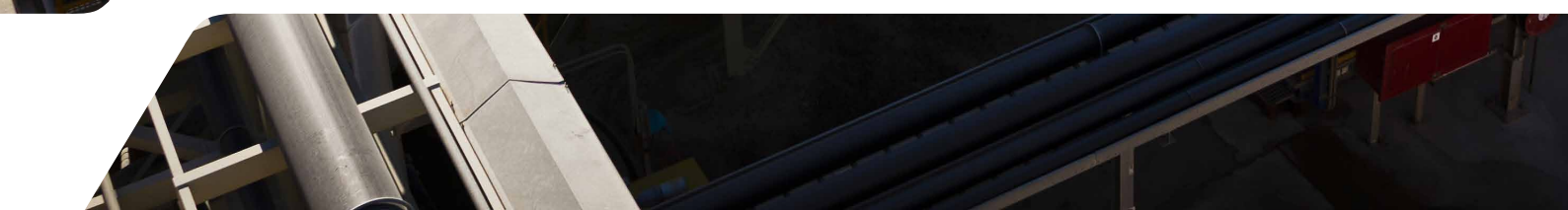
Responsible Mining

Mining & Minerals Industry Sealing Products

Environmentally-friendly sealing solutions save billions of gallons of water per year, while increasing the uptime of rotating equipment in mines and mineral processing applications.

AESSEAL®
ENVIRONMENTAL TECHNOLOGY



AESSEAL® is a world leading provider of quality mechanical seals – but we're more than just a supplier of new and replacement parts.

We are a mining industry pioneer with a total focus on achieving exceptional quality in terms of products, technical innovation, customer service and product support. Established in 1979, we've grown to become a major global player in the sealing industry, operating from 230 locations and supplying customers in 104 countries. AESSEAL® is an expert at sealing rotating equipment in the mining industry and have successfully sealed a wide range of equipment from slurry pumps to autoclaves worldwide.

Our unique modular technology enables us to respond quickly and effectively to even the most demanding technical challenge or delivery deadline. Our seals deliver increased reliability and reduced cost of ownership – and we have the evidence and customer references to prove it. We deliver exceptional service and exceed expectations. Everything we do – from manufacturing to distribution and product support – is focused on redefining the customer experience. We believe that, once we've worked together, you will never need to look for another supplier.

Reduce water consumption and increase equipment reliability? — Simple.

Besides holding one of the world's most comprehensive 'standard inventory' portfolios of mechanical seals, bearing seals, seal support systems and braided packing, we have made a massive investment in creating an industry-defining range of sealing products for the Mining & Minerals industry.

At the heart of this lies our unique modular technology, which means we're able to streamline the order process and deliver against even the most challenging lead times.

Our customer philosophy, like our ordering process, is simple: we'll do whatever it takes to deliver whatever is needed. Our aim is to consistently exceed expectations.

Investment.

We have invested heavily in testing and manufacturing equipment, and in state-of-the-art computer controlled machinery which has increased productivity and reduced manufacturing costs, bringing our customers the best 'value for money' sealing products in the industry. Determined to remain at the forefront of the engineering profession, we invest heavily in R&D, bringing you our customer the very latest in sealing technology. Nobody in our sector is doing more.

Modular Technology.

We have developed a unique and patented range of pre-engineered seal components which enables some 10 million different combinations to be configured, meaning we can rapidly assemble and despatch solutions to meet virtually any application faster and more cost-effectively than any other supplier. The result? Custom-fit quality with off-the-shelf turnaround and cost, and seals which surpass our customers' expectations for reliability.

Customer Service.

Our aim to redefine the customer experience is embedded within our culture. Everyone who works at AESSEAL® is encouraged to champion the customer's cause, to identify improvements in our products, and to challenge our business to find new and better ways of working.

We believe Exceptional is achievable, and offer above average guarantees (48 hour shipment of standard products as part of a seal management program) and a multi-lingual and always-open service (24 hours a day, 365 days a year). Our approach is constantly being recognized by our many repeat and valued customers.

Ethical.

We are totally committed to exceeding our corporate, environmental and social responsibilities. We further promote corporate responsibility throughout our supply chain.

> We empower our people to champion our customer's viewpoint so we can evolve new products that reduce downtime.

