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WATER RESEARCH COMMISSION

Kampala Sanihub project

Facilitating the emergence of sanitation technologies in developing economies

Innovative Pit emptying technologies

Kampala and other areas in Uganda are dominated by onsite sanitation systems. Kampala with a population of over 1.7m people has over 90% relying on On site Sanitation Systems (OSS). The most common ones being ordinary pit latrines, lined and unlined ventilated pit latrines. Some structures are very old and dilapidated hence no new areas to construct other pits.

Most of these challenges are common in unplanned settlements (slums) where urban poor, most students and some middle income earners stay. Such areas lack access routes to allow application of fully mechanized emptying systems which is the most preferred technology. As a result the feacal sludge collection efficiency is still below 50%. The largest volume over 96% is collected by mechanical emptiers and the 10 gulping entrepreneurs collect about 4% per day. This excludes manual emptiers since they do not deliver the sludge to treatment plants.

Manual emptying has been common in slums where faecal sludge is either buried on site or poured in drains during rainy season. As a solution to the above challenges, Water for People has been promoting the gulper [1]technology in Uganda.

Gulper I

The Sanihub has continuously made modifications to gulper I that had challenges of going deeper than 1.5m, pumping thick sludge and contact with sludge

[1]*Semi- mechanical pit emptying device*

Gulper 1

Compiled by Sam Malinga, Habert Atayo and Osbert Atwijukye, Sanitation Engineers Water For People.
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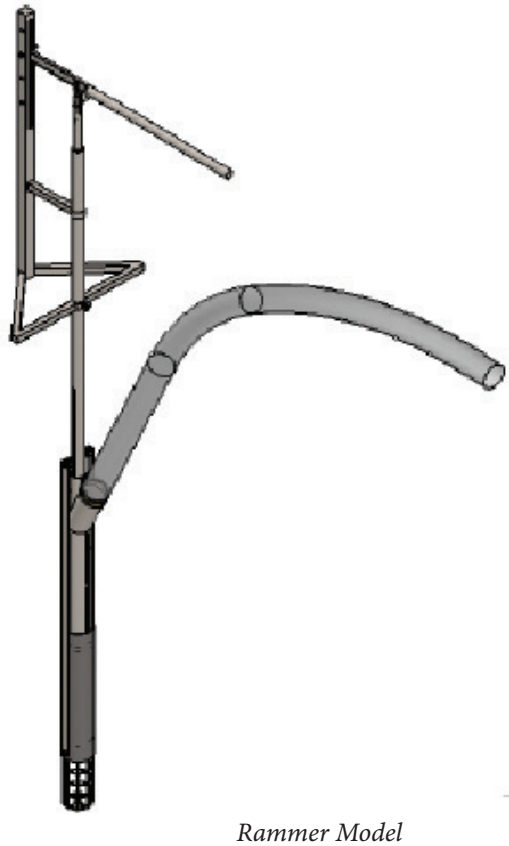
Gulper II/ Rammer

The Sanihub team set out to improve the gulper I in an effort to find solutions to the cited challenges. Research conducted by the team using synthetic sludge has led to development of GulperII that pumps sludge of shear strength between 100-500pa.

Rammer Components



Rammer Model

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Synthetic sludge of shear strength 100pa (thin), 500pa (thick) and 2kpa (very thick) were prepared using a mixture of top soil, Kaolin clay and water. Appropriate composition of the stimulant corresponding to specific shear strength was established using an empirical slump cone method and a chart generated as shown below. From the chart, the amount of water to be added to the matrix to achieve a specific shear strength could easily be read.

