

Interactive
Comment

Interactive comment on “Physical and chemical characterisation of PM emissions from two ships operating in European Emission Control Areas” by J. Moldanová et al.

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Received and published: 20 June 2013

Emission factors (EF) were calculated according to ISO/DIS 8178-1 (1996) from a measured mixing ratio of the pollutant in the exhaust (concentration in case of PM), exhaust flux ($f(e)$ in nm^3/h) and fuel consumption (FC in kg-fuel/h) or break power of the engine (P in kW). The exhaust flux was calculated from FC, the measured fuel carbon content and the measured CO_2 mixing ratio $\text{mr}(\text{CO}_2)$ reduced with the atmospheric CO_2 . The emission factor for pollutant X is then calculated from its mixing ratio in the exhaust $\text{mr}(\text{X})$ (no dimension) according to:

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$$EF [g/kg\text{-}fuel] = f(e) * mr(X) * 44.6 * MW(X) / FC$$

$$EF [g/kWh] = f(e) * mr(X) * 44.6 * MW(X) / P$$

Factor 44.6 is from recalculation from the gas volume to the mass, $MW(X)$ is the molar mass. PM is measured in $\mu g/m^3$ and the calculation of EF is:

$$EF [g/kg\text{-}fuel] = f(e) * c(PM_x) * 1E-6 / FC$$

When gases or PM are measured in dried exhaust, correction for the loss of humidity with factor $corr(H_2O)$ sometimes needs to be applied. $corr(H_2O)$ is then calculated from the fuel H content and the humidity content of the engine intake air. In our experiments both CO_2 used for the $f(e)$ calculation and all other gaseous species were measured in dried exhaust meaning that $corr(H_2O)$ was not needed. In case of PM part, but not all of the water vapour condensed during the cooled dilution. The measured RH in the warm exhaust ($300^\circ C$) was $\sim 4\%$ and the temperature decrease from the exhaust to the gas meter was $\sim 280^\circ C$, meaning that less than 1% of the exhaust water would remain in the gas phase. Hence we have not applied $corr(H_2O)$ for calculation of $EF(PM)$ either.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 3931, 2013.

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