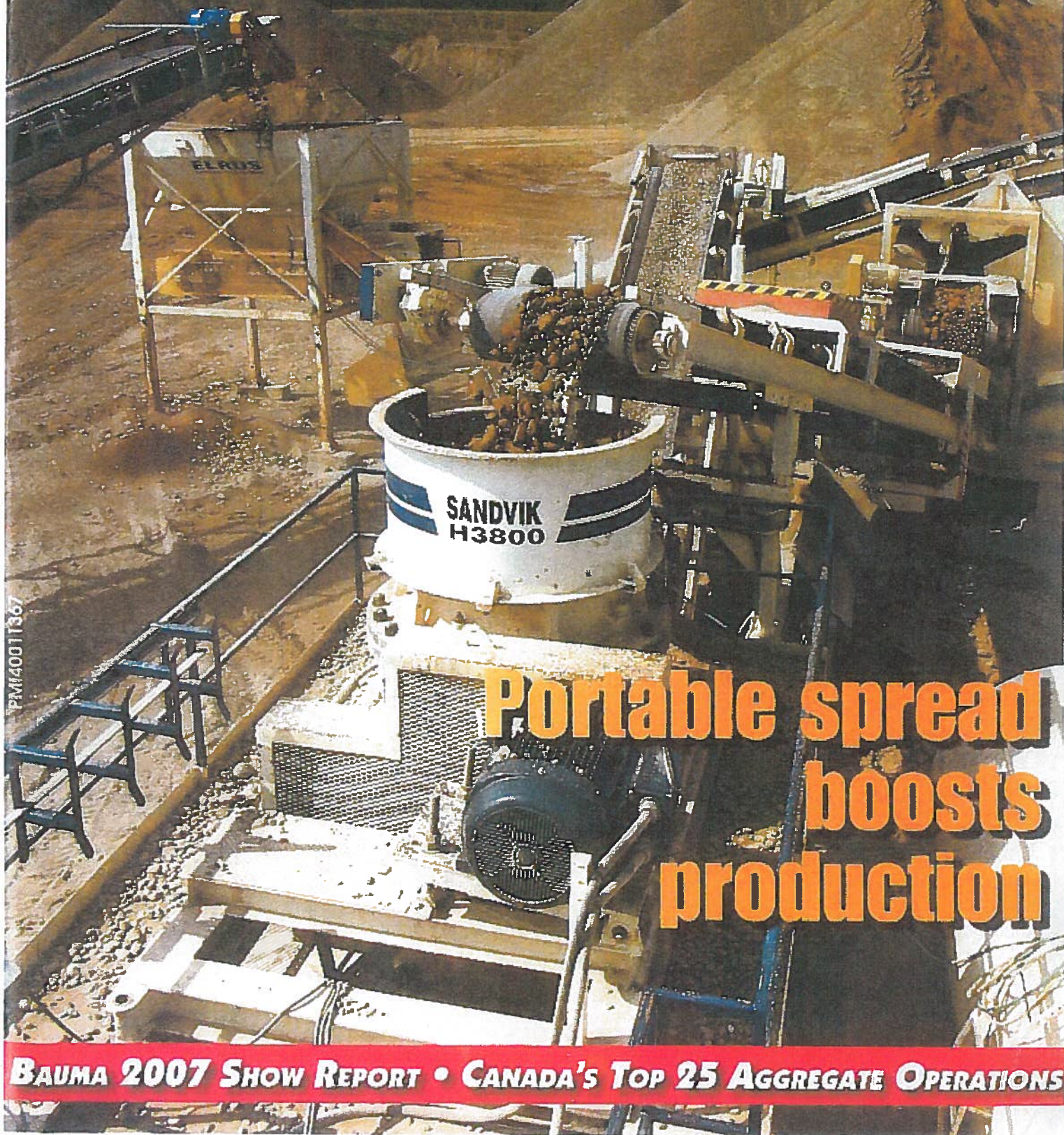


AGGREGATES & ROADBUILDING

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B.C. aggregate producer settles pond fines issue

A British Columbia aggregate producer has developed a unique solution to the treatment of wash plant process water.

By Andy Bateman, Engineering Editor

Allard Contractors is an independent sand and gravel producer, based some 30 km southeast of downtown Vancouver in Coquitlam. The operation there produces a full range of aggregates, including washed aggregates for the company's ready mix concrete operations. To deal with the familiar issue of settling pond fines, Allard's unique water treatment system utilises flocculants to rapidly settle suspended fines out of grey wash plant process water. Known as floc-sand, the collected fines soon dry into a manageable cake suitable for pit rehabilitation and an experimental revegetation program.

