

Italian group keeps powder dry with particle size control

Using in-line particle size measurement at Ferrari Granulati to minimise production costs, and reduce waste and energy consumption, writes **Alain Blasco**

FERRARI GRANULATI OF VERONA, ITALY, IS A MAJOR producer of marble granulates and powders, supplying a wide range of marble in different colours and defined size ranges. The largest product has a specification of 50–80mm, but the company mills down to specifications in the sub-10 micron range, producing very fine commercially valuable powders of exceptional quality.

The first step in the production of these finer white materials is sieving of the zero-to-1.8mm fraction from upstream milling processes. The sieve stack produces the following fractions: 1.2 – 1.8mm; 0.7 – 1.2mm; 0.4 – 0.7mm; 0.1 – 0.4mm; and <0.1mm – fines.

The 0.1 to 0.4mm fraction is used to manufacture artificial marbles and paints. However, particle size distributions are tightly controlled for these applications and the specification on fines must be met: <5 % below 0.1mm.

The finest fraction <0.1mm, although a by-product from this process, is used as a feed for the production of much finer powders. Alternatively, the two lower fractions can be combined to form a less than 0.4mm product with no specification on fines.

Tightly specified

Making the combined, less than 0.4mm product is relatively easy as quality is not compromised by poor performance of the sieve stack. The more tightly specified product, on the other hand, is harder to separate out, particularly during periods of high humidity when the sieves are more prone to sub-optimal operation, and the last cut is often not sufficiently 'clean' to keep fines out of the 0.1–0.4mm fraction.

Humidity is constantly monitored at the plant and informs the operational strategy. If humidity rises above 0.1%, when it is not viable to produce the 0.1–0.4mm fraction, and the combined product is manufactured. In contrast, at low humidity (<0.05%) the sieve stack works well and the 0.1–0.4mm fraction is easily produced at an overall feed rate to the sieves of between 10–15 tonnes per hour (tph).

At intermediate humidity levels, production depends on the effectiveness of control. Some producers address the issue by drying the feed which reduces the impact of humidity variations, but this incurs a penalty

in terms of energy consumption. In contrast, Ferrari Granulati decided to tackle the problem by improving process control.

Historically, the company ran the sieve stack with reference to results from an off-line particle size analysis carried out every two hours. Using this approach, manual manipulation of the feed rate controls the level of fines in the 0.1–0.4mm fraction.

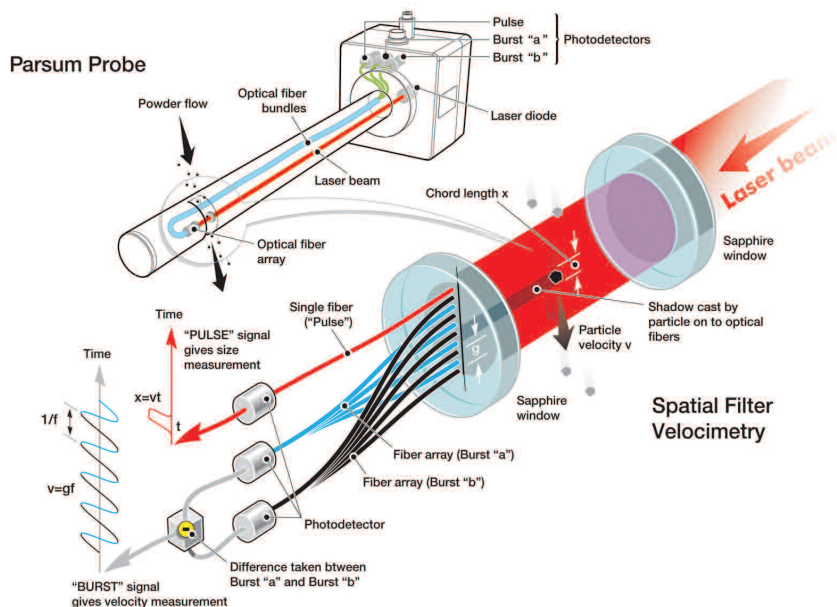
Labour intensive

During the day this is an acceptable, if labour-intensive, solution, providing that humidity is reasonably low. At night, however, no manual input is available, and while dropping the feed to a minimum value of around 5tph ensures that the product remains within specification, it also reduces throughput.

