

Ro-Star ultra-fine grinding one year on

Maelgwyn Mineral Services (MMS) has been developing the Ro-Star™ ultra-fine grinding mill over an extended period, drawing on more than a decade of experience in fine and ultra-fine grinding applications.

Over this period, the concept has progressed through multiple stages of design development, pilot testing and iterative refinement, with the overarching objective of improving energy utilisation and reducing wear in ultra-fine grinding duties. The Ro-Star mill has also been granted worldwide patent protection, underscoring the proprietary design and innovation behind the technology.

The past year has been one of rapid progress for the Ro-Star program, moving from long-term development into a more advanced stage, with both laboratory and industrial assets now established. While the results achieved to date are encouraging, MMS remains deliberately measured in its conclusions. It explained: “Ultra-fine grinding performance is strongly application-specific, and the long-term role of the Ro-Star will ultimately be defined through operation at industrial scale.”



With the industrial mill mechanically complete and the laboratory test platform established, the Ro-Star program is entering a critical next phase, Maelgwyn says

As the program progresses, the emphasis will remain on structured testing, transparent benchmarking and close engagement with industry partners. Future updates will focus on industrial operation, validation of scale-up behaviour and continued refinement of the Ro-Star mill family.

A key milestone achieved during the past year has been the mechanical completion of the first industrial-scale Ro-Star mill, designed for installed motor powers of up to 500 kW. This unit represents the first full realisation of the Ro-Star concept at industrial scale and marks a significant step in progressing the technology beyond laboratory and pilot environments, MMS says.

Manufacture of the 500 kW Ro-Star has been undertaken in close partnership with Ersel Heavy Machinery of Turkey. Ersel's

experience in the design and fabrication of large grinding mills has been instrumental in successfully translating the Ro-Star concept into a mechanically robust and maintainable industrial machine, according to MMS.

“The industrial Ro-Star incorporates the defining features of the technology, including its suspended, bottom-fed vertical configuration and a rotor–stator grinding chamber that relocates the active grinding zone away from the shaft and towards the shell,” MMS says. “This lower, wider geometry is intended to minimise inactive grinding zones, promote efficient energy transfer and reduce wear rates, while also improving access for inspection and maintenance.”

Lab Ro-Star and test work

In parallel with industrial manufacturing activities, MMS has continued the development of a dedicated laboratory-scale Ro-Star mill intended specifically for controlled test work and benchmarking. Rather than serving as a prototype of the industrial machine, the laboratory Ro-Star has been developed as a stable and repeatable platform for generating high-quality signature plot data across a range of materials.

During the past year, the laboratory configuration and operating procedures were refined to address early commissioning challenges and improve hydraulic stability, bead handling and power measurement reliability, according to the company. These refinements have resulted in a laboratory test rig capable of producing consistent and repeatable datasets suitable for comparative evaluation.

The laboratory test procedure was developed and reviewed in close collaboration with Global Met Tech. This collaboration ensured alignment with established industry test work practices and enabled direct comparison of Ro-Star performance against existing ultra-fine grinding technologies under equivalent conditions, supporting transparent benchmarking and confidence in the laboratory results, the company says.

An extensive program of laboratory test work has been completed using the Ro-Star mill at research facilities in Germany. Signature plot testing was conducted on a range of materials, including magnetite, copper concentrate, zinc concentrate and silica. MMS explained: “Particular attention was paid to controlling solids concentration, bead fill, tip speed and residence time to ensure meaningful comparisons.”

Results obtained to date demonstrate that the Ro-Star is a technically robust and competitive ultra-fine grinding technology, according to MMS. Across multiple materials, the Ro-Star achieved lower specific grinding energy requirements for a given product size in several test campaigns, as well as matching benchmark mill performance in others. While improvements are material- and duty-dependent, results consistently align with the Ro-Star's design intent of enhanced energy utilisation and efficient stress application, the company says.

The next phase

With the industrial mill mechanically complete and the laboratory test platform established, the Ro-Star program is entering a critical next phase. The priority for the coming year is to secure an appropriate industrial placement for the 500 kW Ro-Star and operate it under a clearly defined duty.

Data generated from this installation will be used to validate laboratory-to-industrial scale-up relationships, confirm specific energy consumption and wear performance at scale, and refine operating envelopes for different applications. These outcomes will underpin future mill sizing decisions and support broader commercial deployment of the Ro-Star technology.