Sustainable Sealing

The Pulp and Paper Industry

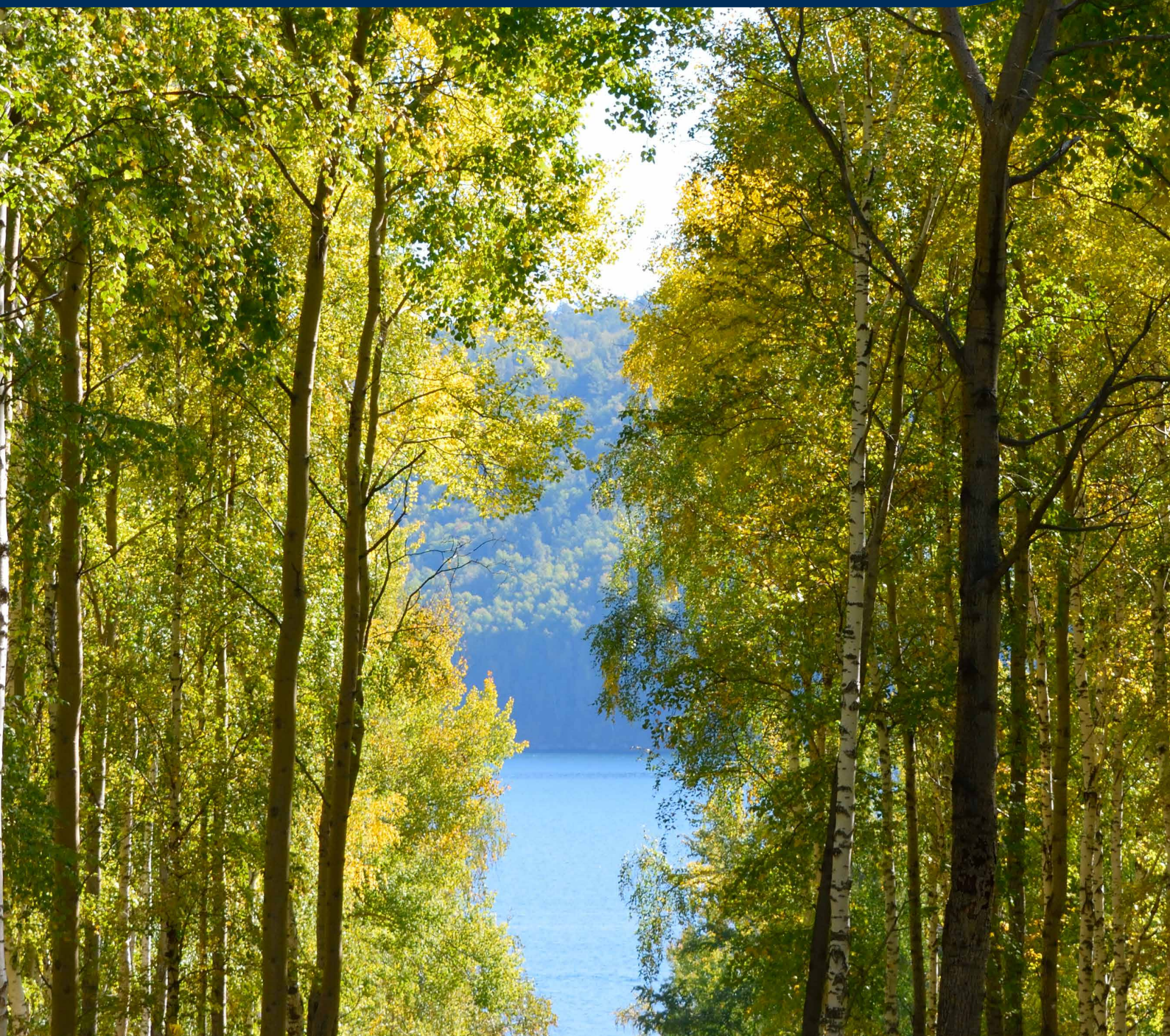
Reliability solutions designed to make the pulp and paper production process safe, profitable and sustainable, with a reduced carbon footprint.

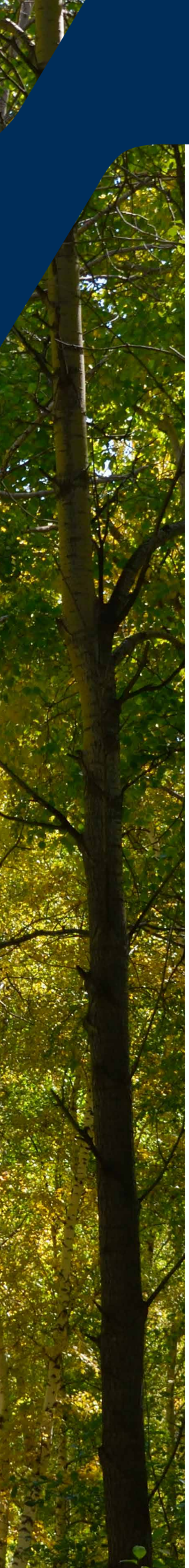
AESSEAL®
ENVIRONMENTAL TECHNOLOGY

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 pulp and paper 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 pulp and paper industry and has successfully sealed a wide range of equipment from process pumps to hydropulpers and screens 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.

AESSEAL® holds one of the world's most comprehensive 'standard inventory' portfolios of mechanical seals, bearing protection seals, seal support systems and braided packings, and we have invested in creating an industry-defining range of sealing products for the equipment found in the Pulp and Paper 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 multilingual 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.

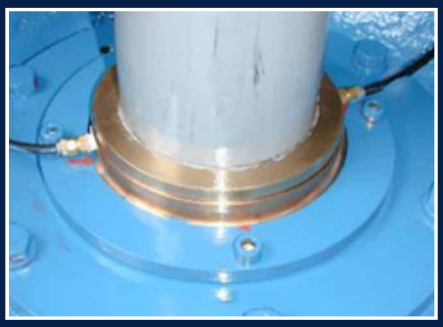
We are totally committed to exceeding our corporate, environmental and social responsibilities. We further promote corporate responsibility throughout our supply chain.

