TECH BULLETIN 002

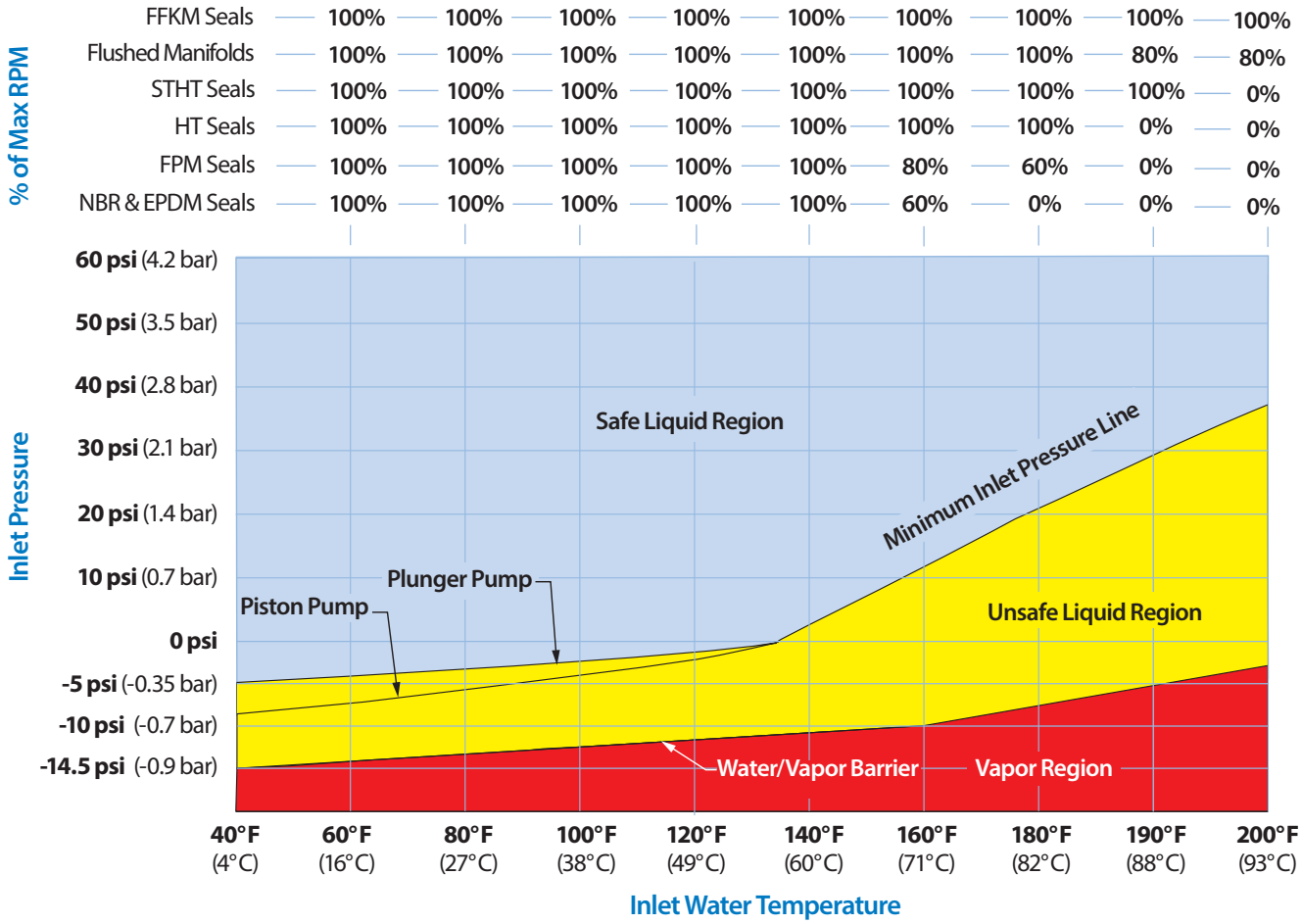
The Pumps with Nine Lives

Inlet Pressure vs. Water Temperature

As the temperature of the pumped water increases, so does the likelihood of vaporization and cavitation. Proactively adjusting multiple system factors (as listed below) when pumping fluids at elevated temperatures is essential to prevent these adverse conditions, thereby ensuring optimal performance.

- Pressurize the inlet if the fluids are above 130° F
- Reduce the pump RPM
- Install an inlet pressure stabilizer in the inlet line upstream from the pump
- Increase the inlet line size of the pump
- Utilize an adequately sized and baffled supply tank

Maximum Pump Speed vs. Water Temperature



PRESSURIZED INLET

With ambient temperatures, piston pumps can handle a maximum negative suction of -8.5 psi (20 feet of water) and plunger pumps can handle a maximum negative suction of -5 psi (11.5 feet of water). As the temperature of the water increases, the vapor pressure (pressure required to remain liquid) also increases. Increasing the inlet pressure to the pump can minimize the increased risk of vaporization, which can cause cavitation.

A booster pump is often necessary to achieve the recommended inlet pressure with an elevated temperature. When selecting a booster pump, it should be capable of providing approximately twice the maximum system flow rate to ensure adequate flow into the pump while maintaining the required inlet pressure. See the chart on the front page for recommended inlet pressure based on fluid temperature.

REDUCTION IN RPM

In addition to increasing the inlet pressure to the pump as temperature increases, reducing the pump rpm will also offer added protection. Decreasing the rpm lowers the velocity of the fluid as it travels through the pump, reducing the water's vaporization risk, which minimizes the risk of cavitation and its damaging effects.

At higher temperatures and increased inlet pressure, pump operation at high rpm can increase wear on the high and low-pressure seals. Review the chart on the front page for recommended rpm reductions based on water temperature and seal type.

INLET PRESSURE STABILIZER

If the inlet lines supplying the pump are more than five or six feet long, are fed with a booster pump, or are supplying high-temperature water, Cat Pumps recommends using an inlet pressure stabilizer directly upstream from the pump to reduce turbulence in the inlet line.

Note: An inlet pressure stabilizer will not function with a negative suction inlet.

INCREASED INLET LINE SIZE

To maintain a low inlet line velocity, the inlet line supplying the pump with fluid should match the size of the pump's inlet port size, preferably be one size larger. Over-sizing the inlet line is even more critical when pumping liquid at an elevated temperature. Undersizing the inlet line will compound the problems of high-temperature vaporization and increase the risk of cavitation. See individual pump data sheets for information on the pump inlet port size.

ADEQUATELY SIZED AND BAFFLED SUPPLY TANK

When pumping ambient or high-temperature fluid from a supply tank, there are a few guidelines to ensure optimum performance and reduced risk of vaporization and cavitation. The tank should be enclosed, have at least two baffles, and have a capacity of 6 to 10 times the maximum system flow per minute.

Informative “Whiteboard Sessions” videos cover a variety of technical topics in short and easy-to-comprehend lessons conducted by Cat Pumps engineering.

Cat Pumps
Technical Services Department

1681 94th Lane N.E., Minneapolis, MN 55449-4324 P: (763) 780-5440 F: (763) 780-2958 E: techsupport@catpumps.com www.catpumps.com