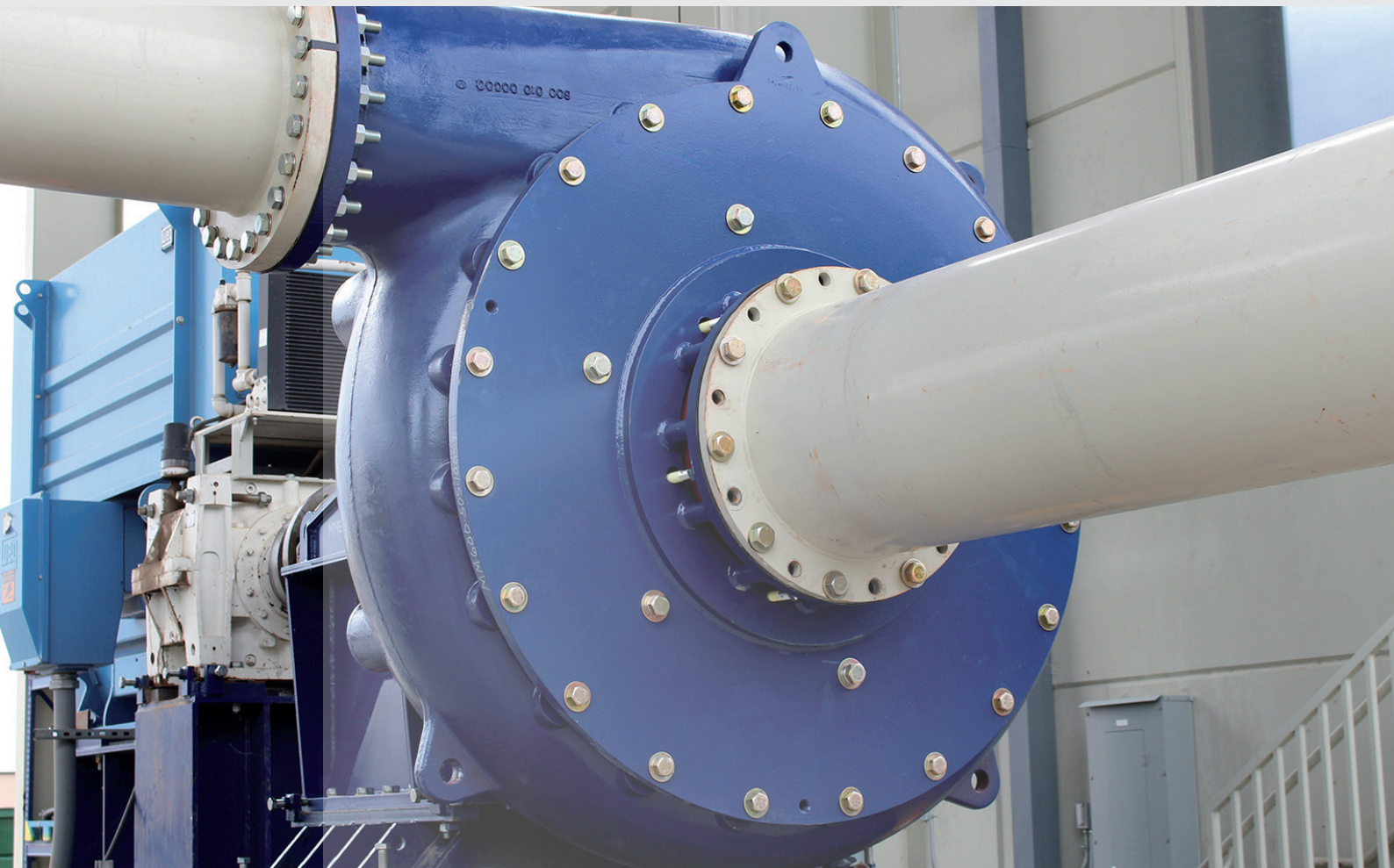


KREBS®

PUMPS, CYCLONES AND VALVES

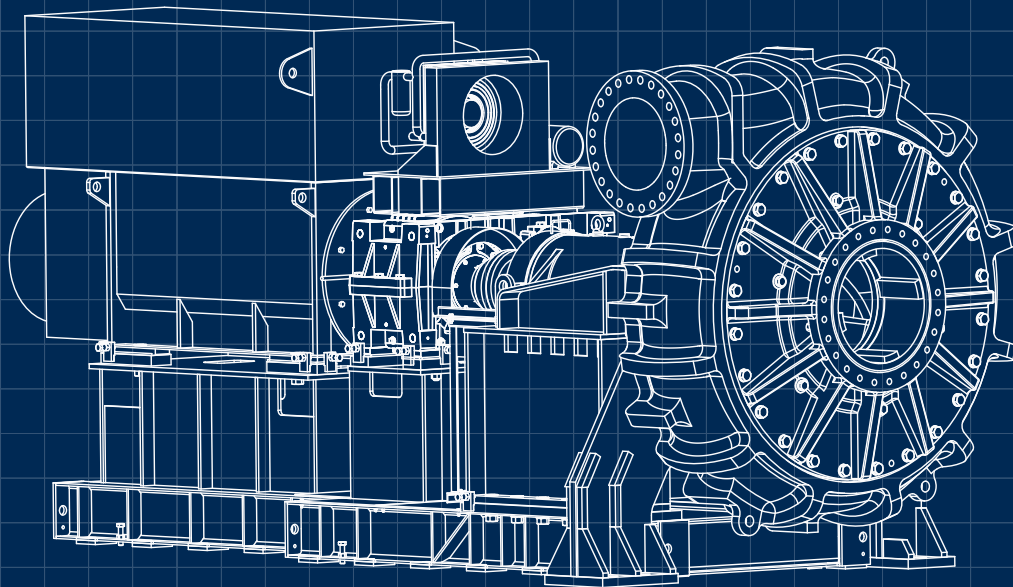
millMAX™ Pumps

The original suction
side sealing pump



Proprietary design the wear ring advantage

Our millMAX™ pump has a unique proprietary design developed specifically for severe duty applications such as mill discharge and other severe abrasive slurries.



Key benefits

- | | | | | |
|---|------------------------------------|--|---|---|
| ■
Even and predictable
wear life for wet
end parts | ■
Significant
energy savings | ■
Constant
hydraulic performance | ■
Long-lasting
bearings that
cannot be
over-greased | ■
Increased
tonnage
throughput |
|---|------------------------------------|--|---|---|

Problems faced by conventional slurry pumps

Prior to the millMAX, slurry pumps experienced two major problems: mechanical grinding of solids between the suction liner and impeller, and flow recirculating back to the impeller eye on the suction side. Both of these problems decrease pump life and increase power consumption. Conventional slurry pumps can only solve one of these issues through impeller and liner adjustment—but not both.

Problems are magnified as the pump wears and the gap between the impeller and the suction liner opens. Slurry recirculates rather than exiting the pump through the discharge, causing the flow and head generated by the pump to drop. To keep up with production, the speed of the pump is increased. Increasing the speed of the

pump causes the rate of wear of all pump components to increase exponentially. To compensate for the loss in production from wear, the speed is further increased, which inevitably leads to the destruction of the pump.

The millMAX difference

The millMAX product family features our proprietary wear ring suction-side sealing system that eliminates both major problems faced by conventional pumps. The wear ring closes the suction side gap while the pump is running, restoring performance WITHOUT speeding up the pump. This feature makes the millMAX the ONLY pump line that can effectively eliminate both the inefficient recirculation and the grinding of slurry.

KREBS® millMAX™ pump product range

millMAX™	millMAX™ HP	millMAX™ HH
3×2	---	3×2
4×3	---	4×3*
6×4	---	6×4
8×6	---	8×6
10×8	---	10×8
12×10	---	12×10
14×12	14×12	---
16×14	---	---
18×16	---	---
20×18	20×18	---
24×20	24×20**	---
28×26	---	---

* Extra high head available

** Extra high pressure available

The millMAX™ advantage

The key advantages of our slurry pump design are lower power requirements (up to 25% less); long, even wear life; and less pump downtime—all of which result in lower cost-per-ton pumped, along with better cyclone separation.

