


INNOVATION IN INDONESIA





Vasupol Kunavuti and Indrifouny Indra, Magotteaux, consider how cement grinding is being revolutionised with innovative, longer-lasting wear parts, referencing a recent case study at PT Semen Padang in Indonesia.

The cement industry continually seeks innovative solutions to enhance efficiency, reduce costs, and improve sustainability and safety. Vertical roller mills (VRMs) are at the heart of cement grinding operations, where wear parts play a critical role in maintaining plant performance. Magotteaux's Expand solution was responsible for a recent success story at PT Semen Padang, Indonesia, demonstrating the impact of the Expand wear parts, not only in extending the lifespan of grinding components but also in optimising energy efficiency and reducing total cost of ownership (TCO).

PT Semen Padang is Indonesia's oldest cement manufacturer, established in 1910. As a subsidiary of Semen Indonesia Group, it plays a vital role in the country's infrastructure development. With a commitment to innovation and sustainability, PT Semen Padang continuously seeks advanced solutions to optimise production efficiency and to reduce the plant's CO₂ emissions.

The challenge: frequent replacements and high maintenance costs

At PT Semen Padang, the OK54.6 vertical mill processes raw materials for cement production. Before 2019, PT Semen Padang relied on high-chrome (HiCr) rollers with periodic resurfacing. The grinding operation required hard facing every 4 – 8 months, resulting in frequent mill



Figure 1. Raw mill.



Figure 2. HiCr rollers with hard facing solution.



Figures 3 & 4. Expand installation.

stoppages, high maintenance costs, and inefficient energy consumption. Each roller required approximately 2 t of welding material, with a cost of US\$15/kg, translating into a significant financial burden for the cement plant.

Hard facing challenge

Cracking

There is a certain risk of roller cracks occurring during or shortly after welding. Welding introduces inevitable microcracks into the support structure and causes stress due to uneven heating. It is impossible to predict when cracking will occur or how many welding sessions it will take to appear. There is generally no early warning, which can lead to unexpected mill stops due to roller breakage, potentially affecting the entire plant.

Mill availability

Hard facing operations require the mill to be stopped for 7 – 10 days each time, reducing mill availability and increasing maintenance costs.

Lethal fumes

Welding emits hazardous fumes, especially when done inside the mill (i.e., in a confined space).

Recognising these inefficiencies, PT Semen Padang sought a solution that would extend the operational life of its grinding components, reduce the frequency of maintenance, and ultimately lower total cost of ownership.

Transition

Magotteaux was chosen as the first priority supplier for metal matrix composite (MMC) solutions. The initial installation of MMC rollers, without altering the original equipment manufacturer (OEM) design, marked the beginning of a new era for PT

Semen Padang. During this period, it was observed that the first wear zone started on the edge of the casting, impacting the ceramic grain faster than the mid-zone.

Based on wear pattern analysis, Magotteaux applied its Expand solution, which includes a long-lasting metal-matrix composite material. This further enhances the hardness of the grinding elements while maintaining ductility and mechanical reliability. The solution also features a customised design tailored to the wear profile, ensuring uniform surface wear and maintaining the proper pressure on the material in the mill.

The first set of two Magotteaux Expand cement innovative longer-lasting rollers was installed in October 2021, achieving a lifespan of 5400 hours. At the same time PT Semen Padang also installed four rollers from a competitor. However, the competitor's rollers achieved a lifespan of only 3000 hours, reinforcing the superior performance of Magotteaux's Expand solution.



Figure 5. Third Expand set in operation.

Table 1. Performance comparison of Expand rollers vs. competitor rollers.

	Expand	Competitor
Lifetime (hours)	5400	3000
Wear rate	21.66 mm/kHrs	38.02 mm/kHrs

Table 2. Performance comparison of different solutions at PT Semen Padang's OK54.6 mill.