From a customer perspective.

In order to continuously improve our products and redefine our Customer's experience, we work as a team, sharing ideas and best practices across our international network. A commitment to delivering an exceptional experience defines our approach, and our focus as a business is on exceeding expectations. We empower our people to champion the customer's viewpoint, so we can constantly evolve new products and services. We see the world through their eyes. Here, you can see the impact of our work through theirs.

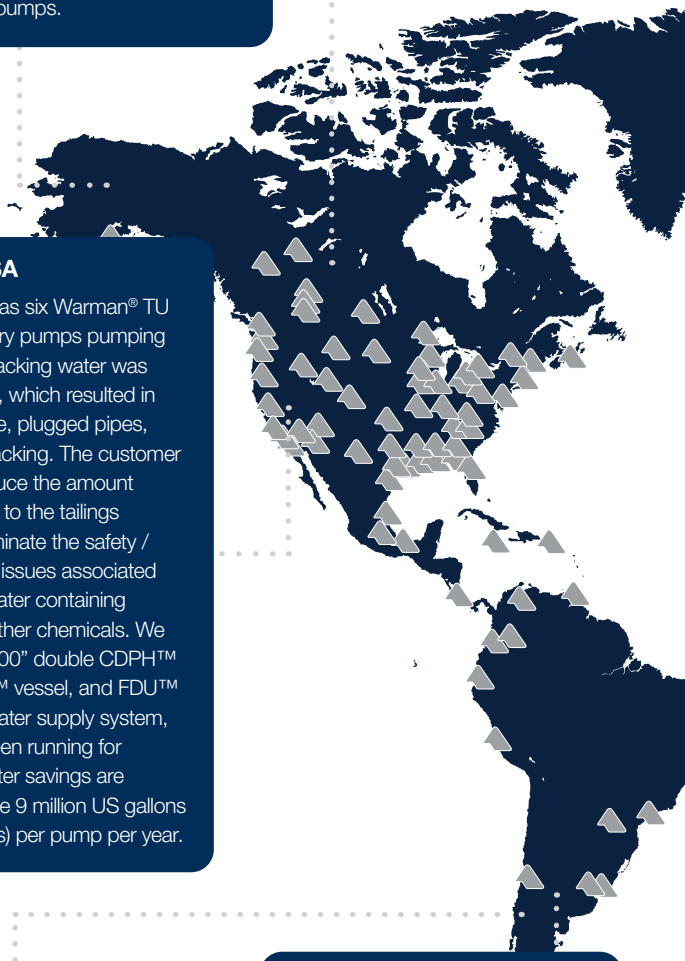
Lithium mine before the AESSEAL® solution

Lithium mine after Installing the AESSEAL® DMSF™ seals with SSE10-W™ systems

Customer Applications. Solved.

Alaska, USA

A Gold mine was flushing packed Warman® 8/6F-AH pumps with fresh water, and paying $131,000 per pump per year to treat the water prior to disposal.
We supplied six 5.000" CDPH™ double seals and PUMPAC-SOU™ (oil supply) systems. Payback was within 2 months, with ongoing savings of $786,000 per year for the six pumps.



Nevada, USA

A Gold mine has six Warman® TU AH 16x14 slurry pumps pumping tailings. The packing water was of poor quality, which resulted in sleeve damage, plugged pipes, and leaking packing. The customer wanted to reduce the amount of water going to the tailings pond, and eliminate the safety / environmental issues associated with leaking water containing cyanide and other chemicals. We supplied a 7.000" double CDPH™ seal, AES-15™ vessel, and FDU™ closed-loop water supply system, which have been running for 6 months. Water savings are estimated to be 9 million US gallons (34 million litres) per pump per year.

Chile

A Copper mine near Santiago has a large 16x14 cyclone feed pump that consumed 5 cubic meters /hour (22 US gallons / minute) of flush water on the packing.
Poor water quality resulted in large quantities of product leaking past the packing and being lost down the drain. We supplied a 9.000" CDPH™ seal and SSE25 SWO2™ seal support system that have been running for 18 months, saving 43,800 cubic meters (11.5 million US gallons) of water per year.

