

Gas cleaning with pulse-jet filters: Emission mechanisms, emission sources, and abatement strategies

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Cleanable filters, often used in the form of baghouse filters cleaned by pressure pulse, have been an effective solution to reduce particulate emissions from very dusty sources, i.e. sources with a dust load in the range of tens to hundreds of g/m³. In many applications one can comfortably reach an emission level of about ≤ 10 mg/m³, which was usually sufficient for many years. However, regulations and customer specifications have become more demanding, like with all environmental issues. And naturally, the filter industry has responded with new developments to improve filter media performance - not to mention the addition of membranes which have been on the market for many years and came down dramatically in price. But are more efficient media the (only) answer to lower emissions? And what exactly does "efficiency" mean for pulse-jet cleaned filters?

In the domain of air filtration, people are accustomed to think in terms of the classical rules for filter media design and evaluation which largely determine a filter's performance throughout its life time. Although these rules certainly apply here as well, cleanable "surface" filters exhibit a much more complex behavior. Their operation is inherently non-steady (periodic at best) and depends on a broad range of additional parameters including their mode of operation (e.g. frequency and intensity of cleaning), the cohesive properties of the dust, all the way to the influence of tiny leaks or the way filter bags are sewn.

The presentation begins with a brief introduction to the basics of cleanable filter behavior, mainly from the angle of particle emissions. On the basis of many years of research at the Institute for Mechanical Process Technology and Mechanics, it discusses suitable metrics to characterize emission performance (which can lead to rather different interpretations of filter performance), and then proceeds to look at the influence of the above-mentioned parameters on emission levels. This will also lead to strategies for reducing emissions.