

Mill liner solutions

Productivity enhancement
from comprehensive
optimisation



A complete solution for your operation

Mining businesses need to be able to rely on productive milling operations, built on today's most advanced equipment and expert process know-how. FLSmidth serves the global mining industry as a leading original equipment manufacturer (OEM) supplier of engineering, equipment and service solutions. Today's mill-liner customers depend on FLSmidth for safe, efficient milling equipment solutions. Our range of proven mill liners is ideal for the full scope of mill brands currently available in the market.



Key benefits

Increased productivity

Encompassing solutions derived from expert process-knowhow, advanced equipment, and complete service.

Improved throughput

Optimised highly durable lower weight mill liners allow for increased grinding capacity and for your equipment to process more tonnes of material.

Safer maintenance

Lighter mill liners with fewer parts allow for a less complex, less time-consuming and much safer maintenance process.

Optimised milling circuit

Full system efficiency with an improved process.

Reduced energy costs

Overall energy expenditure is reduced with low weight mill liners.

Additional uptime

Highly durable mill liners allow for extended periods between scheduled maintenance times.

Superior wear protection

Designed to break raw materials down into usable product, few pieces of mining equipment are exposed to as consistently intense wear as mills. Mill liners help protect those mills, by providing a shield against the internal stresses that have been known to tear equipment apart from the inside. But liners only take so much punishment, and when they wear out, maintenance, replacement costs and productivity-reducing equipment downtime are the natural result.

FLSmidth has the answer. As a complete supplier of mill liner products and services, we offer optimised mill liner solutions to fit any materials or applications. Including customised and ready-made solutions, our range of durable, high-quality liners give your equipment the wear protection it needs to continue operating at peak efficiently, day after day, tonne after tonne.

Cutting-edge technologies

To optimise your equipment life and improve throughput, we employ the latest in material sciences and engineering. Incorporating a

range of materials — including rubber, cast steel and composite options — FLSmidth mill liners offer industry leading wear protection for your SAG and ball mills. And, by incorporating unique geometric designs, these liners empower you to improve your equipment performance, processing more raw materials and allowing for finer grinding than traditional options.

Customised solutions

In mining, there is no one-size-fits-all solution. Your business is unique, and so is the equipment it relies on. Our mill liners are designed with this reality in mind.

Every FLSmidth mill liner solution is optimised to your unique equipment needs. Whether that means finding the right liner, or customising one specifically to your operation, you'll be able to operate secure in the knowledge that you're giving your machinery the best possible protection. With solutions designed specifically for you, we ensure that you get more out of your mills, so you get more out of your investment.

Options to fit any need

Mill liners fill a basic role: to protect your mills from the intense wear and tear that comes from grinding down hard, raw materials. But even if they all do the same job, not all mill liners are created equal. From the abrasion resistance of rubber to the impact resistance of steel, different material parts offer different advantages. FLSmidth supplies the full range of mill liners options, including composite, steel and rubber liner solutions.

Composite

For top performance across a range of applications, FLSmidth PulpMax™ Composite Mill Liners are a best-of-both-worlds approach. These liners offer a longer use life than other options on the market, incorporating a unique matrix of rubber, steel and ceramic. By significantly reducing downtime and allowing for increased throughput, PulpMax Composite Mill Liners offer a return on investment unmatched by single material liners, and are an effective wear solution in all SAG and ball mills.

Steel

Surpassed only by composite mill liners, steel mill liners offer high-quality impact wear protection in both SAG and ball mills. By incorporating different alloys into the steel mill liners, We tailor the mill liner solution to fit specific customer applications. And, with casting services available regionally around the globe, We optimise your supply chain to improve your logistics, cut down on lead times and save you money on transportation costs.

Rubber

Rubber liners are ideal for combating wear from abrasion grinding. Rubber liners are generally a less expensive solution, and are readily available throughout the world. Rubber liners are most commonly used in smaller operations, typically found in ball mills smaller than 22 feet (6.5 metres) in diameter. Rubber mill liners are a reliable, standard solution that can be designed to fit most applications.

Expert recommendations

Each material comes with its own advantages and best practices, and each milling operation faces its own unique challenges. FLSmidth will help you choose the best mill liner materials to fit your needs. Whether your goals are to cut costs, reduce energy spend, improve throughput, reduce downtime or all of the above, We have the mill liners — and the expertise — to help make it happen.

