

# Metso

Finer things in life

## Solutions for sand manufacturing





# Building castles out of sand

Manufactured sand meets the needs of modern construction

Rapid urbanization and population growth are driving an ever-growing need for new buildings and infrastructure, making sand a high-demand commodity. At the same time, environmental concerns and dwindling natural resources mean that construction companies are under pressure to improve their energy and raw material efficiency. As a result, manufactured sand is becoming a viable alternative for new construction.

## Rapid urbanization driving demand

Sand is a key ingredient in concrete, cement and asphalt. As the megacities of the world continue to grow upwards and outwards, the demand for sand is growing along with them.

## Environmental protection a priority

Sand has traditionally been obtained from natural sources; however, this is becoming increasingly difficult as environmental regulations catch up with public opinion and environmental concerns. Around the world, new regulations are being put in place to protect sources of natural sand and in many cases sourcing sand from river banks and shorelines has been banned completely.

## Distance means time and money

The depletion of natural sand resources is also becoming a major concern, and in areas where demand is highest, there are fewer and fewer sustainable sources. As a result, sand has to be transported over greater distances and the price has been driven up.



Together with Metso's experts, we were able to transform a pile of 'waste' material into a product that is actually in great demand in the market.

Ignacio Gonzales, CEO Gravase, Mexico

#### Challenge

- Meet demand for sand
- Reduce waste stockpiles

#### Solution

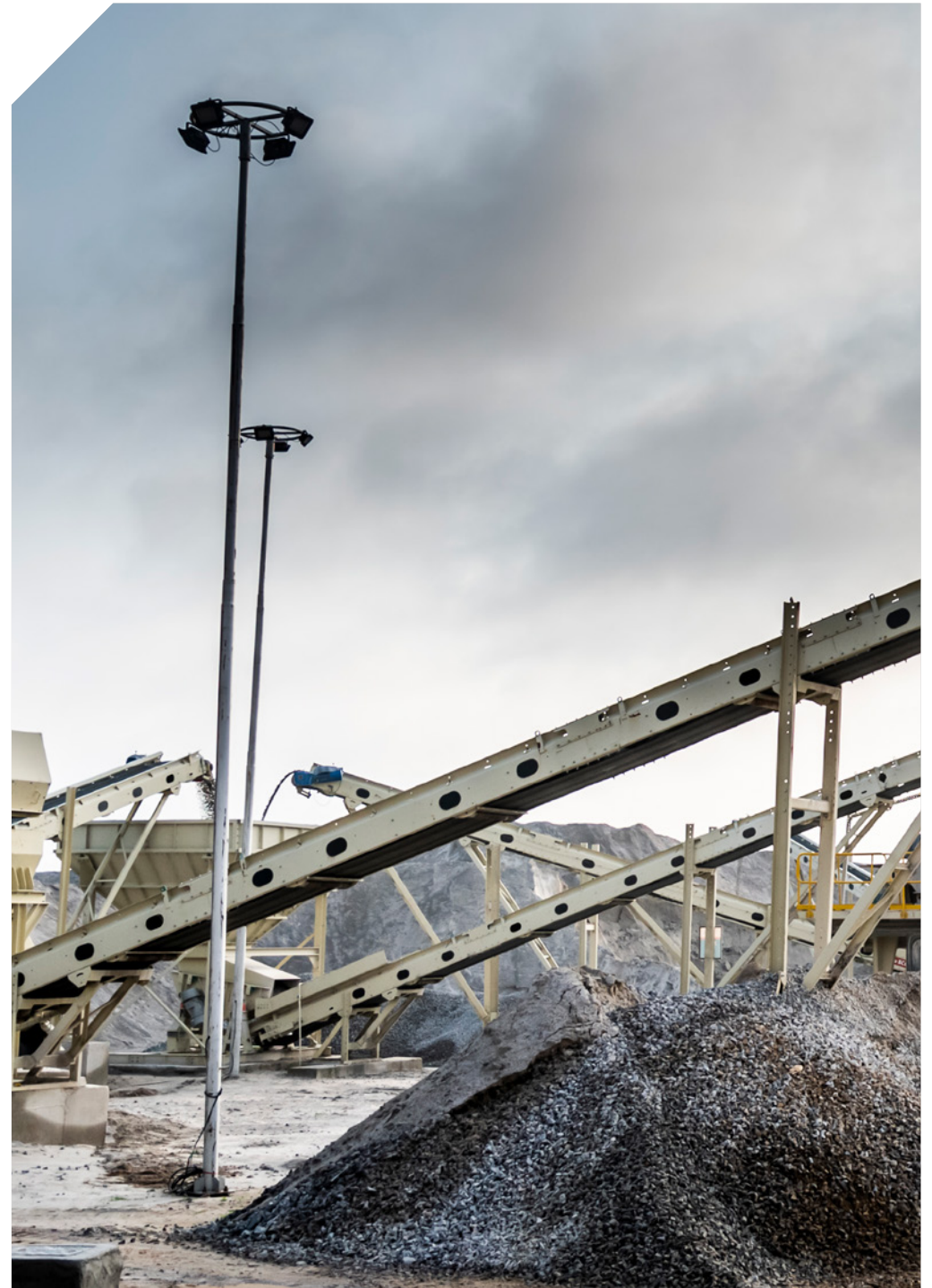
- Upgrade existing process with HRC800™ high-pressure grinding roll
- Other Metso equipment on site:
  - Nordberg® C145 jaw crusher
  - HP400 and HP300 cone crushers
  - Metso CVB™ and TS™ screens
  - Barmac® B7150 VSI crushers

