

Don't Wear The Cost Of Repair

HMA Wear Solutions is a global leading designer and manufacturer of wear solutions, including advanced silicon-carbide and zirconia-toughened alumina ceramics, bringing more than 40 years' experience in engineering and manufacturing to the mining industry.

With ever-growing pressure on operations across the resources sector, mining companies can increase the lifespan of some of their critical infrastructure by up to 10 years by utilising HMA Wear Solutions' services and accessing its globally available ceramic solutions.

With HMA Wear Solutions' innovative ceramic technology, planned maintenance can be extended significantly bringing an incredible benefit to an operation's revenue.

The Australian Mining Review spoke with Wear Solutions' Operations Manager, Mark Osborne, and National Sales Manager, David McKay to learn more about the products.

HMA Wear Solutions
HMA Wear Solutions is a part of the HMA Group of Companies and specialises in the design and manufacture of ceramic lined and wear resistant equipment.

Established in 1966, the company is the pioneer who introduced ceramics to Australia and have since grown to expand its operations globally.

"We are an Australian-owned business and are rapidly growing in Australia, Indonesia, Papua New Guinea, New Zealand, South Africa and South America," David said.

"We have long-standing relationships with our Australian and International clients, some of whom have been with us since the start."

With a head office and factory in NSW, a second factory in Queensland and a third factory in WA, HMA Wear Solutions is the only company established in three states in Australia for manufacturing. HMA Wear Solutions also has a manufacturing facility in South Africa.

"We are well positioned with stock available nationally, we also own the largest inventory

of monolithic liners in the southern hemisphere," David said.

Battling Wear
Engineers aim to design products which can stand the test of time, but naturally, wear and tear in the form of abrasion, adhesion, corrosion, surface fatigue and cavitation occur.

"Where our competitors are happy to repeatedly replace wearing components, we aim to increase the life-span of each component to provide greater durability and reliability," Mark said.

Wear is generally defined as a change in the surface condition of a material, either through damage or removal of material from surfaces in contact with one another.

Wear causes a change in a material's shape or topography and is typically a response to how a material is being used.

The wear of materials used in the mining industry can cause significant operational maintenance and shut down time and cost.

"Mining personnel are growing increasingly busier by the day. When a critical component in a plant breaks down or deteriorates it can create significant cost to the operation," Mark said.

"We support clients by increasing the lifespan of critical infrastructure to make their operational maintenance easier and cheaper.

"We are different, we want components to last as long as possible.

"It may sound counterintuitive for a business that relies on the wear of components, but we believe having sustainable, long lasting products will benefit our clients in the long term."

Types Of Wear
Abrasive wear occurs where rough or hard particles physically impact a material's surface.

This type of wear is common in pipelines, cyclones, and spiral equipment in the mining industry.

Adhesive wear occurs where surfaces are in sliding contact with one another and the contact points are sheared by the interaction.

Mining companies operate in some of the harshest environments on the planet.

As such, many of the mine's infrastructure and plant are subject to corrosive and chemical wear.

Examples of this include the development of rust through oxidation reactions and surface interaction with harsh chemicals or extreme temperatures.

Mining companies must also replace infrastructure suffering from fatigue wear.

This type of wear occurs where a material undergoes repeated stress loading.

The material will be permanently damaged if not replaced in time.

There are many other types of wear but the final type with considerable impact to the mining industry is cavitation wear.

With the drive for increased mining throughputs, the resulting increased flow rates in pipelines can lead to cavitation wear. This type of wear leaves a unique damage pattern on impact surfaces and occurs when small voids in a materials' surface grow and collapse due to rapid changes in pressure.

Tried And Tested Solutions
"We have developed a suite of ceramic solutions supported by our leading manufacturing technology to combat wear issues faced by the mining industry," Mark said.

"Each ceramic solution is tailor-made to suit each site's specific requirements and optimise the lifespan of site infrastructure. "We have used all lining methods available to the industry for over 40 years; we have trialled them all, separated the weak from the winners and found more reliable and consistent ways to do things.

"There are many companies who focus on one or two types of ceramics, but we specialise in all of them available in the

wear market.

"At the entry-level we have WearTech pipe solutions which offer smooth, finished pipes with no internal joints on straights.

"We also introduced basalt to the market in the late 1970s, which is available in pipelined monolithics, tiles and complex cast shapes. "We have high wearing, robust, alumina-based ceramic solutions which are pre-engineered in a variety of geometries from simple to complex shapes.

"Taking a step up from alumina, we have our more sophisticated ceramic solutions: advanced siliconised silicon-carbide ceramics (SiTech), which provide extremely hard-wearing surfaces, and zirconia toughened alumina which offers additional strength and toughness, hardness and wear resistance than alumina alone.

"We have broad experience in a range of products and have trialled them in the field. This allows us to work with our clients to highlight what will work in certain applications. Where our competitors may disagree, we can tell them with confidence that we've tried it and we know it works.

"We often hear that some companies have trialled ceramic technology provided by our competitors in the past without success."

Mark said that often the issue is not with the material itself, but in how the material has been applied.

"We would like the opportunity to bust the ceramic myths, through our extensive experience," he said.

"Australian Standard AS4041 for pressured piping will tell you the welding and thickness requirements of a pipe as well as which flanges are rated to the required pressures. "We apply this design code to our products and use calculations to ensure our products conform to the standard.

"We apply great engineering and design to the way ceramics are applied and consider each specific application. Anyone can install ceramic in a pipe, but it is the application and manufacturing processes which make it a success.



The minerals-processing Cyclone Feed Line. Replacing the mining hose with alumina monolithic linings increased service life by a factor of five times.