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

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. (For a full list of AES solutions download the 80 page application guide to Pulp and Paper Sealing).

Hydropulper Sealing



Labtecta®TE-OAP installed on a Hydropulper Gearbox.

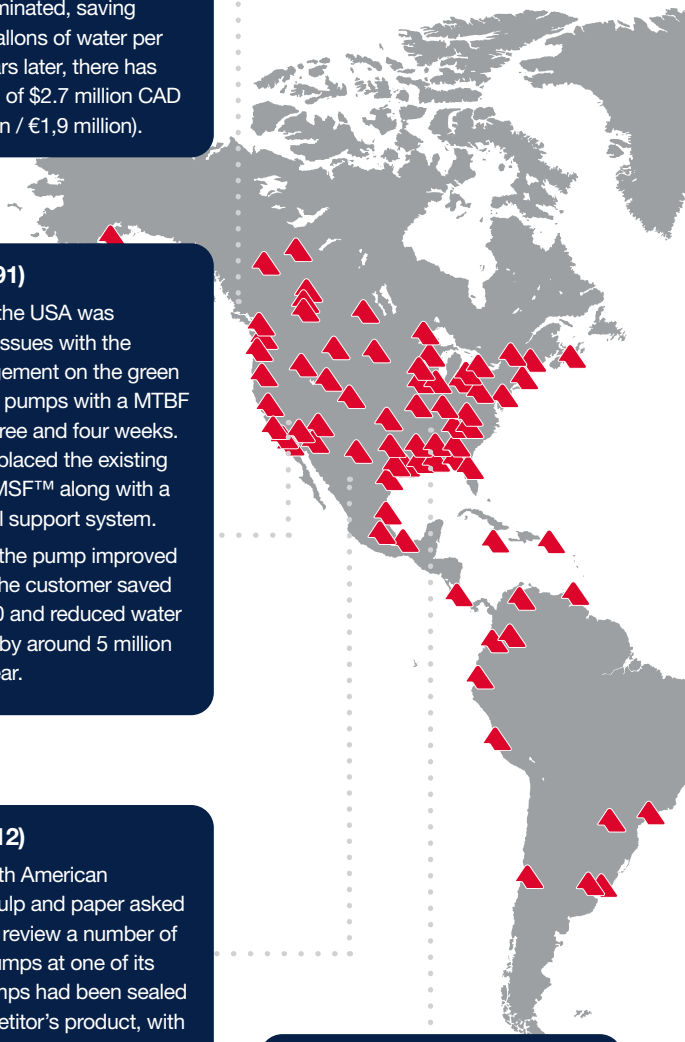
The previous application included lip seals where water contamination caused premature bearing problems and the units needed replacement after six months in operation. Because these units had high radial loads, the LabTecta® was designed with bigger radial clearances to avoid contact between rotor and stator in the event of shaft deflection.

The OAP (Outboard Air Purge) option was included to guarantee that pulp accumulating on top of the LabTecta® would not eventually work through the seal causing contamination of the gearbox.

Customer applications. Solved.

Canada (CS0026)

During an energy audit at a Canadian pulp and paper plant, AESSEAL® identified 15 packed evaporator area pumps that needed upgrading to mechanical seals due to the packing flush water diluting the black liquor. After installing FIDC™ dual seals and 25L water management systems virtually all of the dilution water was eliminated, saving 26.5 million gallons of water per year. Four years later, there has been a saving of $2.7 million CAD (US$2.2 million / €1,9 million).



USA (CS0091)

A pulp mill in the USA was experiencing issues with the sealing arrangement on the green liquor transfer pumps with a MTBF of between three and four weeks. AESSEAL® replaced the existing seal with a DMSF™ along with a SW325™ seal support system.

The MTBF of the pump improved to one year. The customer saved over $100,000 and reduced water consumption by around 5 million gallons per year.

USA (CS0212)

A leading North American producer of pulp and paper asked AESSEAL® to review a number of 'bad actor' pumps at one of its sites. The pumps had been sealed using a competitor's product, with flush water to sewer and/or into the process stream. AESSEAL® undertook a seal reliability and energy audit to evaluate seal and piping plans of each pump. The audit revealed that upgrading a number of pumps with the latest dual mechanical seal and water management systems would have a positive impact on reliability and sustainability. Water and energy usage were reduced, while improving pump reliability. This provided energy savings alone of $900,000 per year.

USA (CS0111)

A paper manufacturer in the USA was experiencing oil leakage from the journals in the dryer section of its paper machine that were sealed with a single ring of gland packing. AESSEAL® replaced the gland packing with a LabTecta®RDS bearing protector.

The MTBF improved from just 10 weeks to more than 169 weeks and savings of US$186,000 have been made so far in the avoidance of charge-backs.

UK (CH01176)

A pulp and paper manufacturer in the UK had frequent failures of its Plummer Block bearing assemblies that support the DNT rolls in the hot pulp baths which were failing as frequently as every two weeks. AESSEAL® installed a pair of Labtecta®66PB bearing protectors, to replace the OEM supplied seals. The LabTecta®66PB seals have now been running trouble free for over two years. The cost of replacing the original OEM seals with the Labtecta®66PB was repaid within 11 weeks of installation.

France (CS0149)

Norpaper Nantes was having issues with the seal of its mixer's drain pump, which was not working properly and typically needed replacement after only three months, resulting in significant labour costs and lost production.

AESSEAL® installed a 50mm FIDC™ with a stainless steel filter to ensure good water quality, free of particles. The result to date has been a saving of 2.6 million litres of water a year.

France (CH01570)

A pulp and paper manufacturer in France was using gland packing to seal the side entry agitator on a stock pulp mixer. The gland packing had a Mean Time Between Failure of just two months and was using 2.4 million litres of water per year.

AESSEAL® upgraded the gland packing to a CDM seal with a SW2 water management system. The seal and seal support system have improved the MTBF from two months to five years. In addition 12 million litres of water have been saved in this period.

