Conveying In Abrasive Environments

Keeling & Walker Ltd of Stoke-on-Trent, located 158 miles (253 km) northwest of London, is the world's largest producer of tin oxide. Not only is tin oxide a very abrasive material, it is very difficult to handle. It smears, doesn't flow well, and readily bridges.

In early 2007, Martyn Pedley, Operations Manager for Keeling & Walker, decided to replace a troublesome bucket elevator at the facility that became too costly to maintain. The maintenance problems associated with the bucket elevator were caused primarily by the abrasive product getting into chains and other mechanical parts.

As a result, Pedley was seeking a conveyor that would be "man" enough for the job and, in addition, a conveyor that would help eliminate fugitive emissions into the work environment.

After trawling the pages of technical publications Pedley kept for reference purposes, he concluded that either a flexible screw conveyor (FSC) or an aero-mechanical conveyor (AMC) offered the best possible solution.

Accordingly, Pedley contacted three manufacturers of FSCs and AMCs including Spiroflow Ltd, a sister company of Spiroflow Systems Inc. of Monroe, NC. Spiroflow was selected by Pedley based on a technical article he read in a trade publication.

Pedley contacted the three manufacturers who all made arrangements to conduct trials at their respective test centers.

At Spiroflow, the continuous trials indicated that, over time, the tin oxide would smear onto the inside wall of the FSC conveying tube and build up to the point where it would most likely bind and cause premature failure. As a result of its finding, the trials at Spiroflow were re-run using an AMC. These trials confirmed that the AMC was the ideal solution for Keeling & Walker. These trial results would later be verified by the excellent operational experience from the Spiroflow aero-mechanical conveyor that has been online at Keeling & Walker since March 2007.

A Global Company Keeling & Walker Ltd, and its sister company Thermox Performance Materials Ltd, operate from the same site in Stoke-on-Trent. Between them, they offer more than 50 tin oxide-based materials for use in ceramics, electrical, electronic,s and advanced technology applications. Originally, the companies supplied materials for the local ceramics industry. Although the local ceramics industry has declined, the company has successfully developed tin oxide products for new applications as well as expanded its production to service the

ceramics industry globally.

Today, a staggering 95 percent of Keeling & Walker production is exported. High purity tin is sourced on the commodity markets around the world and is transformed into oxides of many varieties and grades by both thermal and chemical processes.

Aero-Mechanical Conveyors Detailed Frequently referred to as a “rope and disc conveyor,” aero-mechanical conveyors from Spiroflow Systems are ideal for transporting material up to 5/8” in diameter at distances of from 6 to 85 feet at rates of up to 120 tons/hour.

The AMC consists of a continuous loop wire rope assembly with evenly spaced polyurethane discs that move at high speed within parallel steel tubes. At each end, there are enclosed housings with the rope assembly running from one tube to another around specially designed sprockets. One of these sprockets drive the rope and discs while the other sprocket provides tension to the rope.

The action of the rope assembly traveling at high speeds creates an air system running at the same velocity. As the material is fed into the stream, it is conveyed to the outlet where it is centrifugally ejected. The material is totally protected by the fully enclosed tubular design allowing for a dust-free environment.

Benefits of the AMC from Spiroflow Systems include total transfer of material, low energy requirements, dust free transport with minimal product degradation and virtually no separation of materials.

A significant feature of the Spiroflow aero-mechanical conveyor is its ability to convey material at any angle between 0 degrees and 90 degrees at heights up to 85 feet without any loss of capacity. The system can be set up as a straight-line operation or in a variety of around the corner configurations. This enables the widest choice of system layout options using standard components to optimize available floor space.

Constructed of carbon steel or stainless steel, the Spiroflow AMC has sprocket housing covers that are removable. As an option, AMC’s can be supplied with interlocked, quick-release covers to the sprocket housings for easy cleaning. An integral feed hopper, with side plate to the AMC inlet, regulates the flow of material into the conveyor. Flow promotion devices such as mechanical vibrators, air-pads or rotating agitators can be incorporated into the feed hopper to cater for materials such as tin oxide that have poor flow characteristics.

A new and patented AutoTensioner automatic rope tensioning, monitoring, and adjustment system now available from Spiroflow automatically measures and adjusts rope tension and indicates when the rope is worn and needs to be replaced. As a result, rope life is increased by up to 40 percent due to continuous monitoring. Time and labor costs are also significantly reduced since operations are checked automatically instead of manually, downtime for maintenance is reduced and productivity is increased.

Heavy Investment In the past two years, Keeling & Walker has invested heavily in improving the efficiency of their production processes in order to remain competitive in the global arena.

To meet the need for more efficiency, Pedley decided to upgrade the packaging lines of Keeling & Walker to reduce its labor-intensive nature and to eliminate dust in the atmosphere. To do this, additional conveyors were required to transfer tin oxide from the reverse-jet filter hoppers, where it is collected after undergoing the thermal process, to the storage hoppers above the packing machines.

Spiroflow aero-cechanical vonveyers became Pedley's automatic choice. "Based on the performance of the unit installed in March 2007, the service we received initially and the after sales support we have enjoyed since then, I didn't look elsewhere," Pedley noted. "There was a minor teething problem with our first conveyor but a Spiroflow service engineer not only remedied that very quickly, but took the trouble to stop by a few days later to check that all was still well. The fact that the AMC conveyors were totally enclosed would also make a massive difference to cleanliness in our plant."

Based on Pedley's analysis, Keeling & Walker purchased a second Spiroflow conveyor in February 2008 and two additional AMC's in September 2008.

The original conveyor installed in 2007 is 10 feet long and operates vertically; the other three conveyors are16.5 feet long and operate at around 50 degrees to the horizontal. AMC's can operate at any angle from horizontal to vertical without any change in performance. All four Spiroflow conveyors at Keeling & Walker operate continuously.

More information on Keeling & Walker, their products and their applications, can be found at www.keelingwalker.co.uk *[1]. Visit* www.spiroflowsystems.com *[2] for more information about its conveyor systems.*

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