

PUMP SEAL FAILURES 101:



The Engineer's Guide to Why They Occur and How to Prevent Them

A leaking pump is a common, frustrating problem that maintenance engineers face on the plant floor. When pumps leak, it causes unnecessary downtime and costly repairs or replacements as operators work to fix the problem.

The most common cause of pump downtime is seal failure. While pump seals are meant to keep pumps from leaking, several design and operational errors often lead to their breakdown or premature failure:



- Excessive forces
- Harsh environments
- Operational misuse
- Poor design choice

With proper seal design, correct pump usage, and regular maintenance and upkeep, engineers can mitigate the chance of a failure, keeping their systems up and profitable. This white paper will detail the dangers of seal failures, why they occur, and how to prevent them.



The Dangers of Pump Seal Failures

Pump seal failures are a drag on your facility's productivity and a risk factor for your workers and your products. A single leak caused by a seal failure can quickly turn into a big problem from all the downtime and repair costs. As this occurs again and again, those costs will often exceed the initial cost of the pump itself. Pump seal failures can also lead to regulatory compliance issues if things get bad enough, causing you to incur hefty fines from the EPA and other regulatory agencies.

There are also the day-to-day environmental hazards that seal failures create in your facility. When product leaks onto the floor, it can cause workers to slip and injure themselves. Leakage can also be flammable, leading to dangerous fires and explosions that can cause major damage and loss of life.

Since leaks cause product to spill out of the pump, it can also create a way for contaminants to get in. This is a major hazard for applications in the food production or pharmaceutical industries, where strict sanitary conditions must always be met.

How and Why do Pump Seal Failures Occur?

There is not a single reason why pump seal failures occur. Several different issues can cause them, many of which are avoidable when you specify the right pump design and use the pump properly.

Here are the main reasons why your seals might be failing:



Running the Pump Dry

Most pump seals require some type of fluid to lubricate the materials around the shaft during operation. If you run the pump dry and there are no fluids available for lubrication, it will cause excess heat and friction. Mechanical seals cannot handle running a pump dry and will break down rather quickly if no product is there to cool the seal.



Overly Gritty or Abrasive Product

Gritty or abrasive product will wear down a seal if the seal design and material were not chosen appropriately. While seals inevitably wear down over time due to contact friction between the shaft and the seal, extra abrasion from a product or process fluid will cause the seal to wear down much faster and significantly reduce seal life.



Chemical or Physical Incompatibilities

Severe chemical or physical loading can reduce the life of a pump seal and potentially lead to rapid degeneration and malfunction. The harsher the chemicals or forces acting upon the pump, the faster a seal will fail.



Excessive Shock and Vibration

If a pump experiences too much shock and vibration, it can cause significant axial and radial play of the shaft. This will then lead to misalignment and a greater rate of pump leakage, reducing a seal's lifetime.



How and Why do Pump Seal Failures Occur? (continued)



Operator Error

If a pump is installed incorrectly, the shaft may become misaligned, causing pump seal failure similar to the result of excessive vibration. Other operator errors include over-tightening the fasteners, leaving dirt on the seal face, and incorrectly mounting the seals.



Harsh Environments

Uncontrolled heat or drastic temperature shifts can wear down a seal. Having to deal with significant pressure drops or spikes or the regular caustic washdowns present in pharmaceutical applications can also increase the wearing process.

Any changes in operations parameters can theoretically lead to increased pump seal wear if not accounted for. Adjusting seal chamber pressure, speed, shaft seal dimensions, the pumped medium, and the temperature around the pump can all result in damage to the seal.



Incorrect Pump Design or Seal Choice

If a pump is not designed correctly or you choose the wrong seal material, seal failure is imminent. This is a major cause of pump seal failure, though it is also one of the most avoidable issues if adequate time is spent upfront to determine the appropriate pump and seal combination.

