

# Automated conveyor walks to keep pace with muck pile

*Push-button controlled, track-mounted system swings in a 180-deg arc and provides substantial savings for Granite Rock Co.*

by Joseph L. Robertson

A change in quarrying methods, combined with an automated conveyor system to handle the plant feed material from the face to the main plant area, has allowed Granite Rock Co. to realize a 30% savings in operating and maintenance costs. The key to this saving was two factors: the elimination of drilling and blasting, and a complete change in the way the primary processing was handled. At the same time, the company erected a new primary screening facility at the main plant area.

Ripping the stone with D10 bulldozers and shoving the ripped material over the edge to the quarry floor has virtually eliminated drilling and blasting for the past two years. Some shooting is planned in 1983, to assist the ripping.

Granite Rock's Logan quarry is near Aromas, Calif., about six miles east of Watsonville, where the company has its headquarters. Located in hilly terrain, the quarry contains a highly fractured

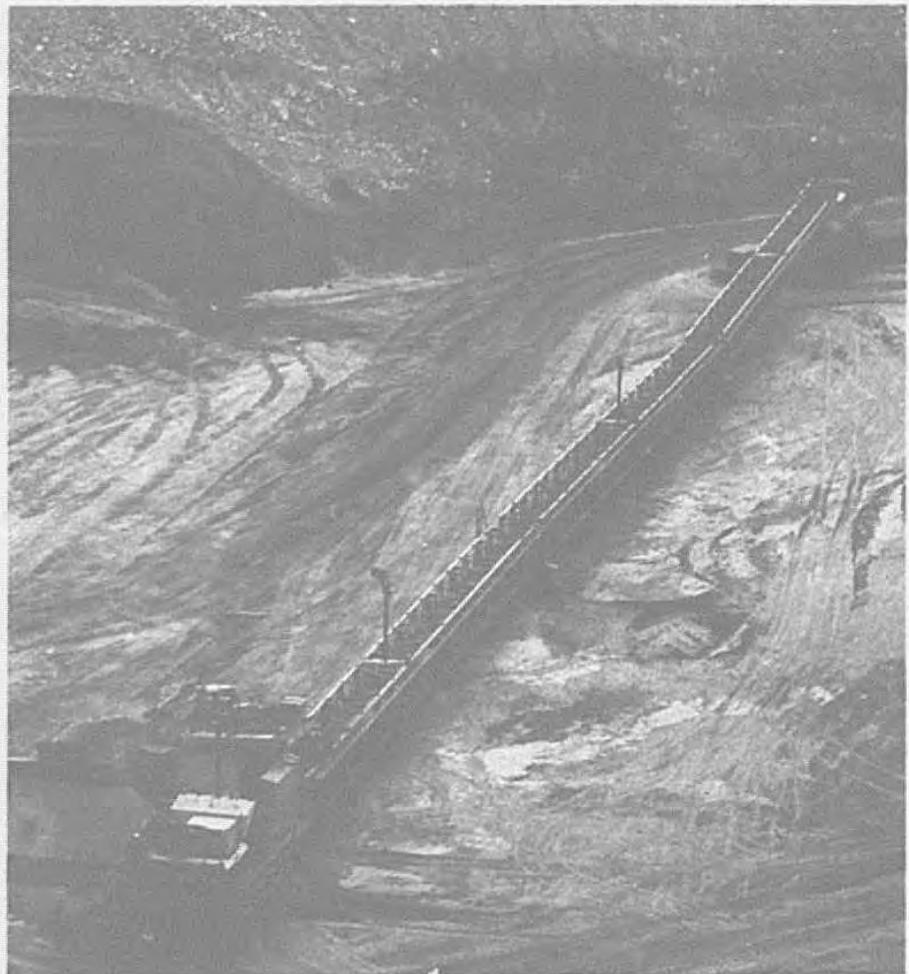
and a highly abrasive granite that lends itself to ripping. In addition, the San Andreas fault runs through one edge of the quarry property, probably one reason the stone is so highly fractured. The shape of the quarry is long and narrow, about 6,000 ft long and 600 ft wide, which lends itself well to the application of the automated conveyor system.

