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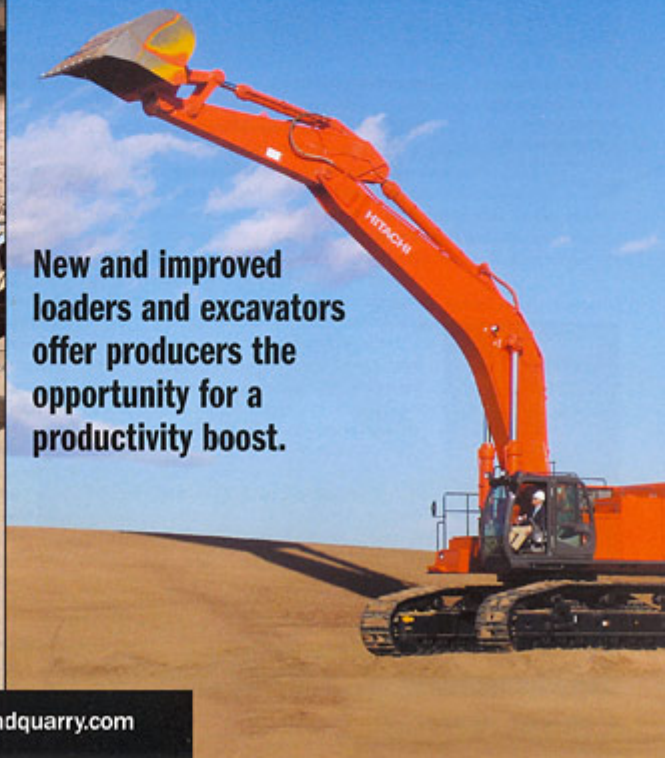

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RIPE FOR RIP-RAP

Keller Crushing & Screening relies on secondary breakers to make its profitable rip-rap product line.

Craig Keller stands in front of the Stanley breaker that is instrumental in the company's rip-rap production.

By Rodney E. Garrett

There are many different ways to make rip-rap. The challenge is in making it as profitable as possible; yet produce it at a rate so it can be delivered in a timely manner to the customers. If there is enough time between major rip-rap orders, the producer can stockpile the rip-rap so there is enough on hand when those big orders come in. However, over-stockpiling can be as much a problem as having too little on inventory.

For one, if the overproduction stays in inventory too long, it will tie up some of the company's working capital. Further, depending on the quantities and the different sizes of rip-rap being stockpiled, it can compromise the quarry equipment's traffic-flow patterns due to the lack of space. For example, there are many sizes of rip-rap and depending on how many sizes inventoried by the quarry, there will be many different stockpiles, which can cover a large area. This predicament will often lead the quarry management to opt for rip-rap production equipment that can produce most of the rip-rap as demanded and thus eliminate most of the stockpiles.

Companies, who deem rip-rap as an important major product to them, take its production methods seriously to maximize its profitability. One such company is the Keller Crushing & Screening Company of Tunkhannock, Pennsylvania. Joe Keller, president, founded the company in 1958 as a gravel sales enterprise. In 1996 he decided to take over an existing quarry located near Lemon. Rock products produced at this quarry are 24 that range in sizes and shapes from sand to R8 rip-rap.
Rock products sales and production have continuously increased through the years from 100,000 tons the first year to a projected 250,000 plus tons this year. Rip-rap has become one of the most important products for the company and is the single product-type that is the most profitable. This past year, 211,000 tons of rock products were produced in the quarry, of which 40,000 tons were rip-rap products. While the overall rock product sales this year are projected to increase by 18 to 20 percent compared to last year, the rip-rap sales will jump up by 50 to 55 percent.

Breaker 1-9

The company's stationary crushing/screening plant consists of a Cedarapids 32x40 jaw crusher acting as the primary. The secondary plant includes two Nordberg cone crushers, a 4 ½-ft standard and a short model. For efficient compatibility in feeding the first inline cone crusher the jaw crusher produces 8-in minus.

R3 (2-6 inch) rip-rap can also be screened out before reaching the cone crusher but no other size rip-rap is possible because of the jaw-crusher output size. Other sizes of rip-rap produced at the quarry include R4 (3-12 inch), R5 (4-18 inch), R6 (6-24 inch), R7 (12-30 inch) and R8 (14-42 inch).

When the quantity of rip-rap produced was 20,000 tons or less per year, the company got by with a hydraulic excavator sorting the different rock sizes at the face, following a blast for including rock for the crushing-screening plant. The larger rock pieces were broken up using an old breaker. It was laborious but it got the job done. Since 2001, the sorted oversize rock pieces were reduced to wanted size using a Stanley Stealth breaker model MB70EXS, which was a greatly improved breaker compared to the older unit.

This model breaker is one of Stanley's higher producing breakers in a lineup of eight models offered (see Table-I for this model's specifications). It has been producing 40 to 60 tons of rip-rap per hour, depending on the rip-rap sizes made, the rock hardness and the degree of laminations of the rock. The rock hardness varies considerably, depending on where it is mined in the quarry. Stratified, blocky rock also found in some mining areas of the quarry is easier and faster to fragment with the breaker.

