

# Keep it all Clean

## Efficient and Water-saving Washing of Crushed Material

*P. Craven, Irland*

*Prior to the introduction of a new washing plant it was the sand washing process which was the biggest area of concern for Natal Portland Cement. Due to inefficiencies of the old plant, the company had to buy up to 80 per cent of the fine sand used for downstream production. This led to significantly increased production costs.*

Natal Portland Cement has improved its productivity and efficiency at their Sterkspuit quarry in KwaZulu-Natal, South Africa, following the introduction of a new washing plant. The loss of quality fines during the sand processing phase of production has been eliminated following the introduction of a new washing plant to replace a bucket

wheel de-waterer previously employed at the Sterkspuit site.

The cement manufacturer also reports an industry first with the introduction of an Aquacycle high rate thickener allowing for the recycling of 90 per cent of the water used in the washing of their crushed material. While thickener systems are in use throughout the mining sector in

South Africa it is believed that the system now in operation is the first of its kind in a crushed rock or sand and gravel application.

### The Washing Process

Sterkspuit quarry is located in the Clifdale area some 30 kilometres from Durban on the eastern coast of South Africa. The new washing plant, a CDE Evowash system, is processing Tillite from the existing blasting and crushing operations and the washed material is being sold by Natal Portland Cement for use in the production of various asphalt mixes and as a replacement for river sand in their own concrete plants.



Natal Portland Cement has improved its productivity and efficiency with introduction of a new washing and water recycling plant.

Pictures: CDE Global



**The Evowash system reduce the need to purchase natural fine sand from external suppliers.**

From the crushing plant the minus 9.5 mm material is first sent to a double deck rinsing screen fitted with modular Iseemann polyurethane panels on both decks. The rinsing screen produces a 6.7-9.5 mm and a 5-6.7 mm aggregate with the minus 5 mm material being delivered to the sand washing phase.

The rinsing screen, a Prograde P2-75, is specifically designed for washing which is a major advantage when compared to many other screens on offer according to CDE. "In the majority of cases rinsing screens are simply dry screens with the crude addition of a few spray bars" explains CDE Sales Manager in South Africa, Des Crawford.

The advantages of polyurethane screen media on the screen have been immediately clear to Dave Kendall. On the previous washing plant the wire meshes had been lasting only a few weeks due to the abrasive nature of the material being processed.

The polyurethane screen deck on the Prograde have shown enhanced performance in the first few months of operation and have resulted in a reduction in the costs of maintenance both in terms of spare part costs and the man hours. An additional advantage is the ease of fitting of the modules when compared with side tensioned wire meshes from a health and safety point of view.

## Sand Washing Efficiency

Prior to the introduction of the new washing plant it was the sand washing process which was the biggest area of concern for Natal Portland Cement at Sterkspuit quarry. "Sand production was very inefficient with the bucket wheel that we had on site" explains Dave Kendall, General Manager at the site.

The bucket wheel was losing up to a third of the fine sand needed for production of asphalt sand leading to significantly increased production costs. The result of this was very coarse sand from the bucket wheel which meant Natal Portland Cement had to buy in large quantities of natural fine sand to blend with this coarse material. "We had to buy in between 70 and 80 per cent of the fine sand we used as a result of the inefficiencies of the bucket wheel as a means of sand production" explains Dave. "This was an area of considerable cost for us."

As a result of the increased capability to recover the fine sand material following introduction of the Evowash system, NPC have seen the quality of the washed sand improve and they have been able to dramatically reduce the need to purchase natural fine sand from external suppliers as the washed sand product now meets the specifications they require for asphalt mixes.

## Water Recycling System

Following the sand washing phase the waste water is delivered to an Aquacycle thickener to allow for the recycling of 90 per cent of the water used in the washing process.

"We believe that the introduction of the Aquacycle to our operations is a first for sand and aggregate producers in South Africa" says Dave Kendall. "With the environmental benefits and health and safety improvements that the Aquacycle offers I am sure it will be adopted by others in the not too distant future."

The wash water containing the minus 75 micron material from the washing system first enters the thickener via a de-aeration chamber located on the side of the thickener tank. The location of the waste discharge point at the top of the washing system allows for a gravity feed of this material eliminating the requirement for the additional sumps and pumps that can be required with other systems.

In the de-aeration chamber the material is dosed with a small amount of flocculent which is prepared in the Flocstation poly dosing plant. Material is then delivered to the centre of the circular tank before being released. The flocculent that has been mixed with the waste material forces the minus 75 micron particles to bind together and their cumulative weight allows these particles to fall to the bottom of the tank where a set of rakes rotate to maintain an even consistency within the settled sludge.



**Sand production was very inefficient with the bucket wheel system.**

The clean water overflows an integrated weir at the edge of the Aquacycle thickener and is then sent to the collection tank for recirculation to the washing plant. When the sludge reaches an appropriate density the rakes report back to the PLC control panel which activates the sludge pump. The settled sludge is then delivered to nearby settling ponds.

The settling ponds at Sterkspuit previously required a substantial area due to the lack of water recycling coupled with the loss of large volumes of material to the ponds. The reduction in area required following the introduction of the Aquacycle gives NPC additional security in relation to the safe storage of waste material from their operations.

"The advantages of the Aquacycle thickener to our operation is two fold" says Dave Kendall. "Firstly we have significantly reduced our use of natural resources through the water recycling capability we now have and secondly, the space required to accommodate our settling ponds has been massively reduced." ■

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