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### CASE STUDY:

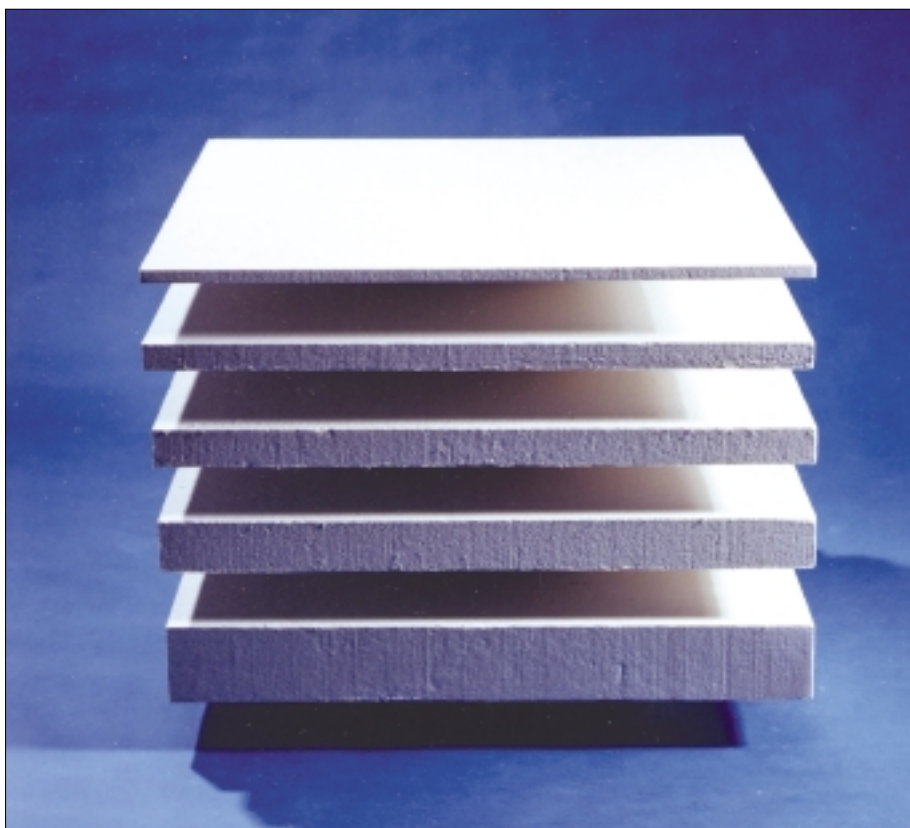
## Clearing the Air with Cartridges

by **Tomm Frungillo**, Regional Manager, Farr Air Pollution Control, Jonesboro, Ark.

A new cartridge dust collection system is helping Thermal Ceramics significantly improve the air quality in its ceramic fiberboard manufacturing plant.

**T**hermal Ceramics, Augusta, Ga., a leading producer of high-temperature insulating products, wanted to find a more efficient way to control dust generated during the finishing of its vacuum-formed Kaowool® ceramic fiber boards. Highly efficient dust collection is essential not only for worker protection but also for process reliability—unless dust is continuously evacuated from the work area, the sanding, planing and trimming equipment cannot operate safely or efficiently.

“When we purchased a new planer-sander machine in 2001 and set out to reconfigure the finishing area, we felt it would be a good time to revamp our dust collection,” says Ricky Criss, senior process engineer at Thermal Ceramics. “Putting worker health and safety above all else, our chief goal was to improve air quality to the point where our manufacturing personnel could operate these machines without wearing respirators.”



The new dust collection system was installed to control the dust generated during the finishing of Thermal Ceramics' vacuum-formed Kaowool® ceramic fiber boards, pictured above.

The products manufactured here—low- and high-temperature ceramic insulating boards—are made with high-temperature insulating fibers that are mixed with proprietary binders and vacuum formed into rigid boards of varying thickness. The baghouse system previously located in the finishing section of the

plant also served the entire board manufacturing plant and did not have the capacity needed for such a large area. “Our new planer-sander generates very high levels of dust, so we decided to install a new collector that would serve this machine, as well as two cross-cut saws used for board cutting and a band saw

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Operator Robert Gilchrist watches as boards are discharged from the planer-sander.

used for small trim work,” says Criss.

At first, Thermal Ceramics considered using another baghouse collection system. But after thoroughly researching its options, the company decided to purchase a high-efficiency cartridge dust collection system manufactured by Farr Air Pollution Control (APC), headquartered in Jonesboro, Ark.

“Baghouses are often popular for applications that generate very high volumes of dust,” notes Lee Morgan, general manager of Farr APC. “However, cartridge collectors, which use pleated cartridges in place of bags, offer several advantages that have caused them to overtake baghouses in market share during recent years. Cartridge collectors are much more compact in design and are safer and easier to service;

a set of cartridges can typically be replaced in an hour, versus a full day for bag change-out. Also, cartridge filters typically deliver higher dust removal efficiencies than bags, an important consideration for anyone paying close attention to emission levels in the plant.”

### Implementing a Solution

Thermal Ceramics contacted Air Improvement Resources, Inc., Young Harris, Ga., a specialist in the design and engineering of systems for in-plant air quality control and manufacturing ventilation improvement. Together they settled on a Farr Gold Series® cartridge collector for the application, as well as the 60 hp fan needed for this new collector. This high-efficiency collector offers a compact, modular design, rugged construction, and a variety of features and options that make it easy to customize the unit to the individual needs of the customer.

