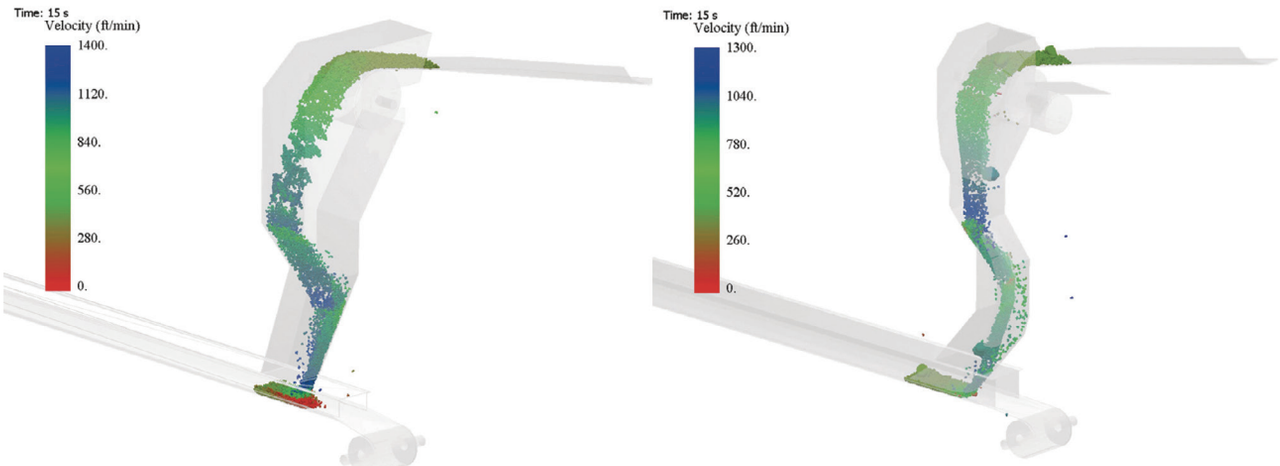
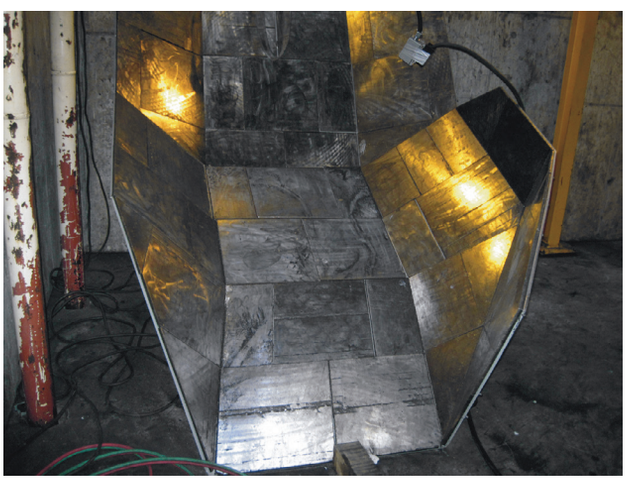
THE ROUTE THROUGH THE CHUTE

Joe Sander and Phil Wowak, ASGCO, US, discuss ways to improve the flow of coal through transfer chutes.

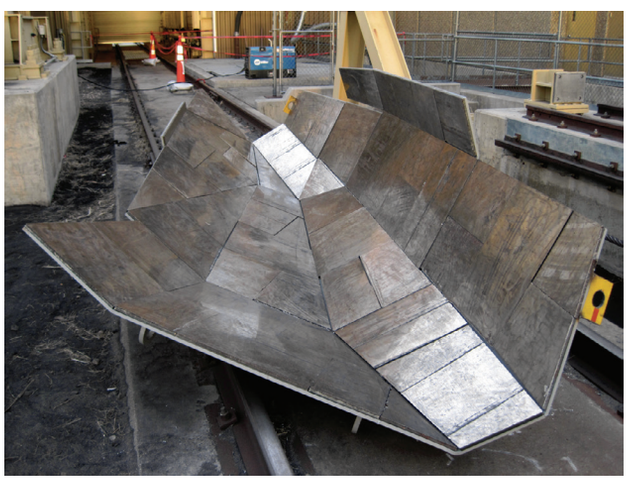
In today's ever-changing world of coal handling, one thing stays the same: coal must be loaded and unloaded onto conveyor belts. At first, this might seem an easy prospect: simply build conveyors and chutes that carry the coal. However, many problems can



3-DEM® flow analysis.



