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Title	**A mathematical analysis of the drying of faeces in a urine diversion toilet – sensitivity analysis**
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A mathematical analysis of the drying of faeces in a urine diversion toilet – sensitivity analysis

The South African government have made a strong commitment to eradicate the backlog in sanitation services within the country. One of the service models being field tested is the urine diversion system for household sanitation.

Urine-diversion ecological sanitation systems are neither widely known nor well understood. They can not be replicated without a clear understanding of how they function and how they can malfunction (Esrey et al., 1998).

eThekwini Water and Sanitation have developed a variant of the Ecosan system to suit local conditions. The management of the faeces is core to the successful implementation of the system. The two dominant processes taking place in the contained faeces in the vault are biological degradation and dehydration. There is a strong linkage between these two processes, the biological process being dependant on the degree of dehydration and the rate of drying being dependant on the biological changes in the solids.

In order to assist the eThekwini Municipality, a mathematical modelling approach has been adopted in order to guide an understanding of the processes occurring in urine diversion systems. Mathematical models have been developed for the physical processes occurring during the filling and storage phases. Thereafter established aerobic or anaerobic digestion models or will be developed for the biodegradation of the solids. Once both of the models have been validated they will be combined.

To date, the filling and standing phases have been modelled. The interplay between air moisture content, evaporation rate, solids filling rate, heap depth, moisture content of fresh solids, the effect of adding adsorbent material and solids moisture diffusion coefficient have been included in the model. The sensitivity of the results to changes in the physical conditions will be described. The use of this analysis to guide field measurements will be presented.

Reference

Esrey, SA, Gough, J, Rapaport, D, Sawer, R, Simpson-Hebert, M, Vargas, J and Winblad (1998) Ecological Sanitation, Sida, Stockholm.