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Sechelt upgrades for high-tonnage aggregates production

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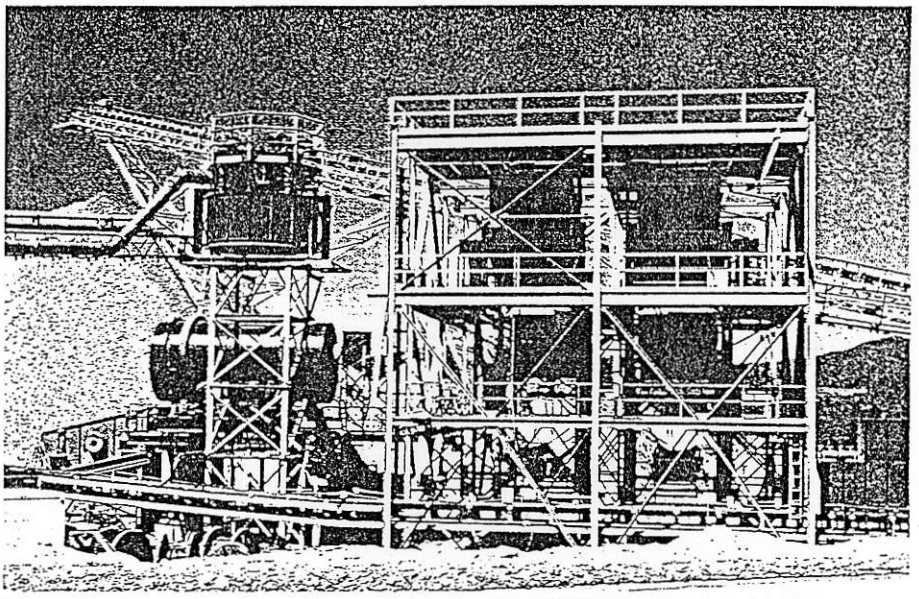
By Robert E. Consedine, Editor

For the past six months, Canada's largest sand and gravel operation, Construction Aggregates Ltd.'s Sechelt Pit, has been undergoing the first stage of a major upgrading program of its primary screening system. When completed, the new system will allow the 3.5 million tonnes per year capacity plant to nearly double the output of premium quality ASTM and CSA spec aggregates while significantly improving the overall cost efficiency of the operation.

Incorporating advanced European screening technology, the upgrading work involves the installation of four bivi-TEC screens from Binder+Co AG of Austria, including two 8x20 double-deck and two 8x16 single-deck units. The top decks of the double-deck units are fitted with Svedala's Trellex modular rubber panels and bivi-TEC's high-wear-resistant polyurethane panels on the lower decks. The bivi-TEC polyurethane media are also utilized on the single-deck units. Also included in the new primary screening arrangement is a 10x20 McLanahan heavy-duty rotary rock scrubber, a 6x14 Deister double-deck dewatering screen, an 914 mm x 10 m Eagle single-screw coarse material washer, a bank of six 380 mm diameter Krebs cyclones and a 13.7 m diameter water clarifier. The Deister screen is fitted with Durex-Camline rubber media on the top deck and polyurethane from Western Canadian Screens/Westrail on the bottom deck.



The new primary screening plant includes four bivi-TEC screens, a 10x20 McLanahan scrubber, a 6x14 Deister double-deck screen, an Eagle screw washer and Krebs cyclones.

The new clarifier is being built by Construction Aggregates (CAL) using components designed and supplied by Process Engineers & Equipment Corp.

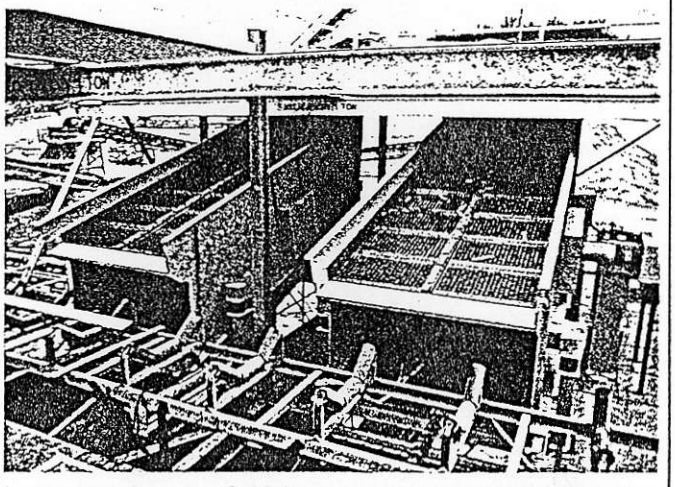
The plans call for integrating the new primary screening section with the existing primary screens until it has proved itself fully capable of meeting the company's expectations. At that time, the old