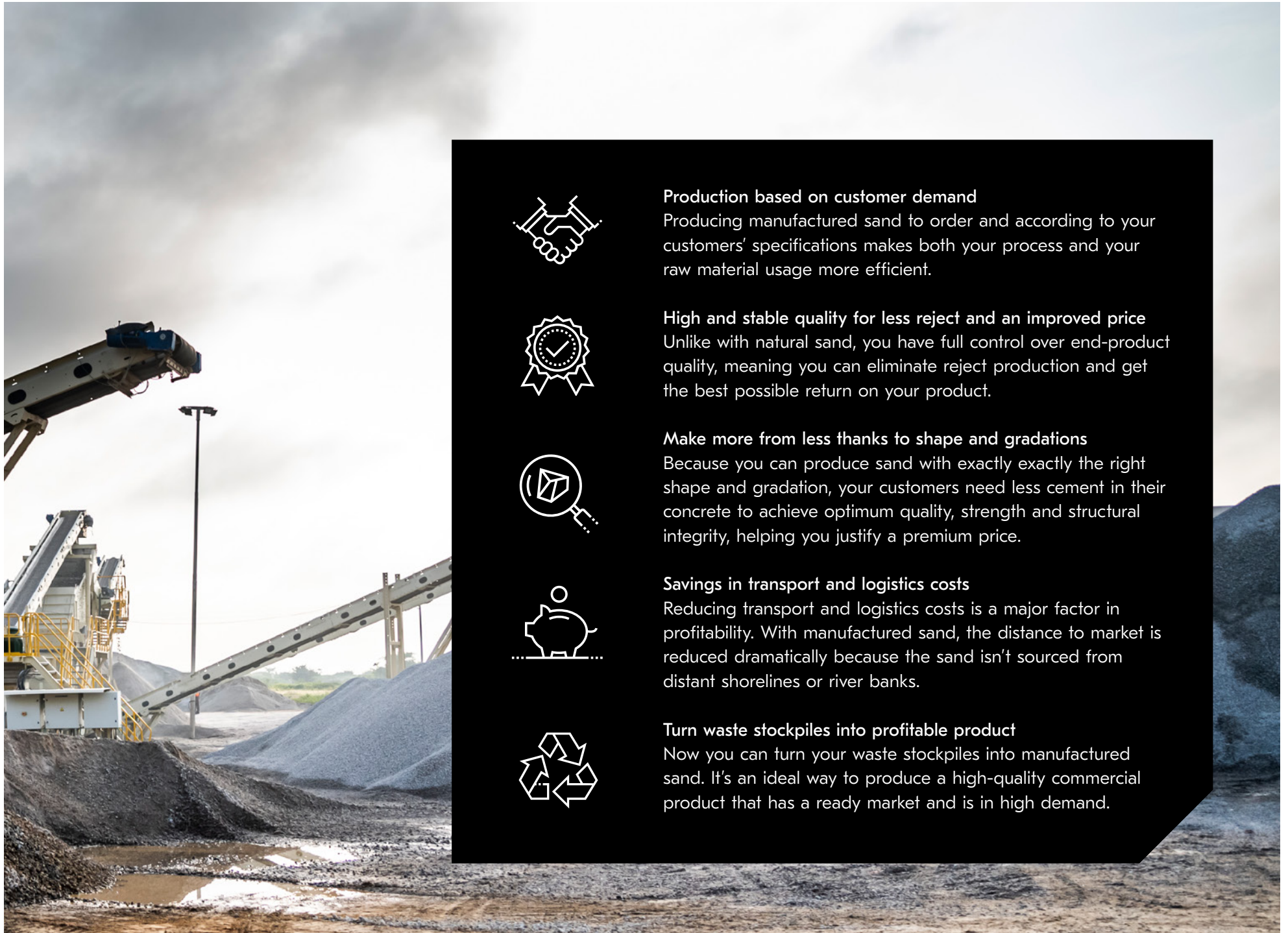
#### Results

- Sand production increased by 80 tons/hour

# Finding new opportunities in the sand

Manufactured sand is the business of building the future. High-quality sand, consistent availability and added value add up to profit – while also improving sustainability across the entire value chain.





#### **Production based on customer demand**

Producing manufactured sand to order and according to your customers' specifications makes both your process and your raw material usage more efficient.



#### **High and stable quality for less reject and an improved price**

Unlike with natural sand, you have full control over end-product quality, meaning you can eliminate reject production and get the best possible return on your product.



#### **Make more from less thanks to shape and gradations**

Because you can produce sand with exactly the right shape and gradation, your customers need less cement in their concrete to achieve optimum quality, strength and structural integrity, helping you justify a premium price.



#### **Savings in transport and logistics costs**

Reducing transport and logistics costs is a major factor in profitability. With manufactured sand, the distance to market is reduced dramatically because the sand isn't sourced from distant shorelines or river banks.



#### **Turn waste stockpiles into profitable product**

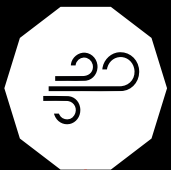
Now you can turn your waste stockpiles into manufactured sand. It's an ideal way to produce a high-quality commercial product that has a ready market and is in high demand.



In crushed aggregates production, up to 30% (rock dependent) of materials acquired from the bedrock are reduced to sizes smaller than 4 mm, meaning they end up as waste. These waste stockpiles are a perfect feed for the production of manufactured sand.



Efficient crushing and screening allows for the production of high-quality manufactured sand with uniform consistency and precise shaping and gradation based on customer specifications.



Dry classification with a gravitational inertial classifier reduces the amount of dust and superfines in the manufactured sand, which helps to meet strict specifications and improve end-product quality.



The final end product is manufactured sand that is superior in quality to natural sand, giving you great returns on a raw material that was previously problem waste, taking up space at your quarry site.



