HIGH-TECH FOR HIGH-SPEC

Innovation has become the watchword in specifying road aggregates, and, as HUGH DE LACY reports, a new pugmill is keeping Stevenson Resources up with the game.

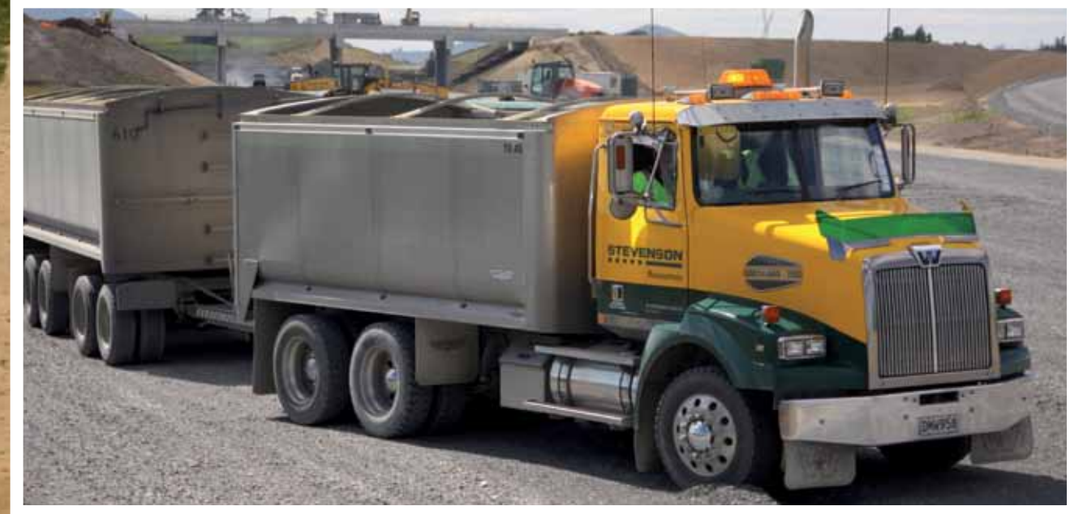
The company's already got one pugmill at its Drury quarry in Auckland, and the commissioning last year of a second one at Stevenson Resources' Huntly site reflected a significant advance in pavement design philosophy.

According to Stevenson's business development manager, Barry Larsen, the change is being driven by the NZ Transport Agency (NZTA), the territorial authorities and their consultants, particularly when planning high-traffic roads.

"They're placing greater emphasis on aggregate performance, specification and selection, and greater use of both in situ and ex situ [off-site] modified aggregates," Larsen says.

"Clients want superior value for money for the life cycle of their roads, from construction to long-term maintenance."

Specifications already exist of course for the likes of M/4 basecourse, but the NZTA is in the process of developing new specifications for modified aggregate production



> ...the Huntly pugmill produces mainly TNZ basecourse, cement-treated basecourse for bridge abutments, and a 65mm base-course designed specifically for the Te Rapa Bypass for which about 120,000 tonnes has been supplied so far.

for pavement layers, in association with the Aggregates and Quarry Association (AQA) and the National Pavement Technical Group.

Respectively the specifications apply to the addition to an aggregate of cement, lime, bitumen emulsion or foamed bitumen.

The Huntly pugmill, designed and built in Matamata for Stevenson by its subsidiary Rocktec, is something of a prototype for quarry owners intent on preparing for the new specifications for modified aggregates.

A pugmill could be described as a glorified cake-mixer – it pops up worldwide in a variety of industrial applications.

The significant feature of Stevenson's Huntly one is that it's served by no fewer than three aggregate feed bins for various constituent aggregates which are blended to make the final product.

It's computer-controlled and can measure the exact proportion of product – by weight, not volume – from each bin.

A conveyor belt feeds the ingredients into the continuous mixer where two counter-rotating shafts with paddle blades, powered by twin 40kW motors running off mains power, give them a thorough mixing at a rate of around 400 tonnes an hour.

Water can also be introduced to the mix to achieve optimum moisture content, which helps with compacting on-site.

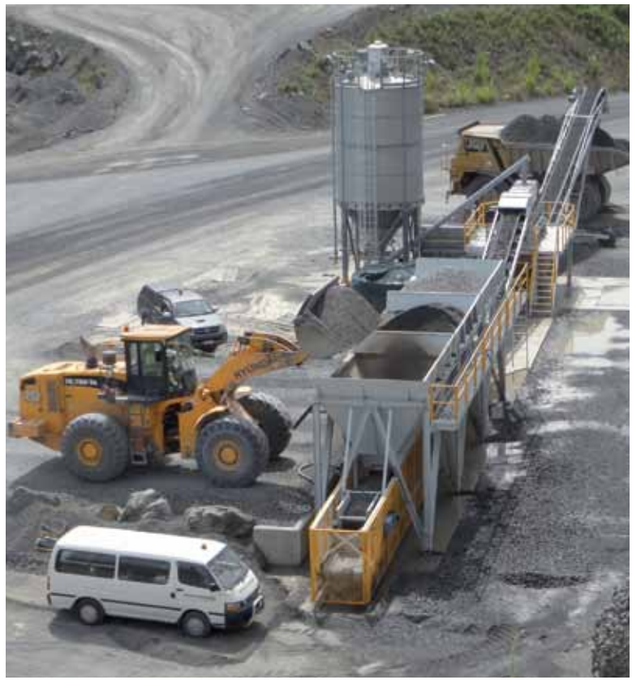
Optional additives of chemical binders, lime, cement and emulsions also contribute to the stabilising of the pavement layer.