Argentina

A lithium mine located in Northern Argentina at 4000 meters above sea level was using single seals in Brine applications at different temperatures and concentrations. Single seals were selected at project level and once the plant was commissioned, seals failed within a few days/weeks. AESSEAL got the opportunity to offer a solution and installed DMSF™ seals with SSE10-W™ systems, supported via and FDU™. Seals operated extraordinary well and after the first 4 trials, a further 22 off seals were ordered and installed.

Canada

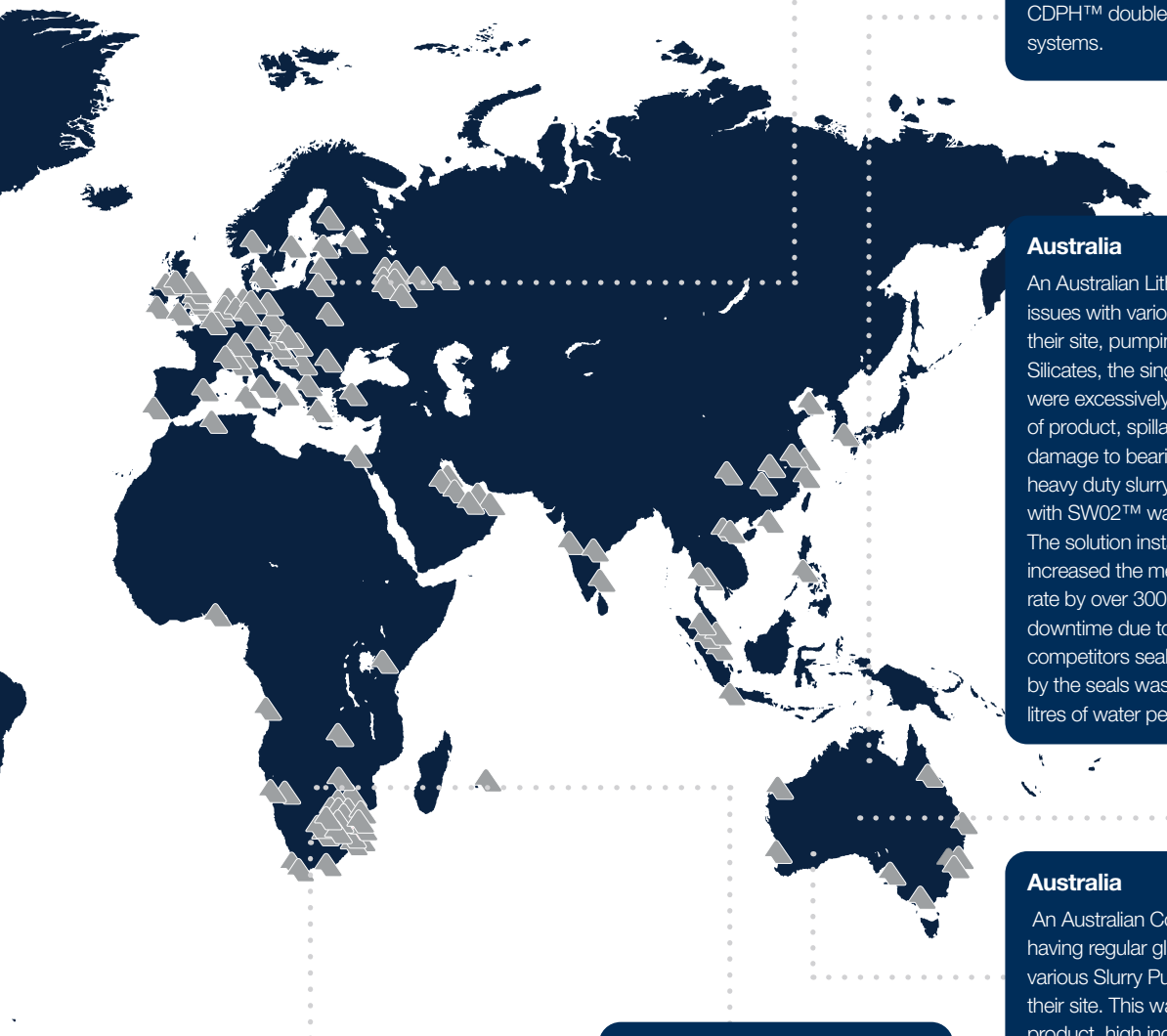
The potash industry has acknowledged that flushing the packing of a single brine slurry pump with 10 US gallons (38 litres) per minute results in the loss of over $500,000 per year of potash crystals that are dissolved by the fresh flush water. Changing the packing to our CDPH™ double seal with a water management system eliminates this product loss and has a payback period of only one week.

