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On Track



**A 3,000-tph tracked
crusher at a Florida
aggregates operation
pg 12**

A QUESTEX PUBLICATION

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On Track

A new, 3,000-tph, tracked crusher feeding a floating conveyor revolutionizes quarry operations for a Florida aggregates producer.

BY CARL EMIGH

Palm Beach Aggregates Inc., located on 4,400 acres in western Palm Beach County, Florida, has more than doubled its quarry base rock production and dramatically cut operating costs with a custom-designed, 3,000-tph, tracked Grasan impact crusher plant that feeds a 2,000-ft. floating, moveable conveyor beltline.

The floating beltline is moved periodically with four 20-hp outboard motors and can connect to four land-based beltlines that transport crushed materials to the company's stationary processing (final crushing/screening) plant. The new system is the brainchild of Operations Manager John W. Bates.

The quarry was opened in 1993 and purchased by Palm Beach Aggregates in 1997. That is when Bates came on board and inherited a system that employed a stationary processing plant (primary 500-tph impactor with secondary/tertiary impact crushing and screening) for producing aggregate products, plus a portable 500-tph primary impactor crushing base rock in a pumped-dry pit. This is one of only several

areas in Florida where the pit can be pumped dry and kept dry due to the impervious rock formation.

Getting down to business

First, the overburden (8 to 10 ft.) would be stripped off with an excavator and sold as structural fill. This is still done with the new system.

Under the overburden are two 9- to 10-ft. layers of lime rock. The upper layer is a coral limestone that Palm Beach Aggregates calls gold rock. The top of the gold rock layer is 1 to 2 ft. above the natural water table. The bottom layer is limestone with a high seashell content that Palm Beach calls gray rock.

With the old system, gold rock was scooped up with a front-end loader and trucked to the stationary plant to be processed and sold for use

Take note

The company went "green." Everything is electric except the grader, dozer and water trucks.

Above: The heart of the Palm Beach Aggregates quarry is a Grasan custom-designed 3,000-tph impact crusher, refurbished 1976 Marion M191M power shovel with 25-yd. bucket, and a floating, moveable conveyor beltline that can connect with four land-based conveyor lines.



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in making asphalt and concrete. The gray rock was crushed to 3-in. minus in the pit for use as road base and then loaded into customers' trucks in the pit. As each new pit was mined, the water was pumped out to an old pit with two 12-in. pumps.

"That system was much too slow, burdensome and expensive," Bates says. "In this tough, competitive business, you have to keep finding ways to cut costs and improve production efficiency."

"We were using about 6,000 gallons of diesel fuel per day to operate the crusher, seven haul trucks, two loaders, a bulldozer, a grader and two water trucks," he says. "We needed operators for all that equipment. We had high maintenance costs and shutdowns that occurred far too often. We simply had too many problems and too much expense."

"In 2005 we started switching to the new system. The first step was adding an efficient, high-capacity dragline. I thought it would be more efficient to harvest and crush the gold and gray rock together, rather than separately, and not have to pump the pit dry," Bates says.

"We were able to locate a 1973 Bucyrus Erie 1260W, which we bought and had refurbished, including the addition of a PLC controller. It would have cost twice as much for a new dragline, plus a 3½-year wait."

The company also went "green." Everything is electric except the grader, dozer and water trucks. That has helped cut diesel usage to 1,000 to 1,500 gallons per day, also making it a major cost reduction and better for the environment, Bates says.

"To increase our production efficiency and capacity, I saw basically two choices," Bates says. "I would need two large crushing plants or one gigantic crushing plant. I figured one plant would take half the maintenance time, half the parts to stock, less crew personnel time and a lot fewer headaches overall. But it would have to be like no crushing plant I had ever seen before."

Bates created a list of what he would need in such a machine.

"I wanted a New Holland type impact crusher with a large upper cavity, rather than an Andreas type," he says. "An impactor is best for our gold and gray lime-

stone, helping us meet LA abrasion specs for hardness. And the impactor explodes the softer materials into sand and reduces shells to 1/8-in. material."

"I wanted 3,000-tph crushing capability, and I wanted the crushing plant track-mounted to propel at various angles up to 90 degrees," he says. "I wanted a scalping screen and an apron feeder that would accommodate a very high volume of incoming material. And the plant had to have a 4,160-volt electrical system; everything in the pit is 4,160."

Bates contacted numerous manufacturers of portable crushing equipment. Most wanted to sell him their standard machines, but they were too small and not configured to handle wet, sticky material. The company needed a custom-designed crushing plant.

"Big companies either didn't want to design the plant I envisioned, or it would take forever at a cost that was absolutely prohibitive," Bates says. "I found that only Grasan was willing and capable of designing and manufacturing this machine at an acceptable cost and on a reasonable production schedule."

"The finished machine is precisely what we need and want for our operation and is performing as planned. Grasan provided us with a custom-written operation and maintenance manual, as well as training for our personnel. Operation of the plant is pretty simple, really."

Custom features

The custom-built Grasan model KRHT-60E crushing plant features a Williams horizontal-shaft, four-blow-bar impact crusher with a Williams 6 ft. x 50 ft.

The crushing plant feeds a 2,000-ft. floating beltline that can connect to four land-based conveyors, leading to a final processing (crushing/screening) plant. Across the pit, a refurbished 1973 Bucyrus Erie 1260W dragline scoops up and stockpiles rock for crushing later, when the dragline and crusher will be switched to their opposite sides of the pit. The floating beltline is moved with four 20-hp outboard motors.



apron feeder and Simplicity 7 ft. x 20 ft. vibrating grizzly bar scalping screen guaranteed to handle even wet, sticky material up to 60 in. lump size. A built-on hydraulic hammer breaks up larger pieces. The 120-ton hopper is 24 ft. wide, 29 ft. long and 9½ ft. high. The plant measures 47 ft. high, 39 ft. wide, 122 ft. long (183 ft. with discharge conveyor) and weighs 1.2 million lbs. It can produce up to 3,000 tph of crushed material.

