# Centrex Technical Sales

**804-354-1511**

## Pump Inquiry Application Data Sheet

**The following information is required to properly process an inquiry:**

Requested by_____ Date _____

Customer_____

Address_____

Telephone_____Fax_____Email_____

Description of product to be pumped

_____

Temperature _____ Specific Gravity _____or Density_____ lb./gal.

Viscosity _____ Centipoise (CPS) or other

Desired Flow Rate _____GPM or lb./hr.

*Discharge Head _____ ft. or PSI

**Suction Conditions:**

Is the pump withdrawing from a vacuum?_____Yes_____No

If so, how much?_____in. Hg.

Is the product level on the inlet side of the pump above or below the center line of the pump inlet?

Above_____ Below _____By how much?_____ in. or ft.

Tubing _____ in. Diameter _____Length _____ No. of elbows _____No. of tees

Tubing _____ in. Diameter _____Length _____ No. of elbows _____No. of tees

No. of size of valves in suction piping:

_____ No._____ Size (in.)

_____ No._____ Size (in.)

Other equipment in the suction piping

_____

*If you do not know the desired discharge head, please provide the following:

**Discharge Conditions**

Is the final destination of the pump above or below the center line of the pump inlet?

Above_____Below _____By how much?_____in. or ft.

Tubing _____in. Diameter _____ Length _____No. of elbows _____No. of tees

Tubing _____in. Diameter _____ Length _____No. of elbows _____No. of tees

Tubing _____in. Diameter _____ Length _____No. of elbows _____No. of tees

No. and size of valves in discharge piping:

_____ No._____ size (in.)

_____ No._____ size (in.)

_____ No._____ size (in.)

Other equipment and the drop or pressure requirement (PSI) in the discharge piping

_____

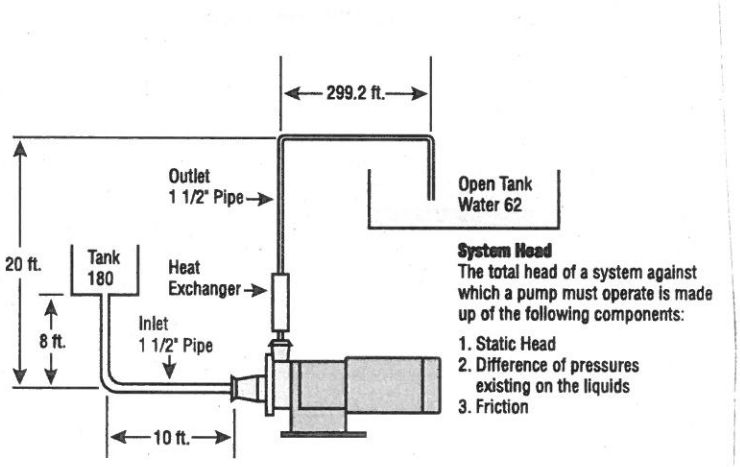
# How To Calculate Required Pressure

**Example:**
Find the head under these conditions: Pump is drawing from an open tank to discharge through a heat exchanger into an open tank that is 20 ft. above the pump. The supply is 8 ft. above the pump. 50 GPM flow is required.

**Solution:**

| | |
|---|---|
| 1. Height to be pumped is 20 ft. minus 8 ft. | =12.0 ft. |
| 2. Friction loss from pipe is (8 ft. + 10 ft. + 20 ft. + 299.2 ft. = 337.2 ft.) 337.2 x .25 ft./ft. | =84.3 ft. |
| 3. Friction loss from 3 elbows is = 0.6 ft. | = 0.6 ft. |
| 4. *Heat Exchanger loss 2.31 times 16.5 PSI | =38.1 ft. |
| The Total Head Loss is..... | .135.0 ft. |

*Heat Exchanger information supplied by manufacturer.




# Determining Net Positive Suction Head (NPSH)

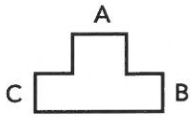
Due to the hydraulic principles involved, some level of NPSH is required in order for the pump to run efficiently and without cavitating. The NPSH required for each sanitary centrifugal pump model has been determined by careful testing. The results of these tests are illustrated by the NPSH requirement shown on the pump curve.

To determine the NPSH available, first add the physical height of the liquid above the centerline of the pump inlet to the pressure above the liquid (in an open tank this is atmospheric pressure). From this total, subtract the friction losses of the line and fittings on the suction side and the vapor pressure of the liquid at the operating temperature. The remainder is the NPSH available. This number must meet or exceed the NPSH required in order for the pump to function properly.

