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Multi-plant quarry supplies quality stone to West Coast r

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By Robert L. Consedine, Editor

On Texada Island, lying in the Strait of Georgia some 100 km north of Vancouver, British Columbia, Holnam West Materials Ltd. is operating a large multi-quarry complex comprising four separate crushing and screening plants producing up to 23 high quality aggregate products ranging in size from rip-rap to 3 mm (1/8-in) gradations.

Holnam West Materials is a wholly owned subsidiary of Holnam Inc. of Dundee, Michigan, which in turn is owned 95 per cent by Holderbank Financière Glaris of Switzerland, the world's largest cement manufacturer with plants in 23 countries.

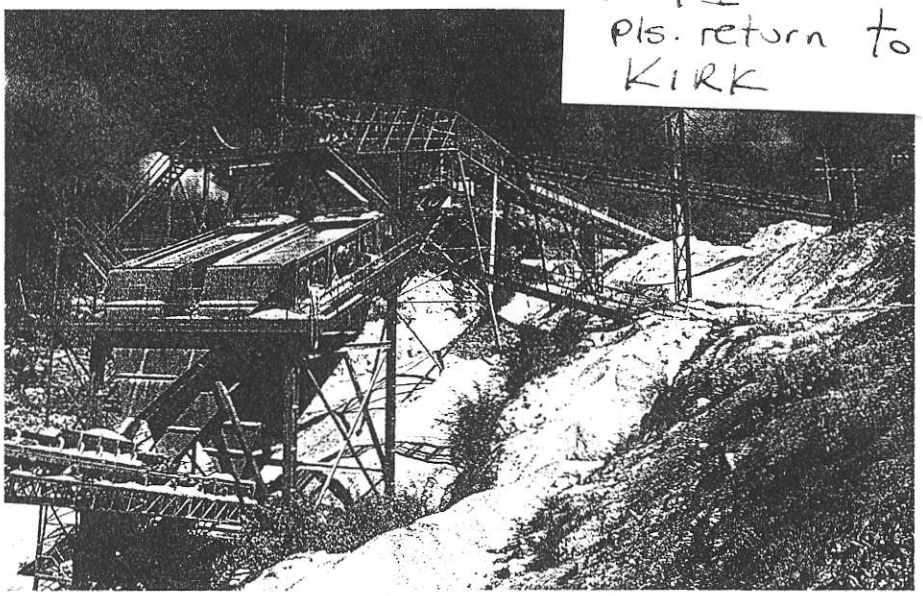
Texada Island is 50 km long and has an area of 160 km^2. It has two main centres of population - Vananda on the east coast and Gillies Bay on the west, each with about 400 residents. Another 400 are scattered around the north half of the island and in the small community of Blubber Bay which has the ferry terminal. The island boasts a 915 m (3,000-ft) paved airstrip which provides a regular scheduled airline service with Vancouver.

There are presently three active quarries on the island – Ash Grove at Blubber Bay, Imperial Limestone south of Vananda on the east coast and Holnam West Materials north of Gillies Bay on the west coast.

Holnam and its predecessor Ideal Cement Company have been quarrying on Texada Island since 1957 and, from a relatively modest beginning shipping some 25,000 tonnes (27,500 tons) annually, the operation has grown to become a major supplier of limestone, crushed rock and rip-rap for the markets of British Columbia and the U.S. West Coast. Holnam's Texada Island operations shipped its products as far south as California and as far north as Bethel, Alaska on the Bering Sea. The company's annual production is currently running at more than 3 million tonnes (3.3 million tons) a year from two quarries located just 500 m (1600 ft) apart.

