MECHATRONICS APPROACH TO NONRESPIRABLE DUST FRACTION SUPPRESSION IN THE DUST MASS CONCENTRATION MEASUREMENT

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The article deals with the ability non-respirable dust fraction suppression for the optical dust monitor based-on the light scattering by the dust particles. As far this function for this type dust monitor is performed by mechanical means, e.g. a cyclone. The article tries to realise this function by using signal processing acquired from the light scattering by the dust particles.

Key words: *dust monitor, dust respirable fraction, cyclone, non-respirable dust fraction suppressing*

1. Introduction

One of the most monitored working area parameters, which can be dangerous for human health, is the dust mass concentration in environment air. From hygienic viewpoint, the dust is defined as small particles of solid state materials, which are dispersed in environment air otherwise which are sedimentary on various objects. These particles come from the various technological operations (metallurgical technological operations, combustion of various substances, ore-working industry, threadmills, cement industry, cereals cleaning, processing of dry vegetal materials, wood processing etc.).

Different physical phenomena are raised for different dust particles (gravity, air resistance, airflow, electrical attraction or repulsion). Particles with dimension over the $10\,\mu$m are sedimentary in several minutes after their creation (or after repeatedly expelling) close to the dust source. Consequently, the working environment air is contaminated with particles smaller then $10\,\mu$m. Particles smaller then $10\,\mu$m sedimentary very slowly and particles smaller then $0.1\,\mu$m almost never sedimentary. So, every particles bigger than $10\,\mu$m are very dangerous for human, because of their possibility to reach deeply inside the lungs [1].

For practical purposes it is possible to divide dust particles into these categories – dimensional fractions: respirable and non-respirable dust fraction. The main goal of this dividing is to imitate the dust separation of the human breathing. So, respirable fraction is the part of dust particles, which is possible to respirable inside the human breathing ways.

Respirable dust monitor would by a sensitive only to respirable dust fraction. This requirement is achieved in practise with using of pre-separator [2]. The most used pre-separator is so-called cyclone, which uses the mechanical way of the dust separation.

There is also a different way how to separate dust. For optical measurement method it is possible via 'non-mechanical way'. One of the possible ways is based on suitable wavelength

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