PULPMAX COMPOSITE MILL LINERS



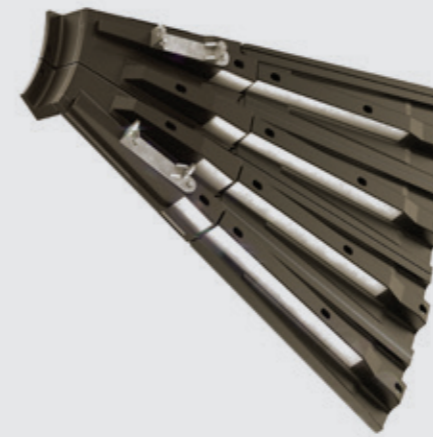
ON AVERAGE 50% REDUCTION IN WEIGHT



ON AVERAGE 50% REDUCTION IN PARTS

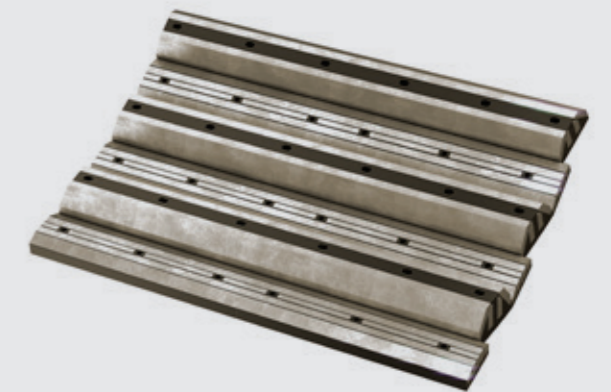


ENGINEERED FOR INCREASED THROUGHPUT



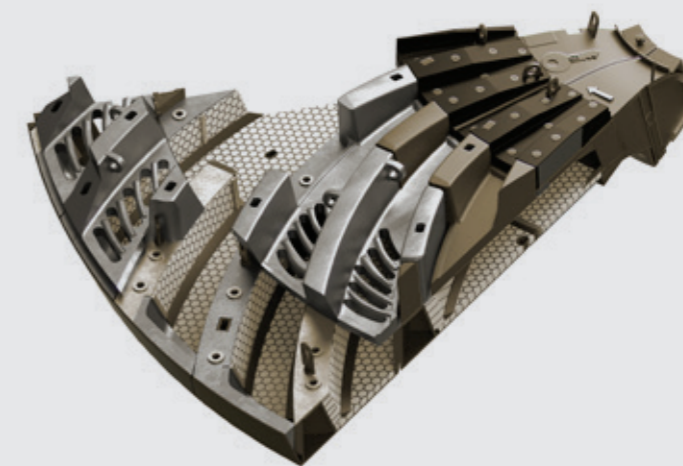
Feedheads

For SAG mills. Available in rubber-and-hot-rolled-steel composite and cast steel; optimised around improving equipment life.



Shells

For SAG mills. Available in rubber-and-hot-rolled-steel composite and cast steel; optimised around improving performance and equipment life.



Discharge

For SAG mills. Available in rubber-steel-ceramic composite and cast steel; optimised around improving throughput efficiency.

We understand the processes that drive your business

As an OEM manufacturer of mills and mill equipment, we have an in-depth understanding of the milling process. Our experience and know-how help you optimise your entire milling circuit.

Everything working together

To get the most out of your operation, you need every part of it functioning optimally and working together seamlessly. We help make that happen. Working closely with you and your machinery, on-site, FLSmidth experts will help you improve your processes and identify potential issues before they become problems. We'll also help you optimise your comminution circuits for best possible energy efficiency. The end result? Everything comes together to improve your productivity, reduce downtime and cut energy costs.

The profits are in the details

Improving processes is your key to achieving the best possible return on investment (ROI). And, when it comes to optimising your milling processes, FLSmidth on-site experts leave no stone unturned. Perfect your operation with an FLSmidth on-site visit, where we evaluate and offer knowledgeable recommendations related to:

- Product feed size
- Tonnage
- Equipment settings
- Slurry density
- Mill speed
- Operational setpoints

Every piece of the big picture

When it comes to most mill liner suppliers, expertise begins and ends with the liners themselves. But there's more to mills than just the liners. And, with potentially large sums of money riding on the efficiency and effectiveness of your mills, liner expertise by itself just isn't enough. That's why FLSmidth takes things further.