European screening method comes to Canada

A key aspect of CAL's new expansion program is the installation of four bivi-TEC screening machines manufactured and supplied by Binder+Co AG of Gleisdorf, Austria. The advanced-technology machines were purchased to screen out clay materials from the aggregates in the raw feed while cutting down the top size of sand, allowing the washing and classifying system to operate more efficiently. Sechelt's plant engineer, Colin Cameron, says that as the pit is worked, an increasing amount of wet, sticky material is contained in the plant feed. Extensive geological testing failed to indicate the amount of this material in the deposit. "More test holes have been drilled in this pit than in any other in the province." He describes it as like trying to screen ready-mix concrete. Over the last four years the company has tried every type of screen media available and has even looked at numerous other alternatives such as increasing the size of the surge piles to improve production.

CAL looked at six different screening options including resonance screens before deciding on the bivi-TEC units. The word 'bivi' describes two vibrations from a single drive which creates a 'flipping' action. A conventional screen operates with one or two Gs of force with up five Gs on a heavy-duty scalping screen. The bivi-TEC dual vibration system can take up to 50 Gs. The result is a screen that can handle very fine material that contains a moisture content in the range of up to 3 per cent without blinding. The boltless attachment of the polyurethane screen decks allows them to be changed quickly.

In the United States, bivi-TEC units have been used successfully to dry-screen fine materials that meet the new Superpave specifications.



Installation of the two 8x20 double-deck and two 8x16 single-deck bivi-TEC screens which are designed to allow screening of very fine moist materials without blinding.

primary screening equipment will be replaced with a duplicate bivi-TEC installation under the final phase of the program. Phase 1 is scheduled to come on-stream later this summer.

Background

Situated along the Sunshine Coast on the Strait of Georgia 100 km north of Vancouver, the Sechelt plant is currently averaging approximately 3.5 million tonnes per year. In 1993, production peaked at 5.6 million tonnes when CAL supplied 2.1 million tonnes of sand for the Vancouver International Airport expansion project. The company is part of the Vancouver-based Tilbury Cement Group which is owned by CBR/Heidelberger Zement of Germany. The 404 ha Sechelt site was opened up in 1989 as a dry processing plant with shiploading capabilities. The washing and classifying section was added in 1991. The area covered by the pit operation has four different landowners: the Sechelt Indian Band, the Crown, Canadian Forest Products and CAL.

The plant produces 12 standard and over 40 blended products including washed aggregates, crushed rock, road bases, asphalt materials and specialty sands including concrete, masonry and United States Golfing Association (USGA) sands. The site also produces approximately 750 000 tonnes of crushed rock a year in four standard sizes: screenings, 12.5 mm clear, 19 mm nominal and 50 mm or 75 mm.

Most of the plant's output goes to the Greater Vancouver area, although a proportion is also exported to Washington and Alaska.

Mining

In 1997, CAL changed their mining system in the pit from two 7.6 m^3 wheel loaders to a pair of 5.5 m^3 Cat 375L hydraulic excavators. The 375Ls were chosen as the principal pit loading equipment following an extensive study carried out by the company - plus input from the operators - which concluded that the excavators would deliver higher, more cost-efficient production in the hard-packed deposits.

After nearly a year of experience with the new loading method, Ray Collier, Sechelt's operations manager, states that the excavators have more than proven their worth. The excavators offer two main advantages over the wheel loaders, according to Collier. The first is that the operator can see what is going into the bucket which is a big help in removing and casting aside the high percentage of oversize boulders from the raw feed which are too large for

One of two 5.5 m^3 Cat 375L excavators used to mine 2500 tonnes/h of pit materials.

the primary crusher. Secondly, the excavators can operate much more safely and efficiently than the wheel loaders on the pit slopes to strip-mine the sand and gravel seams.

The excavators are teamed with a fleet of four 44.5 tonne capacity rigid-frame trucks: two Cat 773Bs on the longer hauls (over 300 m) and two Euclid R50s on the short haul work. With the excavators sitting on top of a 3 m high face, the operators can accurately spot each load into the truck body which is on a level with the top of the bench. The key to the excavator's loading efficiency is ensuring that there is no wasted movement in the loading cycle. The operation produces 2500 tonnes/h over the two 8-hour shifts per day.

