
Question 73: What criteria do you use to justify seal-less pumps in place of conventional double-seal pumps in LPG services? What are the operational and reliability issues associated with these types of seal-less pumps?

PHILLIP NICCUM (KP Engineering)

Seal-less pumps can be either mag drive or canned motor. Seal-less pumps are now commonly used all over the refinery and petrochemical industries. The U.S. is quite a bit behind Europe in the use of seal-less pumps. Europe has been specifying seal-less for multiple services since the mid-1980s.

What criteria are used to justify seal-less pumps in place of conventional double seal pumps in LPG services?

1. The primary drivers are customer specifications and longevity of service.
2. Mag drive pumps are commonly and successfully used for refinery services below 400°F such as LPG, alkylate, amines, aromatics, caustic, kerosene, naphtha, and sour water and sulfuric acid. However, they can be designed for higher temperature applications.
3. Mag drive pumps can be designed to API-685 for refinery process applications.
4. Compared to Best Available Control Technology (BACT) seal designs with double seals and seal support, the seal-less offerings are much less costly.
5. A rough percentage cost difference between seal-less pumps and a single-seal pump would be a premium of about 25%. This cost differential is generally accepted based on the expected longevity and costs savings associated with not having to support a mechanical seal.

What are the operational and reliability issues associated with these types of seal-less pumps?

1. Mag drive pumps facilitate the use of common drivers.
2. In light hydrocarbon services where fluid vaporization is more of an issue, mag drives have an advantage because the heat generated from the motor is outside of the fluid envelope.
3. With respect to bearing life, the bearing materials and configuration are designed for the LPG applications. For light services such as LPG, carbon graphite bearings typically provide a very good life span.

4. An external recirculation line from the discharge of the pump to the bearings prevents flashing due to heat generation at the bearings. This system will look similar to a typical API Plan 11.

5. The concerns with seal-less pumps in LPG services are dry running and improper venting, which can occur with a complete loss of suction.

6. In the event that the torque on the synchronous mag drive exceeds its capability and the inner and outer magnets lose their synchronization, the bearing chamber can overheat in just a few minutes—even in one minute—due to the induction currents that occur. However, over-torque is less of an issue in light oil services such as LPG.

7. Low- and high-motor amp monitors are often used to shut down the pump if the pump is unloaded or over-torqued.

8. In time, the magnets lose their magnetism with the rate of loss increasing with operating temperatures above 300 to 500°F, depending on the magnet material selection. In low-temperature LPG service, loss of magnetism is not an issue.

ACH BEZON [United Refining Company (URC)]

Criteria for using a seal-less pump:

1. The area is highly hazardous.

2. Venting a pump seal to the atmosphere or flare is not possible/acceptable.

3. The pumped fluid is very acidic, caustic, or abrasive. Seal-less pumps do not like to operate under abnormal conditions. Any condition where vapor may be seen in the pump, the pump runs dry, or has low flow can lead to lubricity issues and can lead to damaged bearings. Furthermore, an upset operation that which causes high torque (high flow, high pressure) can potentially cause demagnetization and pump failure. Power monitoring is available and recommended to safeguard the pump by shutting down during abnormal conditions and can prevent costly maintenance repairs.

LANKA PANILLA (Arivegry LLC)

Absence of seal, thus seal leak fires, is an incentive to consider seal-less pumps in LPG service. However, the low efficiency may cause a temperature rise in LPG. There are two types of seal-less pumps: mag drive and canned motor pumps. A mag drive pump has limitations from its differential head and efficiency. In a canned motor pump, bearing wear has to be monitored by instrumentation to prevent failure and loss of containment.

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