India (CS0153)

The Indian company Tamilnadu Newsprint and Papers was experiencing bearing and shaft failures with its existing seals, with repair and maintenance and bearing replacement being required every two to three months.

AESSEAL® installed its LabTecta®66 system, increasing the MTBF to around 18 months. As a result, there has been a major improvement to the lifespan of the bearings, and there have been no further shaft failures, eliminating the need for costly and time-consuming shaft replacements.

Australia (CH01255)

An Australian pulp and paper manufacturer had ongoing reliability issues with its pulp agitator mechanical seals led. On investigation, AESSEAL® discovered major issues with the commissioning and routine maintenance of the seals and the seal support system filters. AESSEAL® upgraded the seal support systems to water management systems and installed the stainless steel filters in an easy-to-access location for routine checking and maintenance. AESSEAL® provides routine maintenance services and attends site during commissioning of mechanical seal systems wherever possible. In addition AESSEAL® provides plant personnel with appropriate training to ensure maintenance staff follow correct procedures.

The result is that 12 of the 14 agitators on site have now been running continuously for more than four years. The seals were previously failing after less than 16 weeks.

South Africa (SSSS3)

A paper producer in South Africa was having problems with the packing on its warm water pump, which was leaking uncontrollably and damaging the pump shaft sleeve. The packing had a life of just one week. AESSEAL® replaced the competitor's standard square cross-section packing with its trapezoidal cross-section packing (AESSEAL® 380TP). The new packing has been found to last much longer (29 months), and the 'run in' is significantly reduced as is maintenance, with adjustments only required weekly to maintain the required drip rate.

South Africa (CS0170)

Sappi Saiccor was having problems with water wastage in a country where water conservation has become a vital consideration. Its existing system had no recovery system and was not preventing a huge wastage of water, amounting to some 4.7 million litres a year.

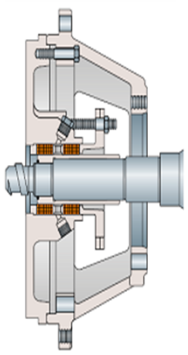
AESSEAL® upgraded the pump with its 40mm CKDA™ full cartridge double mechanical seal, piped up with the SW2™ water management system. By 2022, three years after its installation, the AESSEAL® system had helped to save an estimated 14.1 million litres of water.

> The installation of the LabTecta®RDS has virtually stopped the external oil leakage and associated paper quality issues. It has already saved us tens of thousands of dollars in charge-backs from blemishes.

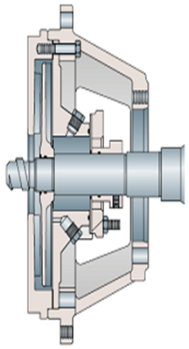
Traditional methods for sealing pulp have severe limitations

Packing

Packing has been used to seal pump shafts since the 1800s. 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 process 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 contact results in damage to the shaft sleeve; and the resistance consumes energy from the motor.



Packing arrangement

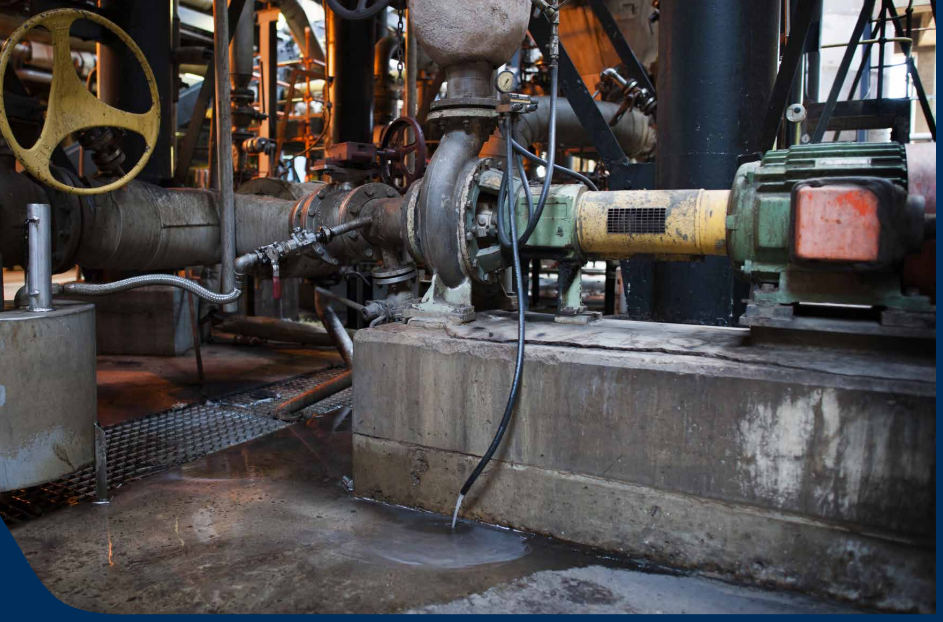


Expeller arrangements

Expellers

Also called "dynamic seals", these consist of a secondary impeller mounted separately on the pump shaft. The vanes are angled to pump the pulp liquid back towards the impeller, thus creating an effective "seal" when the pump is running. Expellers do not work when the pump is stopped, which allows the process fluid to leak, resulting in equipment degradation and unsafe conditions. The use of an expeller will also increase the energy required by the pump, as the motor is driving two pumping devices. In an independent test it was shown that the power consumption increased by approximately 40 percent. This pump design will therefore significantly increase the energy bill of the mill. A simple upgrade will increase equipment life, remove all leakage, and reduce the energy consumed.

Seconds	Dynaseal P(KW)	CURC P(KW)	Power Saving
1	4787	3724	22.21%
2	4769	3766	21.03%
3	4809	3747	22.08%
4	4766	3727	21.80%
5	4756	3750	21.15%
6	4818	3719	22.81%
7	4806	3752	21.93%
8	4798	3658	23.76%
9	4736	3714	21.58%
10	4904	3743	23.67%
11	4711	3708	21.29%
		Average	22.12%



(left) Before the AESSEAL® solution: Pump and mechanical seal, fitted with quench-to-drain flushing system.