# Loss of Head Due to Friction in Feet per Foot of Stainless Steel Tubing and in Feet for Sanitary Fittings

Notes:

1. Flow Elbows—R/D = 1.5
2. Flow Through Tees—Flow A to B Port C capped off.
3. Test Medium—Water at 70°F
4. 16 gauge tubing was used for the measurements when the outer diameter (O.D.) was between 1" - 3" and 14 gauge tubing was used with the 4" O.D. measurement.




*Calculated data for estimating purposes only. Consult your tubing manufacturer with specific questions.

| Capacity in U.S. G.P.M. | O.D. - 1" I.D. - .870" | | | O.D. - 1.5" I.D. - 1.370" | | | O.D. - 2" I.D. - 1.870" | | | O.D. - 2.5" I.D. - 2.370" | | | O.D. - 3" I.D. - 2.870" | | | O.D. - 4" I.D. - 3.834" | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tubing | Elbow | Tee | Tubing | Elbow | Tee | Tubing | Elbow | Tee | Tubing | Elbow | Tee | Tubing | Elbow | Tee | Tubing | Elbow | Tee |
| 2 | .01 | .01 | .1 | | | | | | | | | | | | | | | |
| 4 | .025 | .02 | .2 | | | | | | | | | | | | | | | |
| 5 | .035 | .025 | .25 | | | | | | | | | | | | | | | |
| 10 | .12 | .06 | .4 | .02 | .01 | .15 | .005 | .015 | .1 | | | | | | | | | |
| 15 | .25 | .1 | .8 | .04 | .02 | .25 | .013 | .02 | .15 | | | | | | | | | |
| 20 | .43 | .22 | 1.5 | .06 | .03 | .3 | .02 | .025 | .2 | .005 | .02 | .1 | .003 | .02 | .06 | | | |
| 25 | .66 | .4 | 2.3 | .08 | .04 | .4 | .025 | .03 | .25 | .006 | .03 | .15 | .004 | .03 | .08 | | | |
| 30 | .93 | .7 | 3.3 | .105 | .06 | .55 | .035 | .05 | .3 | .008 | .05 | .2 | .005 | .04 | .1 | | | |
| 35 | 1.22 | 1.25 | 5.2 | .135 | .09 | .8 | .04 | .06 | .4 | .011 | .06 | .25 | .006 | .05 | .13 | | | |
| 40 | | | | .17 | .11 | 1.0 | .05 | .08 | .5 | .015 | .07 | .3 | .007 | .06 | .15 | | | |
| 45 | | | | .21 | .16 | 1.3 | .063 | .1 | .6 | .02 | .09 | .35 | .008 | .065 | .18 | | | |
| 50 | | | | .25 | .2 | 1.6 | .073 | .12 | .7 | .022 | .1 | .4 | .01 | .07 | .2 | | | |
| 60 | | | | .34 | .35 | 2.2 | .1 | .18 | .9 | .03 | .12 | .45 | .015 | .08 | .25 | | | |
| 80 | | | | .57 | .76 | 3.7 | .16 | .3 | 1.5 | .05 | .15 | .55 | .02 | .1 | .4 | | | |
| 100 | | | | .85 | 1.35 | 5.8 | .23 | .44 | 2.3 | .075 | .18 | .6 | .03 | .11 | .5 | .008 | .04 | .1 |
| 120 | | | | 1.18 | 2.05 | 9.1 | .32 | .64 | 3.3 | .105 | .21 | 1.0 | .04 | .13 | .6 | .01 | .05 | .15 |
| 140 | | | | | | | .42 | .85 | 4.5 | .14 | .23 | 1.25 | .05 | .16 | .8 | .013 | .06 | .2 |
| 160 | | | | | | | .54 | 1.13 | 5.8 | .17 | .28 | 1.6 | .07 | .2 | 1.1 | .015 | .07 | .25 |
| 180 | | | | | | | .67 | 1.45 | 7.4 | .205 | .31 | 2.0 | .08 | .21 | 1.3 | .02 | .08 | .3 |
| 200 | | | | | | | .81 | 1.82 | 9.0 | .245 | .35 | 2.5 | .1 | .26 | 1.6 | .025 | .09 | .4 |
| 220 | | | | | | | .95 | 2.22 | 11.0 | .29 | .41 | 3.0 | .12 | .3 | 1.9 | .028 | .1 | .5 |
| 240 | | | | | | | 1.10 | 2.63 | 13.5 | .34 | .48 | 3.7 | .14 | .33 | 2.2 | .035 | .11 | .55 |
| 260 | | | | | | | | | | .39 | .53 | 4.5 | .165 | .39 | 2.5 | .04 | .115 | .6 |
| 280 | | | | | | | | | | .45 | .61 | 5.3 | .19 | .42 | 2.8 | .045 | .12 | .65 |
| 300 | | | | | | | | | | .515 | .7 | 6.2 | .22 | .5 | 3.1 | .05 | .13 | .7 |
| 350 | | | | | | | | | | .68 | 1.05 | 8.5 | .28 | .67 | 4.1 | .07 | .15 | .9 |
| 400 | | | | | | | | | | .86 | 1.55 | 11.0 | .36 | .88 | 5.2 | .085 | .18 | 1.2 |
| 450 | | | | | | | | | | 1.05 | 2.25 | 13.5 | .44 | 1.1 | 6.6 | .105 | .2 | 1.5 |
| 500 | | | | | | | | | | | | | .54 | 1.4 | 8.0 | .13 | .23 | 1.75 |
| 550 | | | | | | | | | | | | | .64 | 1.7 | 9.5 | .15 | .27 | 2.1 |
| 600 | | | | | | | | | | | | | .75 | 2.05 | 10.2 | .175 | .3 | 2.5 |
| 650 | | | | | | | | | | | | | .87 | 2.41 | 13.0 | .2 | .34 | 2.8 |
| 700 | | | | | | | | | | | | | 1.0 | 2.8 | 15.0 | .23 | .4 | 3.4 |
| 750 | | | | | | | | | | | | | | | | .26 | .43 | 3.8 |
| 800 | | | | | | | | | | | | | | | | .3 | .5 | 4.4 |
| 850 | | | | | | | | | | | | | | | | .33 | .56 | 5.0 |
| 900 | | | | | | | | | | | | | | | | .37 | .62 | 5.7 |
| 950 | | | | | | | | | | | | | | | | .41 | .7 | 6.3 |
| 1000 | | | | | | | | | | | | | | | | .45 | .8 | 7.0 |
| 1100 | | | | | | | | | | | | | | | | .53 | 1.06 | 8.6 |

