

Case history

Portable vacuum makes a clean sweep

A glass panel manufacturer acquires a portable industrial vacuum to eliminate airborne dust.

Techneglas, headquartered in Columbus, Ohio, manufactures glass panels for television screens at its plant in Pittston, Pa. In the past, operators would manually sweep up dust and broken glass that accumulated beneath the company's large annealing ovens (or *lehrs*). However, this created airborne dust that caused panel defects. To solve this problem, the company worked with an industrial vacuum supplier to install a portable industrial vacuum in the Pittston plant.

Techneglas produces the glass panels by first preparing a batch mixture that contains various raw materials and recycled cullet or unusable glass. The batch is then charged into a furnace that heats it to between 2,500°F and 2,900°F, creating molten glass. The molten glass discharges from the furnace and passes through various equipment and feeders before discharging into panel molds, where it's

pressed into shape by panel-pressing machines before moving through the processing line's panel-cooling and stud-insertion stages. The Pittston plant produces more than 6 million glass panels each year, operating 24 hours a day, 365 days a year. The glass panels range in size from 20 to 36 viewing-area inches.

Airborne dust causes problems

The company uses several *lehrs* in the processing line's panel-cooling stage to cool the glass panels from about 900°F to about 100°F. The panels are moved through a *lehr* by either a 12- or 15-foot-wide conveyor belt, depending on the *lehr*. The panels lay flat on the belt in rows of 4, 5, or 6, depending on the belt width and panel size. Each conveyor's belt is a flexible, interwoven metal mat that has holes in its surface so that air currents can move around the panels, facilitating cooling. To keep the belt tracked



The model 1020 MFS continuous-duty industrial portable vacuum can pick up between 3 and 5 tons of material an hour from 30 feet away.

and running straight, the belt rides on metal skids that are about 2 inches wide and ¼ inch thick.

As the belt moves the panels through the lehr, the constant metal-on-metal rubbing between the belt and skids creates a red metal-oxide dust that piles up on the floor under the lehr and just beneath its conveyor exit. Also, some of the panels occasionally pop and break, creating glass shards. When the panels exit the lehr, the large glass shards fall onto a conveyor that carries them away for recycling, and the small glass shards fall through the belt and pile up on the floor under the lehr and just beneath its conveyor exit, mixing with the dust.

In the past, an operator used a broom and dustpan to sweep up both the dust and broken glass. However, this created just enough airborne dust to cause quality problems in the panel production process. Mark Perlis, Techneglas maintenance specialist, says, "The dust would get into the air and be carried through the plant by convection currents that naturally move from hot to cold areas. Because of this, the dust would migrate from

the lehrs to the panel production process and fall onto the panels, causing panel defects."

The dust only affected the process when an operator swept it up, so the company needed to find a way to clean up the dust and broken glass without creating airborne dust.

Finding a solution

In July 2000, the company contacted a manufacturer's rep it had worked with in the past when purchasing several small vacuums for another application. The rep contacted Vac-U-Max, Belleville, N.J., a supplier of pneumatic conveying systems and industrial vacuum cleaning systems for the bulk solids industry. After learning about Techneglas's problem, the supplier recommended that the company use a continuous-duty industrial portable vacuum in its plant.

In August 2000, the supplier brought a demo vacuum to the Pittston plant for the company's operators to try. After several weeks of successful trials, the company decided to purchase the vac-

uum, and in September 2000, the supplier delivered a new vacuum to the plant.

The portable vacuum

The model 1020 MFS (manual filter shake) continuous-duty industrial portable vacuum is about 5 feet long, 3 feet wide, and 5½ feet tall and weighs about 1,000 pounds. The vacuum, which is mounted on wheels, can be moved around a plant manually or by forklift. The vacuum's 15-horsepower electric positive-displacement vacuum pump (or *PD-pump*) moves about 380 cfm of air at 12 inches Hg (or 162 inches of water lift). The vacuum's PD-pump can be speeded to run off any 3-phase power supply — 208-, 240-, or 480-volt in the US, 575-volt in Canada, or 380-volt overseas. Techneglas's vacuum plugs into a 3-phase, 480-volt power source.

Along with the portable vacuum, the supplier also delivered a 55-gallon intercept drum that sits on a pallet next to the vacuum; a 40-gallon integral collection container; a Teflon-coated leaf-style filter; a HEPA filter; a 3-inch-diameter 6-foot-long ABR-Flex hose (a flexible, smooth-bore rubber hose for abrasive materials); a 3-inch-diameter 25-foot-long ABR-Flex hose with a built-in grounding wire to eliminate static shocks; a Y-adapter; two 2-inch-diameter 25-foot-long ABR-Flex hoses; and various hose attachments, including a crevice tool, floor brush, squeegee, and 48-inch-long suction tube.