Quarry operations

The drilling and blasting is subcontracted to Ted's Blasting & Construction Ltd. The contractor employs a Furukawa HCR-12 hydraulic drill to sink approximately 100 88 mm or 100 mm diameter holes to a depth of 12 m on either a 2.7 m x 2.7 m or a 3 m x 3 m pattern, depending on the hole diameter. The drill is producing 27.4 m to 30 m per hour. According to Ted Donley, the firm's president, all blasts are closely monitored to tightly control noise and vibration levels. There have been no complaints registered since blasting commenced at the Sechelt site. The production holes are bottom and mid-column primed with a 200 g Titan 8L booster and charged with Titan water-resistant and regular ANFO explosives Blasts are fired using Ensign-Bickford's EZ-Det non-electric initiation system. Shot rock is loaded out from the muck pile by a Cat 375L excavator working with one of the Cat 773Bs. A John-Deere 690 excavator with an Allied hydraulic hammer is used for secondary breaking of quarry oversize and pit boulders.

Crushing and screening plant

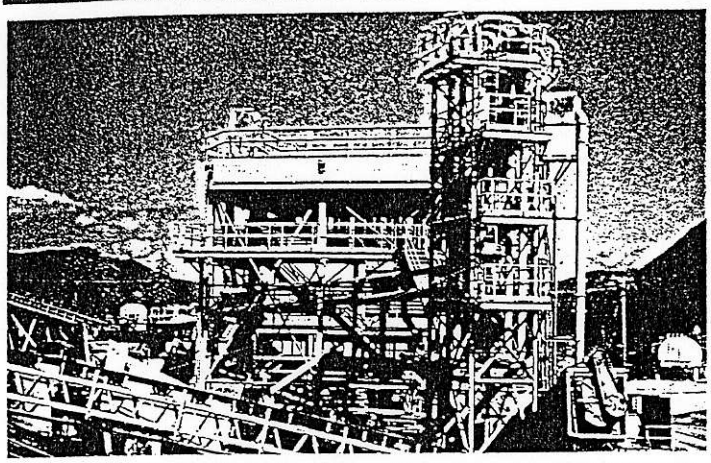
The primary crusher is a 4260 Farrell-Bacon double-toggle jaw rated at 800-900 tonnes/h. Driven by a 250 hp electric motor, the jaw normally works with a 203 mm CSS. In front of the crusher is an 1828 mm x 9.1 m apron feeder and a finger grizzly. Immediately following the crusher is a Syntron F86 feeder which discharges onto a 1524 mm x 22.8 m conveyor leading to an 8x10 Hewitt-Robins grizzly ahead of a 3042 Pioneer jaw with a 152 mm CSS. This second grizzly takes out undersize material which then rejoins the product from the Pioneer jaw crusher on a series of conveyors to the surge pile feeding the existing primary screening system.

The surge pile, which has a live capacity of approximately 3000 tonnes, also receives crushed material from a Torgersen CX primary impactor which is fed by a 1524 mm x 7.3 m apron feeder followed by a fixed grizzly to an inclined conveyor. This belt transports feed material to an 8x20 ElJay double-deck screen which allows the undersize to bypass the impactor.

In a reclaim tunnel beneath the surge pile, a pair of Syntron F86 feeders discharge onto a 1219 mm x 36.6 m reclaim belt which in turn discharges onto twin conveyors leading to two 8x20 Simplicity double-deck inclined vibrating screens. The oversize from the top deck of each screen is taken off by two 1219 mm conveyors and sent to a rotary scrubber before being discharged onto the crushed rock surge pile. The bottom deck retained fractions are conveyed via a 1219 mm belt to a 914 mm Eagle twin-screw coarse material washer before being conveyed to the crushed stone surge pile. The material passing through the bottom deck is taken off to the sand surge pile on a 1219 mm belt.

Material out of the rotary scrubber - which can be bypassed if desired - is carried by conveyor to the crushed rock surge pile. In the tunnel running underneath, two Syntron F480 feeders discharge onto a 914 mm conveyor leading to a 6x12 Simplicity grizzly. The grizzly oversize is fed to a 1.6 m Symons cone. The undersize goes to a surge bin and from there is transported on a frequency-driven feeder belt to a 2.1 Symons cone.