Grind in the mill, not in your pump

To stop recirculation on a pump without a wear ring, the suction-side clearance is closed with either a full-face suction liner adjustment or by adjusting the impeller to the suction liner. This can be effective when pumping fluids with no solids; with slurries, however, the solids become caught between the rotating impeller and static suction liner, and are crushed.

Lower your operating costs

Grinding solids consumes power and wears out the impeller and liner. Additionally, in industries such as the diamond and potash mining, grinding solids is not acceptable because it degrades the value of the product. The millMAX wear ring stops stop recirculation and allows for a large gap between the impeller and suction liner—eliminating solids grinding. This advantage has been proven worldwide to reduce power costs, maintenance costs, and eliminate particle degradation when compared to conventional pumps.



millMAX inventor, John Frater



millMAX pump installed at a phosphate plant in Saudi Arabia

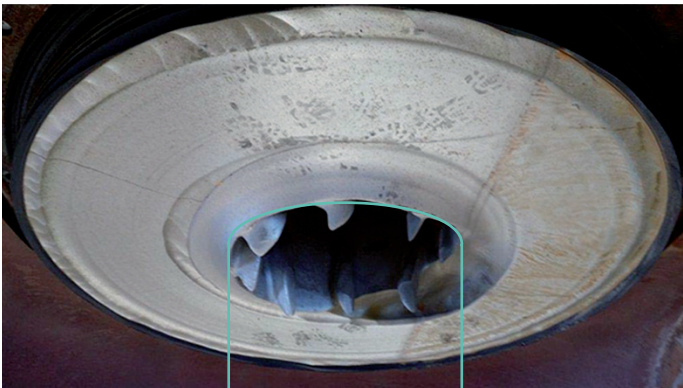
The millMAX™ advantage

The millMAX™ payoff

Because millMAX pumps maintain a constant operating speed and do not grind particles, they naturally last longer and consume less power. This means less plant downtime and lost production, with less money spent on pump maintenance and power. millMAX pumps represent the latest and most advanced slurry pumping technology on the market today.

See the difference for yourself

If you'd like to experience the difference first-hand, millMAX pump wet ends can easily adapt to competitor power frames for a head-to-head comparison. We do recommend complete pump replacements, when possible, as the millMAX bearing assembly design (described on page 7) has the potential to eliminate common bearing failure caused by over-greasing.



Competitor's pump impeller eye is enlarged and deformed, indicating suction-side recirculation

millMAX pump impeller eye is protected from recirculation wear by the wear ring

millMAX™

features

Our unique millMAX™ pumps treat the causes of pump wear and efficiency loss, whereas competitive pumps only treat the symptoms through materials or costly upgrades.

The millMAX™ pump design includes the following:

Casing

Designed for minimum slurry turbulence and even wear—includes integral wear ring, wear ring carrier and adjustment screws for online adjustment and elimination of suction-side recirculation

Wear ring

Adjustable assembly to permit closing of suction-side impeller clearance during operation

Impeller

Designed for high slurry efficiency and hydraulic performance—machined surface at the eye for wear ring adjustment and high expelling vanes

Suction liner

Includes integral wear ring—matches full impeller diameter and profile for close operating clearance

Power frame

Heavy-duty cast iron pedestal with external bearing assembly adjustment mechanism

Flanges

Multiple flange options drilled to suit various pipe requirements

Reverse-taper roller bearings

- Increase the effective load span to improve life
- Pumping action of taper rollers discharges grease to the outside, preventing ingress of slurry and eliminating possibility of failure due to over-greasing

Narrow clearance between impeller and backliner

- Reduces pressure at gland to assist centrifugal dry-gland seal

Optimised expelling vane design

- Clears large solids
- Prevents crushing of solids
- Reduces casing slurry pressure at impeller eye

