EFFECTS OF MONSOONING CONDITIONS ON THE GENERATION AND COMPOSITION OF LANDFILL LEACHATE – LYSIMETER EXPERIMENTS WITH VARIOUS INPUT AND DESIGN FEATURES

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Landfill features and climatic conditions govern the quantity and the composition of leachate. Practical approaches to improve landfills in tropical countries could be achieved by a proper understanding of these effects. Due to the lack of opportunities to observe these phenomena little has been published so far on the variables under given boundaries. Our paper will present the results of on-going lysimeter studies under ambient conditions and will discuss consequences for the design of landfills as well as the leachate management.
The setting of these lysimeters considers both the variability of input and design respectively non-design (dump sites) of landfills in the region. The top covers of the various lysimeters present either state-of-the-art triple layer design or just a simple sand cover (dump site); the input varies from highly organic waste, typical MSW to pre-treated (composted) material. Accordingly the compaction covers a range of 200-900 kg/m³. Given the waste composition of 60 (MSW) and 78% (market waste) biodegradable matter and additional high moisture content in the range of 60-80% a high-polluted leachate is to be expected.
Intentionally the first phase of our experiments started in the beginning of the dry season (no rainfall over nearly 5 months) to avoid any overlapping effects with high downpours. Consequently the Initial water content of the input material and compaction, the top cover system, and the predominant evaporation rules the leachate generation during the dry season. Leachate generation didn't cease for the sanitary landfill systems (MSW) but discharges maintained at very low level. With the start of the rainy season a steady discharge occurred but with a delay of one (dumpsite) to nearly two month (sanitary landfill).
The composition of leachate showed during the early stages (compression phase) well-known peak concentrations. These concentrations are dominated by input of organic matter and are especially low for the composted material. The forthcoming concentrations were lower than those reported from landfills in an acidogenic respectively an early stage of the methanogenic phase most likely due to retarded degradation during the dry season. Certain spill-out effects with emerging heavy rainfalls of the rainy season could then be observed. A much better picture is given by the comparison of cumulative loads. Distinct divergences could be experienced for carbon sources (COD) and nitrogen compounds (TKN). The nitrogen load seems not to being affected by the specific input moreover with intensified decomposition TKN-loads reached nearly similar levels.
Provided these boundaries, we can state that the climatic variations have a profound impact on the leachate generation and it's concentration following distinct phases and degradation stages. According to current observations the dry season causes a retarding of decomposition. With beginning of the rainy season and after obtaining field capacity biological activity intensifies best characterized by a higher TKN discharge. If it is intended to maintain steady state conditions for a landfill to accelerate the degradation an appropriate landfill management and design concept deems to be indispensable.