The 1.6 m Symons cone product is conveyed to an 8x20 Nordberg double-deck screen which feeds a stacking conveyor via a gate and chute arrangement as well as a 8x24 Simplicity double-deck screen. This screen gives three final prod-



Eagle 10x40 AUTOSPEC classifier and Linatex separator tower comprise part of CAL's 600 tonnes/h sand processing system.

uct sizes – 19 mm, 12.5 mm and screenings – which all go to separate stockpiles from which they are loaded out by means of ARC gate feeders onto a recovery belt.

Material coming off the two top decks of the Nordberg screen is recirculated by a 762 mm conveyor for further reduction in the 2.1 m Symons cone. These products are belted to a second 8x20 Nordberg double-deck screen and then conveyed to the Simplicity final product screen.

Material from the crushed stone surge pile is recovered by a Syntron F480 feeder and an ARC gate feeder in a second reclaim tunnel and conveyed to an 8x24 Tyler triple-deck screen. The top deck of this screen yields a 28 mm aggregate product which can either be conveyed direct to stockpile or, if required, sent for further reduction in the 2.1 m Symons cone.

The middle deck of the Tyler screen makes a 20 mm product which is taken off and stockpiled. The 12 mm plus material retained on the bottom-deck joins the material from a shop-built coarse material screw washer on a belt and stockpiled. The bottom deck throughs are pumped to the sand section for further processing.

Sand processing plant

In a tunnel beneath the sand surge pile are three ARC gate feeders and a Syntron F86 feeder. Two of the ARC gate feeders discharge onto a loadout belt. The other ARC unit and the Syntron feeder discharge onto conveyor belts leading to a pair of 8x24 Tyler double-deck screens. Joining the feed are the bottom deck throughs from the 8x24 Tyler triple-deck screen.

The undersize is pumped to two 11-station Eagle 10x40 AUTOSPEC classifiers with Eagle Mark V computerized controls. The classifiers provide CAL with the flexibility required to make a wide range of high-quality products, including specialty sands.

All three product sizes from the classifiers go through three Eagle fine material washers, a 1676 mm twin-screw, an 1828 mm single-screw and a 1676 mm single screw, for concrete sand, masonry sand and waste sand, respectively.

The overflow from the fine material washers is flumed to three 609 mm diameter Linatex cyclones via 203 mm Gallagher pumps. The 6.4 mm minus product from the separators is piped to a 13.7 m diameter Enviro-Clear high-capacity thickener where it is joined by the waste water from the classifiers. A series of three ITT SRL-C pumps then takes the waste to the settling pond.

Plant controls

The processing facilities are 98 per cent computer-controlled by an Allen-Bradley PLC 5 system and RS View PC software with operator interfaces in the main office and five remote locations throughout the plant.

Loadout and dispatch

All the plant's products are stockpiled over reclaim tunnels and any combination can be blended to a tight 2 per cent accuracy via ARC gate feeders on to the recovery belts.

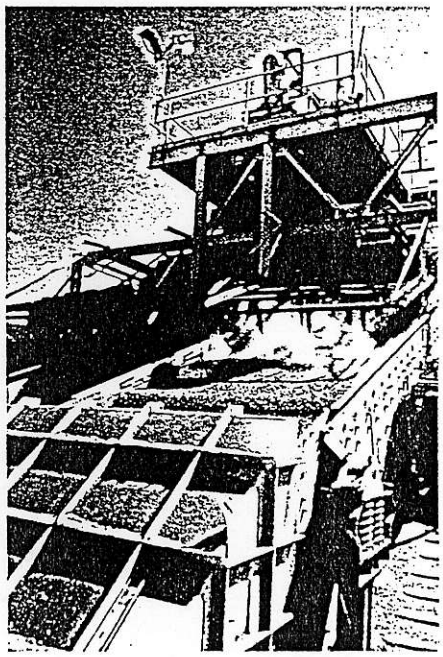
Two 8x24 Tyler double-deck rewash screens allow any product or blended material to be rinsed prior to loadout. All 28 mm plus material is prewashed in the 8x14 primary rotary scrubber and all the 28 mm x 6 mm material is prewashed in a 914 mm Eagle single-screw fine material washer. Some products are, in fact, washed four times before leaving the plant.

The recovery belt under the crushing plant product stockpiles transports the stone down a steep incline and under Highway 101 to the 3000 tonnes/h barge-loading conveyor system.

