

Increasing the Profitability of Dust Filtration Technology in the Ceramic Industry

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Herding GmbH Filtertechnik is one of the leading manufacturers of industrial filtration systems. Sinter-plate filter media, dust collectors, filter units and complete filter systems are produced at the headquarters in Amberg/DE for a broad variety of industrial applications. Herding GmbH Filtertechnik is worldwide active with own companies and cooperation partners in Europe, the United States of America and Asia. To date, the total number of our worldwide employees is approx. 350.

Herding GmbH Filtertechnik exhibits at ceramitec 2018 in hall B6, booth 510.

A reliable and efficient dust collector or dust filtration system is coming more and more important inside the ceramic industry: The protection of employees, environment and the machines requires reliable capturing and better filtration efficiencies, not least the possibility for safe clean air return. Constant operating conditions, the reduction of maintenance costs and prevention of production downtimes should ensure maximum productivity.

Surface filtration with the patented Herding Sinter-plate filter has proven itself over many years to be an effective and reliable method of separating abrasive and ultrafine quartz dust. Thanks to its sintered rigid polyethylene (PE) body it is extremely resistant to mechanical stresses such as compressive forces or alternating pressure loads.

Compared to conventional filter media, there is no usual flexing work, which often causes them to wear very quickly, especially with abrasive dusts. The Sinter-plate filter, on the other hand, is resistant even to the high abrasive dusts. A coating with PTFE is firmly embedded as a filter-active layer into the surface pores of the homogeneous rigid polyethylene (PE) body.

This combination of extremely stable and at the same time homogeneous sinter struc-

ture and the coating with PTFE embedded in it makes the Sinter-plate filter so remarkable.

The, out of the exhaust air stream coming, dust particles are only filtered and separated on the filter surface. During normal operation, a penetration through the filter-active coating into the rigid body is not possible. This pure surface filtration rules out the clogging of the filter due to the lodging of solid particles in deeper filter layers as is encountered in deep-bed filtration in fabric filters.

The cleaning of the filter surface by so-called jet pulses – a compressed air pulse against the direction of flow – is thus very simple and effective. The low primary pressure necessary for this and above all the very short valve opening time provide for low energy consumption for the cleaning. Efficient cleaning and the pure surface filtration result in an almost constant pressure drop behaviour of the filter over the entire life cycle of the filter systems. The extraction thus remains homogeneous and safe. That is an important requirement for the necessary workplace safety.

This Herding Sinter-plate filter has numerous advantages for a huge range of ceramic applications presented in the following.



Fig. 1 WEIMAR porcelain

Non-metallic minerals/ceramic raw material mining and quarrying

In quarrying and refining of ceramic raw materials, the robust Sinter-plate filter element ensures that the dust can be safely separated and disposed, even when the fraction of A-quartz content is very high. The filter systems are used as bin vent filters, air extraction in calcination processes, integrated filters, for sieves or as pure exhaust air filters.

The robust rigid body with its embedded surface coating is ideally suited to ensure long service life with the highest separation performance, even under extreme operating conditions, with possible water ingress and highly abrasive dusts. The Herding MAXX system series – especially for larger air flow

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Fig. 2 Herding MAXX filter series for large volume flows

rates — offers considerable advantages: High filtration efficiency, compact design, very long service life, resistant against abrasive minerals, hydrophobic, low compressed air consumption (approximate 30 % compared to traditional “bag house” filters). The Herding MAXX series is suitable for throughputs of more than one million cubic meters per hour.

Traditional ceramics and fine ceramics industries

The quality requirements in the fine ceramics industry have become much higher. In order to produce the finest tableware and

sanitary porcelain, production processes are in many ways optimized. The modern manufacture of flat- and some hollow ware is isostatic dry-pressing, which is replaced almost completely the traditional plastic manufacturing of plates and bowls.

For this purpose, porcelain or ceramic masses consisting of spray-dried granules are used. Spray drying is a method used to dry materials from a free-flowing fluid to a powder/granular having specific requirements of shape and size. The discharge of the ceramic granular from the dryer chamber into the dust collection system is the final step in most spray drying processes. Herding filter receivers with tangential raw gas inlet can receive very high product loads and still ensure clean gas concentrations below $0,1 \text{ mg/m}^3$. Constant pressure losses allow for the qualitative production of the ceramic granules and significant stable air flows and operating conditions.

Oval, rectangular and square flatware, bowls, platters, casseroles, baking pans and even handwashbasins are isostatic dry pressed, by using these ceramic spray dried granulates. After the article is pressed, it's transported to a cleaning and fettling machine. In the next working step the articles seams have to be cleaning, grinded and fettled. In the case of dry grinding and polishing, dusts will be created.

These fine dusts will be captured with small hoods, vacuumed and transported through a duct work system to the dust collector. Herding filter technology with 100 % surface filtration generates linear airflows

and provides efficient capturing of the dust particles help to ensure that the maximum permissible workplace concentrations for respirable dusts are not exceeded.

Overspray extraction and product recovery during spray glazing

In ceramic/porcelain industry, the usage of spraying technology is a common and effective method of glazing.

Spray glazing creates relatively high overspray quantities. The Herding Sinter-plate filter has proven to be particularly suitable in this application. The moist overspray consists of abrasive and microscopically fine particles. At a traditional glazing booth this dust is separated and collected with wet scrubbers. Due to high operating costs and the relatively low filtration efficiency, water pollution problems and stricter wastewater regulations these filter systems are more and more eliminated and changed to dry filtration systems.