Geology

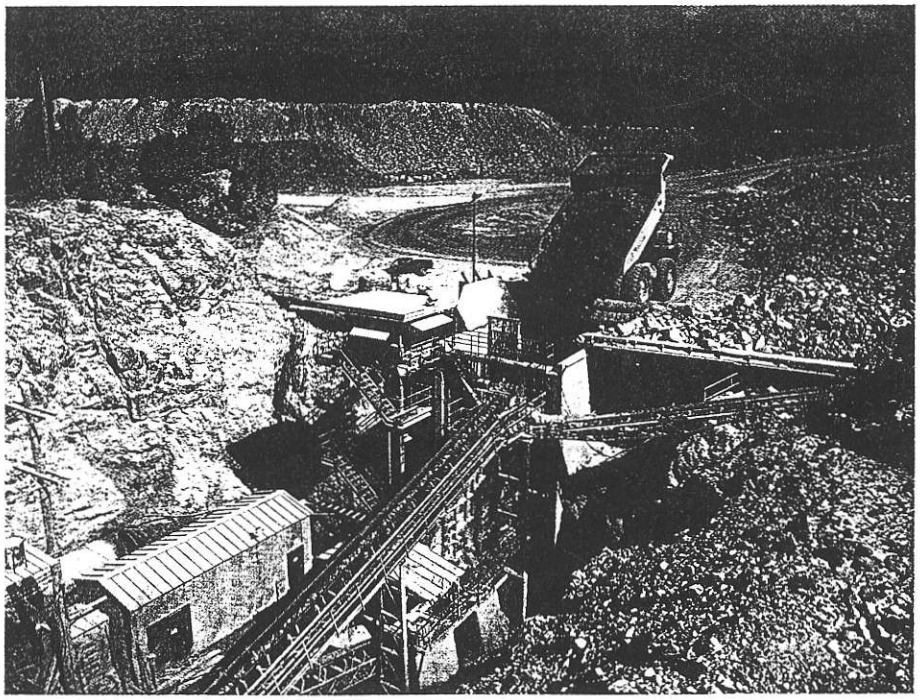
Most of the limestone on Texada is to be found in the northern third of the island and the portion of this limestone being quarried by Holnam is described as the lower member, and possibly part of the middle member, of the Triassic Marble Bay formation. The strata dip 10-12 degrees north-easterly and strike north-westerly. Several faults trending N10 degrees W have fractured and offset the formation. Dykes trending in the same direction have been intruded during at least two separate periods.



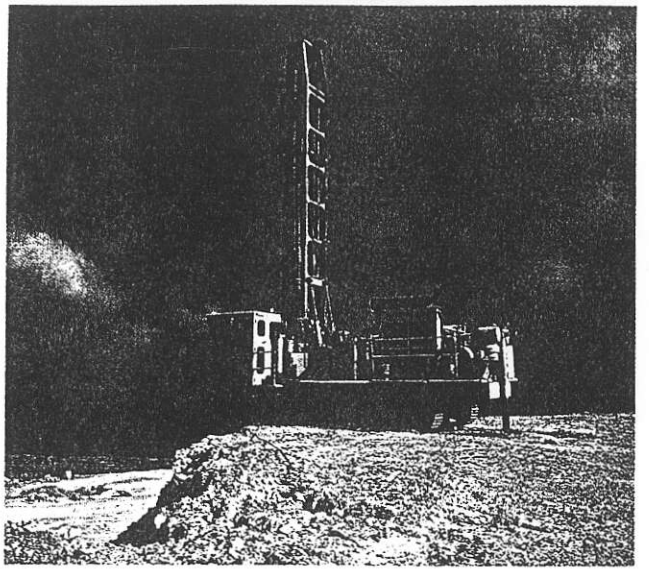
Holnam West Materials' Texada Island quarry operations produce more than 3.5 million tonnes (3.8 million tons) of aggregate products per year.

Within the quarry area, dykes appear to occupy nearly vertical fracture zones, particularly those which are 3 to 4.5 m (10 to 15-ft) thick. These dykes trend N15 degrees W and are commonly resistant to erosion. Smaller dykes ranging from 0.3 to 1 m (1 to 3 ft), either cross-cut the larger dykes at about N45 degrees W or run parallel to them. These dykes erode slightly below the limestone surface and show some indication of post-intrusive faulting.

The limestone can be described as me-



Hauler dumping shot rock at main crushing and screening system for the production of cement and chemical stone. The primary crusher is rated at 800 tonnes/h (880 tph).



Ingersoll-Rand DM45E sinking 203 mm (8-in) blast hole.

