

Meeting NESHAP regulations

by ICR & GE Energy, USA

ICR sat down with GE's Bryan Yetter, product manager at GE Energy, to learn more about some of the key decisions plants will need to make about their dust collector operations, and what they should consider when selecting filter bags.

Q. For the cement industry, what will the new National Emission Standards for Hazardous Air Pollutants (NESHAP) mean for clinker cooler dust collectors?

A. NESHAP calls for a significant reduction in emissions. Existing plants, for instance, will see particulate emissions standards drop all the way to 0.04lb/t of clinker. That is 98 per cent lower than the current limit of 0.3/t of kiln feed.

Q. How difficult is that going to be to achieve?

A. Much of the equipment currently being used simply can't handle those new requirements, and as many as two-thirds of the plants will need to make modifications. As production has increased, so have the problems. To comply with the new particulate emissions limits alone, the Portland Cement

As the economy gains ground and new federal regulations take hold, many cement plants will need to upgrade their current system or buy new equipment. For some cement plants, it will be the first change in equipment in 40 years.

Association predicts that the industry will need to spend US\$3.4bn.

Q. To vent clinker cooler dust collectors, what types of equipment are the plants using today?

A. Electrostatic precipitators (ESP), reverse air dust collectors and pulse-jet dust collectors.

Q. Moving forward, to meet NESHAP, what will the filter options be?

A. With filter bags, you have the traditional fabrics, aramid and P84s, and you also have GE's ThermoPleat® Pleated Filter Elements. The filters are up to 100 per cent efficient when laminated with ePTFE membrane. With membranes, you have the best filtration available because they are efficient even down to submicron particles of dust.

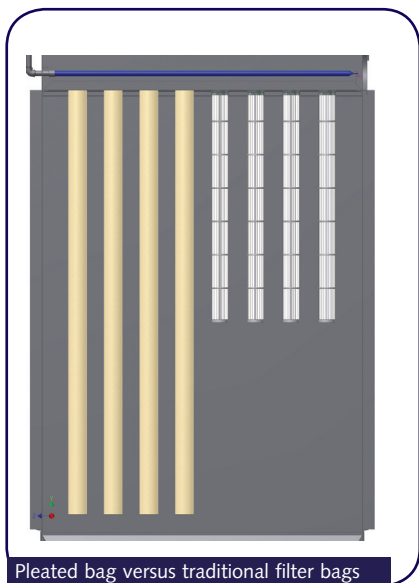
Q. What is ThermoPleat, and how will that help cement plants comply with NESHAP?

A. ThermoPleat is a new type of pleated filter that replaces traditional filter bags and cages in pulse-jet-style dust collectors and allows for an increase in filtration area that's as much as two or three times greater than the standard filter. The increase in filtration area also allows for an increase in productivity. A greater amount of filtration area allows for a reduction in operating differential pressure across the filters in the dust collector. Lower operating differential pressure can mean lower operating costs, and it also could allow for an increase in productivity if conditions warranted. The pleated technology provides more filter area per tubesheet hole than a traditional bag. This added filter area in your collector is like expanding the size of the collector without any structural modifications. Pleated filters are a combination of a high-efficiency filtration media with inner-support core

manufactured into a one-piece element. GE has designed and manufactured pleated filters for an array of applications,



GE Energy Services has a new type of pleated filter called ThermoPleat



Pleated bag versus traditional filter bags

including different temperatures and also different media, from polyester to aramid and PPS felts.

Q. What does a modern clinker cooler dust collector look like today, and what are some of the inherent problems?

A. A modern clinker cooler system has greatly improved over the last 10 years. All have heat exchangers between the clinker cooler and the dust collector. The heat exchanger greatly reduces temperature spikes and also reduces the dust loading to the dust collector. In some cases, plants have been able to install polyester filters, because dust collector inlet temperatures are so low. For these systems to meet the new standards, usually there is only minor tweaking of the system. But in some cases, the plants are either operating the dust collector at a higher air volume than designed or the original design was less than desirable. Pleated elements along with attention to ductwork velocities can make great improvements to overall operation.

