

Case history

Filters slash downtime, swell savings

An absorbent polymer manufacturer replaces bag filters with sintered-plastic filter elements to reduce filter replacement downtime and cost.

Stockhausen, Greensboro, N.C., manufactures absorbent polymers — swellable substances capable of absorbing many times their own weight of liquids by forming a gel — for use in personal care applications, including diapers and toilet paper. The plant's annual production of 80,000 tons and 24-hour-a-day operation gave the plant's dust collectors a workout. Their bag filters had to be replaced frequently, which not only required shutdowns but spending a lot of money on replacement filters.

Separating absorbent polymer from air

The absorbent polymer begins as a liquid raw material that's dried and becomes a white crystalline solid the consistency of table sugar. After this, the polymer is pneumatically conveyed to several additional processing steps to form the final polymer. The material goes through a grinding stage. From the grinding stage a pneumatic conveyor moves it to a screener. From the screener the material is pneumatically conveyed to a sec-

ondary reaction step. After the reaction step it's pneumatically conveyed again to the final packaging step.

At the end of each pneumatic conveying step a dust collector serves as a filter receiver to separate the polymer from the air. The air passes through the collectors' bag filters to a blower, which exhausts the filtered air to pollution control equipment. The polymer is discharged through a rotary airlock to the next process step.

Since 1986, Stockhausen has supplied its dust collectors with polyester bag filters. At the top of each dust collector three cylinders, called *clean-air plenums*, housed the bag filters. Each plenum had a 2-foot radius and a 3-foot vertical height and held 18 bag filters. A quick-connect clamp held the plenums to the collectors. For the dust collectors to function properly, a tight seal between each filter and its cage was necessary. But from 1/30 to 1/10 of the filters that were replaced didn't seal tightly enough to the cages, allowing polymer to reach the blower and leak dust into the production line.



Over a 2-week period during its annual maintenance shutdown in spring 2000, Stockhausen installed 90 filter insert retrofits on its dust collectors.

The improper seals also allowed humidity to seep into the closed process, binding the absorbent polymer particles together and completely blinding the filters.

The company had 90 dust collector clean-air plenums, and, depending on the dust collector, the filters were changed anywhere from 5 to 12 times each year. This required from 6 to 10 hours of downtime every month. But more important, at \$20 per filter and 54 filters per dust collector, the company was spending more than it wanted to on filter replacement.

German plant successfully uses sintered-plastic filter elements

Stockhausen knew it couldn't continue to replace filters at this rate, especially when absorbent polymer demand was steadily increasing. In 1996, the company's German branch, an absorbent polymer manufacturer in Crefeld, Germany, worked with Herding Filtertechnik, Amberg, Germany, to replace the bag filters on 320 dust collectors with sintered-plastic filter elements. The new elements operated successfully. Now the Greensboro, N.C., Stockhausen plant decided to make the same filter exchange.

Stockhausen contacted Frank Schimmelmann, the US general manager of Herding Filtration, Waterford, Mich., who traveled to the North Carolina site to check out the situation. He looked at each dust collector to assess how the change would be made, how many filters were required, and what air volume and differential pressure were required. Because Herding already knew that the filters worked properly in Germany, the filter supplier didn't have to test the filter with the polymer.

"The supplier already had experience with the retrofit in Germany," explains Dan Livengood, Stockhausen's plan superintendent. "On our end all we had to provide was the bag filters' sizes, and the company simply did the calculation and supplied us with what would be a direct retrofit. The filter supplier knew the dimensions of the plenums that would house the new filters. It was simply 'How many do you want?'"

Convenient retrofit, easy installation

Over a 2-week period in spring 2000, while Stockhausen performed its yearly maintenance, the absorbent

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Six to eight sintered-plastic filter elements were installed on each dust collector.

polymer supplier replaced the dust collectors' existing clean-air plenums with 90 new sintered-plastic filter element plenums and installed three new dust collectors with sintered-plastic filter elements. The filter supplier created the new plenums with the same dimensions as the old clean-air plenums to house six to eight new sintered-plastic filter elements. Installation was as simple as unclamping the quick-connect clamps, removing the old plenums with the bag filters, and replacing them with the new plenums filled with the sintered-plastic filter elements. The filters are bolted and gasketed to a tube sheet at the cylinder's top, forming a positive seat and seal. The filter supplier told Stockhausen that the new filters would require 65-psi compressed air for pulse cleaning, and the absorbent polymer manufacturer adjusted the pressure in its tanks. Now, the filters build up a dust layer as the polymer is separated from the conveying air, and every 25 seconds, two filters at a time in each plenum are cleaned by a compressed-air pulse.

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More about the sintered-plastic filter elements

The new rectangular, hollow filters are neither bag nor cartridge filters. Each resembles a radiator with delta-shaped corrugation, providing a greater filter surface area than a flat filter would. The corrugation corners are rounded to prevent trapping dust and to ease cleaning. The filters are made of sintered polyethylene, a patented process in which polyethylene granulates are placed in a mold and heated or *sintered* in an oven,

melting together to form the rigid filter. The rigidity imparts stability to the filter element so it can resist deformation and flexing. To ensure that the dust easily falls from the filter during pulse cleaning, a PTFE coating is embedded in the pores of the filter's polyethylene matrix, forming a microporous surface. The filter provides a constant pressure drop for effective surface filtration. A hollow gasket section between the filter's top and the tube sheet separates the dirty air from the clean air.

The filters can be removed for more thorough cleaning when dust builds up on them. Depending on the application, the Stockhausen filters are installed either vertically on the clean-air side or horizontally on the dirty air side of the dust collector. Although the average filter life is 10 years, when a filter does have to be changed the replacement is easy. It takes about 1 minute per filter and each filter has only one screw to remove — the gasket doesn't have to be replaced.

HEPA filter proves no leaks

As a safety measure, Stockhausen has placed a HEPA filter after each dust collector. If any sintered-plastic filter element were to leak, the HEPA filter would collect the dust. The HEPA filter plugs within 30 minutes, revealing problems quickly. If the precautionary HEPA filter doesn't plug, the plant knows the sintered-plastic filters are sealed properly at the tube sheet. Stockhausen checks the HEPA filters every 30 days, and they have always been dust-free.

Livengood says, "The problem we experienced before was bag filters installed incorrectly on their cages, and we often didn't detect an inadequate seal. Polymer would pass through the filter and into the process when it should have been stopped. The good thing about the new filters is that once



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Since installing the sintered-plastic filter elements, Stockhausen hasn't had to open any dust collector for filter replacement or washdown. This has slashed downtime and maintenance costs. Livengood proclaims, "We are very, very happy. There have been absolutely no problems with the filters." **PBE**

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