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The assessment of CH_4 and N_2O emissions in biomass CHP systems

The CO_2 balances of Biomass CHP systems are decisively influenced by the supply chains of fuels as well as a plant's efficiency. Another important influencing factor is the N_2O and CH_4 emissions which enter the exhaust gas due to incomplete combustion. It is necessary to record the emissions of methane and nitrous oxide, which are produced during the combustion. For the purpose of calculating CO_2 equivalent emissions, the recommended factors of 298 for N_2O and 23 for CH_4 are taken into account. Against this background, the λvalues of the different combustion processes and the exhaust gas fractions of N_2O and CH_4 are measured. The C, H, N, O mass fractions of the respective biogenic fuel mixes are calculated by the measured volume quantities, which can be converted into specific mass fractions by the standard densities and the molar masses. The comparison shows that N_2O emissions have negligible influence. The emission value of CH_4 depends on the combustion process, the gas-fuel ratio and the compression rate. The lowest CH_4 emissions of 6.38 - 27.23 g/h are shown by liquid fuel operation, regardless of the used fuel (biodiesel, rapeseed oil, palm oil, soy bean oil). The highest emission levels show up in the dual fuel operation with bio-methane with maximum gas ratios in low-load operation with 5561.79 g/h - 6505.08 g/h, because of unburned fuel fractions. The combustion of wood gas in Gas-Otto operation shows comparatively low emissions at 28.6 g/h.

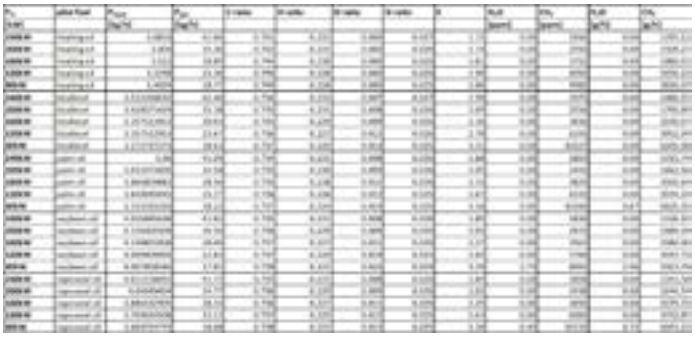

Figure 1: The mass flow of N_2O and CH_4 in dependence of the electrical power for a MAN D 26 common rail CHP system (compression rate 16:1) with dual fuel operation

Biography

Markus Brautsch is Full Professor for Thermodynamics, Energy Technology and Renewable Energies at the Technical University of Applied Sciences Amberg-Weiden since 1998. He is the Founder of the Institute of Energy Technology and the Bavarian Center of Excellence for Combined Heat and Power Generation. In 2014, he was appointed Guest Professor at the Jiangsu University of Science and Technology in China. He is Guest Lecturer at the Renewable Energy Center in Mithradam (India) and the University of Santa Caterina (Brazil) .

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