

OPC

ONLINE PARTICLE SIZE CONTROLLER

Continuous inline detection of screen breaks and wear

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An obvious trend during the last decades and in most customer installations is the need of more automation and the relief from non-core activities for millers and operational staff. Besides this, a continuous inline measurement of the quality of particle size reduction – represented by the ground material's grist spectrum – was a vision that Tietjen had for many years. With the availability of high-performance optical measurement systems, the company pushed its long existing idea to become a real product – the OPC. It provides an automated, quick, reliable, repeatable, and consistent way to monitor the grist spectrum inline the production process and at any time.

In November 2023, the company introduced the product to the market, focussing on petfood and aquafeed customers in the first step. Why? They showed the highest need for an improved and online particle size control to save on their valuable raw materials. Online quality control not only gave them savings in raw materials but also in time as their staff is now able to focus on other activities than taking and interpreting samples during their shift. OPC users are able to keep a constant particle size over different products, batches and shifts.

Advantages at a glance

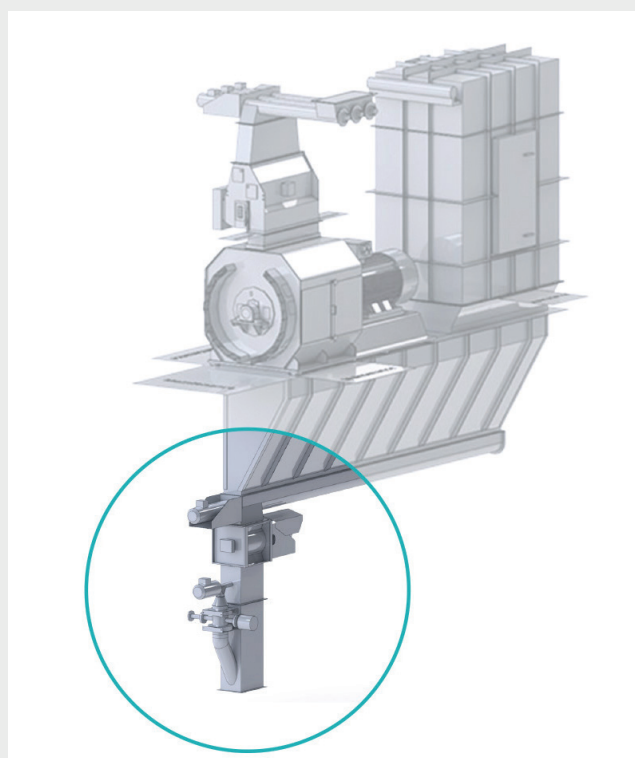
There are multiple benefits why customers are using this OPC, as for example:

- Immediate detection of screen breakages or damages in the mill – avoiding out-of-specification products
- Alarm in the case of deviations from the target particle size distribution - savings on raw materials
- Detection of wear on beaters and screens – optimized replacement of wear parts

- Optimization of maintenance intervals due to particle size changes – cost savings on service and parts

Increased plant availability and better maintenance

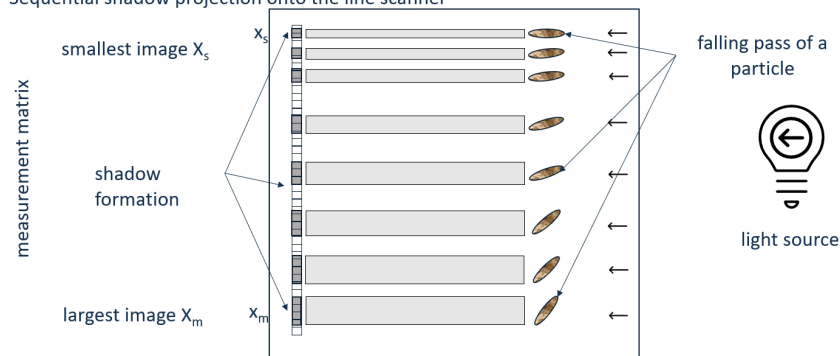
Having the grist spectrum information available at any time allows OPC users to benefit also from other operational advantages. Among others, an optimisation of maintenance intervals due to particle size changes during operation is possible and best practice in condition based- and predictive maintenance



Side view

Dynamic image analysis

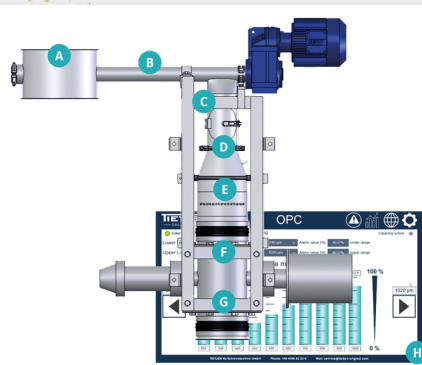
Sequential shadow projection onto the line scanner



concepts. With the Tietjen OPC the operator gains this information automatically and without additional costs compared to the manual sampling process.

The OPC can be used for any free-flowing bulk materials up to a maximum particle size of 6mm. No re-calibration is required when products or formulations are changed in the process.

The online particle size controller OPC can be integrated into both, new and existing systems, as it only requires a simple connection in a vertical pipe via flared flange. It is installed at the outlet of the grinding system and continuously takes samples from the ground product. These samples are analysed by a camera



A Pipe section for installation

C Inspection opening

E Sample preparation

G Sample return/discharge

B Sampling screw

D Purge air connection

F Camera system for particle measurement

H Software

system and the particle size is determined. The analysed sample fully returns into the process or can be discharged for traceability purposes.

The OPC needs a purge air connection for cleaning, especially when running greasy and sticky products. The device is

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manufactured entirely from stainless steel and has its own control cabinet for evaluating the measurement results.

The evaluation and presentation of the grist spectrum information is realized via own electronics and software, which are fully accessible via web interface. Also, a connection to the process control system is possible.

Measurement-process and principle

A small stainless-steel screw separates sample material from the main product stream. The sample will be spread with a patented distribution device before it enters the matrix visualisation system by gravity. The line scan camera system recognizes each particle and its falling pass by shadow projection. Information about both will be handed over to the software that conducts a dynamic image analysis. The sample leaves the measurement bypass and will be ejected or returned to the main process.

The OPC reaches representative measurement results between 500 and 1000 particles passing through the optical system per second. The overall number of particles moving through the system and the sample taking process with its influence on the representativity of samples have an influence on potential deviations in the measurement results. If the number of particles is exceeded, the grist spectrum tends to give out a result “coarser than reality”. For this effect, the software offers adjustable

compensation factors on basis of mean values. The OPC will be commissioned on site together with Tietjen service staff that do the training of operators. They learn how to run the OPC in standard applications and how to implement recipe individual adjustments, if necessary.

The look ahead

The advantages of the OPC will create more services and ideas for the future. Tietjen is working on the first self-regulating grinding system. It uses information from the particle size measurement as guiding values to change and adapt various grinding parameters - to keep the grist spectrum constant over multiple batches, save energy and/or reduce the wear in Tietjen grinding systems. The algorithm for this process will be derived from Tietjen's decades-long process know-how in combination with AI.



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