Discharge hood before installation.



Loading spoon before installation.

occur when transferring coal from one conveyor to another. Chute blockage, excessive wear, material leaking from the loading point, belt mistracking at the tail pulley and conveyor chutes leaking coal are just a few of the problems that pose challenges to the design and engineering of transfer chutes.

One of the first logistical challenges is presented when coal enters the first transfer point. The supply conveyor can move 3000 tph at a speed of 950 ft/min. As it enters the head discharge area – one of the most important areas of the transfer chute – the coal needs to change directions by over 90° and do so without slowing down and without causing any excessive wear points. It must also not stick to the surface of the chute liners, create any dust and must load onto the receiving belt without causing any mistracking of excessive belt cover wear.

Designing a transfer chute

The first step in designing a transfer chute to deal with all of these issues is to have a 3-D discreet element methods (3-DEM) analysis performed on each and every transfer point. 3-DEM provides a way to handle granular and particulate material handling problems through computer simulation and 3-D computer aided design (CAD) for complete transfer point design and fabrication. A company with extensive conveyor and material handling knowledge, engineering capabilities and 3-DEM chute design software will be able to make transfer point problems a thing of the past.

Most engineered flow designed chutes incorporate a material deflector hood to change the direction of the coal stream from its trajectory from the head pulley into the direction of the receiving belt without causing additional dusting or excessive wear. The design and configuration of this deflector hood is determined during the 3-DEM analysis. The shape and size of the hood will vary based on the speed, volume and type of material being conveyed.

The hood assembly should be designed so that the angle and height can be adjusted after installation in order to fine-tune the coal stream, so that it transfers to the loading spoon deflector further on down the chute. The purpose of the loading spoon is to, once again, change the direction of the material flow so that the materials load onto the centre of the receiving belt and in the same direction. This helps to prevent off-centre loading and belt mistracking, as well as accelereted belt cover wear.

Once the coal leaves the chute loading spoon, it contacts the receiving belt and needs to be contained within a skirted

area for the distance necessary for the load to settle down and for any dusting entrained or induced into the flow to slow down and fall out onto the belt – and not escape as fugitive dust. The load must not spill from the belt in the load.

