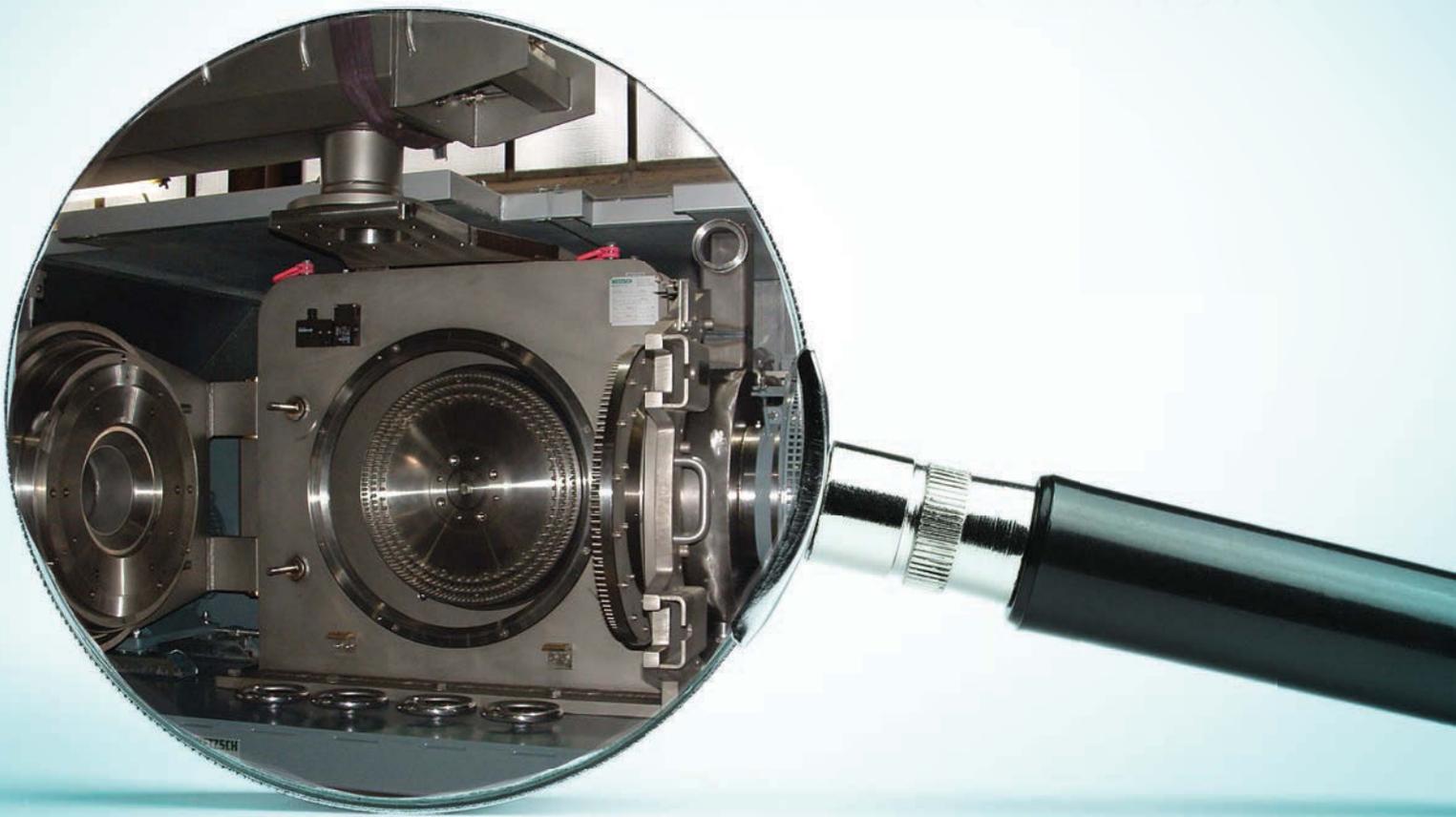


**NETZSCH**

# CASE STUDY



## Innovative Process for Cryogenic Grinding and Inline Screening

CHEMICAL INDUSTRY | a Business Field of  
NETZSCH Grinding & Dispersing

# NETZSCH has developed an innovative Process for Cryogenic Grinding and Inline Screening

## State of the art

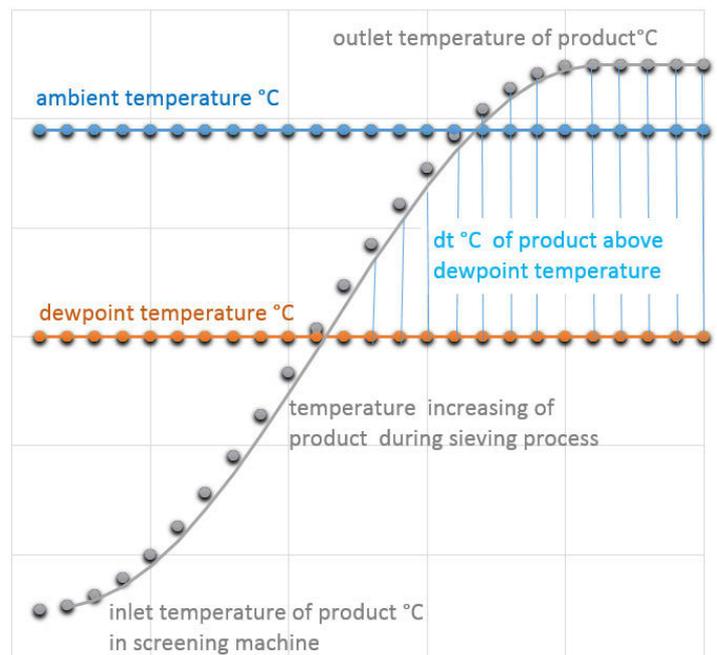
Various products e.g. elastomers, polymers as well as some color- and tire granules cannot be ground in the same way as conventional bulk goods due to their physical texture, but require special treatment before, during and after the grinding process. Up until now, the industry's approach was always to cool the material using liquid nitrogen, then to grind it on an impact mill or similar system with subsequent storage of the ground particles in order to then subject them to screening or another downstream process.