"We apply over 40 years of service delivery and engineering principles to design the ceramic products to be suited for each application."

Six Times Longer Than Steel
The WearTech pipeline products comprise steel pipes lined with a composite epoxy ceramic.

"Standard steel pipes used in the industry today can have a wall thickness of 9-12mm," Mark said.

"In our WearTech products, we can reduce the steel thickness to 3mm and line the pipe with 8-10mm of ceramic material," Mark said.

"We can provide clients with a pipe which has the same outer and inner diameter but has a wear rate five to six times better than its steel counterpart and can be less than half the weight.

"Of course, this is pressure-dependent, but generally the volume of steel can be reduced so long as pressure rating is maintained to the required minimum. In most instances, steel thickness is driven by the level of wear protection required. In our products, steel is only an outer shell, it is simply a mechanical carrier for our ceramic liners."

Increasing Lifespan By 10 Years
"Wear rate increases where there is a change in direction, an outlet or bend in a pipe," Mark said.

"Lower grade ceramics run well in straight pipes where there is not a lot of wear but in bends, many applications require the use of higher-grade ceramics.

"We will often start by assessing pipe bends which may need to be replaced every six to 12 months, considerably sooner than their straight pipe counterparts.

"We aim to make the bends last as long as the straight pipes."

"We have replaced standard HDPE pipe, generally located in low wear areas of a plant, such as, return water pipelines, spirals and dewatering cyclones, with our ceramic products," David said.



A cross section of alumina-lined monolithic cylinders held in stock at all manufacturing locations.



Iron ore polyurethane-lined dewatering cyclones upgraded to Sitech lining to increase service life from three months to two years.

"Where a standard steel or HDPE pipe may only last for one year, installing a ceramic lined pipe can give the pipeline an additional eight to 10 years of life.

"Clients can save on eight to 10 years of maintenance."

Innovation in Silicon Carbide
One of the most sophisticated solutions developed by HMA is made from siliconised silicon carbide or SiTech, a material which was historically used in kilns used to manufacture porcelain products.

With a kiln's temperature reaching more than 1000oC, silicon carbide demonstrated its durability; however development was needed to see whether this would translate into wear life.

"We reviewed the historical uses of silicon carbide and developed a concept that could be utilised in the mineral and resources sector to optimise the life of infrastructure," Mark said.

"In areas of a plant subject to high velocity, pressure, and abrasion, such as cyclones, cyclone spigots, distributors and specialist separation equipment where maintaining the products operational performance is critical, products made from polyethylene, steel and rubber do not meet the required maintenance periods, resulting in unscheduled outages.

"By integrating silicon carbide into component design, we have taken that short life span and extended the products life to that in years."

"By improving the products wear rate, efficiency can be maintained over a longer period and the mine can reduce its maintenance activities," David said.

Handling Big Impact
The most exotic product offered by HMA Wear Solutions is its zirconia toughened alumina.

Although its application can generally be price prohibitive, the zirconia-based product is the latest in ceramic technology which thrives in niche, challenging environments and is more resistant to impact from larger

ore pieces.

Pipeline Lining
HMA Wear Solutions says mining companies can cash in on the ceramic technology installed in pipelines.

"We have IP protecting our manufacturing process but generally our monolithic lined products are secured centrally in the steelwork with bends manufactured via a lobster back arrangement, which allows us to leave bigger bends in sections and line sections individually before welding them back together," David said.

"Ceramics are often tiled to the inside of a pipeline but to eliminate longitudinal joints in the direction of flow, the benefits of using monolithic liners are well proven.

"The monolithic method involves feeding a cast cylinder - whether it's basalt, alumina or silicon carbide - into the selected pipeline, keying the castings and backfilling it with the appropriate material.

"The resulting product will have an increased life span, provided by its new ceramic lined inner sleeve and all longitudinal joints are eliminated as there is only a radial joint per liner segment."

The Right Engineering Know-How
HMA Wear Solutions provides products in all shapes and sizes.

The alumina monolithic products can be manufactured in Australia in sizes ranging from 25mm inner diameter up to 500mm. Larger products can be designed but some considerations need to be made regarding the cast, moulding, consistency of the material and roundness.

The bigger the product is, the heavier it becomes and the harder it is to maintain.

"Anything is possible with the right engineering know-how," David said.

HMA Wear Solutions
"First, we ask our clients to show us any critical site equipment subject to the most significant wear rates," David said.

"We inspect the equipment and provide our

The cast alumina monolithic Y piece one-piece design to eliminate all joints providing a reliable wear resistance solution.



Looking into the Mackay, Queensland workshop with in-house fabrication, lining and protective coatings, all under the one roof.

clients with solutions that can sometimes take a component that wears every six weeks and be confident the client will get a few years out of it.

"Taking the stress out of maintenance and reducing long term cost for our clients is our aim.

"Quite often, we can show clients where they can gain an additional five to ten years of life out of an installed component in their plant.

"You can imagine the net cost saving that has on the operation."

In A Nutshell
HMA Wear Solutions is a well-established, global business with access to more than a hundred years' worth experience across its sales department, technical and workshop teams.

It can offer collaborative solutions across a range of commodities and geographic locations.

All of its workshops have manufacturing and fabrication capabilities. "We have as much steel fabrication capability as lining capability," David said.

"We design and fabricate around the lining required rather than installing lining to off the shelf pipe.

"We created the ceramics market, we were the pioneers and have delivered over 40 years of service," Mark said.

"We service the mineral and resources sectors with considerable experience in coal, base metals, hard rock, gold, copper and iron ore." **AMR**

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