Poland

A Coal mine in Poland used a slurry pump to supply coal mud at 9 bar (135 psi) to a filter press. Flushed packing resulted in huge dilution of product, resulting in greatly increased filtration times and costs. The pump was sealed with a CDPH™ double seal and seal support system, resulting in no more water leakage on floor, and no product dilution.

Australia

A Mineral Sands mine has a Warman® 14/12 G-AH pump used 35 litres (9.2 US gallons) per minute of flush water on the packing. AESSEAL replaced the packing with an HDDSS™ dual seal along with an SW02™ seal support system that eliminated the flush water and product leakage. The upgrade paid for itself in just 3 weeks through the additional amount of product that could be pumped and the savings on flush water. AESSEAL then sealed 24 more pumps with pressures to 21 bar (308 psi) using HDDSS™ and CDPH™ double seals with seal support systems.



Australia

An Australian Lithium Mine was having issues with various pumps throughout their site, pumping Spodumene and Ferro Silicates, the single mechanical seals were excessively failing, leading the loss of product, spillage and down time and damage to bearings. AESSEAL installed heavy duty slurry dual mechanical seals with SW02™ water management systems. The solution installed by AESSEAL not only increased the mean time between failure rate by over 3000%, but also reduced downtime due to regularly replacing failed competitors seals. In addition water used by the seals was reduced to around 100 litres of water per year / seal.

Australia

An Australian Copper & Zinc Mine was having regular gland packing failures with various Slurry Pumping duties throughout their site. This was leading to a loss of product, high ingress of water, spillage and down time to change packing and worn shaft sleeves as well as contamination to the bearing barrels. AESSEAL installed heavy duty slurry seals with SW02™ water management systems. The installation of the SW02™ water management system removes water wastage and provides more cost-efficient cooling and lubrication than the previously packed arrangements. The solution installed by AESSEAL not only increased the mean time between failure rate by over 3000%, but also reduced downtime due to regular packing adjustments and replacements.

Botswana

A Diamond mine in a remote and arid region has Warman® 300, 12/10 L frame pumps pumping highly abrasive kimberlite slurry. We supplied ten CDSA™ 5.000" seals and SW02™ seal support systems. The impellers are replaced every 6 months, but the closed frame liners enable the seals to work for up to 16 months. Estimated water savings is 427,000 cubic meters (113 million US gallons) per year on ten pumps.

South Africa

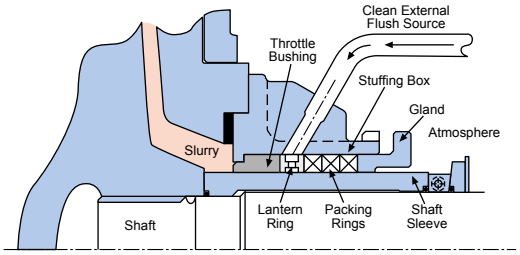
A Platinum mine using Metso slurry pumps could tolerate no product dilution. We installed 32 sets of CDPH™ double seals and SW02™ seal support systems, supported by one FDU™ to supply barrier water. Pumps and seals are running well after 2 years, even through periods of process upset. We added Flowfuse™ units to the SW02™ to prevent product dilution.

> We design and manufacture products which exceed expectations for reliability and performance.

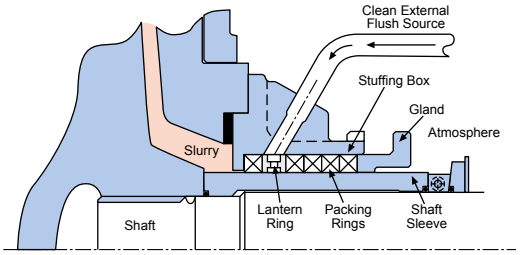
Traditional methods for sealing slurries have severe limitations

PACKING.