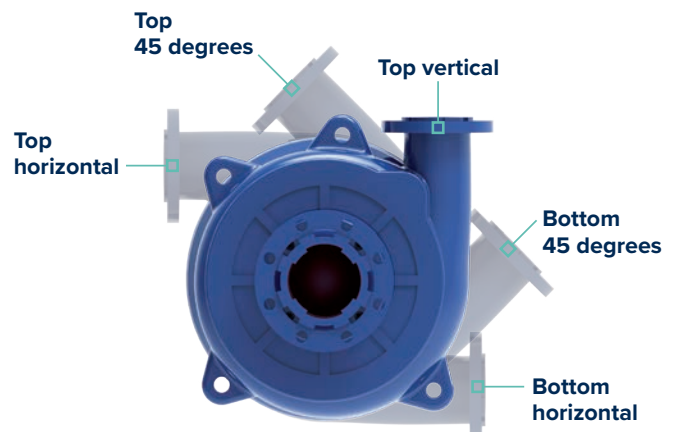
External wear ring adjustment bolts

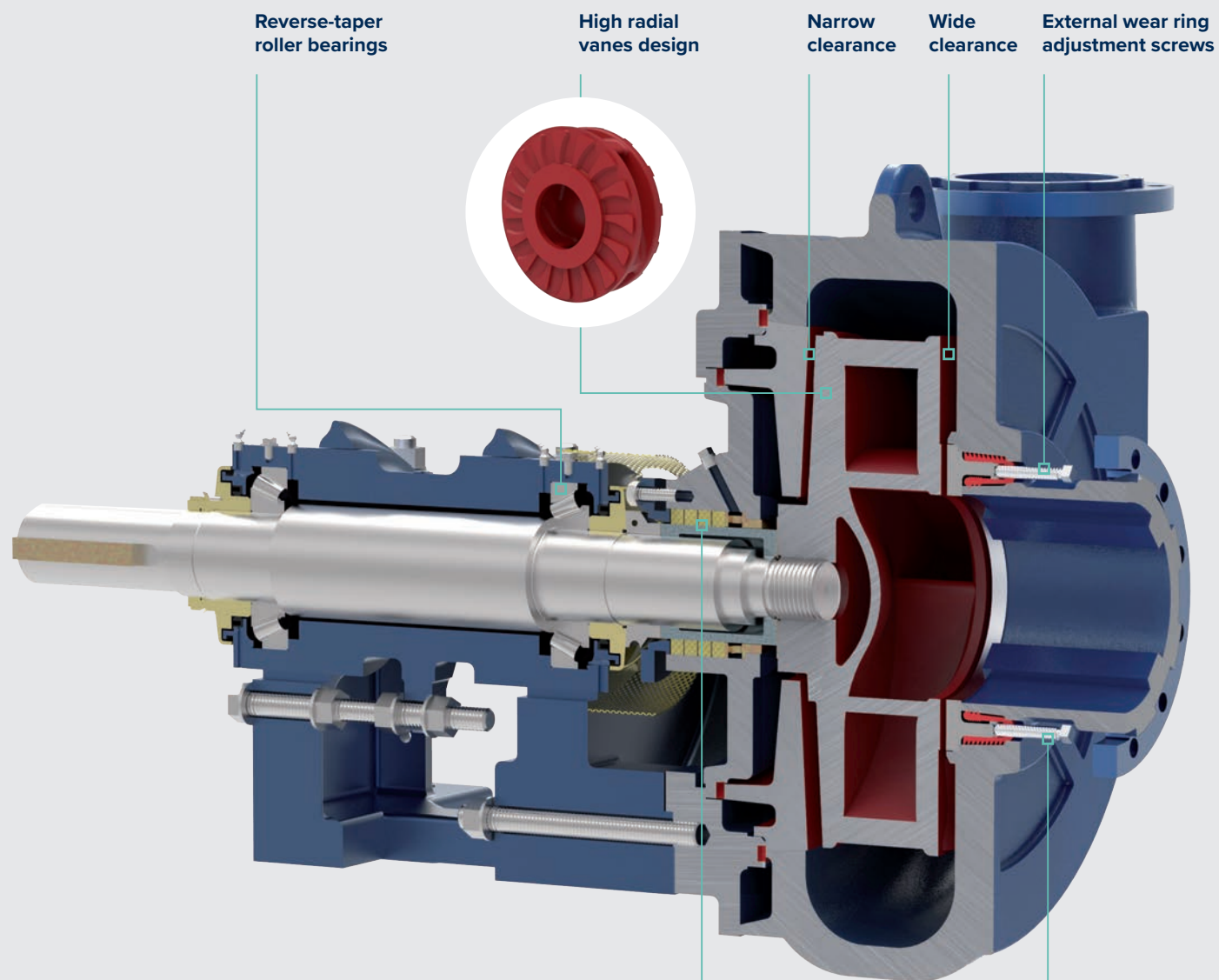
- Allow simple and safe wear ring adjustment while pump is operating