This control strategy also leads to variations in product quality. If humidity is very low during the night then the sieve stack works exceptionally well at the fixed low flow, and the amount of fines in the

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☛ The particle size analyser was installed on the exit line from a sieve stack at Ferrari Granulati

product falls from a control point of, say, 2–3% during the day to almost zero. So although the specification is met throughout any 24-hour period, product quality can be quite variable, making the material less attractive to customers.

Ferrari Granulati, therefore, decided to switch to real-time particle size analysis of the 0.1 to 0.4mm fraction, selecting a Parsum in-line particle probe for the application. Installation of the probe in the exit line carrying the fraction from the sieve stack was trouble-free and it now runs continuously with little attention.

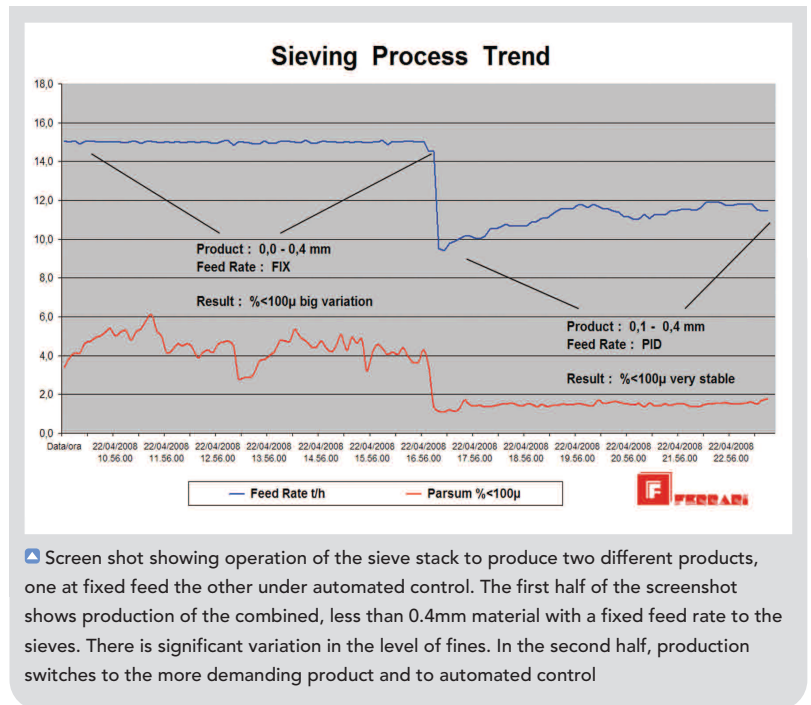
Lots of fines

When the combined, <0.4 mm product is being produced, the instrument sees quite a lot of fines and tends to foul, so that weekly cleaning may be necessary. The probe is withdrawn from the line and cleaned with a pulse of air, though routine maintenance is, otherwise, minimal.

To maximise the benefit of real-time measurement, the company has automated control of the separation process. A PID control loop manipulates feed to the stack to maintain the level of fines in the 0.1–0.4mm product at the designated set-point, typically around 1.5%.

This well-tuned loop operates 24/7, offsetting the impact of slight variations in humidity to maintain steady separation efficiency. Product quality is now highly consistent, manual input is minimal and throughput is optimal, maintained at the optimum level at which the specification can be met, given the prevailing humidity.

The level of fines (material less than 100 microns) is maintained at a steady level of 1.5%, feed rate varying



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between 10tph and 12tph, in response to changes in humidity, to keep the product within specification. If the level of fines is 2% or higher for more than 10 minutes then the control system takes the unit out of the PID loop and simply sets the feed rate at a minimum level.

Business advantages

Since the installation, Ferrari Granulati has reported a range of business advantages stemming from its use of in-line real-time analysis at the Verona facility. These include:

- Reduced energy consumption. With better control Ferrari avoids the drying costs incurred by producers who adopt the alternative strategy. These costs are typically 10 to 15% of the total production cost;
- Better product quality. Product quality is now consistent, at an optimal set-point, giving competitive advantage in the marketplace;
- Maximum throughput. Eliminating the need to run conservatively during the night has increased production. During the winter months when humidity is more of an issue, production has risen by 20 to 30%;
- Minimal manual input. Both control and analysis are now completely automated;
- More rapid process upset detection. The Ferrari system has an alarm with a set-point of 500 microns that instantly alerts the operator to a sieve breakage;
- Less waste. All products now meet the defined specifications, so there is no waste and no re-work. PE

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