

# CONVERSIONS FORMULAS AND CHILLER SIZING GUIDELINES FOR THE PLASTICS INDUSTRY

## METRIC CONVERSION TABLE

To Convert From	To	Multiply By	To Convert From	To	Multiply By
<b>Unit volume</b>			<b>Power</b>		
US gpm	liters/min	3.785	ft-lbs/sec	watts	1.356
US gpm	liters/hr	227.1	kw	BTUH	3413
US gpm	cu m/hr	.2271	Boiler H.P.	BTUH	33475
cfm	liters/min	28.317	hp	BTUH	2545
cfm	cu m/min	.02832	hp	kw	.7457
cfm	cu m/hr	1.6992	<b>Heat</b>		
<b>Unit weight</b>			Btu	gr-cal	252
lb/ft	kg/m	1.4881	Btu	kg-cal	.252
lb/sq in	gr/sq cm	70.31	Btu/lb	kg-cal/kg	.5556
lb/sq in	kg/sq cm	.07031	Btu/sq ft	gr-cal/sq cm	.2713
lb/cu in	gr/cu cm	27.68	Btu/cu ft	kg-cal/cu m	8.899
lb/cu ft	kg/cu m	16.018	<b>Weight</b>		
<b>Length</b>			grams	ounces†	.03527
inches	mm	25.40	ounces†	grams	28.350
inches	cm	2.540	pounds†	kg	.4536
inches	meters	.0254	pounds†	tonnes	.000454
feet	meters	.3048	US tons	kg	907.2
feet	km	.0003048	US tons	tonnes	.9072
yards	meters	.9144	long tons	kg	1016
yards	km	.0009144	<b>Area</b>		
miles	km	1.609	sq inches	sq mm	645.2
<b>Volume</b>			sq inches	sq cm	6.452
cu inches	cu cm	16.387	sq feet	sq meters	.09290
cu inches	liters	.01639	sq yards	sq meters	.8361
cu feet	cu meters	.02832	sq miles	sq km	2.590
cu feet	liters	28.317	acres	hectares	.4047
cu yards	cu meters	.7646	†avoirdupois pounds and ounces.		
fl ounces	cu cm	29.57	<b>Pressure</b>		
US gal	cu meters	.003785	psig	kPa	6.894
US gal	liters	3.785	psig	bar	0.06803
			psig	atm	0.06803
			psig	in hg	2.036
			psig	in H <sub>2</sub> O	27.68
			psig	g/cm	70.307

### TEMPERATURE

DEG. F TO DEG. C		°F		°C	
(*F-32) x 5/9 = °C		°F	°C	°F	°C
0	-17.8	7	-13.9	30	-1.1
1	-17.2	8	-13.3	35	1.7
2	-16.7	9	-12.8	40	4.4
3	-16.1	10	-12.2	45	7.2
4	-15.6	15	-9.4	50	10.0
5	-15.0	20	-6.7	55	12.8
6	-14.4	25	-3.9	60	15.6

### PIPE SIZING GUIDE Based on 10' HD Loss/100' Pipe

1/2" = 2 GPM	1 1/2" = 30 GPM	4" = 320 GPM
3/4" = 5 GPM	2" = 50 GPM	5" = 600 GPM
1" = 10 GPM	2 1/2" = 90 GPM	6" = 900 GPM
1 1/4" = 20 GPM	3" = 160 GPM	8" = 2000 GPM

## SIZING GUIDELINES

### COMMONLY USED ABBREVIATIONS, EQUIVALENTS & FORMULAE

PSI = POUNDS PER SQUARE INCH  
 GPM = GALLONS PER MINUTE  
 1 REFRIGERATION TON = 12,000 BTU/HR  
 1 COOLING TOWER TON = 15,000 BTU/HR