Wide clearance between impeller and suction liner

- Dramatically reduces crushing of solids
- Increases wear life
- Reduces power consumption

Standard millMAX discharge positions





Maximum expected flow rate into a water flush seal at 10 psig (68.9 kPa) above pump discharge pressure

Power frame	Full flow (gpm)	Full flow (m ³ /h)	Low flow (gpm)	Low flow (m ³ /h)
MMAA	8.0	1.8	1.0	0.2
MMA	15.0	3.4	2.0	0.5
MMB	20.0	4.5	3.0	0.7
MMC	25.0	5.7	4.0	0.9
MMD	30.0	6.8	5.0	1.1
MME	55.0	12.5	N/A	N/A
MMF	85.0	19.3	N/A	N/A
MMG	150.0	34.1	N/A	N/A

millMAX™

pump model options

We offer a wide range of pump designs, pump selections and application knowledge. We can provide you with the highest quality and lowest total cost-of-ownership solution for any slurry pump application.

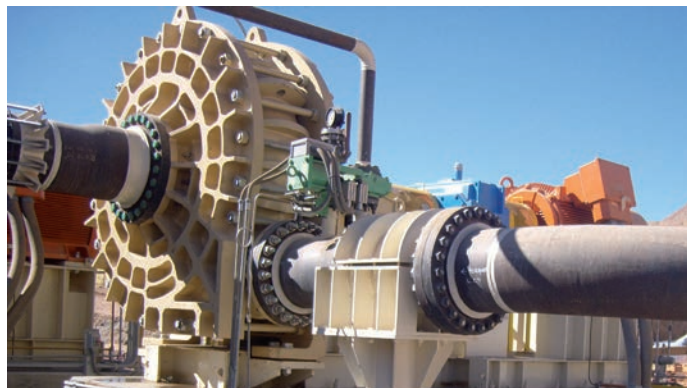
millMAX high-pressure pump

Our millMAX high-pressure (millMAX HP) product line includes a tie-bolt design for high-pressure, multi-stage applications. millMAX tie-bolt-design pumps have the same superior internal hydraulic design as our standard-pressure millMAX pumps, yet can handle operating pressures of greater than 500 psi (35 bar).

High-pressure applications produce extreme forces on the pump suction liners, making full-face adjustment of traditional designs nearly impossible, as well as unsafe. The millMAX wear ring has proven to be easily adjustable in the highest-pressure applications due to its small cross-sectional area.

The result? Our millMAX HP will easily maintain suction-side sealing throughout the life of the pump, leading to higher pumping efficiency and constant operating speeds for a given discharge head. These factors increase the wear life of the wet-end components over our competition.

The tie-bolt design of the millMAX HP also allows for ultrasonic casing thickness measurements. By measuring casing thicknesses all around the pump, operators can predict and schedule maintenance shutdowns before any failures occur—an action that is not possible with split-casing pumps.



millMAX HP

millMAX high-head pump

Our millMAX high-head (millMAX HH) pump is designed for applications that have high total dynamic head requirements. The pump's primary feature is the concentric casing that creates a uniform clearance between the casing and impeller. Along with the concentric casing design, the casing has a higher-pressure rating to handle high-speed and multi-stage applications.

