

## MAGNES Solves | DRY RUN

Dry run seems simple – “operating a pump without any liquid” – but the consequences of doing it are anything but.

**For centrifugal pumps**, dry-run operation results in one of three catastrophic outcomes: 1) bearing failure, 2) magnet coupling failure and/or 3) containment failure. Each failure causes rotating elements to seize and can result in liquid leaks. The root cause is the high rotational speeds of centrifugal pumps, which are often in excess of 3,600 rpm. High rotational speeds cause aggressive friction and heat within rotating elements, including the hardened bushings.

Centrifugal manufacturers attempt to prevent **Bearing Failure** by offering various **bushing material** options, but each option is vulnerable to dry-run failure:

- **Silicon Carbide** cracks within seconds of beginning dry-run operation and requires use of power-monitoring systems to turn the pump off within seconds
- **Protective Coatings** applied to traditional bushings provide a short cumulative wear allowance that depletes over time, is not renewable and quickly leads to failure
- **Composite Blends** have self-lubricating benefits, but wear quickly and sacrifice useful life at the fast rotational speeds of centrifugal pumps, leading to failure

**Magnet Couplings** can fail from 1) eddy-current overheating (with metallic containment shells) and 2) aggressive decoupling action that results from bushing failure.

**Containment Breaches** can occur from 1) fast contacting speeds amongst internal components and 2) likely bearing failure. If the couplings don't fail first, rotating elements wear against the containment shell until it wears enough for a costly and hazardous liquid breach to occur.

**For gear pumps**, dry-run operation permanently damages internal components, because internal gears, idlers, bushings and pins are contacting elements that wear and crack during dry-run operation.

**A permanent solution** is rotary sliding vane pumps, which use non-metallic self-lubricating components that are capable of indefinite dry-run operation. Specifically, the **MAGNES Series Sliding Vane Magnetic Drive Pump** from Blackmer® provides an innovative alternative to centrifugal and gear pumps, mag-drive or otherwise. Key design differentiators within MAGNES are 1) its reduced operational speed and 2) the utilization of a proprietary non-metallic containment shell that prevents eddy-current overheating. As a magnetic drive pump, MAGNES has no dynamic seals, making it ideal for difficult-to-seal liquids that are too valuable, dangerous or hazardous to leak. Even during dry-run operation, MAGNES can pull a vacuum, strip lines and create suction lift exceeding 25 feet (7.6 meters) while ultimately working continuously during and after any planned or unanticipated dry-run events.



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 MAGNES 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 pump dry run events, while staying leak-free with indefinite dry run ability of MAGNES, the Sliding Vane Magnetic Drive Pump.**

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## COMMON CONTEXTS FOR DRY RUN

**Unanticipated Dry Run** – Caused by operator error, faulty instrumentation or system transients

- Competing magnetic-drive pumps are damaged catastrophically from dry run and require expensive monitoring and control systems. These monitoring systems are unreliable, as they often produce nuisance service trips. If ignored, they also leave systems vulnerable to inevitable dry-run failure.
- MAGNES offers peace-of-mind reliability with no cumulative dry-run time limit

**Self Priming** – Required when a pump isn't pre-flooded (i.e., suction lift or batch process)

- Self-priming centrifugal pumps are cost prohibitive and have limited capability: <250 gpm (950 L/min), <250 feet (75 meters) at 100 psi (6.9 bar). Further, they are not true self-primers since they require initial fill of the pump's suction cavity in order to operate.
- Internal gear magnetic-drive pumps suffer from material galling
- MAGNES offers exceptional suction lift that can exceed 25 feet (7.6 meters)

**Line Stripping** – Required when liquid is to be recovered (i.e., cost savings or batch process)

- Self-priming centrifugal magnetic-drive pumps cannot push air. Therefore, they cannot line strip.
- Internal gear magnetic drive pumps suffer from material galling
- MAGNES offers exceptional product recovery and liquid withdraw from piping and hoses when operating in both forward and reverse rotation

## 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

**Dry Run** - operating a pump without any liquid present

**Pre-Flooding** - introducing liquid into a pump before it begins to operate

To learn more, visit us at [blackmer.com/MAGNES-DryRun](http://blackmer.com/MAGNES-DryRun).



MAGNES Series Sliding Vane Magnetic Drive Pump

## COMPETITION

### • Centrifugal Pumps

Heat generation and bearing friction in centrifugal pumps that run dry are the greatest concerns, especially since operating speeds of 3,000 rpm or more are required to achieve the adequate flow rate and pressure. Another concern is eddy currents that build up in the pump's containment shell, which leads to additional heat generation. Expensive monitoring and control systems promise to protect from unanticipated dry run; however, nuisance service trips often leave these systems ignored and vulnerable to dry-run failure

### • Gear Pumps

Dry-run operation causes galling on gears and internal components. Soon, material wear causes decreased performance, accelerated wear and eventual breakdown.

### • Other Pump Technologies That Claim Dry-Run Capability

Some pump styles use coated bushings that allow dry-run operation, but they deliver only about two hours of cumulative dry-run time. This makes it difficult to know how much of the allotted dry-run time has actually passed with no warning for when the dry-run time allowance will be used up.

**Blackmer**  
PSG

1809 Century Avenue SW  
Grand Rapids, MI 49503-1530 USA  
P: +1 (616) 241-1611 • F: +1 (616) 241-3752  
[info@blackmer.com](mailto:info@blackmer.com)  
[blackmer.com](http://blackmer.com)

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