Belt Damage at Loading Areas

An Elegant Solution to a Perennial Problem

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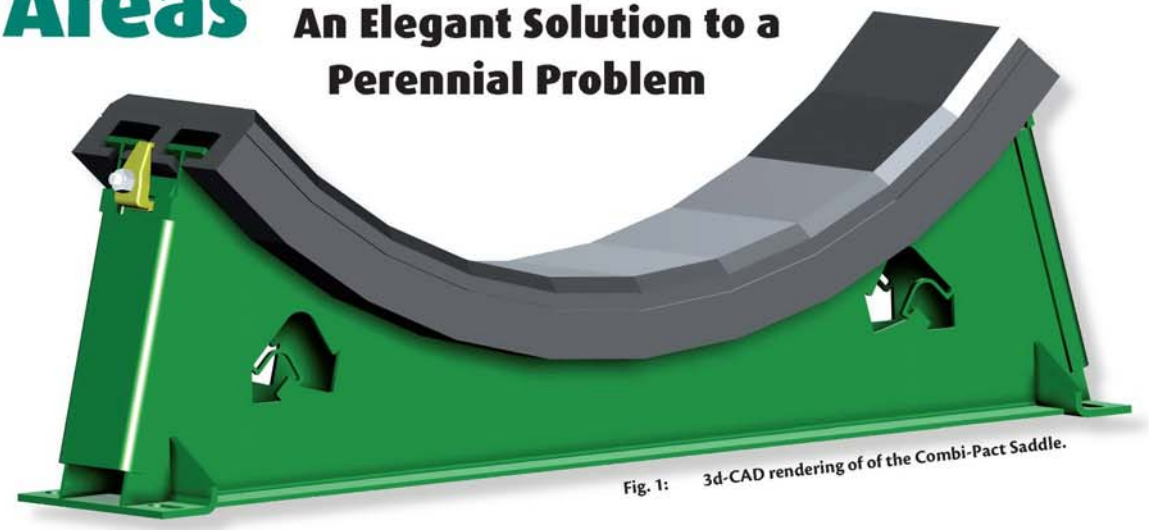


Fig. 1: 3d-CAD rendering of of the Combi-Pact Saddle.

Richwood Industries, Inc., USA

Impact damage to the belt at the conveyor loading point can cause major maintenance work and, thus, loss of time and money. This isn't really a big secret. But it seems that not everybody knows, that this problem can, if not be completely solved, at least be minimized. This paper describes the latest development in this area.

The belt conveyor created a revolution in the mining industry as it replaced more labor-intensive forms of haulage and reduced the cost per ton of handling bulk material. From the beginning, though, belt damage occurred when the material was loaded onto the conveyor belt. Jagged lumps of falling material perforated and abraded the belt. Further, alien materials sometimes found their way into the material stream and caused belt damage. Scrap metal, (roof bolts for example) could perforate the belt carcass, jam in the conveyor structure and rip many feet of belt before the damage was discovered. The impact of loaded material also damaged idlers and even the conveyor support structure itself.

Richwood Industries, Inc. developed the Combi-Pact® Impact Saddle (Fig. 1) to address the shortcomings of earlier technology. It is a bolt-in replacement for conventional idlers and is distinguished by a curved surface supporting the whole area of belt in contact. Installed in arrays, the Combi-Pact® Saddle can replace impact beds or cradles of many feet in length. Applications around the world show their adaptability to conveyors carrying a wide variety of bulk materials and processes. The article following describes the distinctive features of the product.

Replacement for Impact Idlers

The most basic equipment to address loading impact is the impact idler, a special idler with rolls covered with rubber or other soft material. They may be of the conventional three-roll design or catenary, with the linked rolls forming a chain across the conveyor. Both of these types of idler are design attempts to reduce damage to the idler, not damage to the belt. The conveyor belt remains unsupported from one idler to the next and remains susceptible to stretching and penetration. These idlers also have the unavoidable faults of all conventional idlers, the gaps and angles between rolls. These gaps and angles permit stretching and flexing of the conveyor belt at these points. The Combi-Pact Saddle is designed to be a direct replacement for impact idlers of any make without gaps or angles across the span of the belt.

Full Support for the Belt

The Combi-Pact Saddle supports the belt solidly over its entire footprint. Belts fail when either the compression or elongation limits of the material are exceeded. The design of the saddle seeks primarily to control compression of the material because that factor is the most easily and directly controlled. One analogy for elongation failure is the rubber balloon failing when penetrated by a pin (Fig. 2). The balloon, being stretched near the limit of its elasticity is more prone to damage by penetration.

Fig. 2: A burstin ballon is a good analoggy for the elongation failure.

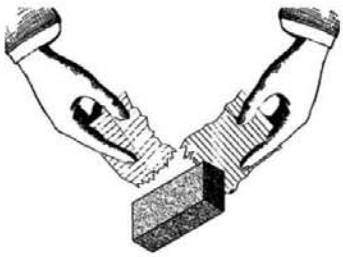


Fig. 3: If only supported at the edges, the paper will be torn by the brick.

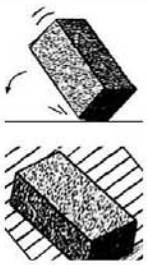


Fig. 4: Fully supported by the floor, damagt to the paper will be limited.