How to Prevent Pump Seal Failures

While pump seal failures are a common problem, there are multiple steps that you can take to eliminate the common risk factors presented above. Here are the top ways for engineers to avoid pump seal failure:



Specify the Right Pump Design

Proper pump design all starts with sizing the pump correctly. This will ensure that the pump is equipped to handle the pressures and other forces that it will face during operation.

You will also want to choose the right type of seal for the application at hand. The goal is to choose a seal that can meet all your operational requirements.

Talking with manufacturers like Unibloc Pump can help to ensure that you select the right pump design. Unibloc Pump's experts have experience across many different applications, delivering tailored advice to your specific task. For example, if you need to take the pump apart frequently for cleaning, hard face seals will be too brittle of an option.



Reduce Installation Errors

Once you select the right pump and seal combination, it must be installed correctly to ensure proper performance. You need to use the right tools and equipment, or else you could damage the pump. Operators must also make sure to keep everything in alignment so that leaks are less likely to occur.



How to Prevent Pump Seal Failures (continued)



Use the Pump Correctly

The day-to-day use of a pump will be one of the biggest determinants of if a seal will last its lifetime or fail early. You will want to make sure that you do not run the pump dry. Instead, shutting it down when there is no product running through. If the pump is shaking and vibrating, this is a sign that your seals are getting worn down and that leakage is imminent.



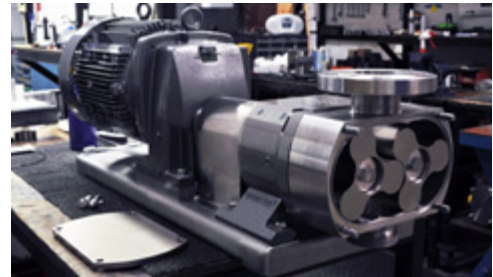
Perform Regular Maintenance and Upkeep

It is commonplace for certain industries and applications to neglect pump maintenance. Do not follow suit. To ensure that your pump seals are not consistently failing, you will want to fix any issues sooner than late so that you can address the problem when it is a simple repair versus having to shut everything down and buy new equipment.

For example, many production applications often run with a shaft seal leak. While this can be overlooked at first, that small leak can compromise the O-ring shaft seal, which penetrates other areas of the product. Now, instead of a somewhat simple fix, manufacturers will need to replace entire sets of equipment, shutting down production while they do so. Remember, you are not just losing capital from the cost of the replacement, but also from all the productivity you lose when not making product.

Since pump maintenance can vary based on your operations, you will want to talk with the engineers at Unibloc Pump to figure out the parameters of your application and determine your maintenance schedule. Unibloc Pump's experts will ask all the right questions so that you can reduce the risk of seal failure to keep your pumps and your operations running smoothly.

With proper seal design, correct pump usage, and regular maintenance, you can minimize the chance of a failure, keep your systems operating and profitable, and prevent seal failures and unnecessary and costly downtime.



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About Unibloc Pump

Headquartered in Kennesaw, Georgia, Unibloc Pump designs and manufactures positive displacement pumps for critical industries, including food and beverage, meat and poultry, pharmaceutical, bakery and confection, transportation, and many others. Unibloc Pump brings Tier 1 performance to the world's most demanding pump processing applications. In the daily battle against downtime and sanitary compliance, Team Unibloc stands shoulder-to-shoulder alongside its customers to solve every problem, meet every deadline, and drive Total Cost of Ownership performance better than any other vendor. uniblocpump.com



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Unibloc-Pump, LLC

1650 Airport Road Suite 110
Kennesaw, GA 30144
sales@uniblocpump.com
uniblocpump.com
770-218-8900

Ricebridge Works • Brighton
Road • Bolney, West Sussex
RH175NA • United Kingdom
sales@flotronicpumps.co.uk
flotronicpumps.co.uk
011-44(0)144 488 1871

Unibloc R&H
Stromberger Strasse 197
D-59269 Beckum
info@unibloc-rh.com
uniblocpump.de
+49-0-25-21/29918-42