

Sampling-device with Enhanced Function of Recording Human Breathing Patterns in Actual Work Conditions

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Investigating worker's breathing patterns in various workplaces is essential information when estimating performances of respirators in actual work conditions. Since workers who use respirator are naturally exposed to hazardous aerosols, a sampling-device used to measure worker's breathing pattern needs to have combined features of accuracy in measurement and adequate protection performance. The sampling-device with the use of a dust respirator that we reported in the past employed the sampling method that monitored the difference in pressure inside the facepiece for measuring breathing pattern; therefore the change in resistance on filter caused by the accumulation of particles affected the accuracy in high dust concentrated environment. To solve this issue, we have developed an innovative sampling-device which utilized differential pressure of a resistive element of mesh structure installed between filter and facepiece. The measurement accuracy of the newer sampling-device was compared to a conventional pneumatochograph under cyclic flows and reproduction human breathing patterns generated by Breathing simulator. The results of the measured flow rates between the both devices were similar; not only cyclic flows but also human breathing patterns which represented irregular breathing. Moreover, by simulating the usage of the sampling-device in dust environments, comparative test with the previous device regarding to the measurement error against filter pressure change was conducted by loading welding fume under a cyclic flow condition. As a result, while the error of the previous sampling-device became significant, with the increase in loading amount, the new device was completely unaffected.