(right) After: Pump and mechanical seal fitted with AESSEAL® continuous loop flushing and lubricating system.

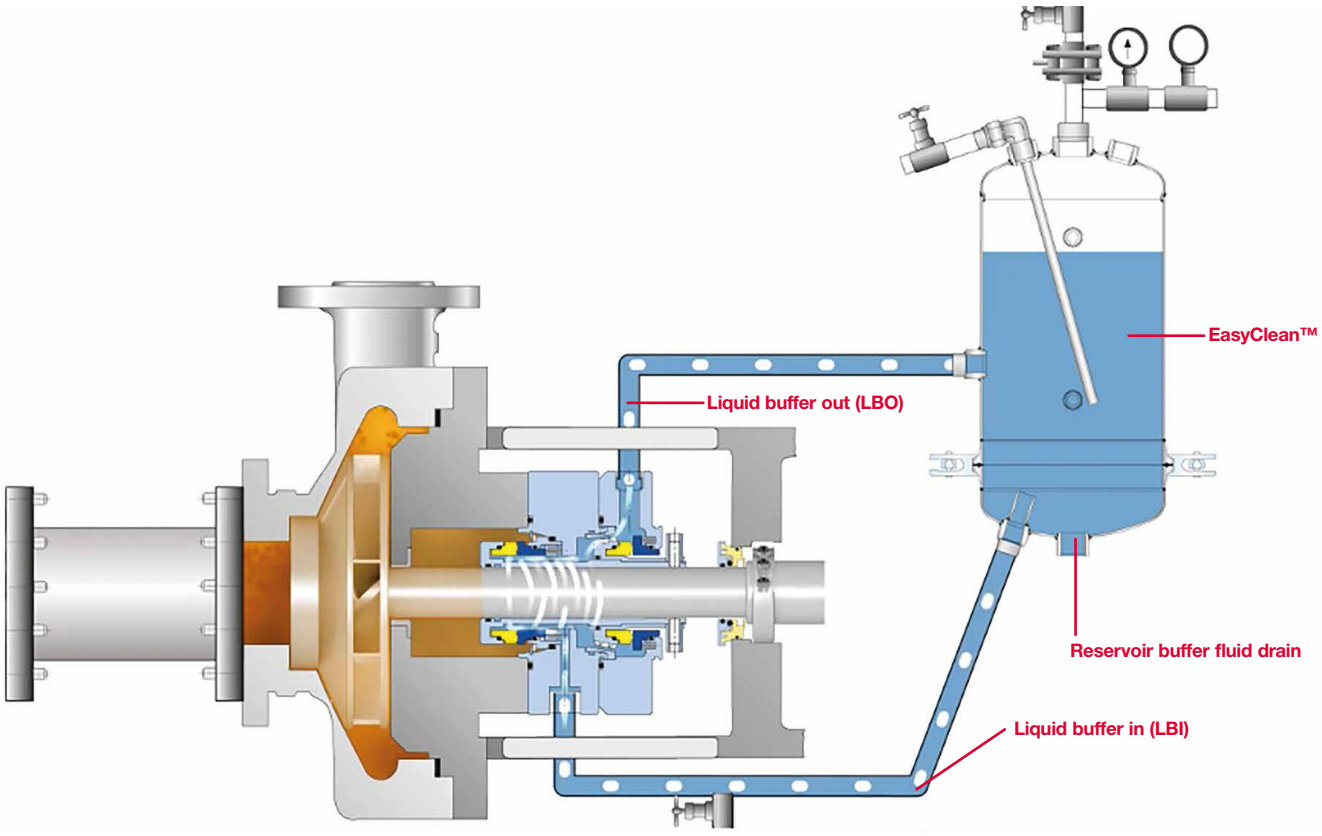
Change the seal environment to extend the life of the seal

AESSEAL® has successfully sealed thousands of pulp and paper pumps, and found that the best way to seal higher concentrations of pulp is to use a double mechanical seal and to CHANGE THE SEAL ENVIRONMENT through two simple steps:

1. Ensure that the liquid crossing the seal faces as the fluid film is a clean, cool and constant supply of water.

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. AESSEAL® supplies a SOLID or SPLIT system if regular cleaning will be required.

We can therefore ensure that a “set pressure” of 1-2 Barg above the seal chamber pressure is achieved and should there be a process upset where product enters the Barrier system, the tank can be stripped and cleaned and reused.



AESSEAL® recommended pulp and paper strategy

How water is saved

A properly designed seal support system supplies a clean, cool liquid (usually water) to the barrier space between the two sets of seal faces in a dual seal, at a higher pressure than the process fluid in the pump.

This pressure differential forces the clean barrier fluid across the faces, forming a stable fluid film, cooling and lubricating the faces. As the mechanical seal faces generate heat, the hot water in the barrier zone of the seal rises to the tank. The tank radiates heat to the atmosphere, and the cooler, denser water sinks back down to the seal. This process is known as a 'thermosyphon', and it enables the tank to provide the mechanical seal with a constant supply of fresh, cool, clean, pressurised water for the fluid film, with no moving parts.

The AESSEAL® SW2™ system uses an integral seal tank to store flushing water for continuous recycling. The system is connected directly to the plant water line, which becomes the system's fluid and pressure source. The pressure is adjusted so that it is maintained at 1 bar above the pump stuffing box pressure, resulting in a positive pressure differential, keeping harmful products away from mechanical seal faces and increasing seal and pump reliability.

Mondi, a paper company in South Africa, uses AESSEAL® water management to reduce water consumption. As well as lowering costs by conserving water, the systems are superior to the once-through format in three ways: first, there is an indicator that shows when any inboard seal failure occurs; second, the system is kept pressurised by a non-return valve which helps to prevent cross contamination of sealing water in the event of a failure; third, the system is fitted with a regulating valve which maintains water pressure and flow rate without further settings or adjustments after installation.

