HANDY PUMP ENGINEERING SHEET

CONVERSIONS

FLUID MEASUREMENT
cfs = cubic feet per second
gpm = gallons per minute
MGD = million gallons per day
AF = acre-foot
AFY = acre-feet per year
ppm = parts per million
PPD = pounds per day

FLOW RATE
1 cfs = 448.83 gpm
1,000 gpm = 2.228 cfs
1,000 gpm = 4.434 AF/day
1 MGD = 694.4 gpm
1 MGD = 1.547 cfs
1 MGD = 325.851 AFY
1 GPM = 1.05 m³/hr

LENGTH & AREA
1 mile = 5,280 ft
1 acre = 43,560 ft²
1 mi² = 640 acres
1 inch = 2.54 cm
1 meter = 39.37 in = 3.28 ft

VOLUME
1 ft³ = 7.48 gal
1 ft³ = 62.4 lb
1 yd³ = 27 ft³
1 AF = 325,851 gal
1 gallon = 231 in³
1 gallon = 3.7854 L
1 m³ = 35.31 ft³ = 264.15 gal

PRESSURE
1 psi = 6,895 kPa
1 bar = 14.5038 psi
1 ft of water = 0.4335 psi

MASS
1 pound = 0.454 kilograms

TEMPERATURE
°C = (°F – 32) ÷ 1.8
°F = °C × 1.8 + 32

CHEMICAL FEED

FEED RATE
ppm = pounds of chemical / 8.34 × millions of gallons of water
Feed Rate (lb/day) = ppm × MGD × 8.34 / purity (decimal, not %)
1 GPH = 63.1 ml/min = 1.05 ml/sec

CHLORINATION RULE
0.012 × Q (gpm)
= Cl_2 required (PPD) for a 1.0 ppm dose

SODIUM HYPOCHLORITE (NaOCl)
1 gallon of 12.5% NaOCl contains ~1.04 lb available chlorine

PUMP FORMULAS

PUMP CURVE
Q = flow rate in gpm
H = Head in feet
P = Pressure in PSI
H = 2.31 x P



BRAKE HORSEPOWER (BHP)

$$BHP = \frac{Q \times H}{3960\ x\ \%eff}$$

WIRE-TO-WATER EFFICIENCY

$$= \frac{Q \times H}{V \times I \times 5.308}$$ ..... (**V** = Volts **I** = amperes)

$$= \frac{water\ HP \times 100\%}{power\ input\ (brake\ HP\ or\ motor\ HP)}$$

NPSHa (Net Positive Suction Head Available) FOR FLOODED SUCTION

NPSHa = Ha – Hvpa +/- Hst – Hf

Ha = absolute pressure
Hvpa = vapor pressure (absolute value)
Hst = static head (+) or lift (-)
Hf = friction head

ELECTRICAL

ALTERNATE CURRENT – THREE PHASE

Amperes (when "HP" is known)

$$= \frac{HP \times 746}{V \times \%eff \times PF \times 1.73}$$

Amperes (when "KW" is known)

$$= \frac{KW \times 1000}{V \times PF \times 1.73}$$

Amperes (when "KVA" is known)

$$= \frac{KVA \times 1000}{V \times 1.73}$$

Kllovolt-Amperes

$$= \frac{V \times I \times 1.73}{1000}$$

Horsepower

$$= \frac{V \times I \times \%eff \times PF \times 1.73}{746}$$

COMMON ABBREVIATIONS
GPM = gallons per minute
GPH = gallons per hour
ppm = parts per million
PSI = pounds per square inch
TDH = total dynamic head
VFD = variable frequency drive
RPM = revolutions per minute
HP = horsepower
BHP = brake horsepower
W = watts
%eff = percent efficiency
PF = power factor
PVC = polyvinyl chloride
CPVC = Chlorinated PVC
KW = kilowatts
KVA = kilovolt
V = volts
I = amperes
R=resistence

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