The conveyor system replaced six rear-dump haul trucks and drivers, plus

two truck mechanics, who used to supply raw material to the "old" primary plant, eliminating a mile-long haul. In place of the trucks, a track-mounted feeder-breaker and 450 ft of track-mounted automated conveyor "walk" along the muckpile in a 180-deg arc. The 450-ft-long fully-automatic walking conveyor section is 48 in. wide and can be moved forward or backed up by a push-button controlled system. The



Two D 10 bulldozers rip the granite and then shove it over the bank to the quarry floor to virtually eliminate drilling and blasting. The granite deposit is highly fractured, which lends itself to convenient ripping.



This overhead view shows the 48-in.-wide by 450-ft-long automated walking conveyor that covers a 180-deg arc along the working face. The conveyor moves forward or backward on tracks, controlled by a push-button system.



The 48-in.-wide plant conveyor runs on the level for about two-thirds of the distance to the screen tower and then rises on a 3,000-ft arc to discharge stone into a holding bin.



The new primary screening facility is housed in a tower topped by a holding bin that has a 400 ton capacity. This tower also has a pair of 6 x 24-ft vibrating grizzly feeders and two, 8 x 24-ft D.D. screens.

feeder-breaker is positioned adjacent to the muckpile with only sufficient space for the loaders to maneuver and fill the receiving hopper. The feeder-breaker is connected to the walking conveyor section by a drawbar arrangement and when a repositioning is required, tows one section of the conveyor.

The controls and switching system basically are a simple idea. The 450-ft-long truss conveyor is divided into three, 150-ft-long segments. Each segment is mounted on a single bulldozer track and each, in turn, is controlled by on-off limit switches. This part of the system has been ex-

tremely reliable. The quarry has gone through an extremely wet winter with no control problems. All conveyor controls are mounted on the tail end of the truss conveyor.

Much of the guesswork is removed from troubleshooting the control system in case of malfunction. An indicator system, located on the control panel, points out the trouble spot so that in the event of a failure, the operator can go directly to the spot and inspect it to determine corrective actions or procedures. The system also has a manual override circuit that can be used to realign any part of the track or belt should it get out of line during repositioning.

Once back in alignment, the fully automatic control system automatically resumes command. The 450-ft-long segment also is self-leveling, both when walking and when in the static or operational mode. Self-leveling normally eliminates alignment problems when the conveyor is started up after movement to a new location.

The conveyor and feeder-breaker travel at a speed of 6 fpm and once all maintenance is completed on the units, is normally repositioned every night. A normal 30-ft move will require from 15 to 20 minutes, using only one man. This includes raising the breaker, backing it up to clean any spillage with a wheel loader, and then moving it to the new position. The feeder-breaker is moved during the lunch break when necessary.

Limit switches also sense the feeder-breaker's position in relation to the truss belt conveyor. These limit switches have two modes: one mode drives the breaker while the second mode functions as action-limiting or "safety" units. The feeder-breaker is mounted on bulldozer tracks which are raised or retracted by four hydraulic rams when the unit is in a static or operating mode and the feeder-breaker rests on the quarry floor. For a move, the four rams extend and raise the feeder-breaker off the ground until the necessary ground clearance is obtained.

The highly fractured granite is ripped by two D10 bulldozers working at different levels on the hill above the quarry. The machines also push the ripped stone over the edge to the floor below where rubber-tired loaders scoop up the stone and dump it in the feeder-

breaker receiving hopper. All pieces over 4 x 4 ft in size are moved aside and piled up to be used as riprap.

Basically, the feeder-breaker consists of a receiving hopper with a flight conveyor below it, which feeds the stone to a rotary pick breaker. The rotary pick breaker consists of a series of carbide-tipped picks mounted in a spiral formation on a shaft. This formation allows only one pick at a time to strike the stone, concentrating the mechanical forces on a given spot and thus fracturing the stone. Once the stone has been reduced to minus 10 in. by the rotary picks it continues to the belt of the truss conveyor. For convenient access to the discharge area of the feeder-breaker and the tail pulley area of the truss conveyor, the tail pulley extends well beyond the feeder-breaker.

The stone is carried along a level course by the truss conveyor until the final section, where the belt rises approximately 10 ft to the pivot-transfer point where it is transferred to the plant conveyor. One of the aims in designing this handling system was the elimination of transfer points. As a result, the plant conveyor runs in a straight line from the quarry to the primary screening tower, a distance of some 5,000 ft, with the only transfer points being where the stone is loaded on the conveyor and at the tower at the other end.

