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"Current Practice and Challenges in Mineral Comminution"

"A quickfire tour of the main comminution equipment used in the mining and minerals sectors. We will show why such a diverse array of crushing & grinding machines exist by studying how the input variables affect equipment choice: What are we grinding? Why are we grinding? What product morphology do we want?

Starting materials will vary in their purity, shape, hardness, crystallite size, abrasiveness, and colour. While the most common reason to grind may be mineral liberation, many end uses require fine particles - particle size affects reactivity, solubility, intimacy of later blending, surface texture of coatings or composites and much more. Finally, our priorities may vary, they could be cost, they could be particle shape, they could be PSD. All these factors lead to many different mill and circuit designs.

The final aspect when selecting or designing a process, is weighing the capital cost and footprint against operating costs and product quality. For example, a machine with a high reduction ratio may allow fewer process steps and save capex, but a series of machines each optimised at centimetre, millimetre and micrometre scale may be more efficient. Similar choices are faced between choosing whether to mill dry or wet, batch of continuous, open or closed circuit - the rationale of these various choices will be briefly explored.

Through this discussion of process design, we will highlight open challenges in mineral comminution, including the eternal drive for better energy efficiency, the value of clean top-cuts, and the reduction of wear."