As a complete OEM supplier of mills and mill parts, FLSmidth employs experts who understand mill equipment and processes inside and out. That means that rather than focus on only one part of the equation, our experts take a holistic view of the entire mill and how it's working with the rest of the comminution circuit. You get actual, complete solutions, rather than short-term fixes.

When you invest in FLSmidth mill liners, you get more than just a premier product; you get process know-how and expertise earned from working with mining sites around the globe.

Globally backed; regionally present — FLSmidth brings world-class process knowledge directly to your site.

Specially selected geometry to ensure proper comminution and power draw.

Iterative process to refine and improve designs best suited for each customer's mill and application.

Operational support to select appropriate ramp-up curves and equipment settings

Rubber and hardened steel inserts make a lighter and longer-lasting part

Composite materials highly resistant to abrasion and impact

Designs vetted through multiple simulations to select the most effective mechanical and material design

Increased capacity with optimised design

Extended wear life through the use of engineered ceramic matrix

FLSmidth field experts use 3D scanning technology to identify the critical wear areas to calculate and extend the wear life.

Liners are only the beginning

There are many suppliers of mill liners on the market, but only FLSmidth offers a complete range of value-added services to back up our products. This is one of the core differentiators that sets FLSmidth apart as a leader in the market.

Relining services

When it comes time to replace your mill liners, every second of downtime can mean significant loss in profits. Our reline services help ensure that your equipment is back up and running as quickly as possible. We offer regionally based full-reline services and maintenance support. These services include assistance and recommendations for:

- Planning
- Inventory control
- Installation
- Maintenance
- Follow up



On-site services

Expertise is something that's best shared face to face. That's why we come to you. FLSmidth on-site services allow us to put boots on the ground, with regional product specialists ready to visit your site and put your milling operation under a microscope. These services include:

- 3D scanning
- Wear measurements and maintenance forecasts
- Inventory control
- Detailed site and technical reports

Avoid unforeseen downtime and prevent failures before they occur. Our on-site services give regional experts a chance to get into your mill and see exactly what's happening and why. We then distill our findings down into comprehensive reports designed to give you the kind of insight that only comes from having experts on-site.

Laboratory services

Get quality data to build the cornerstone of proper flowsheet design and optimisation projects. As a partner in your productivity, FLSmidth Minerals Testing and Research Center and local FLSmidth testing center services extend to:

- Complete in-plant consultations
- Plant surveys
- Grade and recovery optimisation
- Ore characterisation
- Comminution evaluation

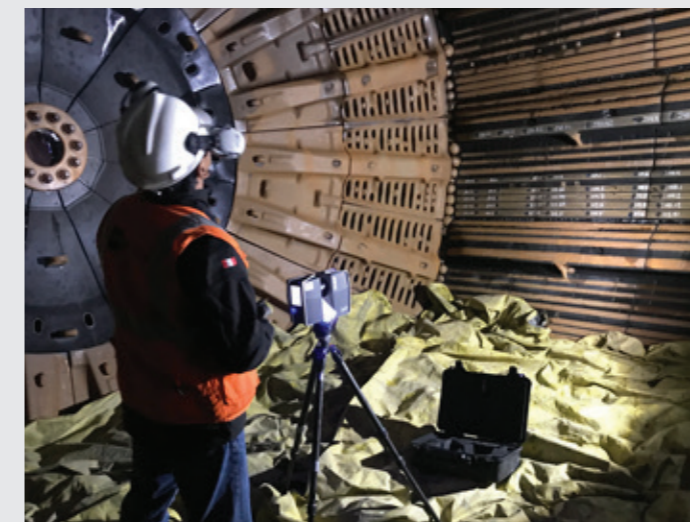
We follow a proven methodology with our lab services and provide you with a full report detailing our findings, suggestions and technical recommendations.

3D scanning

To understand how your mills are wearing — and how to best protect them — you need to go deeper. FLSmidth's 3D scanning services make it all possible.

In this process, a 3D scanner is inserted into the mill chamber. The scanner creates a complete, 360°, three-dimensional map of the existing liners and the entire interior of your mill. This map of the worn liners is compared to scans of new liners. Differences between the two scans are used to identify where and how the mill is experiencing wear. The analysis includes up to 50 million data points. This information is incredibly detailed and reliable, and can be used to gauge wearing trends, inform operating practices and accurately project wear life.