Another analogy would be a comparison between a sheet of paper supported only at its edges and another sheet lying on the floor. With the paper supported only at its edges, a falling heavy object will rip it immediately because the elongation limits of the material would be exceeded (Fig. 3). The sheet supported by the floor will be subject to damage from a falling object only where its compression limits are exceeded (Fig. 4). Similarly, an unsupported conveyor belt is stretched by the impact of falling material and is more easily ruptured by the sharp edges of the lumps. The full support of the saddle prevents stretching and, in turn, perforation of the belt.

Control of Impact Energy

The Combi-Pact Saddle controls impact energy by three mechanisms: distribution, isolation, and absorption.

1. Distribution: An impact on one of the segments is spread over the area of the entire segment.

2. Isolation: The same impact is isolated from the other segments by the intervening rubber cushion.

3. Absorption: Impact systems usually control the effects of falling material by slowing the progress of the energy of impact. Examples of this mechanism are plentiful. When an automotive spring bends in response to an impact, it spreads the force of an impact by bending over a space of time instead of transferring the force abruptly to the axle. If a camper jumps to the concrete floor from the top bunk, the force of his impact is cushioned only by the padding and flexing of his own body. A rug on the floor would soften the jolt a moderate amount. A mattress on the floor would increase the cushioning effect. All of these devices work by spreading over time the impact applied. A less common but more dramatic example is the picnic entertainment of catching an egg in one's hands. The trick is to meet the egg with the hands, match its speed with the hands and decelerate at a rate at which the egg does not break. This operation also is, simply put, spreading an impact over time to avoid damage.

This damping mechanism is the theory of the Combi-Pact Saddle. Materials of varying elasticity absorb the energy of the falling material (Fig. 5) by applying it to the conveyor structure over time. From least elastic to most elastic, the materials of the saddle are:

Fig. 5: Detail drawing of the segment-rubber contact area.

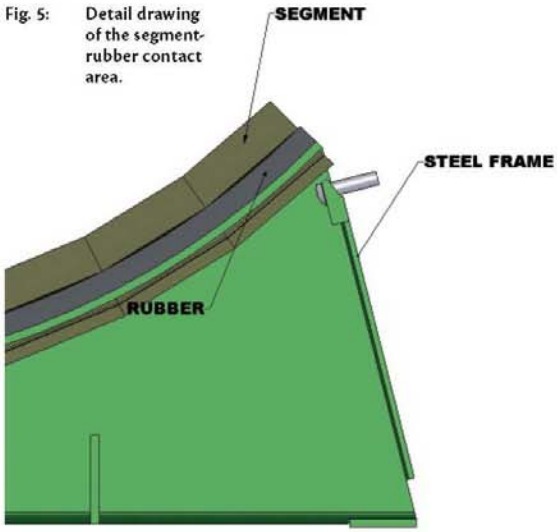
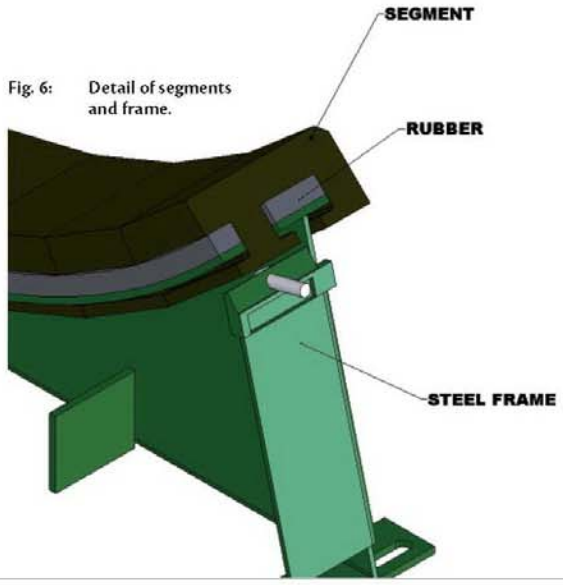


Fig. 6: Detail of segments and frame.



1. The steel of the saddle frame, which provides the principal strength of the device. It is sized to withstand the force of the material being loaded onto the conveyor.
2. The UHMW of the saddle segment which floats on the mounting rails and flexes as falling material lands on the belt.
3. The rubber lining on the saddle rails, which absorbs the force transferred from the UHMW segments.

In Fig. 5, we show the gap between surface of the rubber and the UHMW parts. Fig. 6 shows a better detail of the arrangement of the segments on the frame. The UHMW segment will deform with the impact, increasing the area of contact between rubber and UHMW and thus, the energy absorbed in the rubber.

The Combi-Pact® Saddle has proven to be an effective solution to belt and conveyor damage problems in loading areas. It is unique in the marketplace for its combination of design features to limit these types of damage. Floating, isolated segments manage the transfer of energy to the conveyor structure by distributing and dissipating the force of falling material. An unbroken support surface for the conveyor belt forestalls penetration damage to the belt. The Combi-Pact Saddle's straightforward installation in the place of conventional idlers and ease of maintenance in service makes it the outstanding choice for limiting damage at loading areas. ■

Contact

Richwood Industries, Inc.

Richwood, a West Virginia, USA, corporation, was founded in 1976. Richwood designs and manufactures products for the material handling industry. The company provides solutions to numeruous belt conveyor related problems, from conveyor belt cleaning, protection, sealing to pulley lagging, and more.

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