Standard volute slurry pumps experience radial thrust on their impellers due to differential pressure zones within the pump casing when they operate far away from their best efficiency point (BEP). This radial thrust causes shaft deflection and premature bearing and gland-sealing failures. The millMAX HH concentric casing design creates an even velocity and pressure around the casing, regardless of where the pump is in relation to its BEP.

One application that the millMAX high-head design is ideally suited for is filter press feed. The pump operates at duties that range from low head and high flow, to high head and low flow.

In addition to filter press feed, the millMAX HH is suited for any application where high heads are required in one- or two-stage pumping systems.



millMAX HH in series

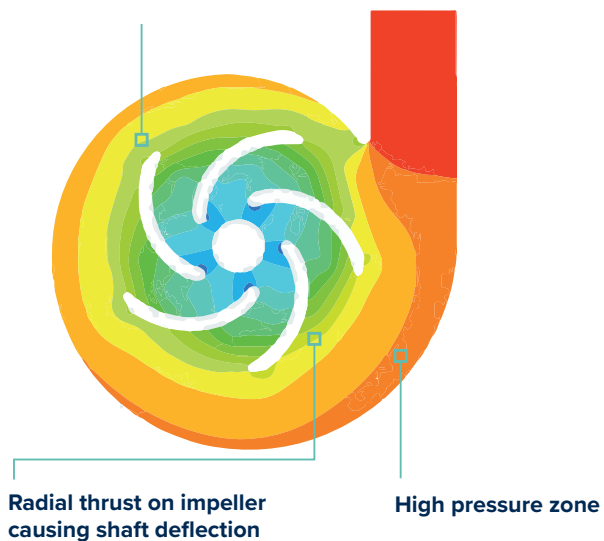
Casing pressure distribution

operating far left of BEP

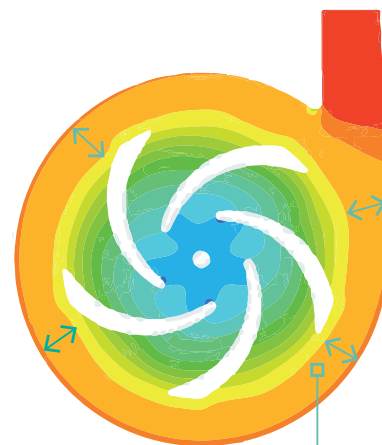
millMAX standard volute design



Low pressure zone



millMAX HH concentric volute design



Creates equal pressure around the concentric casing

Pressure (Pa)



KREBS® quick release

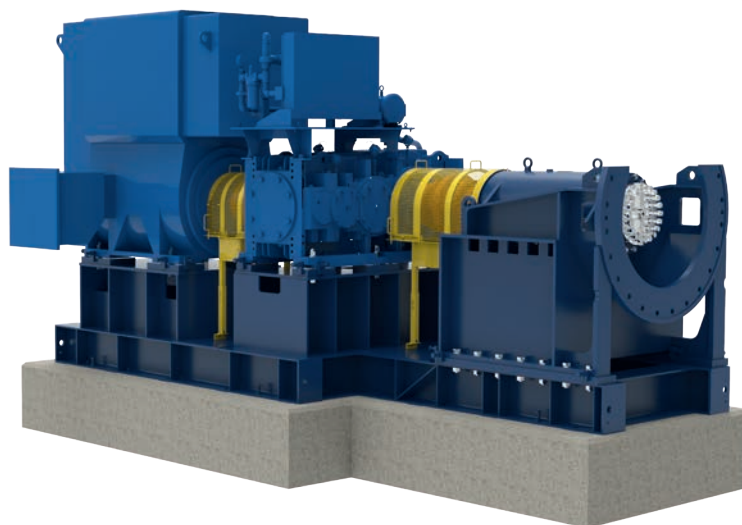
Feature for quick and safe rebuilds

In mining operations, reducing the time spent on pump maintenance is critical because it directly impacts the bottom line. The concept of reducing downtime is similar to a professional auto race where the seconds spent changing tires during a pit stop are some of the most pivotal moments of the race.