The average barge load is 4700 tonnes which takes approximately 4 hours to load, including barge maneuvring time. The barging is handled by CAL's Marine Division which operates a fleet of five tugs and 15 barges.

Habitat restoration

It has been an on-going commitment of CAL to progressively rehabilitate worked out areas of the Sechelt pit and create visually-attractive landscapes on the pit slopes facing the town of Sechelt and offshore. However the task has been complicated by the sandy soil overburden which doesn't lend itself to growing native vegetation. In recent years, two attempts were made to establish plant growth on the slopes facing the town. One of these attempts was made through hydroseeding and the other by hand sowing. Both trials incorporated soil fertilization using commercial fertilizers. These reclamation efforts proved disappointing because the soils on site contain very little organic matter and there is not enough water available for irrigation. Last year, CAL and Sylvis Environmental Inc. initiated a project in partnership with local industry and municipalities that is proving successful in establishing a healthy growth of aesthetically-pleasing vegetation including shrubs, trees and grasses on the site. The project involves the use of pulp mill sludge from Howe Sound Pulp and Paper Ltd. and waste water treatment biosolids from the towns of Gibsons and Sechelt for soil remediation. These organic materials are being used to treat existing soils to promote rapid plant growth. Two areas undergoing reclamation are the sand berm and the mid-escarpment. The mid-escarpment, which is located within the pit, is sectioned off in four plots, each containing different combinations of pulp sludge and biosolids. This process is providing knowledge of which combination will be most successful in future reclamation. Already several



Two 8x24 Tyler double-deck wet screens produce both finished products as well as feed for the two Eagle 10x40 classifiers.

species of vegetation are growing vigorously on the test plots and this summer CAL has commenced large-scale plantings. By using sewage and pulp wastes for fertilization, the company is not only re-using a valuable resource but is also helping reduce the amount of waste that is being dumped or burned in the local communities. (See *Aggregates & Roadbuilding*, April/98, pg 28-29).

The company's reclamation efforts at the Sechelt operations have not gone unnoticed. In early June, CAL was named the winner of the 1998 Minister's Environmental Award. CAL won out over 56 other nominees from across the province. In presenting the award, Cathy McGregor, B.C. Minister of the Environment, praised CAL's ecological approach to operating the site as well as its willingness to work with the local community to find innovative environmental solutions to common problems.

Community relations

Noise is one of the main concerns of the pit's immediate neighbours and a great deal of investment has been put into solving this problem. The three-shift loading operation was reduced to two shifts with the change from wheel loaders to the hydraulic excavators and, by putting in a larger crusher and higher-capacity conveyors, the primary's operation was reduced to a single 8-hour shift. A wall was also built around the primary crusher to reduce noise.

Relations with the local community at Sechelt are given a very high priority and, to this end, management has set up a liaison committee which has produced excellent results in terms of acceptance of the pit's operations. Yearly open houses and tours are held allowing local residents the opportunity to see for themselves the aggregate processing facilities, the areas reclaimed and the areas proposed for reclamation. Local residents have been actively involved in identifying and prioritizing areas for reclamation. Through community meetings, the residents helped decide the kind of vegetation that would be grown on the Sechelt site.

The company also make a point of purchasing supplies and services locally whenever possible and by sponsoring local activities. "We try to put as much money as possible back into the community. We have a donations committee that decides how our charitable contributions are to be dispersed," states Ray Collier.

"Our employees are our ambassadors in the community," he adds. "One of the things we've done recently was to build a bridge over the barge-loading conveyor to provide better access to a popular hiking trail. The bridge and ramp were constructed using recycled plant components and equipment including an old flatbed truck for the bridge approach."

Another example was the fabrication and erection of two 30 m high artificial eagle nesting platforms. Bald eagles are attracted to the area by the local dump as well as by the open areas of the pit which generate rising thermal air currents for effortless soaring. Few eagles, however, actually nest in the Sechelt region due the very even tree canopy along the Sunshine Coast which is not ideal for nesting eagles. CAL decided to try and change that situation by building towers well removed from human activities.

Melissa Pryce, a fourth-year student in environmental studies at the University of Northern British Columbia, who has been working summers at the Sechelt plant, told *Aggregates & Roadbuilding* that CAL's efforts to attract bald eagles to the nests were rewarded in mid-June when two eagles were spotted frequenting the roost. ❑