The exposure limits for crystalline SiO_2 must be strictly observed. Due to the initially high degree of moisture in the raw gas (dust loaded with overspray mist), standard filtration systems (bag houses or cartridge dust collector) cannot be used without prior modification. However, due to this high degree of humidity, these filters become dust loaded and tend rapidly to clogging. This results in unstable airflows inside the glaze booth and a short lifespan of the filter elements. The abrasive particles wear out quickly the conventional woven filter media (bag or cartridge filter) and its difficulty to accomplish the exposure limits.

The Herding Sinter-plate filter has proven in this application to be particularly suitable. With its hydrophobic properties and its “anti-adhesion properties” and due to its 100 % owned surface filtration properties that dust cannot penetrate the filter medium, even during the cleaning jet pulse. The innovative Herding filter matrix — constructed of sintered-polyethylene (PE) is a fibreless filter media.

This property does not contaminate the filtered dust (glaze) and making it ideal for product reclaim process. The usage of the Herding filter technology results not only in the very good separation efficiency, but also in a long service life, and all with very small footprint and space requirement compared to other filter systems.



Fig. 3 Dust capturing hoods at a fettling/rim treatment machine for isostatically pressed articles



Fig. 4 Filter system for the production of patio slabs and tiles

Safe production processes for heavy clay and refractory ceramics

"Up to date" designed capturing hoods and filtration systems are creating a safe work environment. The extremely compact design of the Herding MAXX series allows installation of the units at low available building heights and limited installation areas. Clean gas dust concentration lower than $0,1 \text{ mg/m}^3$ in large filter system installations may be assured compared to conventional large-scale "bag house" filter systems, with clean gas dust concentration lower than 20 mg/m^3 . The durable Herding Sinter-Plate filter is a high efficient filter media used in filter systems up to $1\,000\,000 \text{ m}^3/\text{h}$. Cost savings are practicable for service and maintenance and minimization of production downtimes, as well.

Clean and consistent production for technical ceramics

Today's manufacturing program includes well over ten thousands different products and components and a huge variety of different ceramic materials. Steatite ceramics are characterized by high temperature resistance, leakage current and dielectric strength and are therefore recommended as insulating material in electrical engineering. The typical forming processes are dry pressing, extrusion, ceramic injection molding, slip casting and wet pressing. After press-

ing, the green parts are cleaned on fettling machines/rim treatment stations and the created dust is captured and vacuumed to the Herding dust collector.

To ensure clean and consistent production, linear dust capturing velocities are desired. The resistance of the Sinter-plate filter against abrasive dust also saves the operator production downtime due to wear and tear or any unnecessary maintenance.

High system availability during production of high-tech ceramic

An important field inside the medical technology is the manufacturing of prosthetics such as knee- and hips joints. More than 400 000 hip and knee implants are only used in Germany every year, a reliable, safe and dust free manufacturing of the pieces is required.

The production of the raw materials like high sintered aluminum oxide and zirconia composite and the each individually green production step creates high abrasive dust, which makes extremely high demands against wear and tear of the dust collection systems and filter elements. To ensure high system availability the correct engineering and design of abrasion-resistant ductwork is very important.

Ceramic resistors enable a wide resistivity range. The resistivity value will be lasered



Fig. 5 Herding filter system with clean air recirculation into the production facility for technical ceramics

sprically on the metal coated surface and the fine laser dust is reliably captured and filtered within a Herding filter system. The Herding Sinter-plate filter is one of the few filter media that is suitable for the very fine laser dusts. The linear extraction conditions do not affect the laser engraving, so that a safe and qualitative production of the resistors can be ensured.

Over 40 years of experience and expertise

The matching of filter element and filter system on the one hand, as well as the optimal integration of the complete system into the complete process on the other, ensures an overall efficient and safe extraction of the generated fine dusts. Many years of experience in the design of filtration systems are necessary in order to keep the optimum flow velocity constant at the collection point and in the entire piping system over the entire period of operation.

If the flow velocity falls locally below the solid-dependent limit velocity, this inevitably leads to deposits in the piping system and thus to a creeping reduction in the extraction performance. Particular attention is paid to the design of the collecting device at the point of dust generation. Since the flow velocity decreases with increasing distance from the duct at a rate 20 times faster on

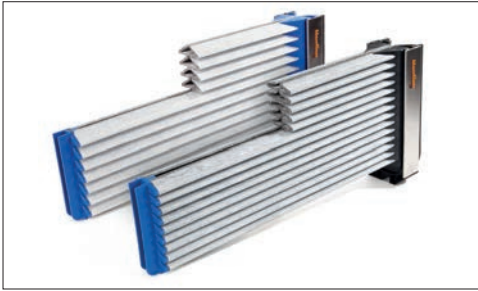


Fig. 6 Sinter-plate filter elements Herding DELTA und DELTA²: pure surface filtraion with absolutely constant operating conditions

the suction side than on the exhaust side, the matching of the volumetric flow rate to the structural design of the collection point is of decisive importance for workplace safety.

With the pure surface filtration of the Sinter-plate filter, the loading of the filter elements can be monitored permanently and very effectively by means of differential pressure measurement. During normal operation, there are no known cases where the filter element has clogged up due to penetration

of fine dust fractions into deeper layers of the filter medium. The automatic cleaning of the filter surface by means of compressed air against the direction of flow is thus very reliable and efficient. The quality of the extraction performance remains constant over the entire service life.

Due to its high degree of separation and its sturdiness, the patented Sinter-plate filter is thus a very economical filtration method for dedusting in the ceramic industry processing plants and all comparable areas of application.