



Technical Article

## **Optimal Design and Operation of Raw Material Stockpile Homogenisers**

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Layered stockpiles have the primary property of removing low frequency variability in quality although they reduce high frequency as well. Provided they are well designed the change in mean quality from pile to pile can be reduced to that acceptable for powder reactor control. A method for optimal stockpile design is given involving microscopic computer simulation of the layering geometry and the allocation of successive significant quality values along each layer with the determination of arithmetic weighted averages of quality for reclamation of successive well mixed quantities. Performance criteria and design guidelines are presented. This paper is the second of two concerned with stockpile design and operation criteria.

Mineral chemical quality heterogeneity can be considered on several levels varying in scale and size. The types encountered in mineral solids during their preparation and processing being related essentially to the way in which such minerals evolved during their formation, the nature of the quarrying methods utilised and the types of handling and preparation procedures employed.

Each quarrying, crushing, grinding, storage and handling procedure in some small way contributes directly to the overall variability of the material.

Each fragmentation from blasting to crushing, each recycling of ore in continuous transport, each hopper and each stockpile introduces a certain amount of restructuring of the spatial distribution of natural mineralisation.

Mineral raw materials have a somewhat chaotic random spatial chemical variability. This observation is true both if one considers the variation in chemical quality with spatial position within the un-quarried ore-body as a whole, or if one monitors by sampling, the variability with respect to time of the ex-quarry mineral as it flows past a given point on a conveyor as it goes to be processed.

In many minerals processing systems there is a subsystem with the role of pretreating quarried or mined rock and producing, via a sequence of interacting processing elements, a fine powder, homogeneous in the time coordinate direction.

As a focus for discussion, let us consider a typical pre-reactor raw material homogenisation system as shown in Fig. 1 which depicts all the elemental units potentially utilised in the homogenisation of any mineral raw material.