However, an undesirably wide range of particle sizes is often produced by the impact mills frequently used for this type of grinding. Also, in order to adjust the product quality, the product must often be sieved before packing. In this downstream process step the low temperatures at which the product leaves the grinding plant cause problems, as the moisture from the ambient air condenses on the product particles and causes clumping.

For this reason, the material cannot be further processed immediately but must be stored until its temperature is above the dew-point temperature of the ambient air. In principle, this storage of the material is inefficient as it causes delays in production, ties up valuable capacity and can possibly require a drying of the particles before screening and packing can be carried out. This process is far from being optimal.

## The solution from NETZSCH

Based on their well-known *CONDUX*<sup>®</sup> Impact Mill, NETZSCH Trockenmahltechnik GmbH has now optimized the so-called cryogenic grinding process (also known as cold-grinding). This innovative method combines all processes, from cooling of the raw material to grinding and inline screening in an inert gas loop system.



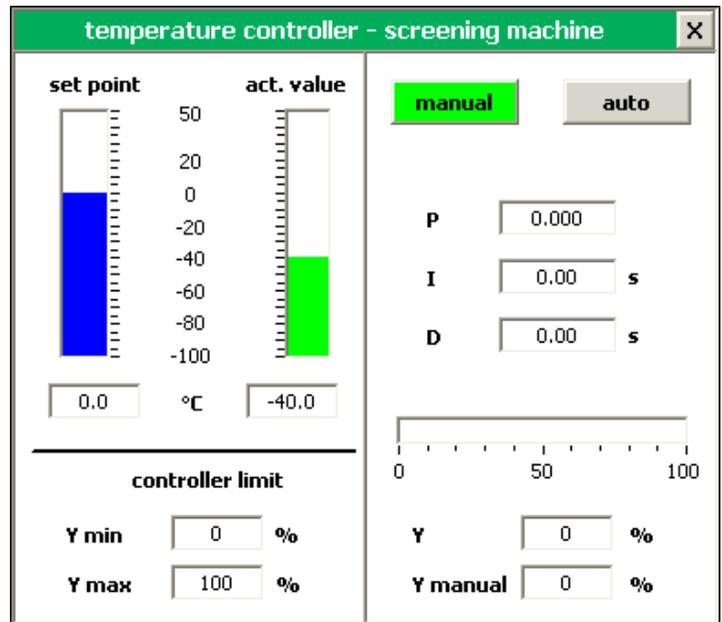
After the grinding process nitrogen enters the screening plant with the input of the material being ground. In this way an inert, dry atmosphere is created within a short period by the circulation of the process gas in the screen loop. This makes the efficient, trouble-free inline-screening and inline-packing possible without delaying the process, as the freshly ground product can be fed directly into the screening machine directly after the separating unit (filter and/or cyclone). For this purpose, screening machines with air jet cleaning are used. The screening decks of these machines are pneumatically cleaned using the process gas of the integrated gas circulating blower. The process gas is fed below the screen inserts where it causes a fluidization of the grinding product, similar to that caused by an air jet screen.

A decreasing pressure gradient between the upper and lower sides of the screen deck ensures the transport of the product through the screen mesh. Thanks to the optimum integration of several screen decks numerous fractions can be produced simultaneously according to the customer's wishes. The blower necessary for the air jet cleaning works here to guide the gas circulation.

Due to the energy input by the gas loop blower the conveyed gas undergoes an increase in temperature. The heated process gas comes into contact with the freshly ground, cold product particles through the air jet cleaning nozzles below the screen surfaces. The ground product is warmed to such an extent that no further condensation on the surface of the particles occurs when it leaves the screening machine.

The target temperature of the ground product is around 15-25°C depending on the season and the atmospheric conditions in order to eliminate any condensation. In the majority of cases the heat input via the loop gas blower is sufficient for ensuring the necessary rise in temperature. However, if the temperature increase in the ground product is too low – as is the case with coarse products with a very high throughput capacity – it is possible to feed additional energy into the gas loop process using a connectible heating register. An additional nitrogen cooling unit should also be included if the gas loop blower causes more heat than it is possible to discharge via the grinding product – which can be the case with greatly reduced throughput capacities. In this way, an increase in particle

temperature in excess of the critical processing temperature is avoided. Control of the gas loop parameters (temperatures, plant pressure, volume flow) is carried out by a fully automatic control unit at a higher level.



NETZSCH Trockenmahltechnik has already applied for a patent for this new process which has already proved itself in practice. Trouble-free screening, higher screen performances, direct packing and therefore a higher plant availability characterize this process, which is principally suitable for all cold grinding plants with downstream screening. NETZSCH offers this innovative technology as a complete system, tailor-made to suit each customer's requirements, in general a complete grinding plant with a *CONDUX*<sup>®</sup> Impact Mill and a compatible screening machine. A packing unit, which is also available, can also be integrated. Moreover, there is a possibility of adapting an existing cold-grinding system for an inert screening process.

Thanks to the consistent further development and improvement of a previously inefficient process by NETZSCH Trockenmahltechnik GmbH, undesirable drying processes before screening in the area of cryogenic grinding are now a thing of the past.

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