Michigan L480 loading shot rock into Euclid hauler.

dium to dark grey, even-textured and cryptocrystalline. Minute irregular veinlets containing minor amounts of silica and pyrite are sometimes present but are not readily apparent to the eye. This high-quality limestone is being used by pulp mills and smelters and in the manufacture of cement and high-purity chemical-grade lime.

The present quarry covers an area of approximately 100 ha (250 acres) with a limestone depth potential of over 215 m (700 ft) where it lies on the Karmutsen volcanic basement. The volcanics generally have a similar dip and strike to the limestone. Company holdings are covered by Crown-granted and located mineral claims, fee simple land, mining leases and limestone mining leases encompassing more than 810 ha (2000 acres), so that limestone for construction and industry purposes is assured for many decades to come.

Working the deposit

The main limestone quarry face at the site is worked 12 months a year in nine 12.2 m (40-ft) high benches. Prior to drilling the formation, the overburden is stripped with a new ripper-equipped Komatsu D375A bulldozer. The primary drilling machine is an Ingersoll-Rand DM 45E with a down-the-hole hammer that is drilling 183 m (600 ft) of 203 mm (8-in) hole diameter per 8-hour shift, five-days-per week. The unit can operate on a single-shift basis and keep enough rock ahead to meet the demand of the processing plant which runs on a three-shift, around-the-clock basis.

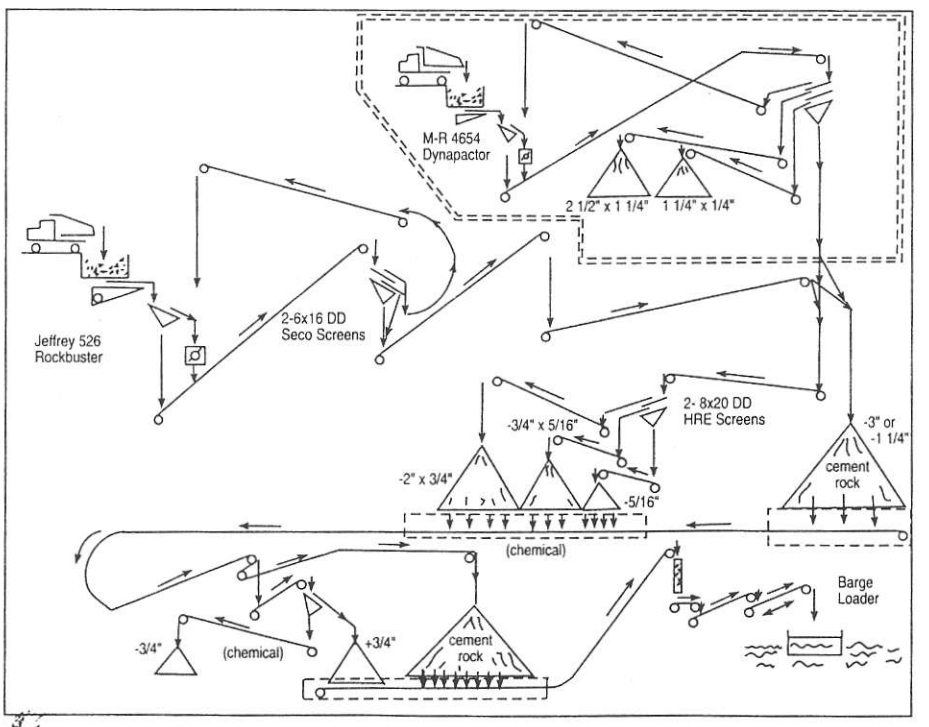
Production holes are drilled vertically in a single row on a 6.1 m x 7.3 m (20-ft x 24-ft) pattern for better control of the formation.

The explosives used are mostly (90 per cent) ANFO with Ensign-Bickford's EZDet® non-electric initiation system used to fire Pentomex primers. The bulk ANFO is delivered to the hole by ICI Conex Explosives.

A Gardner Denver SCH3500 hydraulic drilling rig is also used to sink 100 mm (4-in) diameter holes for pioneering work and for drilling shotholes in a small quarry supplying white rock.