Similar to swapping out worn tires, our quick release design allows you to quickly change out the worn wet end for a new module that's been fully assembled off site.

Our quick release feature provides:

- 50% reduction in pump rebuild time
- Modularization for safe and easy rebuilds
- Option for off-site maintenance with our wet end module exchange program



GLOBAL SALES LOCATIONS

FLSmidth - Australia

Pinkenba, QLD, Australia
Tel: +61 7 5519 5700
krebssaustralia@flsmidth.com

FLSmidth - Chile

Santiago, Chile
Tel: +56 2 2463 8350
krebsschile@flsmidth.com

FLSmidth - Philippines

Ortigas Center, Pasig City, Philippines
Tel: +63 2 687 9251
krebss-philippines@flsmidth.com

FLSmidth - Beijing

Beijing P.R. China
Tel: +86 10 8468 9100
krebsschina@flsmidth.com

FLSmidth - Brasil

Sao Paulo, Brasil
Tel: +55 15 3416 7400
krebssbrasil@flsmidth.com

FLSmidth - Austria

Neusiedl am See, Austria
Tel: +43 2167 3345
krebseurope@flsmidth.com

FLSmidth Private Limited

Chennai, India
Tel: +91 44 4748 1000
krebssindia@flsmidth.com

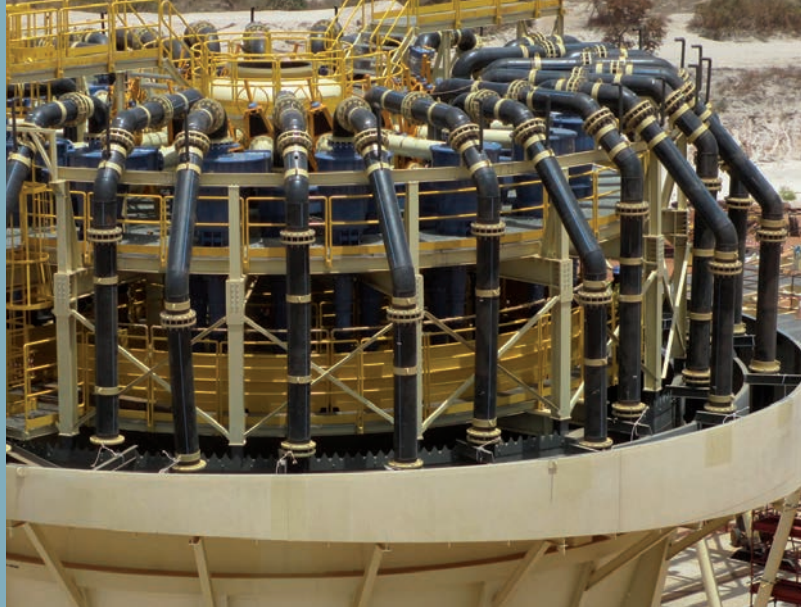
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Johannesburg, South Africa
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FLSmidth Inc. - Tucson Operations
5505 W. Gillette Road
Tucson, AZ 85743
USA

Tel: +1 520 744 8200
Fax: +1 520 744 8300
krebs@flsmidth.com

For more locations see global contact list on previous page
or visit us at www.flsmidth.com

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in the cement and mining industries

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For more than 135 years, we have challenged conventions and explored opportunities. Across more than 50 countries, we are 13,000 employees who combine our unique process-knowledge on projects, products and services to drive success. We develop the most advanced technology in our industries and offer market-leading product and service ranges.

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We are the market-leading supplier of engineering, equipment and service solutions to customers in the global mining and cement industries.

We discover potential.



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Vigerslev Allé 77
2500 Valby
Denmark

Tel +45 36 18 10 00
Fax +45 36 30 18 20

info@flsmidth.com