Solution	Achieved life (hours)	Specific power consumption
HiCr + hard facing	2000 – 4000	19.13 kWh/t
1 st Expand (rollers)	5400	17.71 kWh/t
2 nd Expand (full set)	9500	17.71 kWh/t
3 rd Expand (full set)	5500 (ongoing)	17.71 kWh/t

The real breakthrough occurred when PT Semen Padang adopted the complete Magotteaux solution, including the Expand rollers and grinding table. The second and third sets of Expand rollers demonstrated significantly improved performance, thanks to the optimised compatibility between the rollers and the grinding table.

The second set, which was in operation from mid-2022 to June 2024, achieved an impressive lifespan of 9500 hours. The third set, currently in operation, is expected to perform at least as well as the second set, with ongoing monitoring by Magotteaux's specialist. The combination of the Expand rollers and Magotteaux's grinding table led to a longer lifespan, reduced energy consumption, and lower maintenance costs – offering a holistic improvement over both HiCr hard facing and competitor ceramic rollers.

To highlight the benefits of Expand, Table 2 summarises the performance of different solutions at PT Semen Padang's OK54.6 mill.

Key benefits

Reduction in downtime

The use of Expand wear parts has reduced mill stoppages by at least 3 times against HiCr and Other MMC. Expand offers high resistance and longer life. Customers will experience the lowest wear rates and the longest lifetime of their vertical mill parts. Reduced stops encompass a safety benefit for the maintenance teams, since their interventions are significantly reduced.

Cost savings

The elimination of hard-facing requirements has saved maintenance costs around US\$180 000/yr per set of rollers.

Energy efficiency

There has been an average reduction of 1.42 kWh/t in specific power consumption over the lifecycle.

Consistent product quality

The average residue has been consistently maintained at 16.3% on 90 µm throughout the lifecycle. Expand enables consistent, reliable production and stable operating conditions.

Sustainability impact through improved product lifecycle

Longer-lasting components mean fewer replacements, reducing the environmental impact from manufacturing and shipping wear parts. Lower power consumption and fewer shutdowns also help cut CO₂ emissions, supporting more sustainable and efficient operations. Additionally, worn parts can be recycled.

Testimonial

Prior to 2019, PT Semen Padang experienced recurring reliability issues with high chrome rollers, requiring hard facing interventions every 4 – 8 months. These unscheduled maintenance activities not only incurred substantial operational costs but also led to unplanned production losses, as repairs were frequently conducted outside planned shutdown periods.

The implementation of Magotteaux's Expand solution marked a milestone in improving component lifecycle and maintenance efficiency. With this innovation, the service life of rollers and tables has been extended to 12 months or more, resulting in a notable reduction in maintenance frequency, improved equipment availability, and greater process stability.

PT Semen Padang is now collaborating with Magotteaux on the next phase of development: extending the lifetime of Expand components beyond two years. This initiative is strategically aligned with the company's commitment to enhancing

operational reliability, optimising total cost of ownership, and driving continuous improvement in production performance.

A step forward for the cement industry in Indonesia

The success of Magotteaux Expand at PT Semen Padang serves as a benchmark for cement plants worldwide looking to optimise grinding operations. The transition from Hi-Cr hard facing to MMC has proven to be a game-changer, delivering longer lifetimes, cost savings, and enhanced operational efficiency. This case also highlights how investing in high-end solutions translates into measurable long-term benefits. With lower maintenance requirements, reduced production losses, and enhanced reliability, Magotteaux's Expand wear parts represent a step forward in grinding operations.

Looking ahead, the company remains committed to continuous improvement, collaborating with cement producers to push the boundaries of wear part technology. ■

About the author

Vasupol Kunavuti is the VRM Product Line Leader at Magotteaux, bringing extensive industry experience in optimising wear solutions for cement grinding.

Indrifouny Indra MM, President Director of PT Semen Indonesia (Persero) Tbk, is a leading expert in cement manufacturing with decades of technical and leadership experience within PT Semen Padang.