Testing and selection of filter media for dedusting

Part 2: Field measurements with a mobile filter probe derived from VDI/DIN 3926

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Meanwhile, almost all large manufacturers of cleanable filters conduct systematic filter tests in acc. with VDI/DIN guideline 3926 /1/. The results serve for comparative characterisation and evaluation of the filter media under exactly defined and controlled laboratory conditions, mainly in development and quality control. The corresponding tests are described in part 1 /2/. Due to the limited possibilities to reproduce the gas as well as the dust properties of 'real' dust-charged gasses that occur in practice in the laboratory, a mobile filter probe for conducting 'field tests' was developed and will be discussed in this article.

1. Introduction

Meanwhile, almost all large manufacturers of cleanable filter media conduct systematic filter tests in acc. with VDI/DIN guideline 3926 /1/. The results serve for comparative characterisation and evaluation of the filter media under exactly defined and controlled laboratory conditions, mainly in development and quality control.

Due to the limited possibilities to reproduce the gas as well as the dust properties of 'real' dust-charged gasses that occur in practice in the laboratory, the results can only be applied to a limited extent for the selection of a filter material for a certain application and/or the design resp. optimisation of a filter system. This also requires knowledge of the properties of a reference medium. Derived from the technology and approach applied in the laboratory, a mobile filter probe for the performance of „field tests" was developed in a further step.

This method allows the direct comparison of different filter media available on the market based on the conditions prevailing in the gas flow to be cleaned. With some experience, it is also possible to use the obtained operating data for the design or optimisation of the filter system.

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2. Basic ideas and objectives

The comparative evaluation of filter media based on measuring results includes the characteristic data described in part 1: Pressure drop progression, development of residual pressure drop and cycle time, weight increase of the filter sample and clean gas dust concentration. The behaviour charted in Fig. 13 and 14 (part 1) can be assumed as regular result, meaning an increase of the residual pressure drop, reduction of the cycle times, increased surface weight of the filter sample and, in most cases, improved dust separation, meaning a reduction of the dust content in the clean gas with increasing dusting of the filter sample. However, the latter cannot be safely assumed, as a bad dimensional stability or inhomogeneities in the design of the filter material for example, already leads to increased particle penetration after the ageing phase in the laboratory tests. Fig. 15 (part 1) illustrates the typical development of the filtration behaviour of a filter sample based on the initially concave progression of the pressure drop curve (with particle deposits in the depth of the medium) up to a pronounced convex curve progression after ageing, which inevitably leads to a reduction of the cycle times. This behaviour is more or less dominant with the different available filter media and illustrated in the diagram in Fig. 1. With „ideal" filtration behaviour (also see part 1, Fig. 8), a constant residual pressure drop on a low level and the build-up of a homogeneous filter cake at constant dust concentration and filter face velocity is assumed.

This leads to a linear pressure drop increase with the filtration time or the filter cake areal weight in the total course of a filtration cycle as described with equation 2 to 4 in part 1. In reality, the rise of the residual pressure drop as well as the increasing convex progression of the pressure drop curve after cleaning lead to