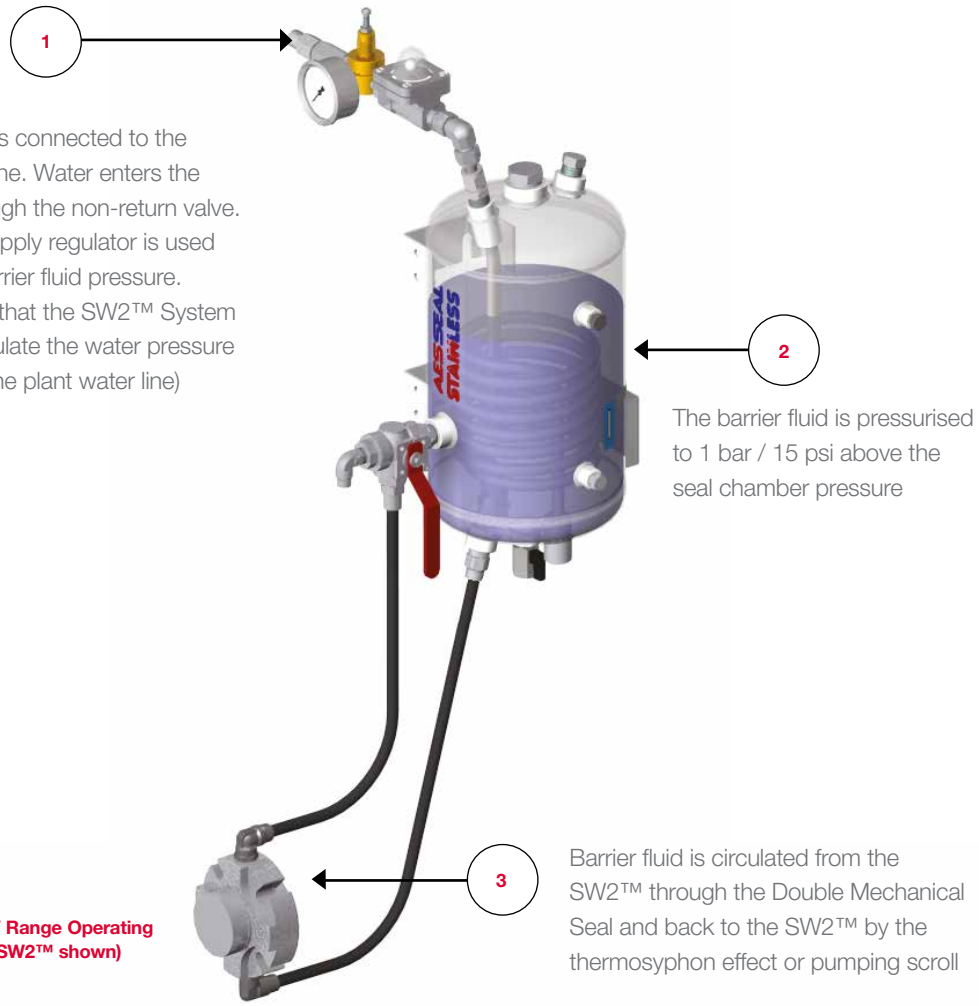


Figure 1. - SW Range Operating Principle (SW2™ shown)

Reducing water usage

and increasing MTBF

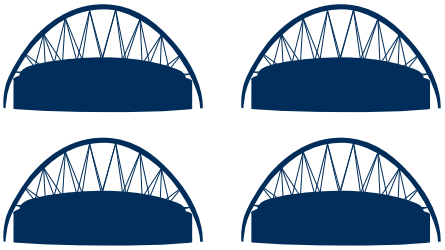
An international packaging and paper group in South Africa replaced 167 competitor cooling and lubrication systems that were consuming an average of 63,210 kilolitres of water every month. The new AESSEAL® systems helped save over 4.5 billion litres of water in six years helping to conserve scarce water resources in northern KwaZulu Natal.

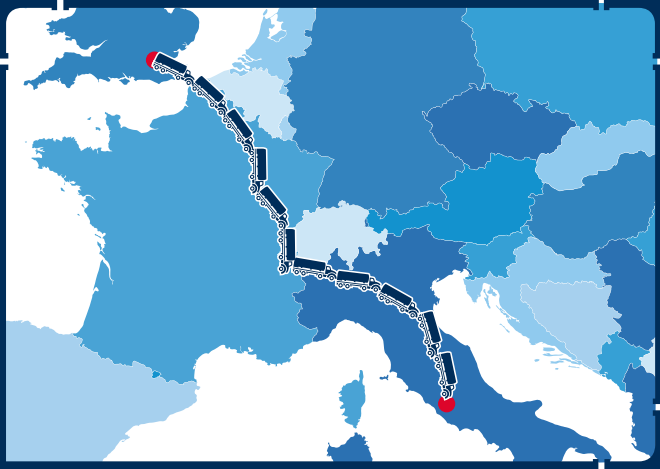
The AESSEAL® SW2™ and SW3™ water management systems use recycled water to cool, lubricate and flush mechanical seals in the plant. Return on investment was achieved in less than one year.

4.5 billion litres
of water saved in six years

4

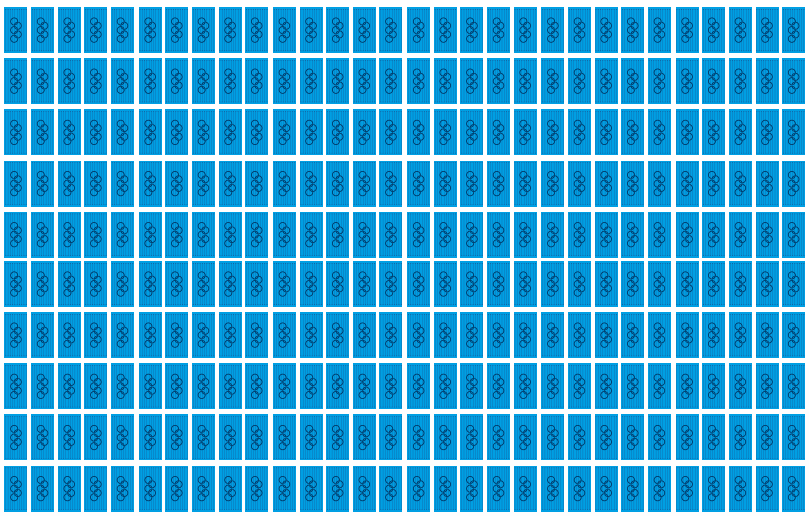
Enough water to fill
4 Wembley stadiums





300

Enough water to fill **300**
Olympic swimming pools EVERY YEAR



1185

If the water was in oil tankers the tankers would stretch **1185 miles from London to Rome or from Chicago to Orlando!**