## Case: Kyung Boo Corporation, South Korea

Large-scale infrastructure projects and government regulation in South Korea mean that manufactured sand is in high demand. Urbanization is expected to double the South Korean market in the next few years. At the same time, the price of manufactured sand is also expected to rise.

Kyung Boo Corporation, located in Gimhae in South Gyeongsang province, currently produces 2.2 million tons of aggregates and manufactured sand annually. 60% of production is aggregates and the remaining 40% sand. The Korean company has already invested in market-leading crushing and screening equipment from Metso, and they are utilizing this leading technology as a basis to grow the share of manufactured sand in their operations. "The company will likely grow its manufactured sand output to around 80% of its total annual material production," Mr. Park, owner and CEO of Kyung Boo Corporation explains. The amount of manufactured sand produced with a Metso plant is 2.5-3 times greater than with a local plant.

## Challenge

- Meet the growing demand for manufactured sand

## Solution

- Nordberg® HP6™ cone crushers
- Nordberg® C160™ jaw crusher
- Metso TS5.3™ screens
- Nordberg® GP500S™ cone crusher
- Barmac® B9100SE™ (VSI) crushers
- Nordberg® HP300™ cone crusher
- Lokotrack® LT120™ mobile jaw crushing plant
- VF866-2V™ grizzly feeder

## Results

- 2.5-3 times greater production capacity

# Equipped for success

## Incorporate sand production into your existing plant

Turn your unused or rejected aggregate materials into profitable product with the help of reliable and robust technologies from Metso. We offer complete crushing and separation solutions for greenfield sites as well as solutions that can be incorporated into existing plants. Depending on your requirements, there are several alternatives for sand manufacturing, all designed to produce well-graded, high-quality end product.

### VSI crushing technology

#### High energy efficiency and capacity

For customers who need to process fine, unscalped, heterogeneous or irregular feeds, Metso offers vertical shaft impact (VSI) crushing technology. Unlike cone crushing, with VSI technology shaping is not influenced by the closed side setting (CSS), and shaping occurs throughout the product curve.