Slump Cone test for shear strength determination

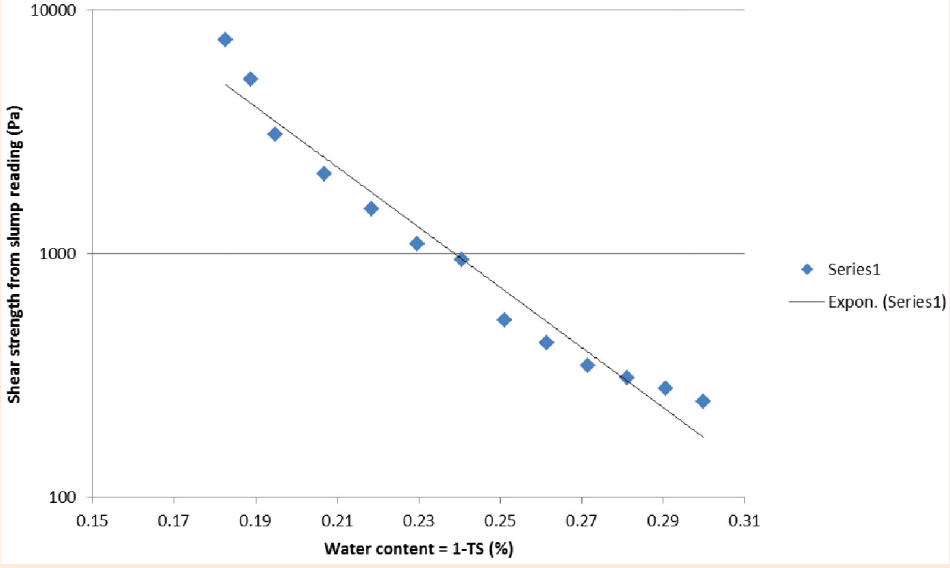

Figure 1: shear strength from slump reading versus water content

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Tests were carried out in a pit- like environment on the Gulper I, Gulper II and Nibbler. It is from these tests that we rated and evaluated the performance of these pumps on sludge of different strength. The first Nibbler prototype failed because of technical errors in fabrication where the chain-disc assembly was unable to rotate freely so it was not rated.

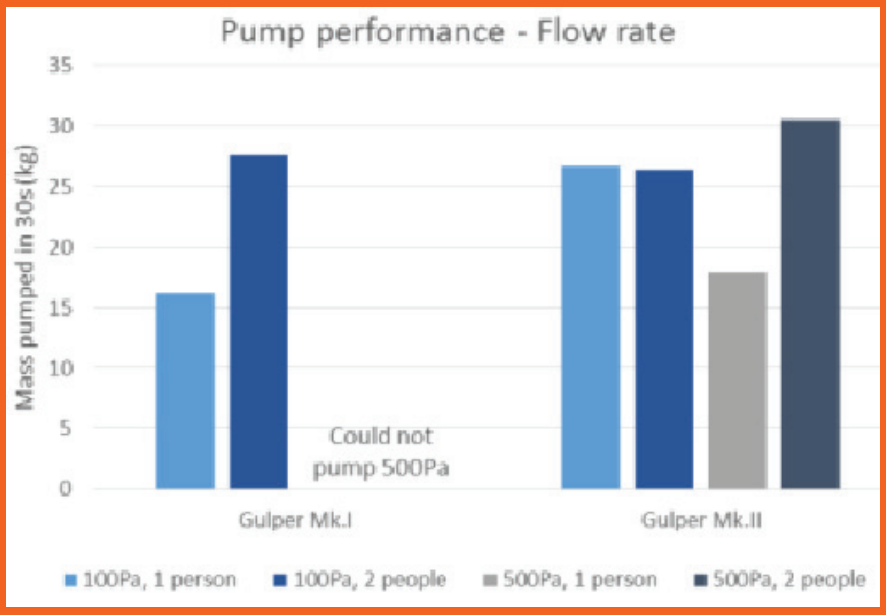


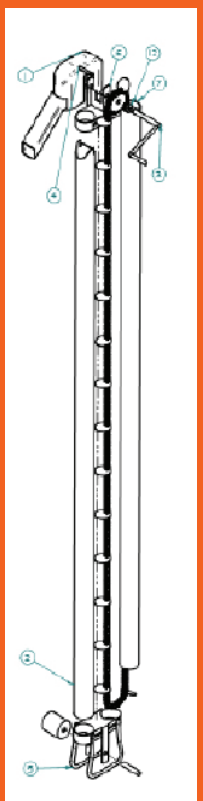
Figure 2 – Results of pump performance testing

The gulper II has been fully tested in the field on faecal sludge in pits, and entrepreneurs trained on its operation. Currently its being market tested in Kampala and neighbouring towns of Mukono and Wakiso.

The gulper II goes deeper up to 3m, removes thick sludge, uses less effort to pump, minimizes contact of FS with operators due to the presence of a horse pipe that pumps directly to a barrel. Its pumping rate is estimated at $1ls^{-1.}$

Nibbler

For faecal sludge that can be very thick especially in unlined pits located up hills, a Nibbler was developed and tested on synthetic sludge but never tested on market due to rejection from entrepreneurs. The device removes very little sludge and is so messy.



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