Also 48 in. wide, the plant conveyor is made up of independent, 17-ft-long sections. These sections are spaced on 20-ft centers and are supported by legs mounted on railroad ties. The conveyor runs on the level for about two-thirds of the distance to the screen tower and then rises on a 3,000-ft arc to discharge stone in a holding bin at the top of the 85-ft-high tower.

The holding bin has a 400-ton capac-



John Greene, plant manager, inspects the limit switch arrangement that controls the track positioning under the truss conveyor when the conveyor is moved.

ity and has two openings at the bottom to allow stone to go onto a pair of side-by-side 6 x 24-ft vibrating grizzly-feeders that have bars spaced 4 in. apart. The stone passing through the grizzly bars (minus 4-in. size) drops down to a pair of 8 x 24-ft D.D. screens which have deck openings of 2½ in. on the top deck and 1½ in. on the bottom deck. Oversize from the top deck blends with the grizzly oversize in a common rock box while stone passing over the bottom deck (2½ x 1½-in. size) can either be blended with the oversize from the top deck or with the throughs from the 8 x 24-ft screens, providing the option of making two different sizes of base material.

The plus 4-in. stone passing over the vibrating grizzly feeders drops on a

6-ft-wide flat belt that goes across the top of the 8 x 24-ft screens to the rock box. Stone discharged from the 7½ x 5-ft rock box goes on a pre-existing system of conveyors that build the 50,000-ton surge. Throughs from the 8 x 24-ft screens are discharged on a pair of 48-in.-wide conveyors which in turn converge and discharge on a pre-existing 36-in.-wide belt which builds the 100,000-ton "fine rock" surge pile. All of the pre-existing belts supplying both surge piles were part of the original primary screening system.

Because of the highly abrasive characteristics of the granite, the feeder-breaker has undergone more wear and has required much more maintenance than was anticipated at the beginning of the project. In spite of all of the added maintenance, use of the track-mounted feeder-breaker and automated conveyor has proven to be more economical than the use of haul trucks for moving the material to the primary plant.

The design of the truss conveyor, the mounting of the feeder-breaker on tracks, and all of the control systems were designed and built by B & K Industries of Orland, Calif. Granite Rock was the general contractor for the installation of the system, subcontracting some phases of the project and handling others with company personnel. [E]

#### MAJOR EQUIPMENT REFERENCE

	Graniterock, Inc. Watsonville, Calif. Logan Quarry
Bulldozers with rippers (2), Model D 10 .....	Caterpillar Tractor Co.
Wheel loaders, Model 400C with 11 cu yd bucket (2) .....	Dresser Industries
Feeder-breaker, Model BF-23F-12-11S .....	The W. R. Stamler Co.
Vibrating grizzly feeders (2) 6 x 24-ft .....	Deister Machine Co.
Screens, (2) 8 x 24-ft (1-T.D. & 1-D.D.) .....	Hewitt-Robins, Div. Litton Systems Inc.
Conveyor & feeder-breaker control system design .....	} B & K Industries, Orland, California
Conveyor-feeder-breaker track designs .....	
Walking conveyor truss work .....	} British Tire & Rubber Co.
Conveyor belt, 48-in. wide for stationary conveyor .....	



The tracks contain the self-leveling equipment which normally eliminates alignment problems whether the conveyor is walking or in a static mode.



The 48-in.-wide plant conveyor is made up of independent 17-ft-long sections which are spaced on 20-ft centers. The legs are mounted on railroad ties.

JULY 1983

# Rock products

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VAN LCOM 042M  
UNIVERSITY MICROFILMS  
300 NORTH ZEEB ROAD  
ANN ARBOR MI 48106

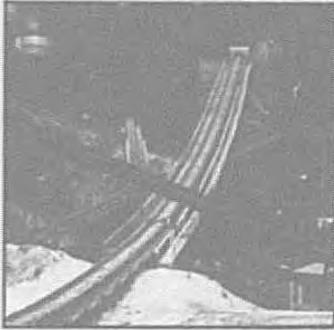
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A Maclean Hunter publication, Vol. 86, No. 7, July 1983

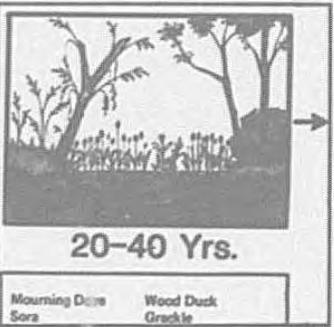
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