The blasted limestone is loaded into a fleet of five 90 tonne (100-ton) capacity Euclid R-100 by an 11.4m³ (15 cu yd) Komatsu WA-800 and a 10 m³ (13 cu yd) Michigan L480 wheel loaders. The company also operates two 9.1 m³ (12 cu yd) Michigan 475's, two 6.1 m³ (8 cu yd) Michigan L320's and a new 4.2 m³ (5.5 cu yd) Komatsu WA-500 wheel loaders at other areas of the site.

Large boulders are separated out from the blasted rock pile and stockpiled on the quarry floor where they are sorted to meet varying specifications for future use as rip-rap.



Flow diagram for main cement rock and chemical stone processing systems.

Cement and chemical stone

The blasted rock is hauled and dumped into a 130 tonne (150-ton) hopper above a Jeffrey vibrating feeder. Ahead of the 800 tonnes/h (880 tph) Jeffrey 526 single-impellor Rockbuster crushing plant is a Tyler vibrating grizzly section. The 75 mm (3-in) minus primary crusher discharge is

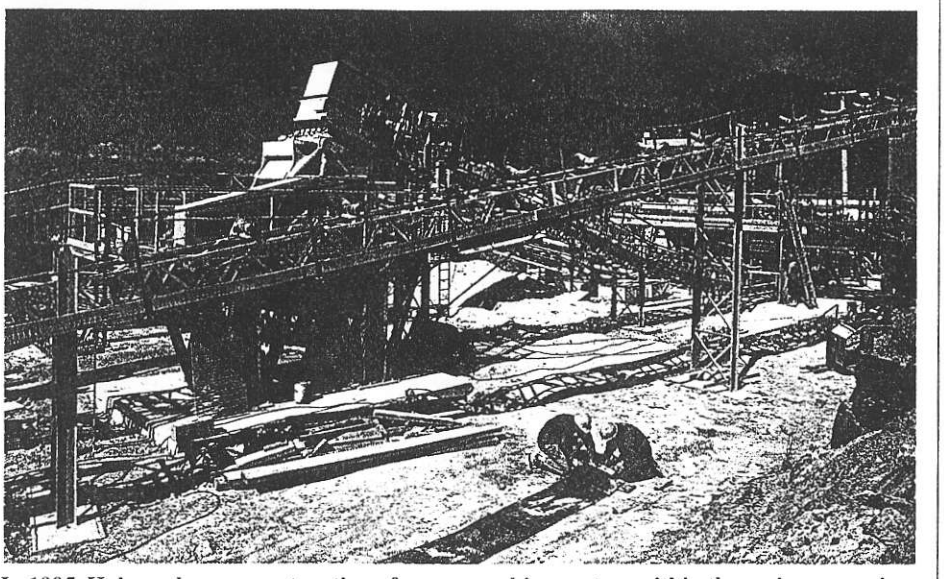
received onto a 1219 mm x 61 m (48-in x 200-ft) conveyor belt for transport to a pair of 1.8 m x 4.8 m (6-ft x 16-ft) Seco double-deck vibratory screens. The top deck is equipped with 75 mm (3-in) openings while the bottom decks are fitted with 50 mm (2-in) apertures. The 75 mm (3-in) plus top deck oversize along with the stone retained on the bottom deck is returned to the impeller via a 610 mm (24-in) conveyor. The recirculating load is approximately 20 per cent. The company told *Canadian Aggregates & Roadbuilding Contractor* that it is looking at adding a secondary crusher.

Two grades of stone are crushed in this plant: cement-grade limestone and chemical-grade limestone. The deposit is core-drilled on 152 m (500-ft) centres and shows a very consistent chemical make-up. Intrusive dykes are mapped on the surface and monitored as the quarry advances. The testing of chemical limestone (+97 per cent CaCO3) is carried out on an individual blast basis: the rock is visually inspected, given the touch test and, if there is any doubt, typical pieces of the material are etched in acid to check for impurities. Percussion drill chip sampling is also carried out to prove purity when necessary.

