Design Considerations

Technical Pump Selection

To properly specify a pump to meet a specific application requirement, use a copy of the application worksheet found on page 96. Please feel free to contact our application engineering department or your local Hydra-Cell distributor for assistance in calculating the appropriate pump for your application.

Chemical Compatibility

Chemical compatibility of the pump materials of construction with the pumped fluid is a critical design consideration. Factors that must be reviewed as part of chemical compatibility include:

- Temperature
- Concentration
- Presence of other chemicals

Temperature

Temperature is an involved issue in the selection of a pump. Factors that must be reviewed as part of this evalutation include:

- Stability of fluid
- Fluid end components
- Hydraulic end lubricity
- Vapor pressure

Inlet Pressure

Inlet pressure to the pump is determined by the design of the pump system: flooded (gravity fed); suction lift; or pressure fed. The preferred design is a gravity fed flooded system.

NPSH (Net Positive Suction Head)

Two NPSH values are involved in pump selection: NPSHr (required head) and NPSHa (available head). NPSHa must be equal to or greater than NPSHr. If not, the pressure in the pump inlet will be lower than the vapor pressure of the fluid, and cavitation will occur. Use the following calculations as a guideline only.

Calculating NPSHa

Use the following formula to calculate NPSHa:

NPSHa = Pt + Hz - Hf - Ha - Pvp

where:

Pt = Atmospheric pressure (use Atmospheric Pressure chart below)

Hz = Vertical distance from the liquid surface to the pump centerline (if liquid is below pump centerline, Hz is a negative value)

Hf = Friction losses in suction piping

Ha = Accleration head at pump suction (see Calculating Acceleration Head at right)

Pvp = Absolute vapor pressure of liquid at pumping temperature

Atmospheric Pressure at Various Altitudes

Altitude (ft)	Pressure (ft of H_2O)
0	33.9
500	33.3
1000	32.8
1500	32.1
2000	31.5
5000	28.2

Calculating Accleration Head (Ha)

Use the following formula to calculate Ha losses. Subtract this figure from the NPSHa, adn compare the result to the NPSHr of the appropriate Hydra-Cell pump (NPSHr cruves in pump specification section).

$$Ha = \frac{L \times V \times N \times C}{K \times G}$$

where:

Ha = Accleration head (ft of liquid)

L = Actual length of suction line (ft) – not equivalent length

V = Velocity of liquid in suction line (ft/sec); [V = GPM x (0.408 ÷ pipe I.D.^{2})]

N = RPM of crank shaft

C = Constant determined by type of pump: (0.066 for the Hydra-Cell pump)

K = Constant of compensate for compressibility of the fluid – use:

1.4 for de-aerated or hot water

1.5 for most liquids

2.5 for hydrocarbons with high compressibility

G = Gravitational constant (32.2 ft/sec^2)

Minimizing Acceleration Head

- Keep inlet lines less than 6 ft (1.8 m) long
- Use appropriate size I.D. inlet hose
- Use flexible hose (low pressure hose, non-collapsing) for inlet lines
- Minimize fittings (elbows, valves, tees, etc.)
- Use suction stabilizer on the inlet

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Application Worksheet

Let us help you determine the best pump solution for your application. Simply fill in the customer information and application data below and fax to our applications department or your local Wanner distributor.

Customer Information

Date: _____

Name: _____

Company: _____

Address: _____

City / State / Zip: _____

Phone: _____

Fax: _____

email: _____

General application description: (i.e. new or existing, pump used presently, etc.)

_____

_____

_____

_____

_____

_____

Application Data

1. Fluid Characteristics

   Fluid name: _____

   Solids present? Describe: _____

   Solids Concentration and Size: _____

   Fluid Temperature: _____ Normal _____ Max _____ Min

   Viscosity: _____ Max _____ Min

   Specific Gravity: _____

   Flow Rate: _____

2. Pump Performance Requirements:

   Inlet Pressure: _____

   Inlet Vacuum: _____

   Suction Lift: _____

   Static Head: _____

   NPSHa: _____

   Total Length of Pipe: _____

   Pipe Diameter: _____

   # of Elbows: _____ 45° _____ 90°

   Duty Cycle: _____

   _____

Wanner Recommendation:

Pump Model Order Code: _____

Valve Model Order Code: _____

Repair Kit Order Code: _____

Tool Kit Order Code: _____

Pump rpm: _____

List Price: _____

Lead Time: _____

cc: _____ Rep _____ Mgr _____ File