A reliable partner

Jack Logue, TerraSource™ Global, US, *outlines the advantage of rotary breakers for reducing and cleaning coal.*

It is no secret to people in the coal industry that coal prices have been steadily trending downward. New government regulations, as well as the availability of cheap natural gas, have led to oversupply and made the price of coal drop significantly in countries around the world.

For example, in the US, the price of coal is currently at US$ 53.02/short t – or only 52 cents more than the 52-week low of US$ 52.50.[1] In China, the price for coal has dropped about 14% already this year – and some predict it could drop even further.[2] In Australia, the coal price has dropped to the lowest point of the year, nearly 17% lower than the average price in January.[3] Indonesia's coal prices are faring somewhat better at US$ 76.70/t, but still 9.39% lower than this time last year.[4]

With coal prices declining around the globe, producing properly sized coal with minimum fines is more important than ever, as doing so has a major impact on the value and marketability of the final product. Using a rotary breaker to reduce coal is one of the best ways to get the final product desired. Bradford Breakers from TerraSource Global's Pennsylvania Crusher® brand are used at mines around the world to crush, size and clean ROM coal and other friable materials. They give a product that is relatively coarse, has minimum fines and is 100% to size. They do it all with very little required maintenance costs.

Figure 1. A close-up view of huck bolts on a Mega Breaker. Huck bolts are an option on all Bradford Breakers.

Figure 2. A Mega Breaker, the largest type of Bradford Breaker, being installed at a mine in Washington.

How rotary breakers work

Bradford Breakers consist of a large rotating cylinder that is powered by an electric motor through a reducer drive and chain, with screen plates throughout. In all rotary breakers, coal is fed through one end of the cylinder. The built-in deflectors inside the cylinder, along with lifting shelves, are attached to the screen plates and are angled in a way that forces material to flow from the feed end of the cylinder to its far end.

Coal is lifted by the shelves as the cylinder rotates. Gravity then takes over as the coal reaches the top of the cylinder, slides off the shelf and drops to the floor of the cylinder. The impact of the coal falling against the screen plates at the bottom of the cylinder is what breaks the coal.

During this process, the properly sized coal quickly exits the cylinder through the sizing holes of the screen plate, while the larger chunks of coal move through and get lifted by the next shelf in the cylinder.

This process of lifting and dropping will continue until the coal exits through the holes in the screen plate. Because the gravity impact tends to break coal along its natural cleavage fractures, rotary breakers are known for producing very little fines. "The standard RMD model works well for most types of coal," says Paul DeVitis, design engineer for TerraSource Global, "but harder coals may require a higher height of drop to create enough force on impact."

Design benefits of Bradford Breakers

In 1905, Pennsylvania Crusher developed the first all-steel Bradford Breaker, modifying Hezekiah Bradford's original design, which was made of cast iron. The cast iron design turned out to be clumsy and inefficient, while the steel design has fared much better. "The strength of the cylinder in a breaker is very important," says DeVitis. "We've achieved incredible strength and rigidity in our breaker cylinders by lap mounting the screen plates and double bolting them in. As an option, I recommend using huck bolts (Figure 1) to hold the screen plates in place."

The cylinder is driven from one end, which requires a properly designed cylinder that can transmit the torque throughout its entire length. Some older designed breakers actually use a drive with a jack shaft that splits the applied torque to both ends of the cylinder. However, this design can be very cumbersome in trying to keep the connected torque properly applied at each end.

The screen plates are fully interchangeable throughout the cylinder, which enables them to be retrofitted more easily in the field. Several shapes of sizing holes are available, including a self-cleaning design that minimises plugging.

Flexible crushing

Perhaps the Bradford Breaker's best quality is its capacity to properly size ROM coal, while removing debris and uncrushable material at the same time. While many other types of size reduction equipment require steel and other uncrushable materials to be removed before feeding to avoid stopping the machine or – even worse – causing serious damage, a Bradford Breaker is able to take in all ROM material.

Any material that resists breakage in a breaker gets retained within the cylinder and flows to the far end, where it is scooped out by an integral plough,

or it is ejected through a separate chute to either a hopper or a free-lying pile. As such, the Bradford Breaker cleans the coal feed of unwanted material as the coal is being reduced. This ability to separate the good materials from the bad is critical in reducing the need for additional machines and replacement parts.