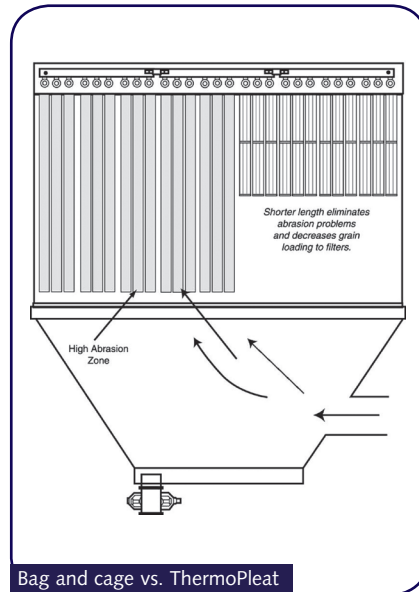
In older collector designs, the bottom portion of the filter bags were installed directly in line with the gas stream. The clinker dust is the most abrasive in the cement plant – almost like a shot blast – and it leads to abrasion on the bottom portion of the filter bags. The design is a problem, and the bag becomes the issue. Again duct design and velocity play a key role here. Once those corrections are made, installing pleated filters will improve the operation of the dust collector and, in most cases, reduce the dust loading the elements see.

Q. What types of equipment do you expect plants to install?

A. For ESPs, you could either install a pulse-jet dust collector after the ESP as a polishing unit, convert the ESP to a pulse-jet dust collector if the existing piece of equipment meets the criteria, or replace the ESP with a new pulse-jet dust collector.

For reverse air dust collectors, you could either do a rebuild with system improvements capable of meeting the new regulation, install a pulse-jet dust collector after the reverse air dust collector as a polish unit, convert to a pulse-jet dust collector, or replace with a new pulse-jet dust collector.

For existing pulse-jet dust collectors, you could either correct any design or



mechanical issue that stands in the way of meeting new regulations, add an additional unit after the existing one as a polishing unit – if the existing pulse-jet dust collector is undersized – or, if possible, you could add additional compartments to the existing unit.

Q. How do you think plants are most likely to respond?

A. To meet the new regulations, all aspects of the dust collector operation need to be examined. But any new equipment will likely be a pulse-jet dust collector and it must be designed with multiple compartments to help isolate and perform online maintenance or inspections. That should be non-negotiable.

Some companies are going to have to change their approach to purchasing decisions. If you're basing a decision only on cost, in the end, you could lose a lot of money, reliability and, in turn, production. The most important factor is a well-designed, well-built unit. Otherwise, you could end up with filter bag failure, and that means you could end up with emissions.

Q. What are the biggest differences between baghouse designs for pleated filters and for filter bags and cages?

A. Several things need to be evaluated to make sure you have the right media, including the temperature and gas stream characteristics. You need to look at air-to-cloth ratio, or filtration velocity, for instance. It can't be so aggressive that it prevents pleated filters from operating

at their optimum levels. And you need to consider the capacity of the collector so it isn't over- or under-designed. Every application is different. You need to evaluate the whole process.

Q. What direction do you think more plants will choose?

A. The pleated filters I mentioned earlier are probably going to become more common, because they offer significant advantages over standard bags.

They make sense if you need to retrofit or upgrade your clinker cooler dust collector because of bottom-bag abrasion, for instance. Besides containing more filter area compared to a standard filter bag, the length of the pleated filter elements, in general, are shorter. A standard filter bag that is 12ft long could be replaced by an 81in pleated filter that's almost half the length. That creates a drop out area by moving up the filter bottom, allowing them to be installed out of the inlet abrasion zone, dramatically reducing or eliminating the amount of bottom-bag abrasion. Some customers have told us their bag life had lasted only one year, and now, after switching to pleated filters, it lasts more than four years. The larger drop out area created by the shorter pleated filters also lowers the velocities of the dust which lowers the grain loading to the filters.

In addition, most pulse jet dust collectors using standard filter bags are designed with an air-to-cloth ratio that, depending on the application, is between 4:1 and 6:1. Moving forward, they will likely need an air-to-cloth ratio of 2:1 with standard filter bags, which is going to require more steel, more parts, more space – in short, more cost.

Q. Is this just experimental? How does the efficiency of a pleated filter compare to a filter bag?

A. It is not just experimental. We have had pleated filters in clinker cooler dust collectors since 1998, working successfully. Recent ASHRAE 52.2 testing of a ThermoPleat filter with membrane had an initial removal efficiency of 99 per cent with dust particle sizes between 1 to 3 microns and a stated minimum efficiency rating value (MERV) of 16. The filters are highly efficient and with laminated ePTFE membrane, you have the best filtration available. _____