To make sure the new dust collection system would deliver optimum performance, Air Improvement Resources recommended a dust analysis at Farr APC’s dust testing laboratory in Jonesboro. Thermal Ceramics forwarded a dust sample to the lab, where Farr technicians performed a series of bench tests to determine the characteristics of the

dust—including its size, shape, weight, moisture content, abrasiveness and other properties. “Bench testing is a very useful tool because it helps the design team to specify a collector’s filter media, hardware and other components based on scientific analysis rather than guesswork,” says Morgan.

According to Scott Soncrant, president of Air Improvement Resources, “Bench testing revealed that the dust [at Thermal Ceramics] was irregularly shaped. Some of the particles were spherical, while others were in the form of short, pointed strands that were highly abrasive. The sizes also varied from very fine particles to fibrous strands of  $\frac{1}{4}$  to  $\frac{1}{2}$  in. in length. Based on this analysis, we determined that standard pleated cartridges would be likely to plug up quickly and would not be suitable for this application.” Instead, the solution was to specify high performance Dura-Pleat™ cartridges in a wide pleat configuration that would minimize plugging problems. Manufactured specifically for tough challenges involving heavy dust loading conditions, the Dura-Pleat cartridge uses a dense, spun-bond media designed to outperform conventional cartridge and bag-type media. It is rugged, highly resistant to abrasion and wear, and washable with medium water pressure, extending the service life of the cartridges.



Operator Robert Gilchrist loads boards onto the inlet rollers for the cross-cut saw.

### Dust Collection System Design

Farr APC worked closely with Air Improvement Resources to customize a 17,000 cfm dust collection system to fit Thermal Ceramics’ unique requirements. The collector uses 32 cartridges arranged in eight rows of four cartridges each. In addition to using premium filtration media with wide pleat spacing to handle the irregularly shaped dust fibers, “inlet design was also a big concern, because this unit sees heavy inlet loading of abrasive dust,” says Soncrant.

To prevent the cartridges from abrading, the manufacturer put in staggered channel baffles at the inlet to knock out the heavier, more abrasive strands of fiber before they can enter the collector. The baffled inlet design also serpentine the air through the inlet channel for better airflow distribution



**View of the Gold Series® dust collector housing.**

through the unit. “We also sized the system very conservatively to ensure proper airflow and conveying velocities,” Soncrant adds.

Since the collector housing is powder-coated to withstand the elements (a standard feature on this collector design) and is made of heavy duty 7-GA and 10-GA steel, Thermal Ceramics was able to locate the collector outdoors. Using hard connections to the machines in the work area, the contaminated air is pulled through about 75 ft. of ductwork to the collector.

As the cartridges load with dust, the system relies on pulses of compressed air that automatically release the dust from the cartridge surfaces and down into a hopper. Extended support legs and bracing were used for the collector, allowing ground clearance for the use of a trough-type discharge hopper with a 10-in. diameter extended length screw conveyor and



**Ricky Criss prepares to open heavy duty access door to the dust collector.**

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Operator Frank Blount makes custom shapes on the band saw.

rotary valve. Dust is discharged directly into portable tote bins, simplifying the disposal of collected dust without creating secondary dust.

Downstream of the collector, the air is clean enough to recirculate back into the plant, where it could eliminate the energy required to heat or cool the replacement air—an important benefit of cartridge collection in locations that experience extreme temperatures. Due to the temperate climate in this area, however, Thermal Ceramics finds it more efficient to exhaust the cleaned air outdoors and maintains Georgia Environmental Protection Division permitting for this practice.

### Indoor Air Quality Improvements

The Occupational Safety and Health Administration (OSHA) has not established a permissible exposure limit (PEL) for refractory ceramic fiber (RCF). However, the Refractory Ceramic Fibers Coalition, an association of the leading RCF manufacturers—through its voluntary Product Stewardship Program, PSP2002—has established a recommended exposure guideline (REG) of 0.5 fibers per cubic centimeter (f/cc), based on eight-hour time weighted average (TWA) emissions testing, and OSHA supports this guideline. Based on dozens of air samples collected at Thermal Ceramics between 1994 and 2001, when the baghouse collector only was in use, the mean TWA was

0.593 f/cc—slightly above the industry's current REG. As a result, respirators were required in the workplace.

After installing the Farr cartridge dust collector, Thermal Ceramics also instituted work practice improvements to further improve air quality in the finishing area. These practices include manually repositioning floor fans in the summer to avoid disrupting airflow into the collection system and more careful handling of finished boards after sanding and during packaging to minimize the potential for dust generation. "Through this combination of higher efficiency dust collection and work practice improvements, we cut our emissions in half," Criss says.

Recent air sampling data has shown a mean TWA of 0.272 f/cc—an approximate 55% reduction in exposures. "After documenting that we were well below the industry REG, we allowed our workers to take off their respirators—though they still have the individual option of using these devices if they wish," says Criss.

According to Criss, "The new system provides better airflow than we achieved previously." The system has also operated at low differential pressure in the 2.0-3.0 in. water gauge range. When the differential pressure rises, maintenance crews can wash down the cartridges if desired and reinstall them for extended service life. When filter maintenance or replacement is needed, the collector has a patented



Cutaway view of Farr APC's patented Gold Cone™ filter cartridge, which is designed to outperform conventional cartridge and bag-type media.

cambar system that allows fast cartridge removal with no tools required.

"Our air flow is better and our air quality is better, and that makes for a cleaner and more pleasant work area with enhanced process reliability," Criss says. 🌐

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