With rock-on-rock crushing you can produce sand that is well known for its cubical shape and consistent gradation, and which has proven performance in concrete and mortar products. With VSI technology the gradation and quality of the product does not tail off with increased wear on parts. This allows you to reliably produce the right grades of sand to ensure the best performance in concrete and mortar mixes, and reduce production costs.

### Case: Tae-hyung Enterprise Co., South Korea

## Selling sand for 40% more than market price

South Korean aggregates producer Tae-hyung Enterprise Co. adopted a new method of producing aggregate by crushing because extracting gravel from rivers had been banned and transporting raw material from the sea had become increasingly expensive. The raw material the company uses to produce their aggregate is one of the hardest stones in Korea.

Investing in Metso's crushing technologies enabled Tae-hyung Enterprise Co. to start making a real profit on manufactured sand. For example, by installing a Barmac VSI and HP cones they were able to double their output.

Metso's Nordberg® HP300™ and HP400™ cone crushers also enabled the company to reduce flakiness to less than 10%. Overall, their choice of robust Metso equipment has helped them reduce operating costs by more than 10%.

With an increase in production combined with a 0% rejection rate from their customers, Tae-hyung Enterprise Co. have increased their overall profitability by 15%. And because their sand is of consistent quality they can sell it at 40% more than market price.



### Challenge:

- High abrasive feed material

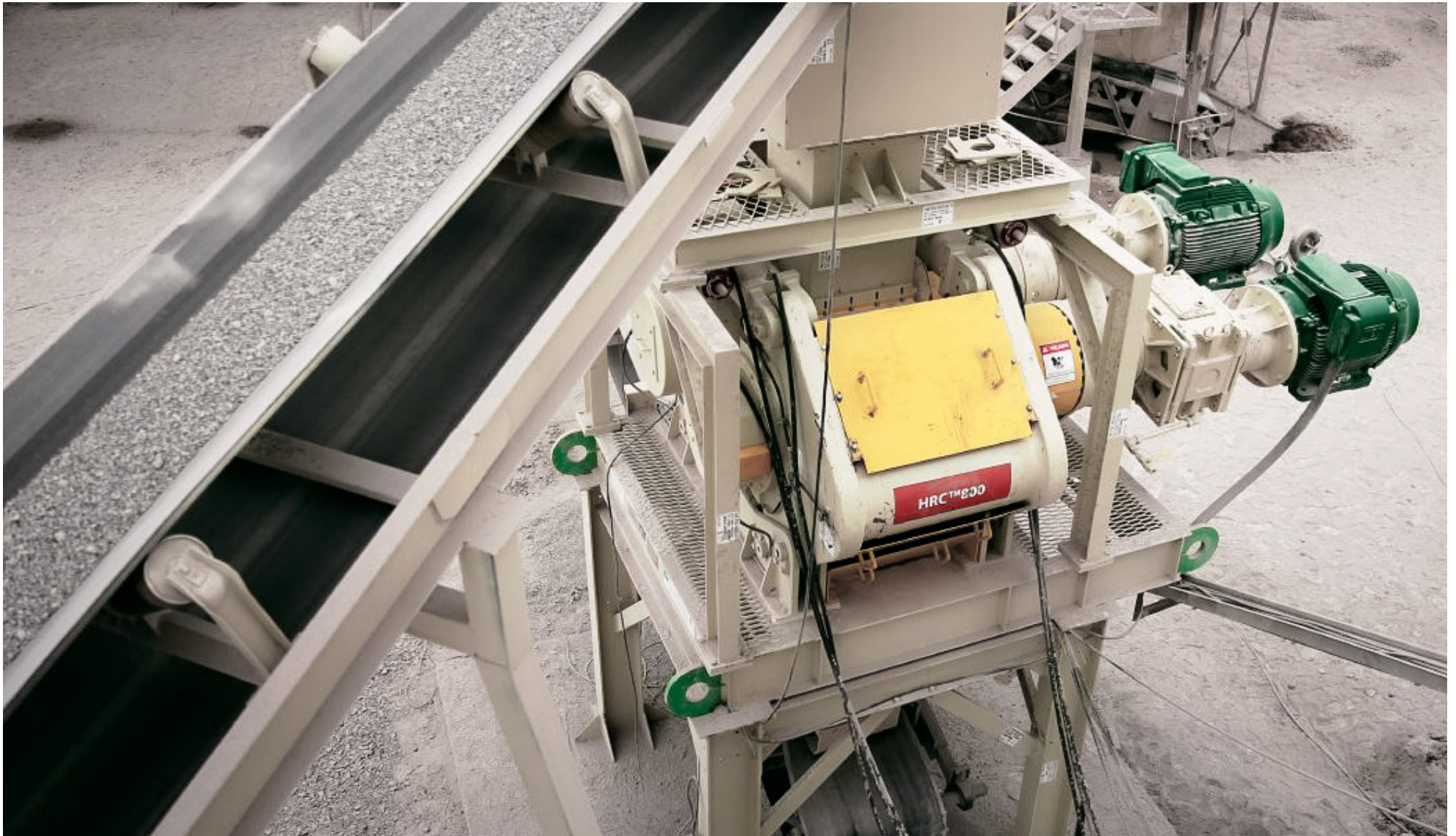
### Solution:

- Barmac® B9100SE™ VSI
- crusher Nordberg® HP300™
- HP400™ cone crushers

### Results:

- Flakiness reduced to <10%
- Operating costs reduced by 10%
- Sand sold at 40% above market price





**HPGR technology**  
**Safe and efficient production**

High-pressure grinding roll (HPGR) technology takes manufactured sand to the next level by providing a simple yet robust design, low-cost operation, and improved product shape and gradation. Our HPGR technology is optimized for the demanding

requirements of aggregates production, with the ability to process hard rock and even moist material. This technology also provides an excellent level of flexibility with the feed. For example, compared to other approaches, you can feed in materials that contain a higher ratio of fines.

Metso's HPGR crushers use adjustable hydraulic cylinders and variable speed to provide the optimal crushing force. High-pressure rock-on-rock crushing enables long wear life of the manganese tires and energy-efficient operation. With HGPR technology the overall sand yield can be as high as 80%.



With manufactured sand, it's all about consistent moisture, gradation and shape. After a lot of testing, we can now say with confidence that Velde Pukk can accurately achieve the gradation that our customers require for their asphalt and concrete production.

Egil Velde, Managing Director  
Velde Pukk, Norway



#### Air classification technology

##### Dry classification with a gravitational inertial classifier

As a sand producer you need an effective way to classify your products. The global trend is to utilize dry classification solutions to separate fine and coarse particles. With Metso air classification technology you can reduce the percentage of superfines in your manufactured sand, enabling you to meet your specifications and produce high-quality products. Air classification is a simple technology as it removes the need for slurry treatment or ponds as well as dewatering. The technology also works in cold climates.

With sand of 0/4 mm or less you can use Metso's gravitational inertial classifier to separate material between 300 microns (50#) and 63 microns (230#). This enables you to manufacture concrete and asphalt sands, which typically require a reduction in the amount of 63 micron (230#) material present. The unit's internal recirculating feature allows you to adjust the efficiency of the separation depending on your desired grading curve.

#### Solution:

- Sand manufacturing process that uses fractionizing of fine sands and dry air classifying

#### Results:

- Superior particle shape, consistent gradation and the flexibility to balance the sand mix according to customer needs
- Local cement producers have achieved cement savings of up to 10–15%



### Cone crushing technology

#### High energy efficiency and capacity

When you produce sand, you need high energy efficiency, high capacity, good product gradation, a high reduction ratio and low sensitivity to rock hardness. Metso cone crushing technology meets all these requirements. Metso's advanced high-speed cones have high crushing forces, while the cavity design ensures that

crushing occurs along the full length of the crusher cavity within multiple crushing zones. This guarantees inter-particle crushing and efficient production of the required fines and cubically shaped products.

Our technology and know-how gives you the opportunity to produce well-graded and shaped <20mm products, including manufactured sand.

### Case: Barracão Quarry, Santa Catarina, Brazil

## 30% production increase with the right equipment

Brazilian company Britagem e Pavimentadora Barracão has achieved a 30% increase in the production of crushed stone after purchasing two Metso MX4™ Multi-Action cone crushers. The company now has a monthly production capacity of 150,000 tons, and revenues are up 30% as a result of high market demand. "We have been working with Metso for many years. We have four Metso machines already installed in our process, and now with the two MX4 cone crushers we are achieving improved performance efficiency, production capacity and ease of operation. Our production quality is excellent, and with less downtime we are reducing costs. We will no doubt be ordering new Metso machines again soon," says Antonio Assini, owner of Britagem e Pavimentadora Barracão.

### Challenge:

- Meet increased market demand and find a solution that removes the need to interrupt the crushing process to make adjustments

### Solution:

- Two Metso MX4™ cone crushers

### Results:

- 30% increase in production