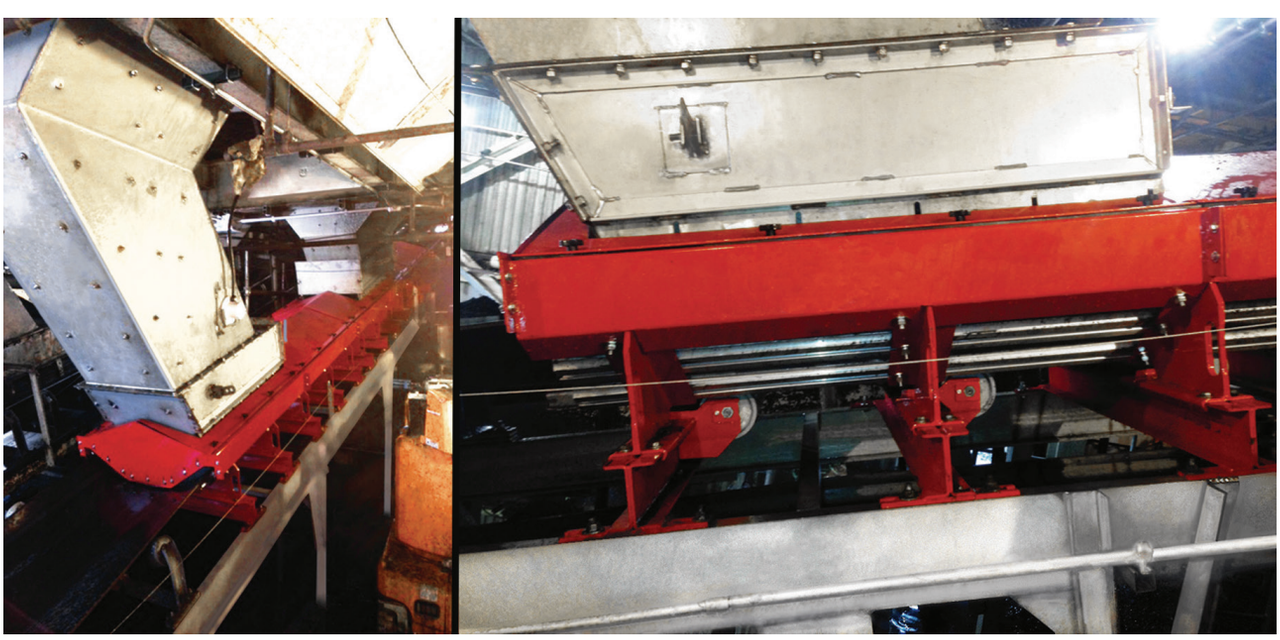
Many plants struggle to keep these areas clean, as they do not have enough time or man power to properly adjust the skirt rubber or fix holes in the chutes. Around many load zone areas, it is usually easy to find coal piles between troughing idlers and on the floor. This coal spillage is expensive because there is a cost to remove the coal and, if not properly fixed, the coal piles will recur repeatedly. One thing is for sure, every plant that has conveyors experiences these problems.

Advanced dust containment

ASGCO® has developed an advanced containment system for dust control solutions in the coal industry. The Pro-Zone™ system is a patent-pending modular conveyor belt load zone system that aims to optimise the seal for air / coal dust tightness on the receiving conveyor belt. This self-contained system is comprised of the company's Slide-N-Roll™ bed, which supports the belt; this eliminates the gaps found in a typical load zone with standard troughing idlers. The system has a slide out design for quick removal of the ultra-high molecular weight (UHMW) support bars. The Pro-Zone allows companies to choose from an impact or steel can idlers, while ASGCO can customise the system to allow the customer the choice of any idler company. The new centre roll design is quick to change out by removing the retainer clips, taking the centre roller out and installing the new roller. Side guards attach to the Slide-N-Roll frame to create a side enclosure that allows the angled hoods to be easily mounted. Hoods can be made out of aluminium or steel and completely seal and enclose the entire system. Inspection doors can be added to the hoods, as this allows operators to inspect the inside of the system. Dust curtains inside the system are anti-static and flame retardant. They are a very important component of the Pro-Zone. Multiple curtains throughout the system allow dust to settle by slowing the air velocity down and allowing the airborne dust and particles to fall to the belt.

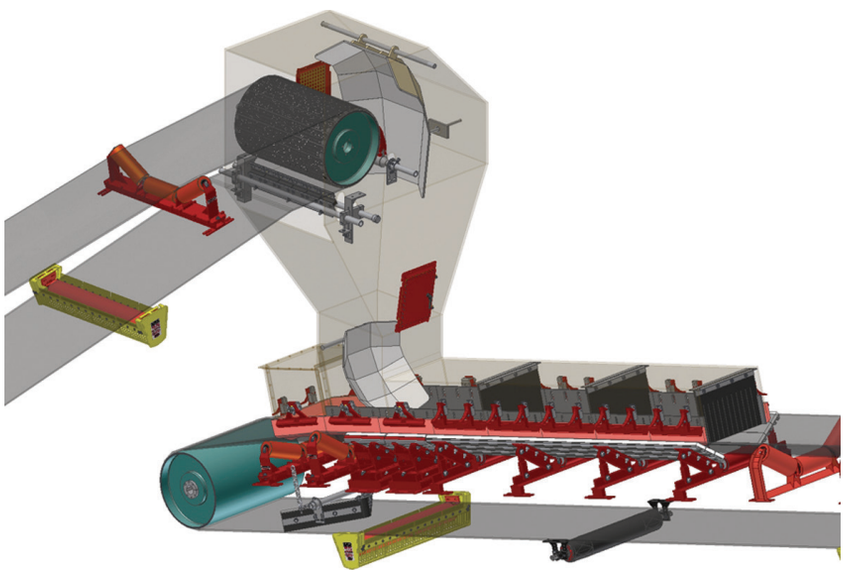
The internal rubber seal is a red ORG sealing rubber and its soft seal qualities allow it to self-seal to the conveyor belt, thereby eliminating any possibility of

