TECHNICAL ARTICLE SERIES

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Wheat Mill Ends Pneumatic Conveying Line Blowouts with Deflection Elbows

HAMMERTEK

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Wheat Mill Ends Pneumatic Conveying Line Blowouts with Deflection Elbows

LEHI, UT — Lehi Mills is famous not only for 100 plus years of flour production, but also for being the backdrop of the 1984 cult film ‘Footloose' in which actor Kevin Bacon fights a ban on dancing instituted by a staid local minister. Recently, the mill experienced a different kind of fight — this time against blowouts in its pneumatic pipeline elbows.

The mill processes roughly 45 tons (49.6 tonnes) of flour per day for bread flour, baking flour, whole wheat flour, and its own line of pre-blended mixes for desserts, waffles and pancakes. Founded in 1906 as a family-run enterprise, the mill still occupies its original building.

A dilute phase pneumatic conveying system was specified to move dry and tempered wheat throughout the process within the historic plant's height restrictions, but the mill staff soon noticed signs of erosion in the system's sweep elbows.

"Abrasive, fast-moving grain was causing frequent blowouts, requiring the mill to shut down every few months," explains Todd Berry, mill superintendent and director of quality control.

Sweep elbows failed on dry and tempered wheat lines

Incoming dry wheat is pneumatically conveyed through separators, sifters, aspirators and washers that filter out foreign material and remove impurities. The dry wheat line runs 25 ft (7.6 m) horizontally, 55 ft (16.8 m) vertically, and includes two 90 degree bends.

Berry noted that erosion in the dry wheat line's two sweep elbows began almost immediately, and that it worsened as the wheat grain, traveling at high speed through the circuit, generated heat and friction due to impacting the elbows' outside radius. "The wheat ate through the sweep elbows and eventually just shot out the side," said Berry. "We tried a heavier elbow, but within weeks the wheat ate through that one, too."

Circuitous routing on the pneumatic line conveying tempered wheat included a high number of sweep elbows. This compounded the problem by creating more opportunities for blowouts to occur in the numerous elbows.

Berry says the tempered wheat line initially employed six sweep elbows at various angles to convey the tempered wheat to a holding bin which allows time for the moisture to soak into the wheat before milling. Over time, however, the abrasive wheat wore through the sweep elbows, even after steel backing plates were welded onto them.

Smart Elbow® deflection elbows solved the problem of sweep elbow failure due to abrasive wheat impacting elbow walls.

Conveyor routing and deflection elbows solved blowout problems

To reduce shutdowns due to elbow failure, Lehi Mills re-configured the tempered wheat line, reducing the number of bends, and installed Smart Elbow® deflection elbows in lieu of conventional sweep elbows in both lines.

Unlike sweep elbows, in which material impacts the outside radius at high speed to change direction, the Smart Elbow design incorporates a spherical vortex chamber that extends partially beyond the flow path around the bend. Within this chamber, the airflow creates a ball of material that rotates in the same direction as the airstream, acting as a buffer to gently deflect and redirect the incoming wheat around the bend without impacting the elbow wall.

The mill reports that no blowouts have occurred as of this writing, since two deflection elbows were installed on each of the dry and the tempered wheat circuits.

"Before the HammerTek elbows, the abrasive wheat would just eat through the elbows regardless of what we did," Berry said. "I'm glad that we found the deflection elbows. They've made my life easier."

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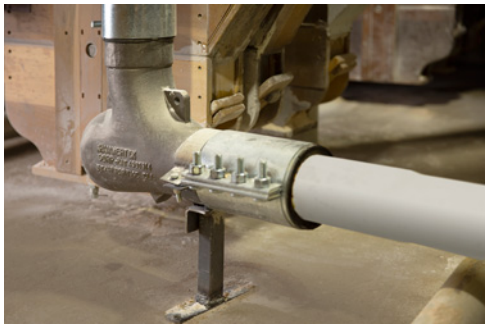
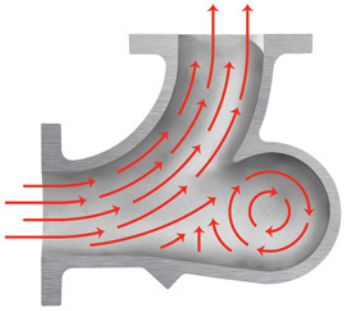


The mill replaced conventional sweep elbows with Smart Elbow® deflection elbows, preventing blowouts and associated downtime.



A spherical vortex chamber protruding from the deflection elbow causes a loose ball of wheat particles to rotate in the same direction as the airstream that powers it, deflecting incoming particles around the bend without impacting or wearing the elbow wall.

Stages of wheat processing: (L-R) dry wheat grains, tempered wheat, finished flour.

Artisan Baking Flour and Turkey Brand enriched bread flour from Lehi Mills.

Founded in 1906, Lehi Mills processes 45 tons (49.6 tonnes) of flour per day in its original building.