With this data, we generate a comprehensive report for you, detailing equipment life estimations, shutdown planning and opportunities for improvements in your operating procedures. We then use discrete element method (DEM) software to simulate potential optimisations and other changes. And as the only supplier of mills as well as mill liners, we provide advisory services and audits to help you improve productivity throughout your operation.

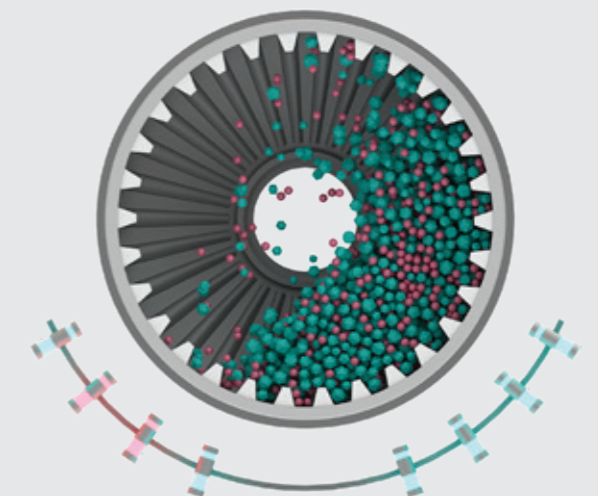


SAGwise™ total process control

SAG mills walk a tightrope of loading efficiency. On the one side, overloaded mills mean inefficient ore reduction, naturally leading to increased energy consumption. On the other side, an underloaded SAG mill leads to an increase in critical impacts, causing damage to critical media and mill liners, and resulting in costly repairs and downtime. With our SAGwise™ total process control system, you can keep your mills operating optimally, always.

The SAGwise system sensors relay detailed operational data to intelligent software, which analyzes the information and automatically adjusts feed, speed and pulp density to compensate. With SAGwise, you'll enjoy the best possible energy consumptions and throughput, while significantly reducing wear and downtime.

SAGwise total process control optimises your mill efficiency. SAGwise can reduce your mill power usage by as much as 6%, and cut the number of critical impacts nearly in half. Whether your SAG mill is old or new, and whether or not it was manufactured by FLSmidth, the SAGwise process control solution will help you get the most out of your equipment.



SAGwise™ audio sensors listen for and identify critical impacts, and relay that information to software designed to automatically adjust equipment settings to compensate.

Key service benefits

Increased productivity

Improved safety

Optimised equipment and processes

Your partner in productivity

As your partner in productivity, we are fully committed to helping your operation grow. That means providing you with reliable products, valuable services and innovative support options.

Good enough is never good enough

We operate under the belief that no matter how effective a product or solution is, there's always room for improvement. That is why we're always looking for better ways to solve your problems. This constant innovation allows us to provide the best possible service, every time.

Your success is our success

FLSmidth is a full equipment and service supplier, but we're also much more. We're your partner, and we are invested in your success. That means we stand ready to provide the equipment, software and advisory services to help your plant achieve its full potential. With FLSmidth mill liners and liner solutions, not only do you receive all of the benefits that come from working with the original equipment manufacturer (OEM), you also have the backing of a global market-leading company that is committed to your goals.

The right foundation

Our solutions are based on process and operational know-how gained from designing and supplying minerals plants around the globe. We look forward to working with you to optimise your milling operations, and providing you with the expert personnel and service offerings for a complete solution, customised to your business.

With your needs as our starting point, together we bring the best possible solutions to light.



Optimise your milling operation

Our experts are ready to help. Contact them at:

✉ grinding@flsmidth.com



Explore our liner and process analysis services

🌐 flsmidth.io/mill-liners



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Bringing better solutions to light

in the cement and mining industries

The future is full of possibilities and you are leading the way. But it's never a straight journey and it's easy to lose sight of true potential. With an ally by your side who shares your ambitions and who sees your world from different angles, we will find the right way together.

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.

Rooted in Danish values, we employ our knowledge and experience to navigate your complexity and bring better solutions to light. So no matter where in the world you are, we are here to help you discover new ground and achieve sustainable productivity enhancement.

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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