While the Stanley breaker proved to be outstanding for producing R7 and R8 rip-rap, a new portable screen was added to the rip-rap production system this year for making the smaller R3, R4, R5 and R6 sizes. The new portable screen was added because of the high screening production rate for the smaller rip-rap sizes. Screening is carried out on the blasted rock at the face. Essentially, the screening plant and the Stanley breaker work in concert for making all rip-rap sizes very efficiently.

More of a Good Thing

This year, the company also added a new Stanley Stealth breaker model MB100EXS. It is the largest and most productive breaker in the Stanley arsenal, putting forth an impact-energy of 12,000 ft-lb. (See TABLE below for more specific information on this breaker.)

STANLEY STEALTH BREAKERS At Keller Quarry

ITEM	UNITS	MB70EXS	MB100EXZ
Impact energy class	ft.-lb.	7,500	12,000
Blows per minute	bl./min.	300-400	230-320
Weight (with tool bit)	lb.	5,803	8,799
Length (with tool bit)	in.	110	128
Excavator weight	lb.	58,000-85,000	80,000-130,000

Craig says the reason for putting this giant into the company's breaker fleet, which now includes three breakers by counting a moderate-size pedestal breaker mounted atop the jaw crusher. That breaker is used exclusively to break up oversize rock that occasionally becomes jammed in the crusher's feeding hopper.

"As productive as the first-bought Stanley breaker [MB70EXS] is in producing size R7 and R8 rip-rap, we recently received an order from a contractor to make both sizes of rip-rap for one project that totals 41,000 tons," explains Craig. All 41,000 tons will be used by the contractor for building a temporary

causeway across the Susquehanna River for accommodating heavy lift-capacity lattice boom cranes needed to construct a new bridge.

Starting in May, the contractor wants Keller to deliver 1,000 tons of R7 and R8 rip-rap each day. Realistically, the Stanley MB70EXS breaker can produce about 500 tons per 10-hr day. “We started breaking rock weeks in advance of the first delivery day so there is a stockpile but it would be risky to depend on our one breaker to produce in a timely manner the daily quantity of rip-rap wanted,” says Craig. ‘We decided to eliminate that production risk by purchasing the big Stanley breaker. It is not just for this order but all the other customers’ orders we will have to fill at the same time.”

The new breaker reduces material at a rate of 80 to 100 tph.

The new Stanley breaker was commissioned at the quarry in late March and is proving to be a real rock-buster by reducing over-size rock to R7 and R8 at the rate of 80 to 100 tph. Craig says, “I am amazed at the how productive this breaker is. It produces fewer blows per minute compared with our smaller Stanley breaker and when we first used the new breaker, I thought that the production would not be all that much greater than the smaller breaker. To my surprise, however, it was much more productive. At 12,000 ft-lb energy compared to 7,500 ft-lb [for the smaller Stanley breaker] this breaker fractures big boulders with only one or two blows. We can get 1,000 tons of rip-rap in a day with this breaker. It does not look all that big when it is lying on the ground but when mounted on a hydraulic excavator and in the vertical position you realize its giant size by standing aside it.”

According to Craig, the new breaker certainly was not bought to replace the existing one because of reliability problems. To the contrary, he says the breaker shows virtually 100% availability for the 4½-years it was operated at the quarry. Nevertheless, he points out that no matter how well a breaker is made, it will eventually fail during its operation. “We can not afford to be without a breaker available at all times when 1,000 tons of rip-rap must be produced daily without fail. The existing breaker will remain in our fleet as a backup unit for there still is plenty of useable life left in it,” he says.

Custom Blast Designs

Carefully-designed drilling patterns and blasting technology are used when high quantities of large-size rip-rap are wanted. Usually, Craig seeks extensive rock fragmentation when blasting at the face so the process of crushing and screening for aggregates is carried out as efficiently as possible. This extensive rock fragmentation is not wanted when blasting rock to make rip-rap. Consequently, each blast is custom-designed by Craig in coordination with an outside expert blasting contractor to maximize the number of large rock sizes produced. Depending on the size rip-rap wanted, the blast is designed to yield large oversize pieces of rock so they later can be resized with the excavator/Stanley breaker. Boulder size rock is especially desirable for making R7 and R8 rip-rap.

At the face, the large rock pieces are segregated from the rest of the rock using a hydraulic excavator or a front-end loader. Once the rock is segregated, the front-end loader, fitted with a 6.5-yd³ bucket, carries the rock to a nearby work area where a 96,000-lb hydraulic excavator fitted with the new Stanley breaker proceeds to break up the over-sizes so they meet R7 or R8 standards.

If more than 800 to 1,000 tons of rip-rap is to be produced in a day, the smaller Stanley breaker is also put into production. It is attached to a second hydraulic excavator that otherwise is used for working at the face.

Rip-rap produced and sold by the Keller Quarry is the most profitable rock product made, according to Craig. He attributes the continued success of the rip-rap sales to the high-quality product the company offers. “We have a good thing going here so we will continue to make high-quality rip-rap. That is why we invested in the Stanley breakers in the first place for producing the larger size rip-rap and the new portable screening plant for the smaller sizes. I would like to add, that not only are the Stanley breakers high-producing and low-maintenance, but the local Stanley distributor, Midlantic Machinery, gives us very good service before and after the sale. Service is so important to us that we will not purchase equipment where the distributor’s service reputation is questionable no matter how good the quality of the equipment is,” says Craig.