

Abstract

The workers are exposed to aerosol particles in a coal strip mine. These particles are usually generated by the Bucket-wheel excavators which break the mined rock.

The goal of the thesis was to compare the concentrations of atmospheric aerosol particles – PM on the Bucket-wheel excavator Schrs 1320, the Stacker ZPDH 6300 and the Bucket-wheel excavator K 800/N2 in the coal quarry Doly Nástup Tušimice, and then to answer the questions what is the main cause of increased concentration PM_x and whether the mining machines are different from each other. The measurement was realized stepwise on every mining machine in the time period from 12. 8. to 2. 9. 2016. The concentrations of PM_1 , $PM_{2,5}$ and PM_{10} were measured by two portable laser nephelometers in the cab drivers and the outdoor walkway of the mining machines with the integration time of 1 minute. The air temperature and the relative humidity were monitored in both types of settings in every five minutes.

The PM_x concentrations variability is usually determined by the type of work and by the type of smoking. Consequently, PM concentrations on the mining machines were compared at the morning exchanges and evening exchanges, during the outdoor cleaning by sweeping, the indoor cleaning by hoovering and during the smoking. The highest concentration PM_{10} ($6,1 \pm 11,3 \text{ mg}\cdot\text{m}^{-3}$) was gauged during the cleaning by sweeping on the Bucket-wheel excavator K 800/N2. The concentrations during sweeping were identical on Schrs 1320 and ZDH 6300 ($1,5 \pm 1,7 \text{ mg}\cdot\text{m}^{-3}$). The concentrations PM_{10} were different during indoor hoovering. Values decreased in this sequence ZPDH 6300 ($3,1 \pm 3,6 \text{ mg}\cdot\text{m}^{-3}$), Schrs 1320 ($1,8 \pm 1,6 \text{ mg}\cdot\text{m}^{-3}$) and K 800/N2 ($1,0 \pm 0,9 \text{ mg}\cdot\text{m}^{-3}$). The concentrations PM_{10} were different during morning exchanges. Values decreased in this sequence K 800/N2 ($0,66 \pm 0,24 \text{ mg}\cdot\text{m}^{-3}$), ZPDH 6300 ($0,24 \pm 0,12 \text{ mg}\cdot\text{m}^{-3}$) and Schrs 1320 ($0,07 \pm 0,04 \text{ mg}\cdot\text{m}^{-3}$). The concentrations PM_{10} were also different during evening exchanges. Values decreased in sequence K 800/N2 ($0,96 \pm 1,23 \text{ mg}\cdot\text{m}^{-3}$), Schrs 1320 ($0,54 \pm 1,43 \text{ mg}\cdot\text{m}^{-3}$) a ZPDH 6300 ($0,54 \pm 1,43 \text{ mg}\cdot\text{m}^{-3}$). The $PM_{2,5}$ concentrations were the same as the concentrations PM_{10} . The concentrations PM_1 variability was determined by the smoking. The highest concentration PM_1 was in the cab drivers of Schrs 1320 during smoking ($1,8 \pm 2,2 \text{ mg}\cdot\text{m}^{-3}$). The concentrations PM_1 were identical in the cab drivers of ZPDH 6300 and K 800/N2 ($0,9 \pm 1,1 \text{ mg}\cdot\text{m}^{-3}$). The exposure of the workers PM_1 caused by smoking for eight hours is on average $1,4 \text{ mg}/12 \text{ h}$, which represents 87% of the total exposure. The exposure of the workers PM_{10} caused by hoovering in the cab drivers for 15 minutes reaches an average value of $0,09 \text{ mg}/12 \text{ h}$, which is 4,9% of the total exposure.

The values of PM_{10} measured by PCIS certificated by US EPA was three times up to twenty-four times higher than the values PM_{10} measured by the standard method according to Government Decision 361/2007. The PCIS and the laser nephelometer were the same therefore; the standard method isn't correct because it can come to pass undesirable handling of IOM.