Cement-grade limestone leaves the crushing and screening plant at either 75 mm (3-in) minus or 50 mm (2-in) minus gradations. The materials are transported by a 914 mm x 610 m (36-in x 2000-ft) conveyor system to a 70 000 tonne (77,000 ton) surge pile near the shore. The surge pile is built over a 122 m (400-ft) long reclaim tunnel.

Chemical-grade stone is crushed and screened to 50 mm (2-in) minus. The stone is then screened on two parallel 2.4 m x 6.1 m (8-ft x 20-ft) Hewitt-Robins double-deck screens which produce three products: 50 mm x 19 mm (2-in x 3/4-in), 19 mm x 8 mm (3/4-in x 5/16-in) and 8 mm (5/16-in) minus. The 50 mm (2-in) minus product is used by lime plants such as Chemical Lime in Port Kells, B.C., Ash Grove in Portland, Oregon and Continental Lime in Tacoma, Wash., while the minus 19 mm (3/4-in) material goes to several pulp mills on the B.C. coast. The minus 8 mm (5/16-in) stone is used for aglime or is blended with the 19 mm (3/4-in) material to produce 19 mm (3/4-in) minus construction aggregates.

All three product sizes are conveyed to stockpiles formed over a reclaim tunnel from where they are recovered by conveyor and taken off, along with the recovered cement-grade stone, to the waterside processing plant. Here, another screen can be used either to form a cement stone stockpile or to send the crushed material over a small sizing screen which separates out any 19 mm (3/4-in) minus chemical-grade stone and 19 mm (3/4-in) minus cement stone. The cement-grade stone is then reclaimed from the stockpile by nine feeders for transporting over a series of belt conveyors to the barge loader.



In 1995, Holnam began construction of a new crushing system within the main processing plant to simultaneously produce cement-grade and chemical-grade limestone. This new system is expected to be operational by summer, 1996.

An additional crushing installation is currently being built within this plant to allow simultaneous production of chemical-grade and cement-grade limestone.

New processing system

The new plant will be fed by 77 tonne (85-ton) capacity rock trucks dumping onto a vibrating grizzly feeder. The VGF will feed a new Missouri-Rodgers 4654 Dynapactor impact crusher. Following the primary will be a single-deck Allis Chalmers screen from which the undersize will be taken off to bypass the 63.5 mm x 1066 mm (25-in x 42-in) Kue-Ken secondary jaw. The overs will go into the crusher which will give 100-125 tonnes/h (110 to 137 tph) of 50 mm (2-in) minus material. This crusher product will then be conveyed to a 1.5 m x 3 m (5-ft x 10-ft) Allis Chalmers triple-deck vibratory screen. The top deck oversize will be recirculated to the Missouri-Rodgers crusher with the middle and bottom decks producing 50 mm (2-in) minus to 31 mm (1-1/4-in) plus and 31 mm (1-1/4-in) minus to 6 mm (1/4-in) plus gradations, respectively. The 6 mm (1/4-in) bottom deck throughs are used to feed the 2.4 m x 6.1 m (8-ft x 20-ft) Hewitt-Robins double-deck screens in the chemical stone circuit.

The aim is to achieve 350 tonnes/h (385 tph) output from four different products: 50 mm (2-in) to 19 mm (3/4-in), 19 mm (3/4-in) to 8 mm (5/16-in), 8 mm (5/16-in) to 3 mm (1/8-in), and 8 mm (5/16-in) minus.

Barge transport

All the material from the quarry is shipped out by barges ranging from 900 to 10 900 tonnes (1000 to 12,000 tons) capacity. The barge loader has a capacity of 1815 tonnes/h (2000 tph) and is able to cover the barge by slewing a 1066 mm (42-in) shuttle loading belt over it. The loader pivots on a central thrust bearing and is fed through a vertical rock ladder from the reclaim tunnels. The material flows on to the reclaim conveyors by gravity through chutes without the need for feeders.

The dock consists of three concrete-filled caissons joined by catwalks. The face of the caissons towards the barges is hung with rubber tires to protect the barges from damage.