Packing has been used to seal pump shafts since the 1800's. Packing consists of specially engineered, square-braided "rope" which is placed in rings around the shaft and then compressed to reduce the leakage from the pump. The packing must be flushed with clean water to keep it cool and lubricated. Large slurry pumps require 2 to 40 US gallons (7.5 to 150 litres per minute of fresh flush water. Some of this flush water enters the process liquid causing dilution, and some of the flush water goes down the floor drain. In addition, packing requires continuous labour for weekly adjustment; the continuous rubbing results in damage to the shaft sleeve; and the rubbing consumes energy from the motor.



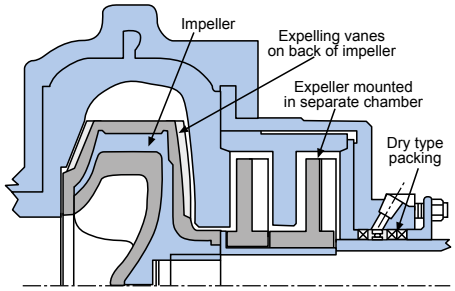
Packing Arrangement for wear services classes 3 and 4



Packing Arrangement for wear services classes 2 and 3

EXPELLERS.

Also called "dynamic seals", these consist of vanes that are either built into the back side of the impeller, or mounted separately on the impeller shaft. The vanes are angled to pump the slurry liquid back towards the impeller, thus creating an effective "seal" when the pump is running. Expellers do not work when the pump is stopped, thus a few rings of packing are normally used with the expeller to prevent leakage when the pump is stopped. Expellers are also limited to fairly low pressures, and cannot be used on the 2nd and higher pumps in series. The Hydraulic Institute advises that "for no-flush applications, care must be taken to ensure that any impeller back vanes do not cause a vacuum to develop in the seal chamber", which could cause dry-running and premature failure of a single mechanical seal. Therefore, expeller vanes are often removed or filled in when the pump is fitted with a single mechanical seal. It is not necessary to remove the expeller vanes when the pump is fitted with a double seal and seal support system.



Expeller arrangements (a) on back of impeller, and (b) in chamber

Before the AESSEAL® solution

After installing the AESSEAL® double seal and tank system

Change the seal environment to extend the life of the seal.

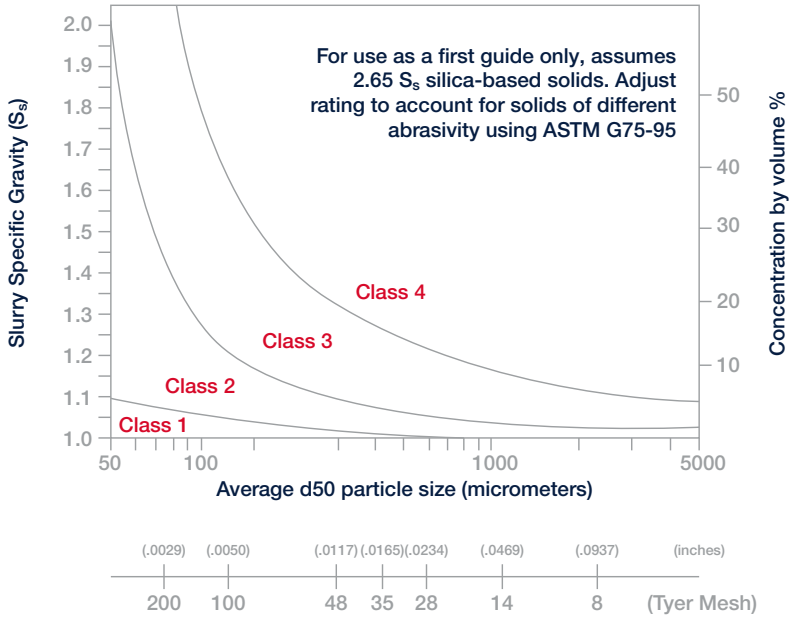
AESSEAL® has successfully sealed thousands of slurry pumps, and found that the best way to seal tough mining slurries is to use a double mechanical seal and to CHANGE THE SEAL ENVIRONMENT through two simple steps:

1. Use a CLOSED FRAME LINER to keep the high-velocity slurry away from the seal, and

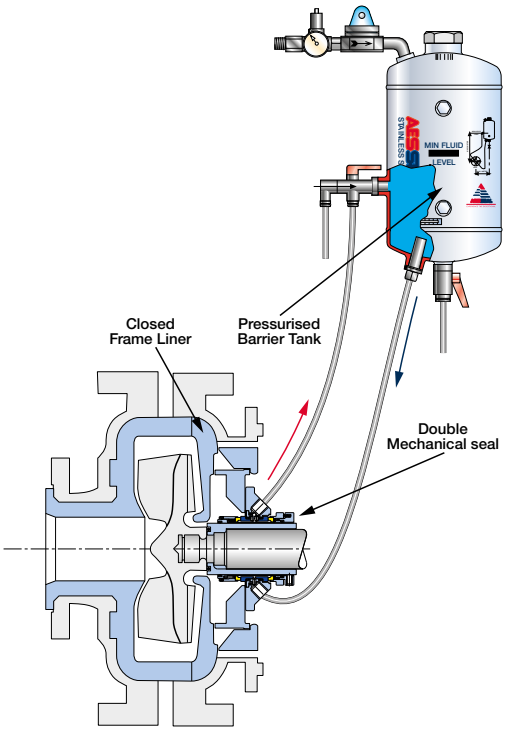
2. Use a PRESSURISED BARRIER TANK system to feed clean water to the area between the double seals at a pressure higher than the product pressure, thus creating a **clean and stable fluid film** for the seal faces.

The Hydraulic Institute recommends (ANSI/HI 12.1-12.6 2011) the use of dual pressurised seals on slurry pumps
"…when the limits in Table 12.3.8.3.8 are exceeded (i.e., solids concentration >50% by volume, or specific gravity >1.5, or average d50 particle size >1,000 µm), or when there is a potential for entrained air in the slurry…"
This recommendation would apply to many Class 2, 3, and 4 slurries, and to all frothing pumps.

Service class chart for slurry pump erosive wear



AESSEAL® recommended slurry-sealing strategy



Diagrams above and on facing page provided courtesy of Hydraulic Institute, www.Pumps.org, Parsippany, NJ

Our Product Range

For Mining and Slurry Applications

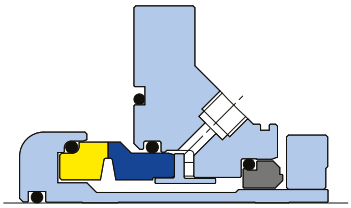
Packing

AESSEAL® offers a range of gland packing that has been designed and manufactured to reduce plant operating maintenance costs. AESSEAL® offers trapezoidal cross section packing along with the regular square cross section packing. Trapezoidal cross section packing transforms to a square shape when compressed providing even pressure distribution over the entire stuffing box, avoiding leakage along the outer diameter and minimizing wear on both the packing and the shaft. This extends the life of the packing, improves the sealability and gives shorter run-in periods. The cost of packing is low when compared to the cost of down-time of a plant. Therefore, it is of the utmost importance to select the highest quality modern fiber packing in an inter-braided construction with optimized profiles to provide the most resilient, long-lasting packing sealing solution. You can find more information at www.aesseal.com/en/product/gland-packing

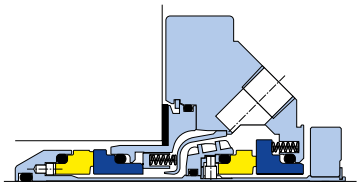
Mechanical Seals

AESSEAL® offers a range of mechanical seals suitable for the challenges of most mining applications. You can find more information at www.aesseal.com/en/product/cartridge-mechanical-seals

- The FGDSS-N™ – single mechanical seal that incorporates large radial clearances and a shrouded multi-spring design that increases seal life. The seal has hydraulically balanced seal faces that reduce seal face heat generation and improve reliability. Also available with special-alloy wetted components.

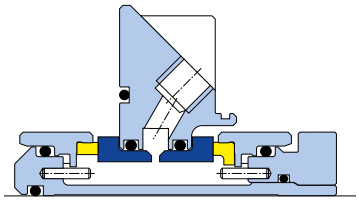


- The DMSF™ – range of double mechanical seals has been designed as a high-performance sealing solution for arduous applications. A double cartridge stationary seal with an integral pumping ring and monolithic seal faces. The DMSC™ is supplied without an integral pumping ring meaning that it is perfect for use on applications that demand the use of an external forced circulation device (e.g. PUMPPAC™). The seal is supplied with monolithic seal faces.