For co-owner Jim Allard, the new system represents a major step forward in fines management and the closely related issue of pit water management. Allard explains: "Effective water management is a particularly sensitive issue here due to the proximity of the Coquitlam River. Over the years, our water management system has evolved to meet multiple needs, including a reliable supply of fresh water for aggregate washing, settlement of wash water and containment of surface run off.

"Our goal is to ensure that water discharging into the river is clean and in normal operating conditions the pit does not contribute to any sediment entering the river. However, the pit's water system can become overtaxed during severe storm conditions, because storm water from the Westwood



Treated water discharges into a rectangular 18.3 m x 4.6 m x 1.5 m floc-sand pond.

Plateau residential subdivision is diverted into the gravel pits."

Allard's original water management system consists of three fresh water ponds and four settling ponds together with associated pumps, pipe work and culverts. From time to time, fines accumulating in the settling ponds are excavated into one of three separate silt ponds and allowed to dry. There, after a drying period of up to six months, the fines are transferred to the pit as rehabilitation fill, although the transfer is still a messy process due to the sloppy nature of the material.

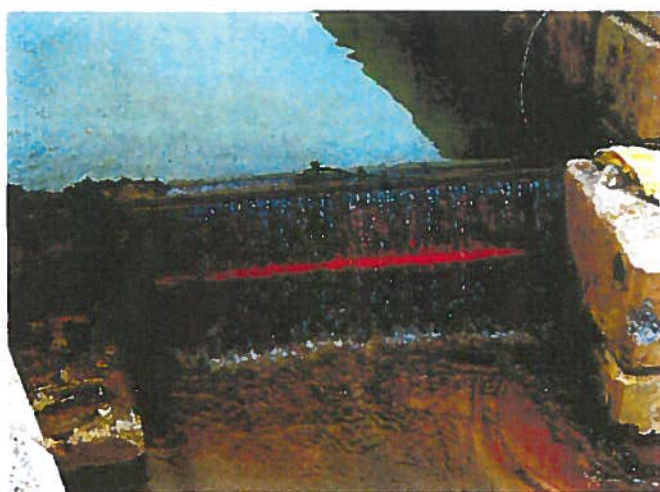
Once in the pit, another year may go by before the fill is sufficiently stable to bear the weight of mobile equipment. For Allard,

the promise of improved fill quality as well as improved water clarification were reason enough to invest significant time and money in a new approach.

With the "Allard Secret Floc System", grey water from the aggregate washing processes is piped near to a new flocculent house for treatment. A solution of flocculent A is first added to the process water followed by a solution of flocculent B further downstream. The flocculent house contains two dilution assemblies such that a controlled amount of each flocculent concentrate can be mixed with a controlled amount of clean water. To achieve this, the flow rates of clean water and flocculent concentrate are controlled by pressure regulators and a number of check



Following the addition of the flocculent solutions, a three outlet manifold discharges the treated water into the rectangular floc-sand pond.



Clear water weirs over the steel retaining wall of the floc-sand pond and rejoin the pit's existing water system.

valves to ensure that fluids flow through the mixing system in the right direction. Each dilution assembly receives clean source pond water via a 25 mm diameter pipe with the freshwater initially passing through a Watts pressure regulator set at 45psi +/- 5psi. Once its pressure is regulated, the freshwater flows through as pressure shut off valve installed in the line as a precaution to activate if the pressure exceeds 45 psi.

Downstream of the shut off valve, a solenoid switch regulates freshwater flow and is followed by a spring check valve to prevent backflow or loss of flocculent concentrate. Downstream of this check valve, concentrate is introduced into the line, with the concentrate supply pipe also containing a check valve to prevent flow of clean water up into the flocculent tote.

Once the flocculent concentrate is in the freshwater line, the mixture flows through a 25 mm USA BlueBook mixing chamber to produce a homogenous mixture containing 0.5 per cent flocculent, that is, 5ml of flocculent per litre of solution. The mixture is fed into a large tank for storing or pumping into the 102 mm process water line. Inside each concentrate tote, the level of concentrate is monitored by a float switch to ensure an adequate supply of concentrate is maintained. Once diluted, the flocculent solutions are injected into the pit process water at two locations, with each injection point equipped with a lever valve for manually regulating

flocculent flow if required. Flocculent A is injected just outside the flocculent house while flocculent B is injected just before discharge.

Following the addition of the flocculent solutions, a three outlet manifold discharges the treated water into a rectangular 18.3 m x 4.6 m x 1.5 m floc-sand pond. Three sides of this pond are constructed with removable concrete stac-a-bloc units while the remaining end wall consists of a removable steel gate. Within the pond, the floc-sand precipitates out almost immediately as 10-12 mm diameter pellets and accumulates on the bottom. At the same time, clear water is allowed to weir over the steel retaining wall and rejoin the pit's existing water system. Each morning, the pond's steel retaining wall is removed and the floc-sand is hauled to a nearby floc storage pond.

