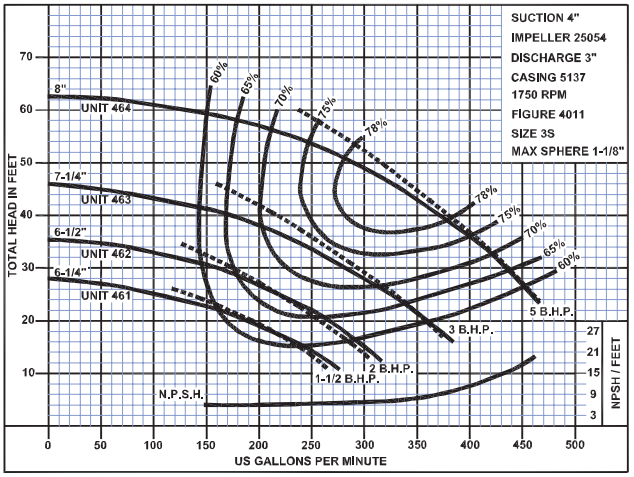
Engineering Data



Also, use these correction curves only for centrifugal pumps of conventional design in the normal operating range, with open or closed impellers. Do not use for mixed flow or axial flow pumps. To avoid the effect of cavitation make certain there is ample NPSH.

Use only on uniform liquids. Gels, slurries, paper stock and non-uniform liquids may produce widely varying results.

For most centrifugal pump applications the viscosity of the liquid should not exceed 3000 SSU unless experience has indicated a higher figure is practical.

V. Liquid Temperature

Temperature of the liquid should be taken into consideration with regard to:

1. Viscosity - (Generally not important factor with water at normal temperature) See Par IV.
2. Vapor Pressure - Very important for hot water and vaporous liquids (See NPSH Par XII).

VI. Solids in Suspension

Solids in suspension may restrict the use of a pump. Refer to DEMING characteristic curves for maximum allowable solids. Should there be any doubt regarding the use of a pump for liquids containing solids in suspension, please refer to the factory. Sizes of solids should always be indicated when referring to a sump or sewage pump.

VII. Well Information

At Sea Level a shallow Well Water Pump may generally be used with a suction lift of up to about 25 feet maximum. A deep well pump is necessary for greater suction lifts at sea level. At higher altitudes, however, the maximum suction lift becomes less and less. (See Table No. 9 Par XVI Column 5).

For Deep Well Installations it is important that the pumping level be ascertained. This is the level of the water while the pump is operating at its rating. It is this figure upon which the deep well pump "lift" is based, rather than the static level.

The well diameter is important for all Jet, deep well plunger, and especially Vertical Turbine and Submersible installations.

The well capacity should also be determined before the pump selection is made, least a pump of too great a capacity be installed, causing the well to be pumped dry. A pump which will over-pump the well can result in considerable damage to the well, the pump, and the motor or engine. Since wells will often produce varying capacities at different depths, it is often recommended that a well be tested to make certain that the required capacity can be obtained and at what depth or "pumping level".

VIII. Total Dynamic Head

Total Dynamic Head - (TDH) is the sum, in feet, of:

1. Suction Lift from lowest water level to pump. (If positive suction head - subtract this figure from the sum of No.'s 2 thru 5).
2. Friction in suction line (See Tables 1, 3, & 5 Par. XVI)
3. Discharge Head or Vertical Distance from Pump to point of discharge.
4. Friction in discharge line (See Tables No. 1, 3, & 5 - Par XVI)
5. Discharge Pressure required (if any) at point of discharge.

Since Centrifugal Pumps develop a "velocity head" measured in feet, it is important that "pressure head" requirements in psi be changed to "feet" before determining the total dynamic head. Thus under Item 5, above, if a discharge pressure of 20 psi were required, this should be changed to 46.2 feet of water since each psi at sea level is equal to 2.31 feet of water. For liquids having a specific gravity other than that of water, this figure must be corrected by dividing the number of "feet of water" by the specific gravity of the liquid being pumped. Using the above example 20 psi discharge pressure of fuel oil having 0.7 SG would be:

PSI x 2.31 / SG	=	Feet Head
20 x 2.31 / .7	=	66'

Reciprocating pumps, on the other hand, are generally selected on the basis of pressure in pounds per square inch. Therefore, "head in feet" will generally have to be converted into psi.

$$PSI = \frac{\text{Feet Head} \times SG}{2.31}$$

NOTE: In any case, if a liquid is other than water, special attention should be given to specific gravity and to viscosity. Information on selecting pumps for these liquids is covered in Par. III and IV.

IX. Pump Speed

The Speed of a centrifugal pump is important in that any variation in speed will create a change in the capacity, head, and horsepower. Changing the speed on a centrifugal pump will affect the performance as follows:

Capacity - Changes in direct proportion to the change in speed.
Head - Changes as the square of the change in speed.
Horsepower - Changes as the cube of the change in speed.
Efficiency - Remains approximately the same.