




Design of Mineral Sand Surge Bin to deliver consistent Slurry Density

Project Scope:

Bulk Material: Mineral Sand

Equipment: 220-1150 m³

Problem: Historically, mineral sand surge bins were designed without considering the mode of flow within the bin. The mode of flow was inevitably funnel flow where the slurry moved down a central channel "rathole" to the discharge point. This resulted in an inconsistent slurry density at the discharge and reduction of process efficiency. In addition, bins "rathole" resulted in particulate solids slumping causing blockages.



Figure 1: Direct Shear Tester with submerged Cell

TBS Solution:

The solution proposed was to design the bin to be mass-flow where the slurry flows in mass down the hopper walls. This results in a consistent slurry density at the discharge due to a consistent consolidation stress created by an arch stress field existing in the hopper. In order to design the bin with the

appropriate hopper angles to achieve mass-flow, flow property testing was undertaken on the mineral sand slurry utilising a direct shear tester, with the test cell submerged to simulate conditions within the surge bin as shown in Figure 1. The design¹ developed in collaboration with Mineral Technologies is shown in Figure 2 with the

1. Lyons J, Hill G, Vadeikis C, Wiche S. Innovative Surge Bin Design for Mineral Sands Processing Plant, Recent Advances in Mineral Processing Plant Design Tucson 2009.

essential elements illustrated in Figure 3. TUNRA and Mineral Technologies have designed units ranging in size from 5 m³ to 1150 m³ which are marketed as Lyons Feed Control Units.



Figure 2: A Surge Bin in Service

Project Outcomes:

The surge bin operated in mass-flow and delivered a consistent slurry density at the discharge. Figure 4 shows the process variables. The variables of interest are the Primary Spirals mass flow and density which remain consistent apart from a step change requested by the process operator.

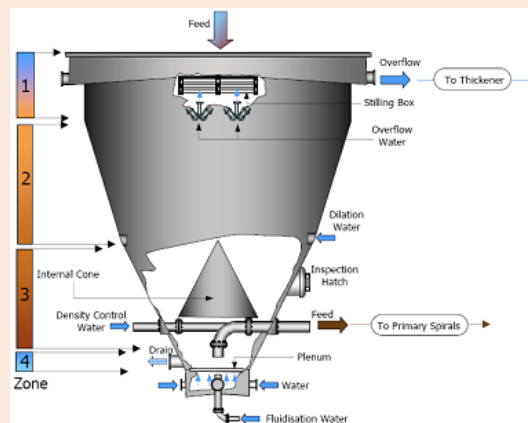


Figure 3: Surge Bin Design

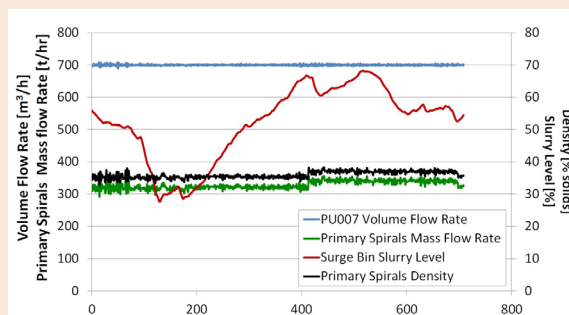


Figure 4: Process Variables

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