In 1977 the company purchased some of the assets, both physical and land, from the closed-down Texada Iron Mine. The physical assets included a deep sea dock giving 13.7 m (45-ft) depth at low tide. Holnam subsequently built a barge-loading ramp with a capacity of 90 tonnes (100 tons) was built to load barges with rip-rap by truck at this site.

The dock is also used for the handling of coal destined for Japan and brought in by barge from Campbell River — the coal is unloaded by wheel loader and trucked to a 200 000 tonne (220,000-ton) stockpile close to the barge ramp. It is then rehandled through a 200 tonne (220-ton) capacity bin with two Allis Chalmers feeders discharging on to a 1066 mm (42-in) shore belt which in turn feeds two approach belts leading to twin shiploading booms which

SUMMARY OF SHIPMENTS - 1994

HOLNAM WEST MATERIAL LTD. ROCK PRODUCTS	BARGES	TONNES	TN/BG	LOADING TIME HOURS	LOADING RATE T/HR	AV. LOAD TIME HOURS
BEALE COVE - LIMESTONE	459	2,527,866	5,507	2,745.75	921	6
KOLBERG LOADER	12	29,686	2,474	89.33	332	7
BARGE RAMP - LOAD ROCK	77	177,893	2,310	625.25	285	8
BARGE RAMP - UNLOAD COAL	69	391,758	5,678	1,035.25	378	15
SHIPLOADER - ROCK	125	317,591	2,541	517.25	614	4
SHIPLOADER - LIMESTONE	1	14,764	14,764	51.25	288	51
SHIPLOADER - COAL SHIPS	6	356,676	59,446	443.47	804	74
TOTAL BARGES	743	3,459,558	4,656	5,064.08	683	7
TOTAL SHIPS	6	356,676	59,446	443.47	804.00	74
GRAND TOTAL	749	3,816,234				

can slew and shuttle independently. A splitter allows single-boom loading or any combination of the two. The loading rate with both booms averages 1000 tonnes/h (1100 tph) over a 24-hour period. The overall loading rate is 25 000 tonnes (27,560 tons) per day and the complete cycle of unloading, rehandling and shiploading is completed in 48 hours. This facility could be used to load other products if required.

The coal-handling system is being used presently to load deep-sea Panamax-class 70 000 tonnne (77,000 ton) ships with coal reclaimed from the stockpile, again using loaders and trucks, but cycle controllers will allow the boom belt to be speeded up to permit the handling of Cape-size 120 000 tonnes (132,000 ton) vessels up to 40 m (130-ft) wide.