EWT = ENTERING WATER TEMP.  
 LWT = LEAVING WATER TEMP.  
 1 GALLON = 8.33 LBS. (WATER)  
 1 CT FT = 7.48 GALLONS

$$\text{PUMP HP} = \frac{\text{GPM} \times \Delta P (\text{FT. H.D.})}{3950 \times (0.65 \text{ to } 0.75)}$$

$$Q = 4.5 \times \text{CFM} \times \Delta h = \text{Btu/h}$$

$$\text{KW} = \frac{\text{AMPS} \times \text{VOLTS} \times 0.85 \times 1.73}{1,000}$$

$$\text{FT H.D.} = \text{PSI} \times 2.31$$

$Q = C_p \times \text{LB/HR} \times \Delta T$   
 $C_p = \text{COMMON VALUE}$   
 PAPER = .324  
 COPPER = 0.094  
 P.S. = .41  
 hdpe = 0.81  
 PLATE/FRAME = 1000

$Q = U \times A \times \Delta T_{LN}$   
 U FACTORS -  
 SHELL/TUBE (H<sub>2</sub>O/H<sub>2</sub>O) = 250  
 OIL/H<sub>2</sub>O = 50  
 TANK PLATE COIL = 100  
 COIL IN TANK = 80

$$\text{BLOWER HP} = \frac{\text{CFM} \times \text{IN OF H}_2\text{O}}{6350 \times E (0.65 \text{ to } .9)}$$

$$\Delta T \text{ RISE (BLOWER)} = 10^\circ\text{F}/1 \text{ PSI}$$

### CHILLER SIZING—INJECTION MOLDING SIZING GUIDELINE

30#/HR H.D. POLYETHYLENE = 1 TON  
 35#/HR L.D. POLYETHYLENE = 1 TON  
 OR POLYPROPYLENE

40#/HR POLYSTYRENE = 1 TON  
 45#/HR P.V.C. = 1 TON  
 40#/HR P.E.T. = 1 TON

MOLD ROOM HEATING = 25 BTU/FT<sup>2</sup>  
 NON-MOLD ROOM HEATING = 50 BTU/FT<sup>2</sup>  
 (-10°F-70°F) (16' CEILING)  
 MOLD ROOM AIR COND. = 80 FT<sup>2</sup> TON  
 AIR COMP. 1 HP = 4 SCFM @ 100 P.S.I.G.

### CHILLER SIZING—OTHER EQUIPMENT

AIR COMP. W/AFT COOLER = .2 TON/HP  
 VAC PUMP = .1 TON/HP

HYDRAULIC COOLING = .1 TON/HP  
 BARREL COOLING = 1 TON/IN.  
 SCREW DIA.

### WEIGHED WATER TESTS

$$\frac{\text{GPM} \times \Delta T}{24} = \text{CHILLER TON}$$

$$\frac{\text{GPM} \times \Delta T}{30} = \text{TOWER TON}$$

$$\frac{\text{\#/MIN} \times \Delta T}{200} = \text{CHILLER TON}$$

$$\frac{\text{\#/MIN} \times \Delta T}{250} = \text{TOWER TON}$$

### PRODUCTION ESTIMATOR

Cycle Time (Sec.)	Shots Per Hour	Cycle Time (Sec.)	Shots Per Hour	Cycle Time (Sec.)	Shots Per Hour	Cycle Time (Sec.)	Shots Per Hour
1	3,600	16	225	31	114	46	78
2	1,800	17	211	32	112	47	76
3	1,200	18	200	33	109	48	75
4	900	19	189	34	106	49	73
5	720	20	180	35	102	50	72
6	600	21	171	36	100	51	70
7	514	22	163	37	97	52	69
8	450	23	156	38	94	53	67
9	400	24	150	39	92	54	66
10	360	25	144	40	90	55	65
11	327	26	138	41	87	56	64
12	300	27	133	42	85	57	63
13	276	28	128	43	83	58	62
14	257	29	124	44	81	59	61
15	240	30	120	45	80	60	60



**PLASTIC PROCESSING EQUIPMENT, SYSTEMS AND SUPPLIES**

(see lines on back)

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