Saving
£568,890
Not including effluent treatment savings

Our Product Range

For pulp and paper applications

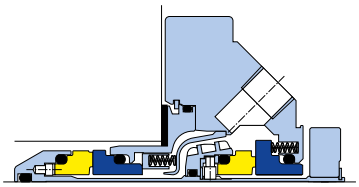
Packing

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 downtime 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

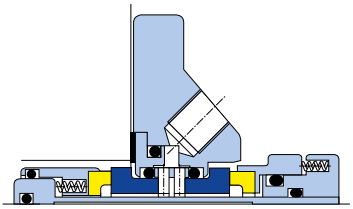
Mechanical Seals

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

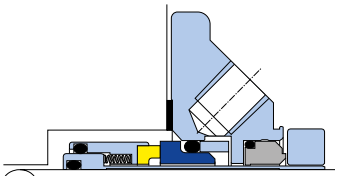
- The DMSF™ – range of double mechanical seals has been designed as a high-performance sealing solution for arduous applications. The double cartridge stationary seal has an integral pumping ring and monolithic seal faces. The DMSC™, by contracst, is supplied without an integral pumping ring meaning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



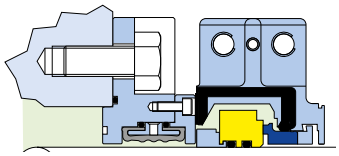
- The FIDC™ – double mechanical seal is designed to meet the arduous requirements of heavy duty applications. The modular design contains a pumping device to force circulate the barrier fluid around the seal, ensuring that the seal runs cool and clean in more concentrated stock applications. Exotic metal parts are available to resist corrosion and erosion.



- The CURC™ – single mechanical seal is a modular, balanced mechanical seal with the spring assembly out of the product and is non shaft fretting. The AESSEAL® CURC™ mechanical seals are part of a range of seals specifically designed to optimize the use of silicon carbide.

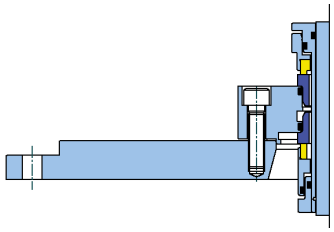


- The RDSX™ – The RDSX™ seal eliminates the need to remove or strip equipment for seal replacement. The self-aligning rotary makes the RDSX™ one of the easiest and quickest to install split seals on the market today.

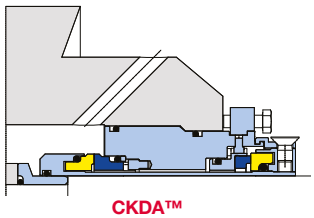


RDSX™ shown with ISOS™

- The IADC™ – The IADC™ Screen seal design is a double seal available in a wide range of seal face and elastomer applications to suit individual process requirements. This seal is used on screens and knotters. The modular two part gland and adaptor arrangement reduces repair costs.



- The CKSA™ and CKDA™ – Single and double mechanical seals that incorporate large radial clearances. The seal has hydraulically balanced seal faces that reduce seal face heat generation and improve reliability. Also available with special-alloy wetted components. The seal range is designed to install in all sizes and designs of Sulzer / Ahlstrom APT/APP and UP pumps.



CKDA™

Engineered Seals

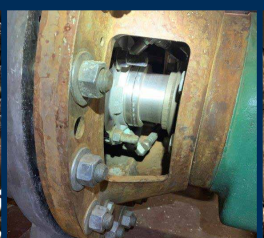
Sealing solutions in the pulp and paper industry are specifically manufactured to fit the equipment and often require a custom engineered design. AESSEAL® has many years of experience in designing solutions for the industry that deliver improvements in reliability for our customers.

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 companies all over the world typically producing over 13,000 custom engineered mechanical seals annually.

You can find more information at **www.aesseal.com/paper**

> “The mill had an unacceptable Mean Time Between Failure of between three and six months. The single seal was replaced with an AESSEAL® dual seal along with seal support system and has been running now for more than nine years without issue.”




Seal Support Systems

You can obtain your mechanical seal and seal support system from the same supplier: 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. 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

- 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.

- EasyClean™ – The AESSEAL® EasyClean™ is part of the latest development in water and oil API plan 53a barrier fluid management systems, aimed at environments which require a higher level of hygiene. In addition to all the features that come with the standard offering of AESSEAL® water and oil management systems, the EasyClean™ benefits from the ability to be disassembled for inspection and cleaning. By using a clamp, the bottom section can be removed when required and the internal cavity can be checked for deposits. Once the inspection is complete the bottom section is simply reattached using the clamp supplied.

- SW Range™ – The AESSEAL® SSE10™ and SSE25™ are used as the core of a modular Water Management System Range (SW2™ & SW3™). The environmentally friendly SW Range has significantly contributed to the global drive for water conservation. AESSEAL® Water Management Technology can save 6.3 million litres / 1.7 million US gallons of water per pump per year! The Water Management Range starts with the SW2™, which is piped as an API Plan 53A configuration (see Figure 1, page 8). This is a self-regulating system which can both refill and re-pressurise itself upon any mechanical seal upsets. The SW3™ is piped in the same way as the SW2™ and has the addition of finned tubing to deal with high heat applications. The entire range is designed and manufactured in accordance with ASME VIII Div.1 and all SW systems comply with Pressure Equipment Directive PED (2014/68/EU)

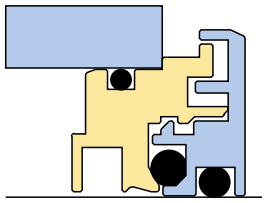
Bearing Protection

AESSEAL® offers a range of bearing protection devices suitable for most applications. The innovative LabTecta® and MagTecta™ products include patented features that deliver the best possible bearing housing sealing solution for your motor, pump, plummer block, gearboxes or steam turbine.