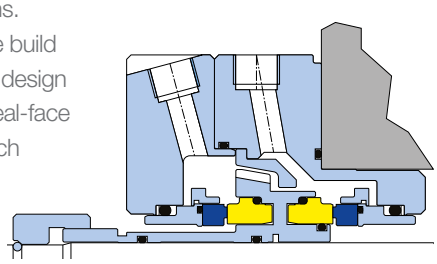


> The solution installed by AESSEAL® not only increased the mean time between failure rate by over 3000%, but also reduced downtime.

- The CDPH™ – double mechanical seal is designed to meet the arduous requirements of heavy duty slurry applications. Large ports and increased radial clearances enable the seal to maintain a stable fluid film for extended seal life. Metal parts are much more heavy duty. Exotic metal parts are available to resist corrosion and erosion.



- The HPVD™ – these robust seals are designed for use on difficult applications. High pressures robust seal-faces minimize the effects of pressure distortion. Monolithic seal-faces – maintain flatness under temperature fluctuations. Axial displacement capacity to accommodate machine build tolerance and differential thermal expansion. Seal-face design optimized using FEA and hydrodynamic algorithms. Seal-face loading factory set and statically tested prior to despatch Sculpted lug drive for improved torque transmission. Compact and robust design allows seal to be fitted on close bearing centre pumps.



Engineered Seals

11.5” (290mm) Mining Seal

Sealing applications in the mining industry are some of the most arduous and often require a custom engineered design. AESSEAL® has many years of experience in designing solutions for the industry that deliver improvements in reliability for our customers.

We work with you to design a sealing solution specifically for your application ensuring that the correct materials of construction are used that will deliver the optimum life and minimize maintenance. AESSEAL® has worked with mining companies all over the world typically producing over 13,000 custom engineered mechanical seals annually.

You can find more information at www.aesseal.com/mining

Seal Support Systems

You can obtain your mechanical seal and seal support system from the same supplier: AESSEAL®. All of our systems comply with the following international standards:

- ASME VIII Div.1
- PED 2014/68/EU
- GOST

A range of instrumentation options are available to adapt your seal support system to specific application requirements and to prevent damage to your large process pumps in the event of a power failure, etc. To find out more, please visit:
www.aesseal.com/en/product/seal-support-systems

SW2™
Water Management System

- Seal Support Systems – AESSEAL® offers a family of fully maintenance-free, self-topping, self-pressurising seal support systems that support our double mechanical seals with pressurised barrier fluid. Pressure ratings available up to 435 psi (30 bar) makes these seal support systems ideal for servicing multiple slurry pumps in a “series train”.

FDU™
Fluid Delivery Unit

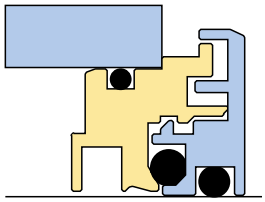
- Fluid Delivery Unit (FDU™) – The FDU™ is used where there is no plant water supply available for topping up the seal support systems, or where the plant water supply does not have the required pressure or water quality to maintain a clean fluid film on the seal faces (the barrier fluid pressure is typically 15 psi or 1 bar greater than the stuffing box pressure). The FDU™ normally uses water as the barrier fluid, but may also use a water/glycol mixture or oil in extremely cold climates for freeze protection.

Bearing Protection

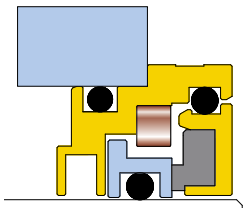
The LabTecta® and MagTecta™ range of bearing protectors has a proven track record of increasing the MTBR (Mean Time Between Repairs) for all rotating mining equipment, including pumps, motors, gearboxes, trunnions, and pillow block bearings. The LabTecta®OP is independently certified to IP-69K for superior protection against water and solid contaminants. With no contacting parts, it is ideal for oil splash, grease, or even dry-running conditions. A wide range of special designs are available to suit large axial movement, split seals, vertical-up shafts, self-aligning pillow-blocks, air purge (dusty conditions), all-stainless steel, and fully flooded applications.

