Abstract

This project deals with issues associated with emptying pit latrines in developing countries, particularly in urban and peri-urban areas. The majority of people living in these areas rely on pit latrines as their only form of sanitation. Once the pit latrines are full, due to high densities, overcrowding and limited available space attributed to urban and peri-urban, it is impractical and most often impossible to cover over the full latrine and build a new one. Hence, the pits must be emptying. Conventional methods of doing involve using large vacuum tankers to pump out the contents of the latrine. However, this method is capable of removing only the lower density and almost liquid contents of the pit latrine. Difficulties also arise with access; this machinery is often too large to navigate the narrow and unplanned system of road and pathways in urban and peri-urban areas. Although developments have been made to reduce the size of emptying equipment so access is not an issue, they are still incapable of remove denser material which has settled at the bottom of the pit latrine.

Henceforth, this project aims to investigate ways to facilitate effective emptying of pit latrines. This was done through laboratory experimentation using synthetic sludge developed by Radford (2011). As part of this project, synthetic sludge was further developed altering its composition of clay, compost and water to one of clay, maize meal and water. Following on from this it was attempted to determine a method of classifying pit latrine contents using test more commonly used to test the workability and flow of fresh concrete on construction site. Finally, the fluidising effect of detergent on stiffer sludge samples was investigated.

It was concluded that maize was an effective replacement for compost in synthetic sludge. It allowed more accurate control on the water content of samples, which is negatively correlated to shear strength. The density of maize based samples had a higher density than compost base sample by approximately 100kg/m^3. This provided more accurate representation of the properties of actual pit latrine sludge.

The mini flow table test, normally used to test the flow of lime mortars, was successfully used to develop classes to correlated the flow of a sludge to its rate of pumping and shear strength, however due to limitations in the laboratory further experimentation is

needed to develop classes to represent the full range of shear strengths encountered in pit latrine sludge.

Finally, detergent was successfully used to fluidise and hence pump the synthetic sludge. A sample that could not initially be pumped, achieved a pumping rate of 3.53×10^{-3} m^3, which is greater than the most fluid sludge composition tested in the classification section.