The situation with greenhouse gas and odour emissions from digestion plants for biowaste and for residual waste - mechanical biological treatment MBT

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Gewitra company is carrying out R&D project of the German federal environmental agency (Umweltbundesamt) UFOPLAN Project on determining gaseous emissions from different types of large scale treatment plants for biowaste in Germany: open windrow, enclosed systems and composting plants with integrated anaerobic digestion step. The project of UBA will take until the end of 2008. Measurement data of emission control are TOC (FID), CH_4, NH_3 and N_2O; emission factors and CO_2-Equivalents will be calculated as well.

Of high interest are the national emissions of Global Warming Potentials (GWP of Kyoto Protokoll) like CH_4 and N_2O, and for the NEC-Directive NMVOC and NH_3.

Arrangements to optimise / minimise process emissions to air are Guidelines: “Good practice of composting“. They are well known by operators but sometimes superior necessities swing a decision. On principle for a well done process the material characteristics should have structure (high porosity) and a water content: of max. 65-70 %, the C/N ratio should be 25-35 to avoid ammonia emissions. Important process parameters are water content: 50-60%, O_2-supply, turning cycles (intensive phase 1-2 times per week, phase of declining activity 0.5 times per week). Windrow profile: height max. 2.50 m (active aeration), height max. 1.50 m (passive aeration), best available technology must be decided case-by-case.

Depending on the rotting milieu there is an opposed formation of CH_4 (*anaerobic*) and N_2O (*aerobic*) within the biological process. It is a principle that minimisation of the CH_4 and N_2O emissions to air is the result of the right material characteristics and the right process parameters for the entire time of aerobic treatment. Because there is no end-of-pipe technology to reduce CH_4 and N_2O in the waste gas afterwards, like scrubber and biofilter.

Arrangements for the emission control with acid scrubber and biofilter are shown to the components. For methane (CH_4)there is only very less / no reduction in biofilters at suitable air loads > 50 m^3/m^3*h. For nitrous oxide (N_2O) and nitric oxide (NO) there are no reductions, but rather new generation due to NH_3 degradation in biofilter. For Non-Methane Volatile Organic Compounds (NMVOC) there are normally good reductions of easily degradable compounds (~ 80%) at well operating biofilters and suitable air loads < 100 m^3/m^3*h. Ammonia (NH_3) has a high deposition rate in biofilter, accordingly to new generation of N_2O and NO, declining pH value -as a result of nitrification- reinforces accumulating NH_4. Acid scrubber (H_2SO_4) precipitates NH_3 > 90%, mostly necessary after anaerobic step. Ammonium sulfate from acid scrubbers could be used as fertilizer in agriculture.

CO_2-Equivalent (data from methane, nitrous oxide) from biological treatment of biowaste is in the waste gas ~ 30 – 40 kg/Mg and in the clean gas after biofilter ~ 70 – 80 kg/Mg. The estimated emissions for CH_4, NH_3 are overvalued so far, specific contingent of composting / digestion is rather low (<0,5% of total national emission).