To operate the vacuum, an operator first connects the 3-inch-diameter 25-foot hose and the 6-foot hose to the intercept drum. The operator then connects the free end of the 6-foot hose to the vacuum. If only one operator is going to vacuum debris, the operator connects the appropriate attachment to the free end of the 25-foot hose. If two operators are going to vacuum debris, the operator connects the Y-adapter to the free end of the 25-foot hose and then connects one 2-inch-diameter hose to each of the Y-adapter's free ends. The operator then connects the appropriate at-



An operator checks a glass panel for quality as another operator (background) vacuums up debris.

tachments to the end of each 2-inch-diameter hose.

After the hoses and attachments are connected, the operator plugs in the vacuum and pushes the start button located in the vacuum's control panel to start the PD-pump. The PD-pump creates a vacuum that pulls air through the hoses and intercept drum and into the vacuum chamber, where it flows through the leaf-style filter and HEPA filter before passing through the PD-pump and exhausting into the plant.

To vacuum up material, the operator simply places the attachment into a debris pile. The material is sucked through the hose to the intercept drum where it hits a rubber baffle that makes 90 percent or more of the material fall out of the airstream into the drum. All of the remaining fine particles travel to the vacuum chamber where the leaf-style filter captures and separates them from the air.

The vacuum can pick up between 3 and 5 tons of material an hour from 30 feet away.

When the intercept drum gets full, the operator shuts off the vacuum and a forklift operator removes the filled drum for disposal. The operator then manually actuates a mechanical shaker, which is located on the front of the vacuum. The mechanical shaker agitates the filter to loosen and remove any caked-on material, which drops from the filter into the collection container. To empty the collection container, the operator releases two clamps on the vacuum's side and the container drops to the ground. Because the container is on wheels, the operator can easily roll it to a disposal station. To replace the leaf-style filter, the operator opens the vacuum's top and lifts the filter out. The operator doesn't need tools to do either of these tasks.

The vacuum can pick up between 3 and 5 tons of material an hour from 30 feet away. The more material the vacuum picks up, the harder the PD-pump works to create more vacuum to continue pulling the material effectively. A vacuum gauge in the control panel tells the operator the PD-pump's performance level in inches mercury, and a relief valve keeps the vacuum from operating above a preset level to protect the pump from breaking down.

"When the vacuum is running and not picking up material, only air moves through the hose, and the vacuum gauge will read zero," says David Kennedy, Vac-U-Max vacuum cleaning division sales manager. "When the vacuum picks up a small amount of material, a lot of air moves through the hose with the material, and the vacuum gauge might read five inches mercury. But when the vacuum picks up a large amount of material, very little air moves through the hose with the material, and the vacuum gauge might read twelve inches mercury. The more material the vacuum picks up, the less air moves through the hose, and the higher the vacuum rating will be."

Because the vacuum is totally enclosed and the PD-pump is located on the inside, the vacuum operates under full load at about 80 decibels at 3 feet, which is well within OSHA regulations.

Using the vacuum

Techneglas uses the portable vacuum to clean up the red metal-oxide dust and broken glass that accumulates on the ground under the lehrs. An operator uses a forklift to move the vacuum and intercept drum and pallet to the appropriate lehr. The operator picks up the glass shards larger than 2½ inches by hand and puts them in the intercept drum, and then uses the vacuum to pick up everything else.

"We typically use two operators when using the vacuum because the dust accumulates in some hard-to-reach places," says Perlis. "This allows one operator to vacuum around and under



The vacuum is mounted on wheels, allowing an operator to easily move it around a plant.

the lehr while the other operator stands near the vacuum so that if the filter blinds, he can shut off the vacuum and activate the mechanical shaker to clean the filter. This allows the operator with the hose to stay put and not have to constantly crawl in and out of tight spaces to activate the shaker."

Perlis adds, "The vacuum also does a better job of cleaning up the dust and broken glass than a broom, because the operator can use the crevice tool to get into small areas and pull material out that a broom couldn't reach. We use the vacuum about twice a month, and we pick up anywhere from twenty-five to fifty-five gallons of material each time."

Since installing the vacuum, the company has eliminated airborne dust and the associated product quality problems. "The vacuum's leaf-style filter filters out a majority of the small particles from the airstream," says Perlis, "and the HEPA filter filters out everything else so that the vacuum exhausts air that's nearly 99.9 percent pure, creating a dust-free operation." **PBE**

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