For more information please visit:
www.aesseal.com/en/product/bearing-protection

LabTecta®OP
Bearing Protection



LabTecta®OP



MagTecta-S™

Preserving Our Environment.

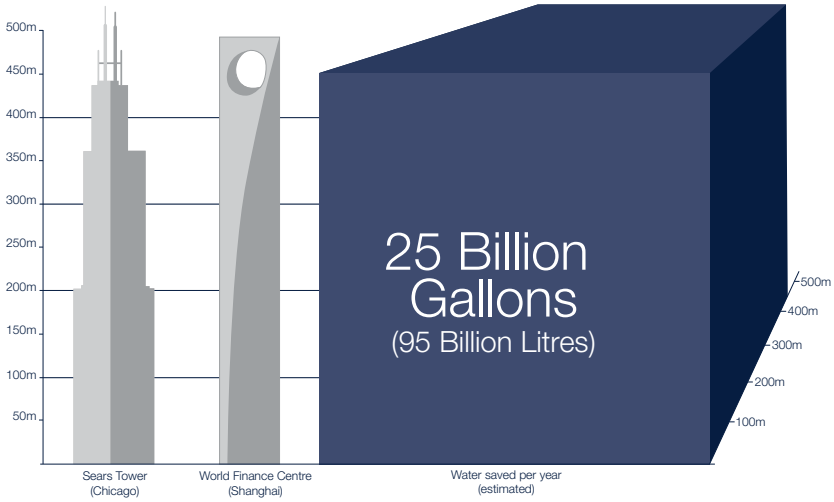
"Almost 3 billion people will face severe shortages of fresh water by 2025 if the world keeps consuming water at the current rates…"

The United Nations

"The simple fact is that there is a limited amount of water on the planet, and we cannot afford to be negligent in its use. We cannot keep treating it as if it will never run out…" Mohamed Al Baradei, International Atomic Energy Agency

The processing of metals and minerals requires large quantities of water, yet water is a finite resource. How does the Mining Industry reconcile this dilemma, and still remain good stewards of our environment? We must embrace technologies that can reduce the water footprint from mining operations.

One large, conventional slurry pump consumes 10 US gallons (37.8 litres) per minute of fresh water to cool and flush the packing. In one year, this amounts to over 5.2 million US gallons (19.6 million litres) of water added to the waste stream. A double seal and tank support system, which re-circulates the water instead of flushing it to drain or adding it to the slurry, eliminates this wasted water.

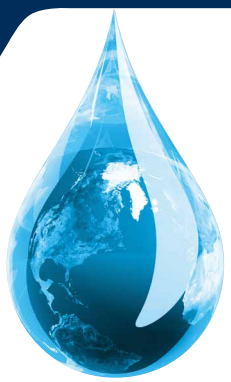


US Gallons per minute (GPM)	US Gallons per year	Litres per minute (LPM)	Litres per year
1	525,600	3.7	1,989,400
5	2,628,000	18.9	9,947,000
10	5,256,000	37.8	19,894,000
20	10,512,000	75.7	39,788,000
40	21,024,000	151.4	79,576,000

Water Usage Conversion Chart

With in excess of 15,000 systems running globally AESSEAL® water management systems contribute to water savings of over **95 Billion litres / 25 Billion Gallons per year!**

AESSEAL® estimates that our tank support systems installed on pumps around the world save **more than 25 billion US gallons (95 billion litres) of water per year.**



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For further information and safe operating limits contact our technical specialists at the locations below.

THE QUEEN'S AWARDS FOR ENTERPRISE: INNOVATION 2021

THE QUEEN'S AWARDS FOR ENTERPRISE: SUSTAINABLE DEVELOPMENT 2022

AESSEAL plc is certified to:

ISO 9001, ISO 14001, ISO/IEC 20000, ISO/IEC 27001, ISO/TS 29001, ISO 37001, ISO 45001 & ISO 50001

Use double mechanical seals with hazardous products.

Always take safety precautions:

WARNING

- **Guard your equipment**
- **Wear protective clothing**

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