Commercialisation Pathway for Low Energy Gyratory Rolls Crusher Technology

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ABSTRACT

Comminution accounts for over 5% of global energy consumption and an innovative Gyratory Rolls Crusher (GRolls™) technology has been developed in South Australia to reduce energy and water consumption, providing dry and wet crushing from ~20mm to 20-micron fractions without media, replacing up to two stages of size reduction. The GRolls is a compression-based particle size reduction device, designed to generate fine and ultra-fine products from coarse feeds, by simultaneously applying pulsed compression and shear forces to a packed particle bed. The breakage mechanisms initiated by these forces include impact breakage, inter-particle compression, induced tensile failure and particle shear forces generated by a gyrating roll.

The paper presents the commercialisation pathway of the GRolls technology, from "proof of concept" to laboratory scale Alpha prototype and upscaled 3-5 t/h Beta prototype for a pilot plant. A systematic progression of laboratory scale testing of a wide range of feed materials through the Alpha prototype was undertaken to confirm the "proof of concept" design and identify the many design variables and operational configurations that affect the GRolls crushing and energy performance. The test results were evaluated against some of the currently available comminution solutions such as the High Pressure Grinding Rolls (HPGR) and Vertical Rolls Mill (VRM) that the sector is moving towards to provide more economical dry comminution and a progression towards partial to fully dry process flowsheets.

The commercialisation pathway has confirmed the broad performance range and energy consumption of the GRolls which could be modularised in the near future to support new and existing low grade mining operations including critical minerals, potentially unlocking resources located in remote areas restricted by limited water and power infrastructure.