Load zone before upgrade.

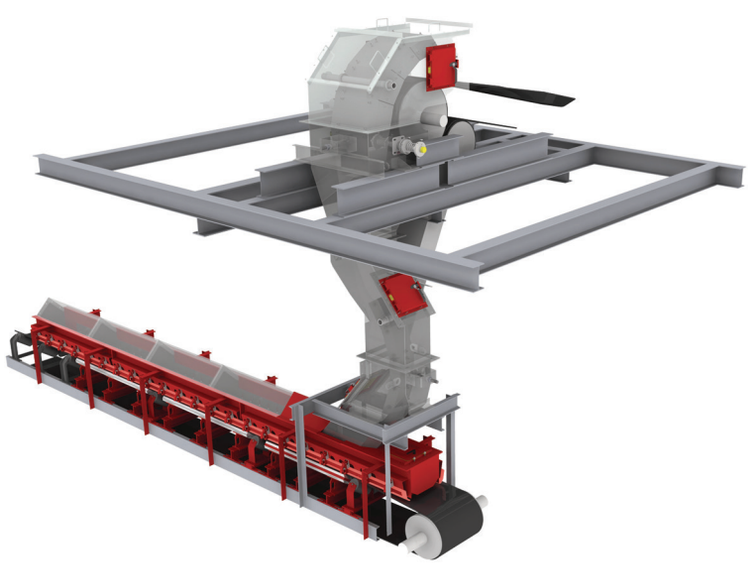


Load zone after upgrade.

Dust curtain to contain dusting.



A typical engineered flow design transfer point.



All of the compounds working together.

grooving the belt. This ORG sealing rubber system helps contain the coal dust.

Many accessories are available with every Pro-Zone system. Slide-lers™, which enable operators to change rolls without having to remove the adjacent belt idlers, can be mounted to the system. This allows the Slide-ler to fit into tight or confined spaces, ensuring proper belt support and ease of change out.

Two products that usually get forgotten about under every load zone are V-Plows and belt trainers. A hinged V-Plow is designed to effectively keep bulk material from becoming trapped within the conveyor belt and the tail pulley. This patented design of the hinge part of the V-Plow allows operators to change the amount of angle the plough can have from 30° to 45° or 60°.

With every Pro-Zone system, installing a Return Tru-Trainer® idler is recommended. This training idler keeps the conveyor belt centred on the tail pulley, which is very important in any load zone area. The Tru-Trainer has a stainless steel internal pivot, which is perpendicular to the plane of the belt. The roller's rubber covered shell and tapered ends help actuate the trainer immediately, as the belt moves off centre. The Tru-Trainer reacts as the belt moves off centre and will contact the tapered section of the roller on that side of the conveyor belt. The effect of this is to force the roller to rotate on its pivot, causing the belt to come back to its original centred position.

The Pro-Zone has been in service for about 10 months and has helped eliminate coal dust and spillage in customer's load zone areas. Customers have expressed satisfaction with the performance of the system and it has lowered their cleanup costs.

Conclusion

Every transfer point needs to have all of the above mentioned designs and products in order to function properly, contain dusting and promote flowability without excessive wear on the chute or the receiving belt. WC