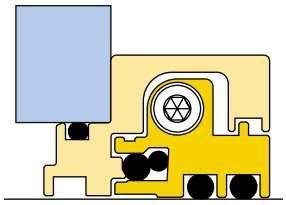
Bearings have been found to be responsible for almost 21 percent of rotating equipment failures. The majority of bearing failures are due to contamination of the bearing oil as a result of water or particulate ingress into the bearing chamber. This contaminant ingress is preventable using today's advanced bearing protection devices. These devices offer ingress protection up to IP69K, ensuring that all particulates and moisture are kept out of the bearing oil even in the most arduous environments. In addition, these devices are non-contacting in operation, ensuring that expensive rotating equipment shafts are not damaged.

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

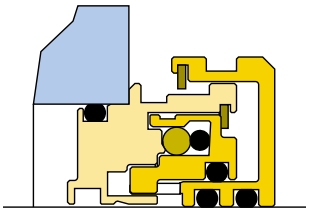
- LabTecta®OP — The LabTecta®OP is a further addition to the bearing protection range offered by AESSEAL®. Through the use of proven LabTecta®66 technology and extensive testing, AESSEAL® has produced a product which will optimize running conditions and improve bearing life. The LabTecta®OP is a cost effective bearing protection upgrade solution, which is non repairable. Specifically designed to inhibit water ingress and oil egress.



- LabTecta®66RDS— Radially Split Design for easy installation. The only radially divided bearing protector available with rotor / stator static sealing technology as standard. The LabTecta®66RDS is available in several configurations including flange-mounted, axial movement and internal air-purge, giving even greater flexibility and tailored to suit your specific application.



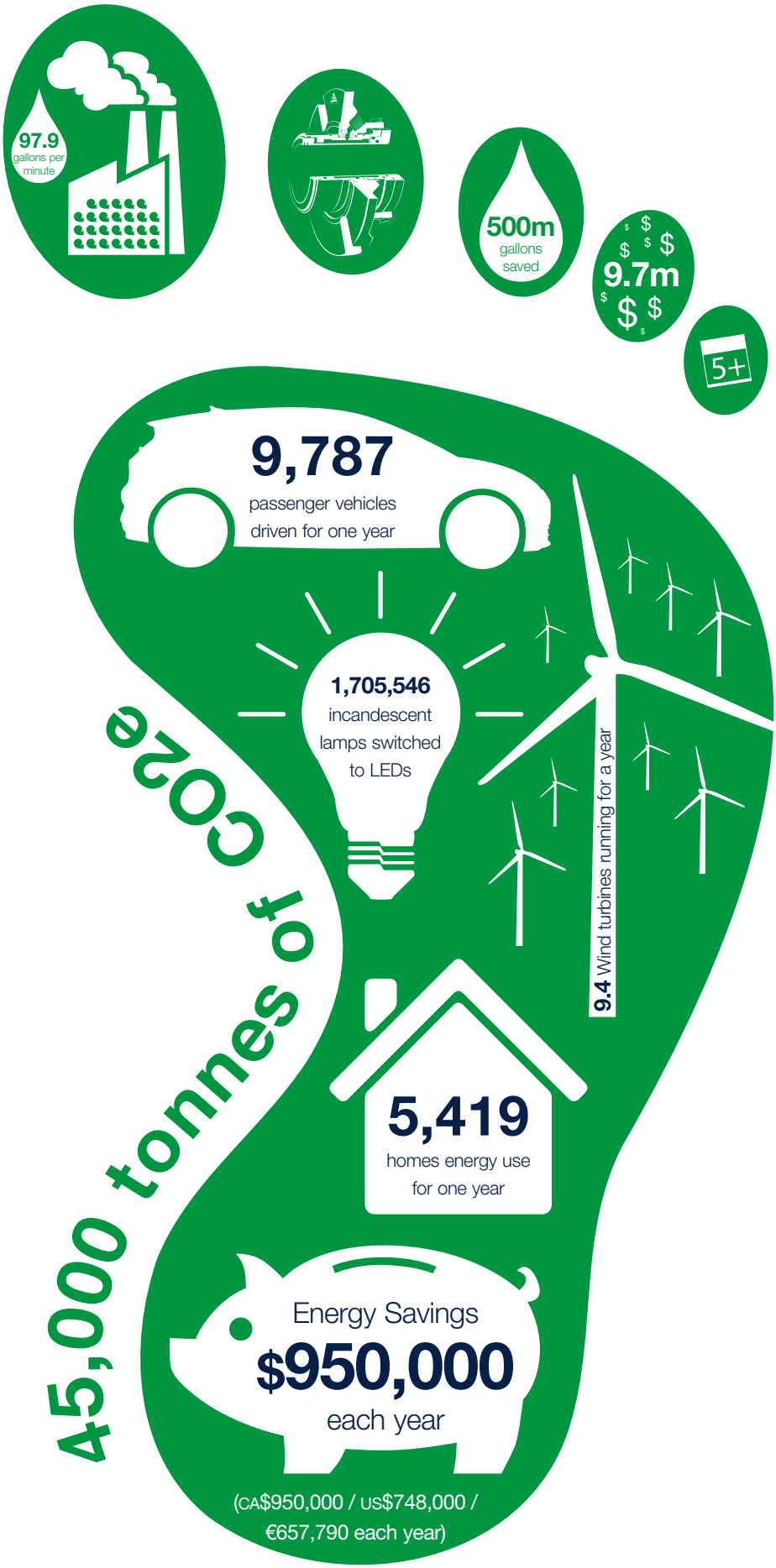
- LabTecta®66AX— The AESSEAL® LabTecta®66AX is specifically designed and engineered for axial movement applications. The LabTecta®66AX design uses a unique sliding rotor that allows the seal to absorb axial movement internally. With this rotor design there is no axial sliding movement on the shaft that can cause shaft damage, rotor drive ring damage or allow contamination to pass under the drive 'O' ring.