# Conversion Factors

### Length

| | | | |
|---|---|---|---|
| Meters | x | 3.281 | = Feet |
| Centimeters | x | 0.394 | = Inches |
| Millimeters | x | 0.0394 | = Inches |

### Mass

| | | | |
|---|---|---|---|
| Kilograms | x | 2.2 | = Lbs. |
| Gallons Of Water | x | 8.34 | = Lbs. |
| Cubic Feet of Water | x | 62.4 | = Lbs. |
| Pounds | x | 0.454 | = Kilograms |

### Volume

| | | | |
|---|---|---|---|
| Liter | x | 0.264 | = Gallon |
| Cubic Feet | x | 7.48 | = Gallon |
| Lbs. Of Water | x | 0.119 | = Gallon |
| Imperial Gallon (British) | x | 1.2 | = Gallon (U.S.) |
| U.S. Gallon | x | 3.785 | = Liter |

### Pressure

| | | | |
|---|---|---|---|
| Feet of Water | x | 0.433 | = PSI |
| Inches of Hg. | x | 0.491 | = PSI |
| Atmosphere | x | 14.7 | = PSI |
| Meters of Water | x | 1.42 | = PSI |
| Kilograms/sq. Centimeter | x | 14.22 | = PSI |
| Bar | x | 14.7 | = PSI |

### Pressure (continued)

| | | | |
|---|---|---|---|
| Atmosphere | x | 33.9 | = Feet of Water |
| PSI | x | 2.31 | = Feet of Water |
| Inches of Hg. | x | 1.13 | = Feet of Water |

### Flow

| | | | |
|---|---|---|---|
| Lbs. Of Water/Hour | x | 0.002 | = GPM |
| Lbs. Of Fluid/Hour / Specific Gravity | x | 0.002 | = GPM |
| Cu. Meter/Hour | x | 4.4 | = GPM |
| Kg. Of Water/Minute | x | 0.264 | = GPM |
| Liters/Minute | x | 0.264 | = GPM |
| GPM | x | 3.785 | = Liters/Minute |

### Power

$$\text{Liquid HP} = \frac{\text{GPM x Head ft. x Specific Gravity}}{3960}$$

$$\text{BHP} = \frac{\text{GPM x Head ft. x Specific Gravity}}{3960 \times \text{Pump Efficiency}}$$

### Viscosity

$$\frac{\text{Centipoise}}{\text{Specific Gravity}} = \text{Centistokes}$$

Centistokes x 4.64 = SSU (Approx.)

### Temperature

(1.8 X °C) + 32 = °F

.555 (°F – 32°) = °C

Degrees Kelvin – 273.2 = Degrees Centigrade

# Vapor Pressure Chart