



PROCESS ENGINEERING & EQUIPMENT CO.

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Relative Filtration Size Information

Particle Size Retention	Mesh	Micron	Reference
.063	10	1600	Beach Sand
.036	20	890	
.024	30	600	Human Hair
.015	40	380	
.009	60	230	Pin Point
.007	80	180	
.0055	100	140	Milled Flour
.004	150	100	
.003	200	80	
.0016	500	40	
.0012	700	30	
.0006	—	15	
.0002	—	5	
.00004	—	1	

"Rule of Thumb" Formulas

Hydraulic Cooling	.....	1/10 Tower Ton per HP
Air Compressor Cooling	...	1/10 Tower Ton per HP
After Cooler Cooling	.....	1/10 Tower Ton per HP
Chiller Condenser Cooling	..	1 Tower Ton per Chiller T
Injection Mold Cooling		
PVC	.....	75lb/HR = 1 Ton (Chiller)
Polypropylene	.....	35lb/HR = 1 Ton (Chiller)
Polystyrene	.....	50lb/HR = 1 Ton (Chiller)
Aluminum Mold Cooling	...	25lb/HR = 1 Ton (Tower)
Zinc Mold Cooling	.....	100lb/HR = 1 Ton (Tower)
Welder Cooling	.....	1/4 Ton per Tip
Rectifier Cooling	.....	100 KVA/Ton

Commonly-used Heat Transfer Formulas

1 Boiler Horsepower = 33,475 BTU/HR
1000 BTU/HR = 1 lb/HR
lbs/HR Condensate = GPM
500
500 x ΔT x GPM(water) = BTU/HR
1 Ton of Refrigeration = 12,000 BTU/HR
1 Cooling Tower Ton = 15,000 BTU/HR
1 KW = 3413 BTU
Temp (°F) - 32 x 5/9 = Temp (°C)
Temp (°C) + 1.778 x 1.8 = Temp (°F)
1 HP = 2545 BTU/HR

60 Hertz Pump On 50 Hertz Power

50 Hertz	60 Hertz	Factor
GPM =	GPM X	.829
Head =	Head X	.687
B.H.P. =	HP X	.569

To Size A 60 Hertz Pump Using 50 Hertz

60 Hertz	50 Hertz	Factor
GPM =	GPM X	1.2
Head =	Head X	1.45

c — SPECIFIC HEAT VALUES (BTU/LB °F)

Aluminum	.....	.22	Steel	.....	.12	Lead	.....	.03	Alcohol	.....	.58
25% Ethylene Glycol	.....	.92	Paper	.....	.40	Water	.....	1.0	Ice	.....	.49
35% Ethylene Glycol	.....	.86	Paraffin	.....	.70	Zinc	.....	.09	Glass	.....	.20
45% Ethylene Glycol	.....	.79	Rubber	.....	.45	Copper	.....	.09			

Commonly-used Pumping Formulas

1 PSI = 2.31 Ft of Head (water)
 Specific Gravity (S.G.) of Water = 1.0
 PSI x 2.31 = Head in Feet
 S.G.
 Pump BHP = $\frac{\text{GPM} \times \text{Head (ft)} \times \text{S.G.}}{3960 \times \text{Pump Eff.}}$

Pump capacity varies directly with impeller speed or impeller diameter:
 $\frac{\text{GPM (1)}}{\text{GPM (2)}} = \frac{\text{RPM (1)}}{\text{RPM (2)}}$ $\frac{\text{GPM (1)}}{\text{GPM (2)}} = \frac{\text{DIA (1)}}{\text{DIA (2)}}$

Pump head varies as the square of the speed or impeller diameter:
 $\frac{\text{HEAD (1)}}{\text{HEAD (2)}} = \left(\frac{\text{RPM (1)}}{\text{RPM (2)}}\right)^2$ $\frac{\text{HEAD (1)}}{\text{HEAD (2)}} = \left(\frac{\text{DIA (1)}}{\text{DIA (2)}}\right)^2$

BHP varies as the cube of the speed or impeller diameter:
 $\frac{\text{BHP (1)}}{\text{BHP (2)}} = \left(\frac{\text{RPM (1)}}{\text{RPM (2)}}\right)^3$ $\frac{\text{BHP (1)}}{\text{BHP (2)}} = \left(\frac{\text{DIA (1)}}{\text{DIA (2)}}\right)^3$

VISCOSITY CONVERSION TABLE

SAYBOLT UNIVERSAL SSU	STOKES	CENTI STOKES	POISES*	CENTI* POISES	ENGLER SECONDS	REDWOOD NO. 1 SECONDS	TYPICAL LIQUIDS AT 70°F
31	.010	1.00	.088	.8	54	29	WATER
35	.025	2.56	.020	2.05	59	32.1	KEROSENE
50	.074	7.40	.059	5.92	80	44.3	NO. 2 FUEL OIL
80	.157	15.7	.126	12.6	125	69.2	NO. 4 FUEL OIL
100	.202	20.2	.162	16.2	150	85.6	TRANSFORMER OIL
200	.432	43.2	.346	34.6	295	170	HYDRAULIC OIL
300	.654	65.4	.522	52.2	470	254	SAE 10W OIL
500	1.10	110	.88	88.0	760	423	SAE 10 PIL
1,000	2.16	220	1.73	173	1,500	896	SAE 20 OIL
2,000	4.40	440	3.52	352	3,000	1,690	SAE 30 OIL
5,000	10.8	1,080	8.80	880	7,500	4,230	SAE 50 OIL
10,000	21.6	2,160	17.0	1,760	15,000	8,460	SAE 60-70 OIL
50,000	108	10,800	88	8,800	75,000	43,660	MOLASSES B
100,000	216	21,600	173	17,300	150,000	88,160	MOLASSES C

*Poises and centipoises are given for oil of .8 spec. Gravity. Relationship: centistokes X specific gravity = centipoises.