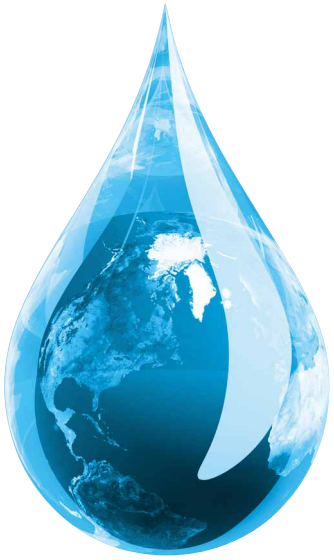
Energy and water savings

A Northern Bleached Softwood Kraft (NBSK) pulp mill located in western Canada has reduced evaporator steam use by 103,000,000 lbs a year by eliminating 97.9 gallons of water per minute, or over 49 million gallons of water per year, from entering 26 evaporator pumps. AESSEAL® replaced the packing on each pump with a CDSA™ dual cartridge seal and a 25 litre SW2™ water management system.

It is estimated that to date, the mill has saved CA$9.7 million (€6.72 Million), conserved almost 500 million gallons (1.893 billion litres) of water and reduced its carbon footprint by 45,000 tonnes of CO2e over an eight year period. The total repeatable annual cost savings due to reduced energy and water usage alone amount to just under CA$1 million (€700,000) per year. There is also an enormous 61 million gallon (231 million litre) reduction of water usage for these pumps **every year** - enough to provide the total water needs of 2000 people. Mean time between failures (MTBF) has improved from one year to 5+ years and the lowering of the company's carbon footprint is worth an additional CA$234,000 (€162,221) **annually**, and this is set to rise to almost CA$1 million (€700,000) **annually** by 2030. The entire project cost ROI was achieved in less than one year.



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 rate…" The United Nations

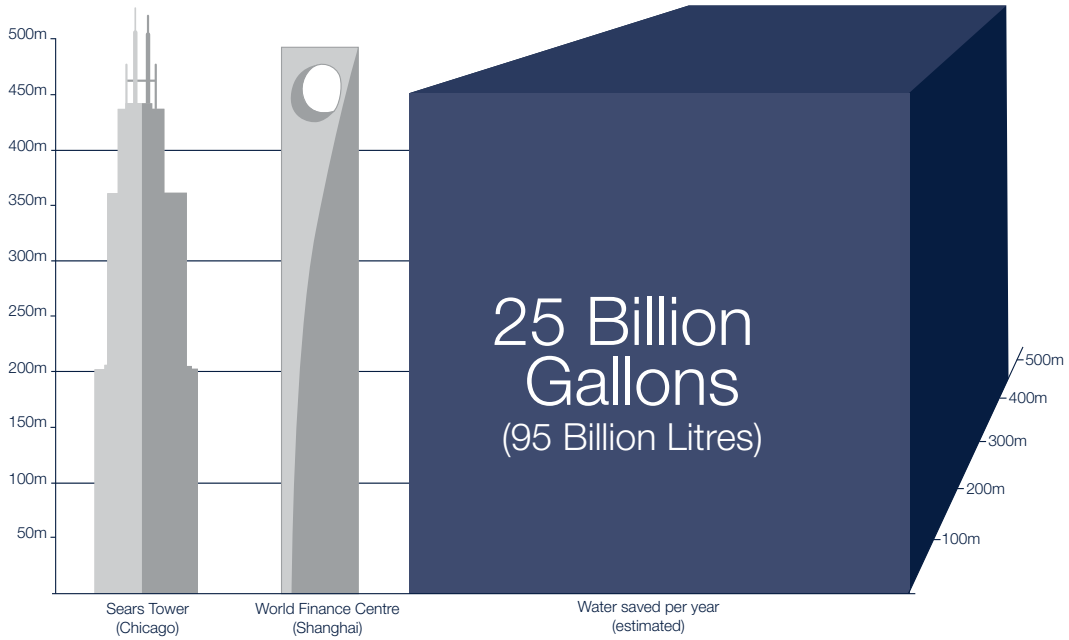
"The simple fact is that there is a limited amount of water on the planet, and we cannot afford to be negligent in its use. We cannot keep treating it as if it will never run out…" Mohamed Al Baradei, International Atomic Energy Agency

The processing of pulp and paper requires large quantities of water, yet water is a finite resource. How does the industry reconcile this dilemma, and still remain good stewards of our environment? We must embrace technologies that can reduce the water footprint from pulp and paper production.

One standard, process pump consumes 2 US gallons (7.6 litres) per minute of fresh water to cool and flush the packing or seal. In one year, this amounts to over 1 million US gallons (4 million litres) of water added to the waste stream. A double seal and tank support system, which recirculates the water instead of flushing it to drain or adding it to the slurry, eliminates this wasted water.

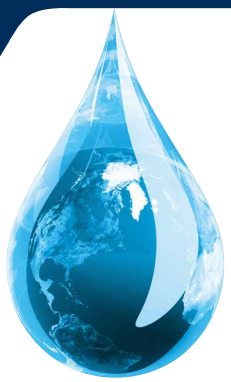
US Gallons per minute (GPM)	US Gallons per year	Litres per minute (LPM)	Litres per year
1	525,600	3.7	1,989,400
5	2,628,000	18.9	9,947,000
10	5,256,000	37.8	19,894,000
20	10,512,000	75.7	39,788,000
40	21,024,000	151.4	79,576,000

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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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**

UK Sales & Technical advice:
AESSEAL plc
Mill Close
Bradmarsh Business Park
Rotherham,
S60 1BZ, UK
Tel: +44 (0) 1709 369966
E-mail: **enquiries@aesseal.info**
www.aesseal.com

NET ZERO

Net Zero champions globally

INVESTOR IN PEOPLE

USA Sales & Technical advice:
AESSEAL Inc.
355 Dunavant Drive
Rockford,
TN. 37853,
USA
Tel: +1 865 531 0192
E-mail: **inquiries@aesseal.us**
www.aesseal.us

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