The standard New Holland type Williams crusher design has been modified to enlarge the hydraulic inlet opening for easier maintenance and replacement of the 1,000-lb. manganese blow bars. Power is supplied by two 500-hp electric motors.

Palm Beach Aggregates Operations Manager John W. Bates originated the design concept for the tracked crusher, power shovel, dragline and beltline system combination.



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The Grasan 3,000-tph crushing plant is 47 ft. high, 39 ft. wide, 122 ft. long (183 ft. with discharge conveyor) and weighs 1.2 million lbs. It is mounted on two sets of custom-designed tracks with self-leveling stabilizer legs, can travel at ½ mph and can turn at various angles up to 90 degrees.

The chassis mounting consists of two pairs of custom-designed B9 tracks with 40 in. wide smooth pads and self-leveling stabilizer legs. The tracks are powered by two 300-hp electric motors. The plant can travel at ½ mph and turn at various angles up to 90 degrees.

The PC-based electrical control system monitors every function of the crushing plant and will shut it down if any problem occurs. The system includes Allen-Bradley full-voltage and redundant motor starters: 4,160 volts for motors 200 hp and over; 480 volts for all others. The plant has the same kind of sophisticated filtering and sensing system as an aircraft. In addition, outside programmers are able to access the control system from a remote location for troubleshooting, if necessary.

The 60 in. x 75 ft. discharge conveyor, powered by twin 100-hp electric motors, deposits crushed material directly into a wheeled, rolling hopper on a 2,000-ft. floating conveyor beltline mounted on pontoons. The hopper regulates flow

rate to keep material from spilling off the belt. The floater beltline can connect with four land-based conveyor beltlines leading to the stationary final processing plant, which is essentially the same as the old plant, except that the two tertiary crushers have been replaced with rock-on-rock vertical shaft impactors for reduced wear costs. The five conveyor lines total about three miles in length. Fabric carcass belts are used for durability and easier maintenance.

The processing plant can produce up to 14 materials, depending on demand. The screening equipment can produce eight materials simultaneously, including drain field, road base and various aggregates for production of asphalt and concrete. Virtually all of the materials are sold to various construction trades in the local market. Palm Beach Aggregates has developed a proprietary process for removing 99 percent or more of the seashell content from the crushed stone to meet requirements for producing concrete.

“The Grasan crushing plant has been operating for two years now, and we’ve processed about 5.5 million tons through it,” Bates says. “The plant runs extremely well and is very dependable. We devote two days a week to maintenance, at which time we do a thorough inspection of the crushing plant for wear and perform all required maintenance procedures.”

The crusher is equipped with four square manganese blow bars. Every two or three shifts the company welds the bars to build them up as needed, depending on the wear patterns. Bates says maintaining the machine is pretty simple.

Reaping the benefits

The company knew at the outset that feeding the crusher efficiently and continuously would be crucial if it were to realize the full benefits of the machine’s 3,000-tph capability.

“After a thorough search, we located a 1976 M191 Marion power shovel in

Montana,” Bates says. “We bought it, took it apart, had it shipped to our quarry and had it completely refurbished, including adding a PLC controller. It’s the only shovel of its kind operating in Florida, and maybe the only one in North America. We could have bought a new 20- to 25-yd. machine, but I wanted the older, strip-mine type with longer reach so we could feed the crusher better and not have to move it as often.

“The company owners have nicknamed the power shovel ‘Little John’ and the dragline ‘Big John,’” Bates chuckles. “They both keep the Grasan crusher and our whole quarry system humming.”

Bates has the quarry operation set up so there is little or no equipment idle time. The dragline and crushing plant operate in coordination with each other at opposite ends of the pit. At one end the dragline scoops up gold and gray rock together and accumulates a long, high stockpile to be crushed later. At the other

end of the pit, the crusher processes material that had been brought up earlier with the dragline and has had some time to dry. The current pit is 2,300 ft. wide and 3,000 ft. long. When finished, the pit will be 4,000 ft. long.

“We move the crusher a short distance once each day to keep up with the diminishing material stockpile,” Bates says. “When the stockpile is gone, we switch the dragline and the shovel-crusher combination to their opposite sides of the pit. We move the floating beltline at the same time with four 20-hp outboard motors.

“It’s the only conveyor line I know of that has life jackets on it,” adds Bates, grinning. “The whole beltline and equipment-moving procedure can be completed in one 12-hour shift.”

This type of operation, with the dragline-shovel-crusher combination and beltline system, has more than doubled the company’s production capabilities

and reduced costs dramatically.

“In addition, mined-out pits have not gone to waste, but rather are being used for fresh water storage,” Bates says. “Pits are 27 to 30 ft. deep when all the rock has been removed. Using a dredge, we have deepened a 900-acre previously mined area to 57 ft., developed it for water storage and sold it to the South Florida Water Management District as a pre-built reservoir. Demand for fresh water in Florida keeps growing and growing, and we hope to develop more reservoirs with our mined pits in the future.

“We currently have reserves in our quarry for at least 20 more years of production,” Bates adds. “With proper maintenance and care, I believe our whole system will still be going strong all the way – and then some.” PQ

Carl Emigh of CME Creative Services Inc., Marion, Ohio, is a freelance writer and marketing communications specialist serving the aggregates, recycling and construction industries.



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