



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA



Improvement of a Discharge System for Aluminium Hydrate

Project Scope

Bulk Material: Aluminium hydrate, known to be a very abrasive material

Equipment: Existing metering valve used to discharge alumina into a pneumatic conveying system at a rate of 1 to 20 t/h. The valve operates via a conical plug moving up or down, thus changing the annular opening size and controlling the material discharge.

Aim: Unreliable feeding into the conveying system, leading to process interruptions, which has been an ongoing issue for 20 years.

Goals: Identify the reasons for unreliable material discharge and investigate possible solutions to overcome the problem.

Strategy used by TUNRA Bulk

Analysis of the discharge issues:

Step 1: Getting un-biased information on the existing operational issues. The goal was to identify what is really happening in contrast to what the operators / engineers thought was happening.

Step 2: Investigate the flow properties of the specific material including material arching dimension, compressibility, cohesiveness and flowability.

Step 3: Relate the results of flow properties with existing design and operation procedures to identify the issue.

Investigate Solutions

The client asked for the following four options to be investigated. Manufacturers of screw conveyors and rotary valves all claimed that their system is the best for this application.

1. Improvement to the existing equipment design
2. Replacement by a screw conveyor
3. Replacement by a Fuller-Kinyon TM pump
4. Implementation of a Lisbon rotary valve

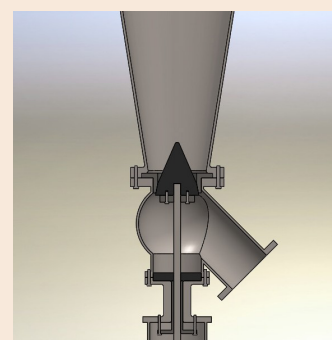


Figure 1: Existing metering valve



Figure 2: Calculation of the operative curve for a rotart valve with 350 mm diameter

Project Outcomes

Material arching occurred in the metering valve

The client always assumed that the discharge issues do not result from the metering valve operation but from material arching in the feed hopper. Therefore, air jets had been put in place in this hopper to break the material bridges. The investigation revealed that the annular opening of the metering valve was too small for the aluminium hydrate, resulting in material arching across the opening. The circular orifice was 70 mm when fully opened while flow property testing showed that the material's critical arching dimension is 120 mm.

Replacement of the discharge system was the only solution. Using a screw conveyor was not recommended due to the great size of the screw required to avoid material arching and the resulting very low screw speed to achieve the desired low range of throughput. A Fuller-Kinyon™ Pump was found to not have any benefit for this application while having high risk of blockage, high maintenance issues and high power consumption. Using a rotary valve was found to be the most suitable solution to replace the current system, although wear must be considered.



Why TUNRA Bulk Solids?

Experience and Expertise

We have provided expert solutions to industry for over 45 years and are the leading organisation for materials handling research and consulting in Australia and internationally

Research and Development

We have a proven track record in research and development through the close association with The University of Newcastle

Quality Service

We have highly qualified, well-trained and specialist staff that are committed to delivering excellence

First Class Facilities

Our laboratory is a state of the art facility located within the Newcastle Institute of Energy and Resources (NIER) at The University of Newcastle

Industry Standards

We are accredited to ISO 9001, ISO 45001 and ISO 14001

Independent

We are independent and not for profit

Advancing the Bulk Materials Handling Discipline Globally



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- To discuss your industry and business needs **phone 02 4033 9055**