Some 200 tonnes of floc-sand is generated daily during the production of 2000 tonnes of washed aggregates, of which about 800 tonnes is concrete sand. On average, the system treats 4500 l/min of grey water during aggregate washing operations.

From Allard's perspective, the new system delivers a number benefits, tangible and intangible, with intangibles such as the public's perception of the aggregate industry perhaps the more important: "This new approach to fines management is an effective way of demonstrating our environmental commitment to the general public and other

sectors of the aggregate industry. We have also taken the process a step further by using a mixture of the recovered fines and biosolids to grow test plots of cottonwood and so provide a possible method for similar vegetation growth on a larger scale. For operators, this water treatment method means that collected pond fines can now be viewed as a potential resource and not just a headache."

Staying on operations, Allard adds that the floc-sand's early stability is a big factor in the system's success: "Each day's accumulation can be dug out of the floc-sand pond by wheel loader the next morning and within 24 hours the material can be walked on. Ten days later it is stable enough to support the weight of mobile equipment."

These benefits aside, the new system seems to make good business sense although Allard readily admits it is not cheap to run. Flocculent A is purchased at \$US1.43/lb and Flocculent B is \$US1.65/lb, delivered in 2290-lb totes. At \$3000 to \$3700 per tote, accurate control over flocculent mixing and dosage is essential to clarify the grey process water without using excess flocculent. These flocculent system costs are equivalent to about \$2/tonne of washed sand finished product, so with other production costs running at about \$3/tonne, total finished product costs of \$5/tonne. High as that number may sound, average selling prices of about \$10/tonne for washed concrete sand in the pit's market area mean that the process still yields a healthy

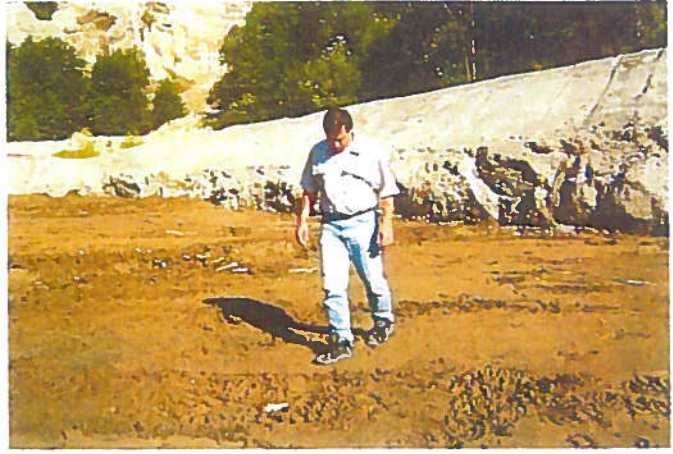


Within the floc sand pond, floc-sand precipitates almost immediately out of the treated water as 1-2 cm diameter pellets.

Environmental Report



The early stability of the floc-sand is a big factor in the system's success. Each day's accumulation can be dug out of the floc-sand pond the next morning.



The early stability of the floc-sand is a big factor in the system's success, with the material stable enough to be walked on within 24 hours.

margin. As Allard also points out, there are significant cost offsets from reduced wash pond maintenance and fines rehandling.

Going forward, the focus is on opportunities to drive down the new system's operating costs. One such opportunity is a huge existing stockpile of screened sand containing 20 per cent minus 200 mesh material. Concrete sand produced from this feedstock can be produced at lower cost as most production costs have already been incurred in its production. At present, system operating costs are also increased by the daily requirement to clean out the stac-a-bloc pond, resulting in

some 90 minutes of plant downtime as well as \$225 in loader operating costs. Over 250 annual working days, these additional costs amount to \$56,250 in loader operating and maintenance costs and some 375 hours of plant downtime.

Plans are in hand to refine the system and eliminate these clean out and downtime costs. Two 3 m x 3 m inverted pyramid hoppers will be installed within the stac-a-bloc pond to receive the manifold discharge rather than allowing the discharge to empty directly into the pond. Clear water overflowing from the hoppers will discharge into streams and

rejoin the existing water system. Meanwhile the floc-sand settling in the hopper enters 254 mm piping that is gravity fed into the pond. Once the pond is full of floc-sand, the end steel gate will be removed and the sand removed. This refinement will improve the sand/ water separation and reduce time spent on pond gate removal, sand removal and gate replacement.

Allard Contractors Limited is a family owned business with five gravel pits, three processing plants, and two ready mix concrete plants located in Vancouver's Lower Mainland region.