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# Slippery engineering helps solve the challenges of ratholes nibbling away profit



Ratholes inhibit free flow

Common and costly bulk material flow challenges include arching of product to inhibit free flow and the clogging condition known as ratholing.

These wasteful, energy-consuming and sometimes hazardous events occur when handling and storing a wide range of cohesive materials, such as iron ore and wet coal through Run of Mine (ROM) bins, slag, sand, cement, gypsum, flour and food and beverage ingredients and materials on silos, hoppers and transfer chutes of conveyor systems.

Ratholing occurs when cohesive bulk materials are stored and conveyed in vessels with a funnel flow discharge pattern. When a stable rathole develops, the bulk

material remaining in the vessel is stagnant and will not discharge. This stagnant inventory of bulk material can spoil, cause cross batch contamination, spontaneously combust and limit storage capacity

Similar problems occur with arching, which occurs when an arch-shaped or bridge obstruction forms above the hopper outlet and stops flow. It can be an interlocking arch, where large particles mechanically interlock to form an obstruction, or a cohesive arch. A cohesive arch occurs when particles bond together due to effects of moisture, fines concentration, particle shape, temperature and other factors.

Australian engineering is answering many of these profit-sapping challenges using flow-promoting plastic liner material formulated and shaped to increase the throughput and capacity of hoppers and silos by curtailing the "hang up" of materials and eliminating dead spots in material flow.

"In many situations, the condition of ratholing and arching occurs because the wall surfaces of the vessel are not steep or smooth enough for materials to flow," says Mr Pat Flood, NSW Manager of the national and international engineered plastics specialist Cut To Size Plastics.

Cut To Size custom-engineers solutions to such issues using its UHMWPE (Ultra High Molecular Weight Polyethylene) Green Wearex material, which is a regenerated material specifically formulated to promote material flow in situations as diverse as mines, ports and hygiene-intensive food, beverage and agricultural processing and packaging facilities.

"Green Wearex achieves outstanding mass flows to eliminate ratholing and arching problems hampering flow rates and increasing downtime in unlined materials handling technology," says Mr Flood. The improvements reduce the need for energy consuming air cannons or vibratory equipment to dislodge hang-up material, reducing costs and enhancing profitability.

### **Abrasion and corrosion resistance**

Green Wearex's extremely high molecular weight delivers a unique combination of low coefficient of friction together with outstanding abrasion and corrosion resistance. This permits reliable handling of a wide range of cohesive materials with "funnel flow" characteristics in which flow issues arise because they are affected greatly by variables such as moisture content, temperature and storage design.

These factors can result in a material bulk which has a tendency to stick to conventional lining materials – a difficulty which needs to be overcome at the material wall interface, so the material can flow down or along the hopper or chute wall.

"Often a solution to a funnel flow problem is to convert the discharge pattern to mass flow, facilitating uniform dwell time, minimising stagnant areas and keeping all of the material moving. To ensure this mass flow, the bunker or bin walls must be

sufficiently steep and have a sufficiently low coefficient of friction to allow the material to flow along them.

Green Wearex achieves this mass flow with a low co-efficient of static and dynamic friction, while its wear resistance ensures a long life, even against abrasive materials.

Cut To Size Plastics manufactures components for applications across Australasia and the Asia-Pacific from its Head Office in Sydney, where facilities include CNC machining facilities coupled with GibbsCAM™ and Solidworks™ software .