MANAGING FOOD WASTE COMPOST ODOUR EMISSIONS

Is your composting process beset by an odour emission problem? Don't worry, Nordic Council of Ministers has financed a study providing practical instructions for food waste composting.

The pH of compost material correlates to odour emissions from the composting process. If the pH declines below 6, pore odour formation is many times that of a situation in which the pH is at least 6.6.

Most food waste collected in the Nordic countries has a low pH. To minimise odour problems, the pH of compost material must be raised to over 6.6 before the temperature exceeds 40 degrees Celsius:

- by strong aeration, which promotes cooling and oxygen supply and/or
- by adding recycled compost or possibly ash or lime to the compost or
- by stacking the material to a lower height. A lower load height provides more aeration and surface cooling, and can represent a simple way of achieving a faster increase in the pH.

Aeration affects the composting process in three important ways:

- boosts the oxygen supply
- lowers the temperature
- removes moisture
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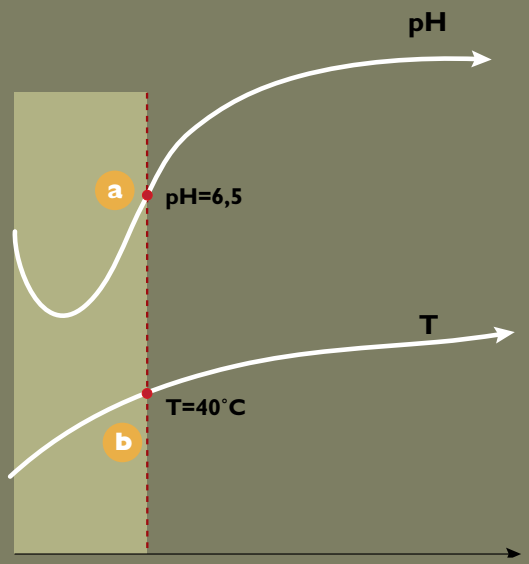
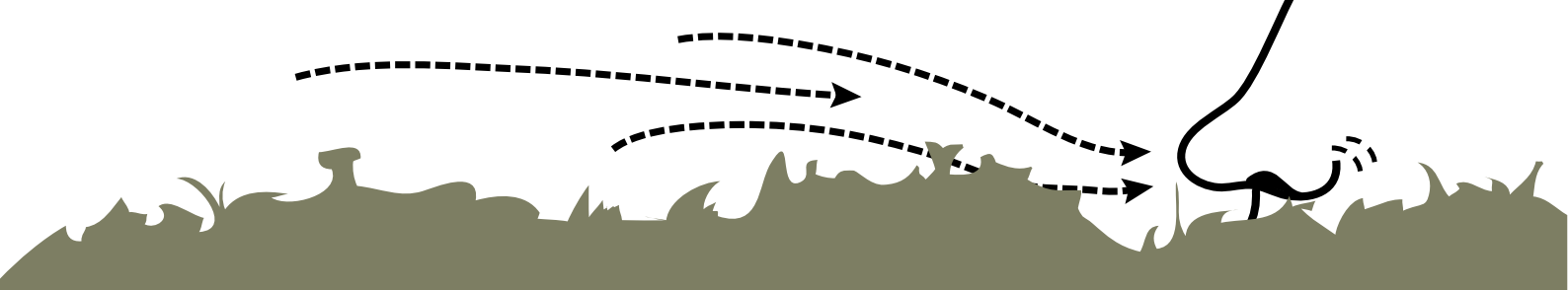
Every kg of oxygen consumed corresponds to a certain amount of heat, which must be conducted away from the process (around 12 MJ/kg O_2)



Controlling of the process in the start-up stage
- a *by adding recycled compost or possibly ash or lime and/or*
- b *by aeration*

PROCESS CONTROL IN THE START-UP STAGE

The optimal composting temperature – at which decomposition is most effective– is around 55 °C, with the prerequisite that the pH is above 6.6. In these circumstances, the process is then around twice as fast than if the temperature were 40 °C or 67 °C.



In the beginning of the process, the pH declines under 6. At this stage, the temperature must be kept at a maximum of 40 °C. During the process, the pH begins to increase. When it reaches 6.5, the temperature is allowed to rise to 55 °C. This maximises the degradation rate, and the controlled composting process has been achieved.

The low pH value of bio waste collected in the Nordic countries is a consequence of the high organic acid content in waste. Acids are formed in the early stages of the composting process, which decreases the pH a little before the pH rises between 7 and 9 alongside the degradation of organic acids. If the compost becomes anaerobic, large amounts of organic acids may be formed, which decreases the pH.

In food waste, the water content is insufficient to lower the heat produced by the composting process. Unless water is added or recycled into it, food waste compost will dry out before stabilising. Evaporation is the most important heat reducing mechanism.

During the intensive decomposition phase in food waste composting, the air flow must be significantly higher than when composting sludge or garden waste. Food waste decomposes more easily; without powerful aeration the compost may become partly anaerobic and its pH may fall. Water evaporation per kilo of decomposed matter is somewhat independent of the temperature; the relationship is around 6 litres of water per kilo of decomposed matter.

ODOUR MEASURING

Odour is usually measured using the human nose, with the help of olfactometry. The costs are high because many individuals are needed for the "sniffing panel". Another problem lies in transporting the odour samples to the laboratory unchanged.

Although the content of the compounds causing the smell can be analysed through chromatography, it is then necessary to know what compounds are causing the smell. Another problem lies in the fact that the human nose can often detect the smell even when the content is below the detection limit.

It has been discovered that the total amount of volatile organic compounds (TVOC) correlates with the strength of the odour. Using the photo ionisation (PID) method to detect TVOCs is relatively simple, flexible and cheap. Tests have shown that the PID method works well during the acidic phase of the process, but not in the later phases.

Measuring pH is easy and cheap. For this reason, pH-values should always be measured during the investigation of composting odour problems."

The complete report can be downloaded from:
http://www.norden.org/no/publikasjoner/publikasjoner/2009-561