MAGNES Solves | ENTRAINED VAPOR & POOR INLET CONDITIONS

Pumping gravel is not a joke – and neither is cavitation. Most pumps fail when pumping vapor mixtures, but there is a solution.

Within a piping system, vapor can form in three locations: inside the supply tank, within suction piping and inside the pump. Vapor forms additively through these locations, creating a liquid/vapor mixture that is fed to a pump's pressure stages.

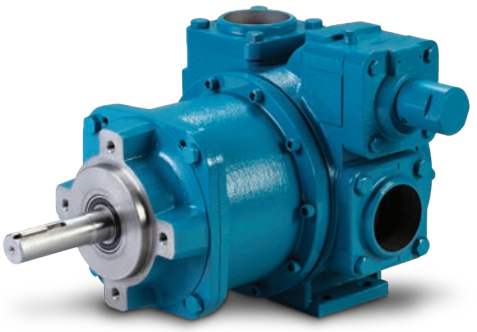
Often, operators focus on a Net Positive Suction Head (NPSH) comparison of Required and Available (NPSHr vs. NPSHa) pressure. Vapor forms within a pump chamber if the pump requires more NPSH than a system provides. Yet this ignores two of the three vapor sources: the supply tank and suction piping. Systems with a NPSH surplus often still have liquid/vapor mixtures due to vapor that forms upstream.

Regardless of where vapor forms (tank, piping, or pump), all vapor implodes within a pump's pressure stages. Vapor implosion produces shock waves that sound like gravel passing through piping. These shock waves can impact pump, seal and inline components as frequently as 10,000 times per second. This rapid, repetitive shock-wave phenomena is known as cavitation. Depending on the intensity and frequency of the cavitation, the pump's internals degrade, leading to breakdowns, leaks and costly downtime and repairs or replacement.

Cavitation is a significant pain point in the transfer of chemicals, solvents and hydrocarbons, many of which operate near vapor pressure. Both centrifugal and gear pumps fail when operating under sustained cavitation, liquid/vapor mixtures and poor NPSH applications.

- Gear pumps fail fast with vapor and thin liquids because of the galling of internal parts and failed bushings.
- Centrifugal pumps rely on converting velocity head to pressure head, which is not possible with compressible entrained vapor. Magnetic-drive centrifugal pumps rely on high surface speed ceramic bushings that fail when exposed to non-lubricating vapor.

A permanent solution: With a sheer sensitive design, low internal velocities, self-lubricating elements and open internal flow paths, positive displacement (PD) sliding vane pumps are well equipped to battle the causes of cavitation when handling liquid/vapor mixtures. Building upon 70 years of designing technologies that can pump liquefied gases, Blackmer® has recently developed a new weapon to neutralize the negative effects of cavitation through the creation of the MAGNES Series Sliding Vane Magnetic Drive Pump. MAGNES boasts capabilities to process mixtures of up to 20% vapor content, producing an effective zero-NPSHr. MAGNES is rated to receive vapor that is formed both upstream and within the pump. This is especially convenient for fluids that are stored in vacuum tanks and liquefied gas tanks.



The MAGNES Series is available in 3- and 4-inch models in either ductile-iron or stainless-steel construction with flow rates up to 520 gpm (1,968 L/min). While operating at a speed of just 400 rpm, MAGNES generates the same pressures and flow rates of other pumps that operate at 3,600 rpm, with no excessive heat buildup or component wear. As a true self-priming pump, MAGNES will never require pre-flooding at startup and is well-suited for continuous-duty operation. Since the pump also has no cumulative dry-run time limit, it provides confidence that any type of dry-run event will not result in catastrophic pump failure. **Solve all pumping issues due to entrained vapors and poor inlet conditions, while staying leak-free with the low to zero NPSHr & cavitation and vapor mixture handling ability of MAGNES, the Sliding Vane Magnetic Drive Pump.**

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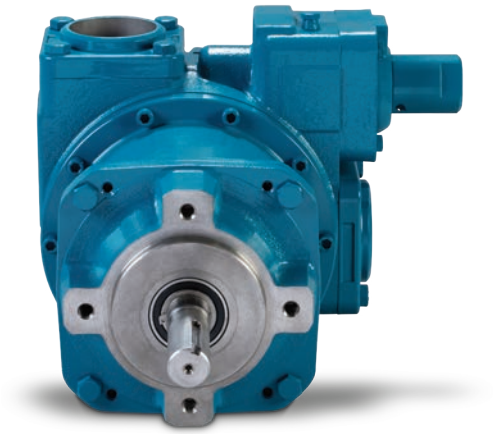


MAGNES Series Sliding Vane Magnetic Drive Pump

COMPETITION

- **Centrifugal Pumps**

Due to fast internal velocity and inability to process compressible vapor, centrifugal pumps require significant NPSHr. Considering many systems have low NPSHa allowances, vapor and resulting cavitation are common occurrences that can ruin a pump's impeller, liner and bushings. Also, since vapor is not lubricating, it's likely that there will be insufficient cooling and lubrication of the bushings and magnet housing. Cavitation, NPSH and vapor issues stack up to be major pain points for magnetic-drive centrifugal pumps.

- **Gear Pumps**

Due to meshing metallic components and contracting internal flow paths, gear pumps rely on process liquid for lubrication. Meanwhile, vapor mixtures are inherently non-lubricating and cause premature galling and wear of internal components. Furthermore, gear pumps struggle with thin-viscosity liquids, as the gears rely on thick viscosity to cushion meshing contact. The result: liquid/vapor mixtures depreciate a gear pump's useful life, with its service window measured in day and hour terms, instead of multi-year terms.

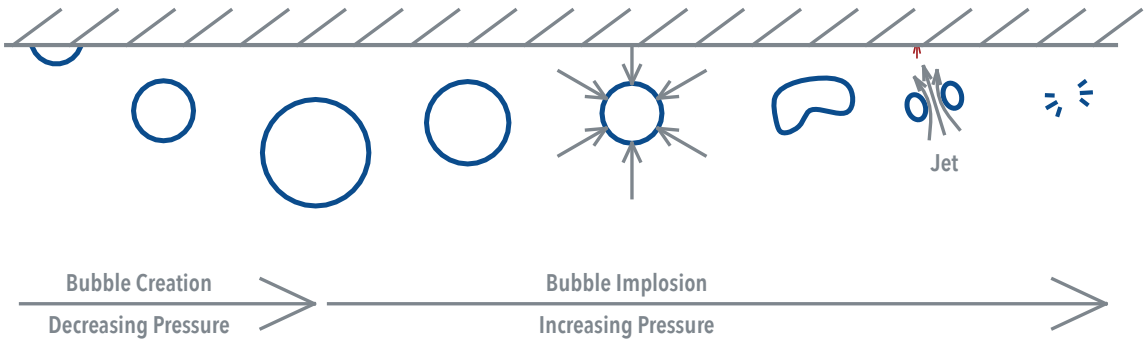
GLOSSARY

Magnetic-Drive Pump – a pump that uses a balanced magnetic field to transmit torque from the prime mover to the pump, in lieu of a continuous shaft

Cavitation – often destructive and noisy, cavitation is the implosion of entrained vapor within a pump's pressure stages

Net Positive Suction Head (NPSH) – the margin of pressure over vapor pressure as measured at the suction nozzle of a pump

Entrained vapor and poor inlet conditions degrade the performance of centrifugal and gear pumps, often leading to costly pump damage.



To learn more, visit us at blackmer.com/MAGNES-VaporMixtures.

Where Innovation Flows

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