"The Bradford Breakers are great because it doesn't matter if a very hard rock or a piece of steel gets into the feed and goes through the cylinder," says DeVitis. "The machine won't break the rock or the steel, but those materials also won't break the machine. The debris will simply get separated from the coal through a discharge chute. In some other machines, a piece of steel could get stuck and lead to stoppage or major damage. And that could be a very expensive repair with required downtime."

Variations to the standard type RMD Bradford Breakers are available for plants and mines using harder coals and for those feeding very large chunks of coal: "The Brad-Pactor is a better option for use on harder coals because it is designed to simulate a higher height of drop than a standard RMD Breaker without taking up much more added space," says DeVitis. "For much larger feed sizes, we designed the Mega Breaker." Figure 2 shows a Mega Breaker being installed in Washington, US.

Improved output product

Depending on the desired output size and the size of the Bradford Breaker, typical production from these units can range anywhere from about 400 to 3000 short tph.

Because the breaker reduces and screens the feed material at the same time within a single machine, they provide a consistently sized output product. The gravity impact method of crushing that rotary breakers use, as explained earlier, induces breakage with very little production of fines.

The angle of the lifting shelves can be adapted to changing coal conditions to better control the capacity, the amount of ash or rock in the final product, the amount of good coal in the discharge pile and the distribution of material as it first enters the cylinder.

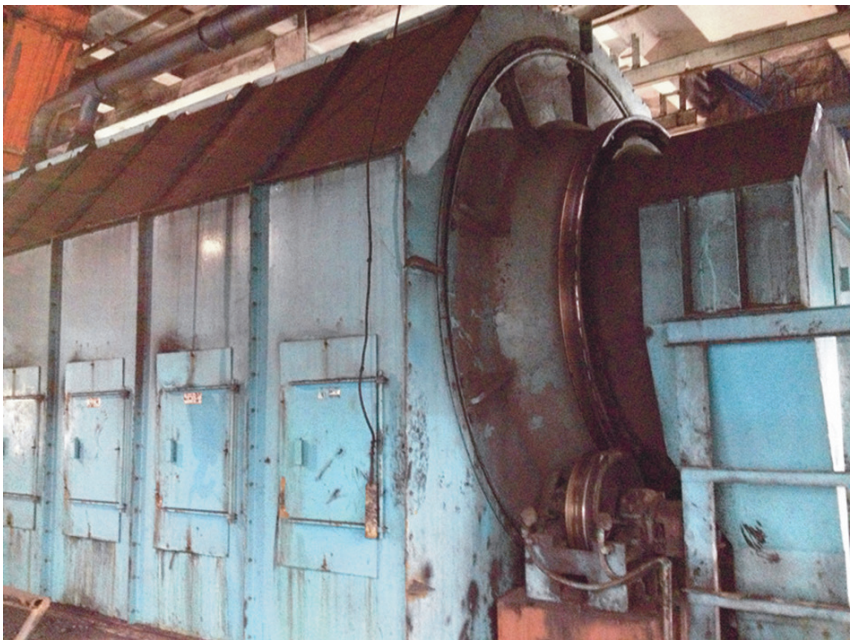

Figure 3. This RMD Bradford Breaker passes about 1000 short tph of coal at a power plant in China.

Minimal maintenance requirements

Maintenance costs are surprisingly low on all models of rotary breakers. Pennsylvania Crusher Bradford Breakers have proven their ability to function for years in the field with little more required than periodic lubrication and inspection. For example, HuBei Ezhou power plant, in the Hubei Province in China, provides power to the state grid and runs two Bradford Breakers simultaneously in its plant. Figure 3 shows one of the breakers installed. Each machine works 300 to 500 hours/month.

Each of the breakers installed passes about 1000 short tph of coal. Depending on the coal quality, each rejects about 1 short tph of waste.

Besides regularly scheduled maintenance, the power plant has only had to change the support wheels since the original purchase and installation of their machines in 1999, nearly 15 years ago. "The Bradford Breaker can go three to four years with no maintenance other than grease," says DeVitis. "These machines really don't break down and don't leave our customers left to deal with downtime." Because they rarely need maintenance, they also eliminate the added cost of keeping back-up machines onsite to make up for planned downtime.

Longevity and reliability

The ability of Bradford Breakers to provide decades of reliable service has helped make them the most widely accepted rotary breakers in use. "It's not unusual to get 40 years of life out of the Bradford Breakers," says DeVitis. "We have units that have been running for more than 60 years that are still running today."

More than 360 Bradford Breakers have been installed around the world since 1905 and more than half are still in operation today. WC

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