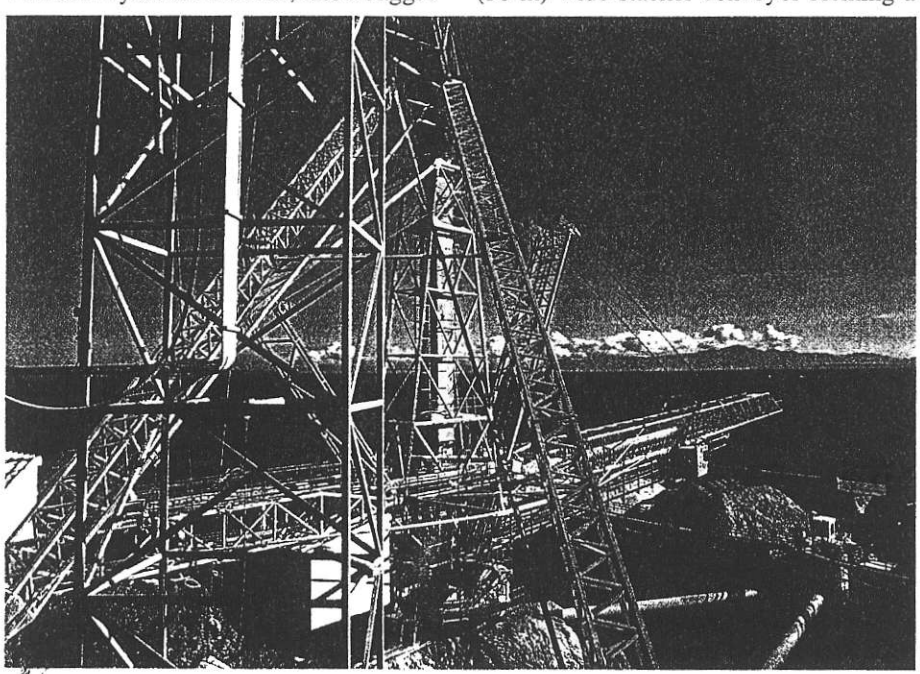
Aggregate plant

Holnam also purchased jaw and cone crushers from Texada Mines and in 1982 these machines were incorporated, together with conveyors and screens, into an aggregate processing plant in which dyke material from the limestone quarrying operation and mixed limestone/dyke material are crushed to produce road base, railroad ballast and drainage rock. Plans are under way to make provision for the production of specification materials for concrete and asphalt aggregates.

Currently, this plant is being used to meet a 1 million tonne (1.1 million ton) contract for 100 mm (4-in) minus stone for the new state-of-the-art Deltaport container terminal at Roberts Bank just south of Vancouver. This material leaves the quarry in bottom-dump barges which discharge directly onto the site.

Quarry haul trucks discharge the as-dug material into a ground hopper fitted with a Clemro vibrating grizzly ahead of the 914 mm x 1219 mm (36-in x 48-in) Traylor Bulldog primary jaw crusher with 100 mm (4-in) closed-side setting. The product from the crusher is conveyed on a 1066 mm (42-in) wide belt to a 762 mm (30-in) wide stacker conveyor forming a surge pile over a reclaim tunnel. The material is fed by a Jeffrey vibrating feeder from the surge pile onto a recovery belt which takes it to a feed hopper over the 1.3 m (4-1/4-ft) Symons Standard cone secondary crusher. The cone product is conveyed up to a 2.1 x 4.8 m (7-ft x 16-ft) Hewitt-Robins triple-deck screen. The screen makes three aggregate products — 75 mm (3-in) plus, 75 mm (3-in) minus to 19 mm (3/4-in) plus and 19 mm (3/4-in) minus — which are blended to give the correct specification for the Roberts Bank contract.

The finished products are stockpiled over tunnels where a reclaim belt feeds the shiploader system.



The 1815 tonnes/h (2000 tph) ship loader handles over 450 barges a year.

White rock plant

A further small crushing plant with a capacity of 100 tonnes/h (110 tph) has been built to crush and screen a white limestone from a small quarry on the site. The white stone occurs in a zone surrounded by blue to black limestone. The quarrying operation involves the mining of off-colour rock at a ratio of about 6:1 off-colour to white stone. The resultant product is crushed, screened and washed for shipment to a multitude of uses including paper, paint filler, plastics manufacture and wallboard crack filler.

In the processing plant for this material, a 75 tonne (82-ton) capacity receiving bin with a pan feeder underneath discharges into a 762 mm x 1066 mm (30-in x 42-in) Kue-Ken jaw crusher. This is followed by a 1.8 m x 4.8 m (6-ft x 16-ft) Seco double-deck vibratory screen fitted with spraybars to wash the stone. The top deck of this screen takes off the 100 mm (4-in) plus oversize while the 113 mm (1/2-in) undersize passing through the bottom deck is passed to a 762 mm (30-in) diameter by 7.6 m (25-ft) long Eagle screw. The 100 mm (4-in) minus to 13 mm (1/2-in) plus product off the bottom deck is conveyed to a finished product stockpile. The 100 mm (4-in) plus stone is picked up by front-end loader and trucked back to the crusher.

Occasionally, the crusher is opened wide and the top deck of the screen is replaced with one having 152 mm (6-in) apertures to produce material for a pulp mill in Bellingham, Wash. A 75 mm (3-in) square opening screen is also sometimes fitted on the bottom deck to pull off 152 mm (6-in) to 75 mm (3-in) drainage rock. The 75 mm (3-in) minus rock is in this case taken off by truck to the cement-grade processing plant.

It is estimated that the quarry contains reserves of at least 2 million tonnes (2.2 million) of the white rock — sufficient to last for the next 40 years at present rates of production. ❑