A Programming Logic Controller (PLC) runs the operation through an ordinary computer interface and a touch screen in the control room of the nearby main crushing plant.

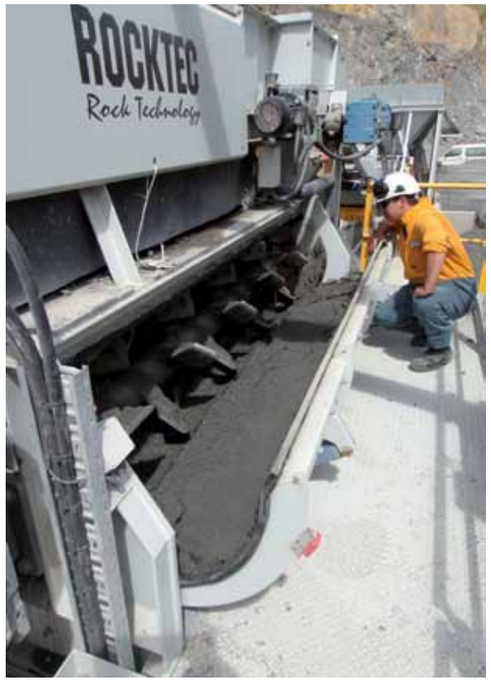
It can also be operated by remote radio control by the loader or dumper operator.

A radial luffing conveyor belt allows mixed aggregates to distribute the finished product to a stockpile, or directly to road-truck or dumpers.

"We can make [aggregates] to order, producing custom-designed products," Larsen says, adding that the Huntly pugmill produces mainly TNZ basecourse, cement-treated



A loader loads various sized aggregates into feed bins. These are mixed, and cement and water added if required and then fed out into trucks.



The pugmill with the cover open, showing the mixing paddles.

basecourse for bridge abutments, and a 65mm basecourse designed specifically for the Te Rapa Bypass for which about 120,000 tonnes has been supplied so far.

"The generic term is 'modified aggregates': you're modifying the aggregate in some way by adding cement or lime or improving the grading by blending various products."

The principle driving the modified aggregates evolution is that pavement design has two competing demands: the cost of supplying and applying the aggregate, and the quality of the finished road's performance in terms of stability, longevity and maintenance.

From that it follows that a key determinant of an aggregate's performance is its consistency, load after load.

Consistency in aggregates is a matter of time and money to contractors – the right blend is easier to compact, thereby reducing construction costs - and it's the pugmill's job to ensure it.

The reports on the consistency of Stevenson's pugmill aggregates on the $112 million Te Rapa Bypass project, a section of the 102-kilometre Waikato Expressway Road of National Significance, are more than favourable.

Te Rapa Alliance project manager Tony Dickens puts it this way: "Once you've got consistency with your aggregates you can have consistency with your methodology.

"We get consistent grading results from our aggregates because Stevenson put it through the pugmill, and with blends create the recipe that you want to make the aggregate you specified for the job," he told *Contractor.*

Ross Inglis, the alliance's pavement and surfacing manager, told *Contractor* that "The Stevenson aggregate is very consistent and well graded, which makes it easier to compact and reduces our compaction costs.

"We have consistently exceeded our pavement production targets on the Te Rapa Bypass project using this aggregate."

And the aggregates, produced at the quarry in pre-tested 6000-tonne lots, are very consistent, he says.

Stevenson's first pugmill has been operating at its Drury quarry in Auckland since 2006, the year it won the Aggregate and Quarry Association/Institute of Quarrying innovation award.

It has developed a good track record, having supplied modified aggregates to projects such as the Manukau Harbour Crossing, Victoria Park Tunnel and the Hobsonville Motorway.

Stevenson will be supplying 300,000 tonnes of aggregates for the Te Rapa Bypass project, a contract Barry Larsen says was won in part because of the Huntly pugmill.

"Our technical and operational people collaborated early on with [the Te Rapa Alliance's] pavement designers and the project managers during their pavement design," Larsen says.

"We knew what they wanted and they knew that with the new pugmill we could deliver."

Stevenson's two pugmills represent a significant investment in modified aggregate technology, and Larsen also points to the company's collaboration with the likes of Dr Greg Arnold, a pavement highway design consultant and former engineering policy manager with Transit New Zealand.

Greg has developed a test method using the Repeat Load Triaxial (RLT) laboratory test for aggregates, which simulates the way they will perform on the road under heavy traffic.

RLT tests apply repetitive loading in the laboratory to compacted aggregates for a range of specified stress conditions, and multi-stage tests are used to obtain deformation curves for a range of stress conditions to develop models for predicting pavement rutting.

"We've put a range of our products through the RLT test, giving us a good understanding of how they are likely to perform in pavement," Larsen says.

With the advent of modified aggregates it seems that the humble roading metal, which began its New Zealand life as a shovelful of gravel on the boggiest bits of a bush track, has graduated into a high-spec, high-tech foundation of the modern arterial highway.