THE UNIVERSITY OF NEWCASTLE AUSTRALIA

TUNRA BULK SOLIDS

Re-Design of Grain Ship Loading Chute

Project Scope:

Bulk Solid Material: Grain, wheat, barley

Equipment: Telescopic ship loading spout/chute

Problem: High dust levels and non-standard operating procedure

Aim: Reduce dust emission levels and improve loading trajectory to a 3.0 m horizontal throw for a 1.0m vertical drop

Existing design required non-standard operational procedure (operating spout in non-vertical position) to aid in filling of vessel. Conceptual re-design of existing ship loading chute was performed within structural and geometrical constraints, notably limited head height (under 2.0m) and slew ring located above.

Figure 1: Existing Design and Dust Emission Observed

Prototype:

Prototype design was based on minimising impact angle and maintaining dust encapsulated within a fast moving material stream.

Analysis performed utilising a continuum approach in parallel with Discrete Element Modelling (DEM). Prototype design included a removable top cover allowing for incorporation of "thinning wall" to reduce the amount of air or space within the chute. The design was endorsed by operators - reduced operational movement (due to extended throw range) and visible dust reduction were reported.

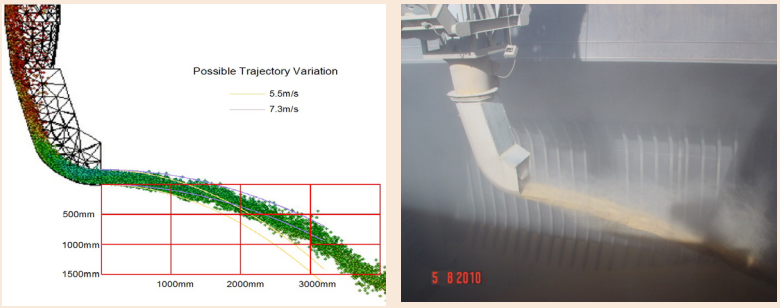

Figure 2: Prototype

Revised Design and Project Outcomes:

In consultation with the client, the prototype was revised and "thinning wall" with flap incorporated. Further "visible reduction in airborne dust" was reported. Future plans to increase the head height and incorporate a circular chute cross section were also investigated.

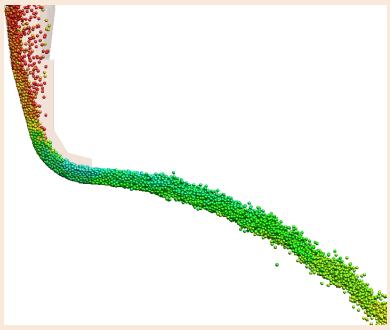

Figure 3: Revised Design

Advancing the Bulk Materials Handling Discipline Globally

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