Maxi-Tuff® Nylon Elevator Buckets Hang In There

When Halliburton Services wanted to prevent its elevator buckets from pulling out their rivets, the company switched to Maxi-Tuff® nylon elevator buckets attached to the belt with bolts.

An oil-field services installation of Halliburton Services, a division of Halliburton Co., in Bakersfield, Calif., receives sand by bulk railcar. The room-temperature sand gravity loads onto an underground belt conveyor, which dumps it into a chute that connects to a 60-foot tall bucket elevator. The bucket elevator's multi-ply rubber belt and attached buckets move the sand through a metal enclosure and up to a metal down-spout, where the buckets discharge 3,100 pounds of sand per hour. The down-spout empties the sand into a piping system leading to storage tanks or to trucks, which haul the sand to oil fields serviced by Halliburton.

Steel buckets pull out their rivets and are noisy

Halliburton had been previously using steel elevator buckets, each attached to the belt with four steel rivets. The strain caused by the loaded buckets loosened the rivets, loosening the bucket's attachment to the belt. While Halliburton routinely examined the belt, if loosened rivets were not detected and replaced soon enough, the rivets pulled through the belt and the bucket fell off, damaging the belt.

The steel buckets also banged around and made a lot of noise during operation.

Loosened rivets cost labor, downtime, and money

To combat the problem of loosened rivets, workers installed flat washers or, in some cases a steel plate to distribute the strain on the belt. But workers still had to replace rivets about once every 2 weeks, which idled the bucket elevator for about 1 hour each time.

Occasionally, the belt had to be repaired with a laced mechanical splice, which required a day of downtime. Every 4 to 5 years, the belt had to be replaced, which cost approximately $1,000 and took a day to install.

To solve these problems, the belt's manufacturer suggested that Halliburton contact a supplier that could install lighter buckets.

Nylon bucket is light and tough

Based on Halliburton's needs, the bucket supplier recommended its tough-

Halliburton's 60-foot tall bucket elevator elevates sand, which empties into a piping system leading to storage tanks or to trucks that haul the sand to oil fields the company services.

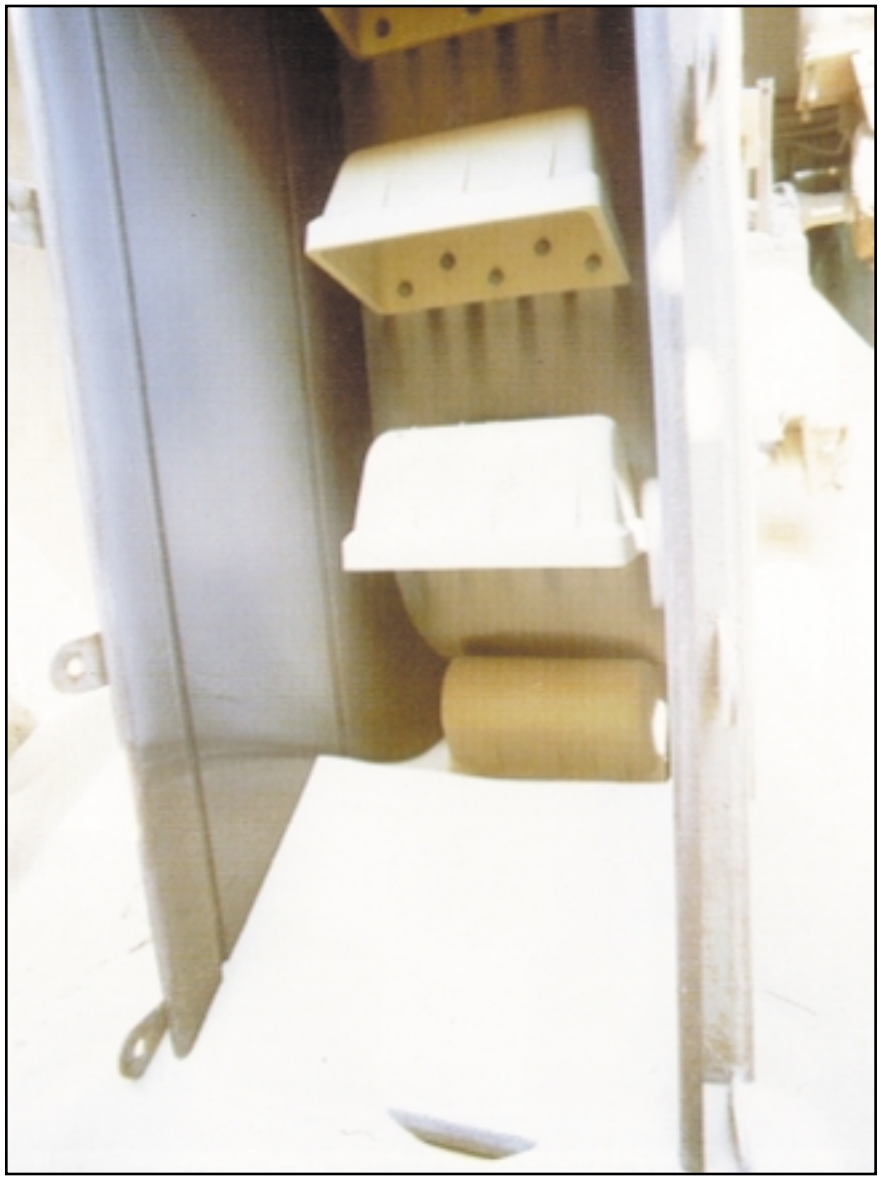
est bucket. Called Maxi-Tuff®, the bucket is made of DuPont Zytel®, a heat-stabilized, super-tough nylon that can be used at temperatures from -60ºF to +270ºF. The nylon also resists corrosion and has a surface that promotes clean discharge of material.

In addition to being made of super-tough material, the nylon bucket is designed for heavy industrial applications. The bucket's shape is roughly modeled after a traditional malleable iron or fabricated steel bucket. However, since the bucket's rim digs into the material and is most vulnerable to abrasion and bending, the nylon bucket features a wear-resistant rim. For easier loading, the top rim is tapered to be thinner at its edge.

The bucket's front forms a lip that slopes at 38 degrees off vertical. Running from under the lip to the bucket's rounded bottom, ribs reinforce the entire bucket, especially the corners, which take the most abuse. The bucket's back is thicker where it attaches to the belt.

Depending on its size, the bucket attaches to a belt with between 2 and 9 elevator bolts. The Maxi-Tuff® comes in 18 sizes ranging from 4 inches deep with a 3 inch projection (outward from the belt) to 18 inches deep with a 10 inch projection.

The company's elevator now uses 2-1/2 pound nylon buckets instead of 10 pound steel buckets to move sand from railcars to storage.



As the elevator buckets make a 180 degree turn at the elevator's bottom, they fill with sand to be carried up to a downspout for discharge.

Company decides to install new buckets

Halliburton's workers replaced 130 steel buckets, each weighing 10 pounds, with nylon buckets, each weighing 2.5 pounds, for a total weight reduction of 975 pounds.

Each bucket is 12 inches wide with a 7 inch projection, has a gross capacity of 320 cubic inches, and is attached with five steel bolts arranged in a "W" shape to distribute the load on the belt. Flat washers further distribute the load, and lock washers keep the nuts on the bolts.

The lighter buckets have eliminated the problem of rivets pulling through the belt and buckets falling off. The elevator also operates more quietly than it had previously. An unexpected benefit of the new buckets is that the load on the bucket elevator's motor is now lower. Another benefit is that the elevator now moves more sand per hour. There has been no significant abrasive wear on the buckets since they were installed.

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