Cu Ft = $\dfrac{VS\ Added,\ Lbs/Day}{Digester\ Vol,\ Cu\ Ft}$

LBS / FLOW / MGD / 8.34 LBS/ GAL / CONCENTRATION Mg/L

CONCENTRATIONS & SOLUTIONS

1 mg/l = 1 ppm

Lbs, Chemical = $\dfrac{Desired\ ppm \times Flow,\ MGD \times 8.34}{Purity\ of\ Chemical}$

ppm = $\dfrac{Lbs\ Chemical\ Fed}{MGD \times 8.34}$

1% Solution = 10,000 mg/l