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### **Innovation Technologies in Mineral Processing**

A trend across all areas of mining industry is the increased size of equipment that is raising productivity and efficiency. One large unit typically costs less than two smaller ones of equivalent capacity, with concomitant savings in floor space, construction costs, piping, cabling and instrumentation, although the cost of downtime, whether owing to a breakdown or routine maintenance, is more severe and investment in specialized tools and equipment may offset some of the initial capital savings. The large grinding mills are being installed today. They have outgrown the power transmission capability of conventional motors and gearboxes and, instead, are fitted with gearless drive the motor windings being wrapped directly around the mill shell. Grinding is an essential early stage in mineral processing and is very energy intensive, accounting for as much as 30% of a mine's total electricity use. The aim is to maximise throughput at any given moment by changing parameters such as mill speed, ore-feed rate and dilution water flow. These systems can increase production by as much as 5% over the efforts of the best human operators, as well as stabilising operations despite constantly-changing ore-feed properties.

Online analytical instruments can provide valuable insights into the operation of many processes at any given moment, supplementing more accurate information that is only received from the assay laboratory at a later time.

Better comminution will benefit all areas of mineral processing. Microwave technology offers the biggest advance in the comminution of rock for mineral extraction since human labour gave way to the machine. This technology exploits the differing thermal dielectric properties of minerals to cause them to fracture along grain boundaries. Its potential has been understood for more than 20 years, but has not been considered commercially viable until now because of the amount of energy required. It is believed that within a few years the technology will be economically more efficient than conventional comminution for many ores.

A database of ore types that are responsive to this approach is being built up and a lot of economically significant types can benefit from it.

High voltage pulse power fragmentation (SELFrag) is another innovation with much potential. The SELFrag process opens up new possibilities for analyzing mineral samples in scientific and materials testing applications. The systems can selectively fragment raw materials to liberate mineral inclusions or to increase the quality and quantity of products, consumes extremely little energy in spite of the very high voltages used. With pulsed technology, the energy is actually emitted in brief, abrupt pulses lasting less than one thousandth of a second.

Thus new technologies have a lot of benefits in reducing energy consumption and provide the flexibility to modify and optimise the performance.