

A COMPACT GRANULAR BED FILTER FOR HIGH TEMPERATURE GAS CLEANING

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ABSTRACT

The Panel Bed Filter (PBF) is a granular bed filter which can be used in the cleanup of hot exhaust gases in various power generation plants. The filtration material in a panel bed filter may be sand, gravel, activated carbon or any type of granulated particles. The filtration medium is supported by louvered walls keeping the granular material in place. These loose-filled granular medium has the advantage over other type of filters as it can be used for wide range of temperature applications, good resistance to corrosive gas media, high efficiency in particle removal, the renewal of gas-entry surfaces allows handling of sticky materials and the possibility of regenerating the used filter material. The filtration concept operates in the surface filtration mode where it utilizes the transient behavior of deep-bed filtration. The surface filtration mode causes filter cake to be formed on the surface of each gas-entry surfaces. The pressure drop across the filter increases with increasing thickness of the filter cake and thus the cake must be removed for economical reasons. Therefore filtration is cyclic, dust gas flow is interrupted at the preset maximum pressure drop value, and the filter is subjected to a sharp, short reverse pulse of gas, causing body movement of the granular material, removing the filter cake formed with relatively small amount of granular from each gas-entry surfaces. The sharp pulse can be sent vertically (down-shot) or horizontally (side-shot) depending on the filter design. Due to the lower residual pressure drop and the renewal of the gas-entry surfaces, PBF allows longer filtration cycles with no permanent increase in the pressure drop. This paper presents a laboratory scale PBF with new panel bed design and adjustment of the overall filter size to form a compact filter. The filter occupies a smaller ground area, assembled from fewer louvers with down-shot regeneration mode and has lower pressure drop compared to the previous designs. The filter has been tested in the laboratory from low to high filtration velocities (5-15 cm/s) using alumina spheres as granular medium at 120°C. The lengths of the tests were varied from few hours to several days. The results obtained from the laboratory investigation show filter cakes are being formed on each gas-entry surfaces and indicate good filtration efficiency with low residual pressure drop.

Keywords

Panel Bed Filter, High Temperature, Puff-back cleaning, Surface Filtration

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