Precise dry classification for ultrafines in manufactured sands
Manufactured sand - the ideal ingredient for concrete

Sand is a key ingredient in concrete and asphalt, and 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. As a result, manufactured sand is becoming a viable alternative for new construction.

Metso offers a complete industrial process and full equipment range for producing manufactured sand. One of the key benefits of the Metso process is precise control and classification of different grades of sand, enabled by automation and deep integration between the various crushing and separation stages.

Screens separate out oversized aggregate fractions and return them to the crushers. Screening is then followed by the final and most critical stage in terms of controlling the continuous grading: classifying the material flow’s different fractions with an accuracy of microns with Metso’s gravitational inertial classifier. The end result is sand with optimized gradation and particle moisture.

The most efficient way to achieve ultrafine separation

Metso’s solution achieves an extremely accurate separation and moisture rate without the need for moving elements in the airflow. It does this by using a secondary recirculating airflow. Because the airflows are not affected by wear, the grading remains consistent to an accuracy of microns. At the same time, particle moisture remains at an optimal level.

As the process uses no water it is both economical and environmentally friendly, as well as being ideal for cold climates.

A full-scale industrial process

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 material for manufactured sand production.

Efficient crushing and screening produces 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 result 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.
How does it work?

1. Feed material is evenly introduced from the top of the classifier.
2. The material falls in a controlled curtain into the classifier chamber along with primary air fed in at the top.
3. Secondary air is drawn in at the bottom, inducing a scrubbing effect on similar-sized particles.
4. Recirculation and scrubbing enables high efficiency and precise separation of ultrafines.
5. Coarse particles drop out of the bottom of the classifier through an airlock.

Metso Gravitational Inertial Air Classifier models

<table>
<thead>
<tr>
<th>Model</th>
<th>Capacity (MTPH)</th>
<th>Air Volume (CMH)</th>
<th>Weight (kg)</th>
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</thead>
<tbody>
<tr>
<td>AC22.5</td>
<td>45</td>
<td>20 400</td>
<td>12 856</td>
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<tr>
<td>AC27</td>
<td>54</td>
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<tr>
<td>AC30</td>
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<tr>
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<td>Dual AC27</td>
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<tr>
<td>Quad AC27</td>
<td>216</td>
<td>97 900</td>
<td>59 595</td>
</tr>
</tbody>
</table>

Available options for all models include an electrical package, VSD on fan, extraction solution, and mobile installation.

A complete solution

In precise dry classification of different fractions of sand, a complete solution for separation and dust collection is needed.

The system consists of an air classifier and dust collector system with a fan, a compressor, airlock, and piping. Metso can provide a complete system with all equipment and steel structures, or individual equipment as needed. Each system is designed according to customer need and the requirements of local safety and environmental regulations.

Lab-verified performance

Metso conducts lab tests with the customer’s feed material for a best equipment recommendation. We have laboratories in the USA, Finland, and Brazil.

High quality end-product
Low operating costs with minimal wear

Ceramic liners that last for years
Highly durable ceramic tiles are used to protect the classifier’s body. The tiles need to be replaced every four to seven years, which is double the two to three year replacement interval of hard-rock liners. Because Metso’s solution has no moving parts in the material airflow stream it provides highly effective protection against wear.
Ceramic tiles are suitable for all types of feed material: abrasive, hard, and soft rock.

Easy to adjust
The amount of ultrafines in the end product is adjusted by changing the total airflow, and by changing the ratio of primary and secondary airflows. With the right combination both separation size and accuracy can be fine-tuned to meet application requirements.

Ceramic liners after 4 years of usage
Ceramic liners after 7 years of usage

Metso 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%

Read the full story

“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