Abstract Title: Breakthrough pit latrine emptying technology: A case study of the PuPu pump in Kenya, Ethiopia, and Bangladesh

Research focus (Sub-Theme): Access to sanitation services for all - Inclusive and safe sanitation

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Key Words: fecal sludge, pit latrine emptying, manual pit emptiers

Summary

Over 60% of the urban population in Africa relies on manual pit latrine emptying yet this job can be dangerous, degrading, and poses health risks to the emptiers and the public[1]. To address this, the Practica Foundation has developed a new fecal sludge pump called the PuPu (Pull/Push) pump that is mobile, affordable, and can be used with any type of storage and transport. To test the applicability of the technology and its market potential, Practica has been working with Opero WASH Technology Hub and Finish Mondial in Kenya, Ethiopia and Bangladesh. The results of the work show that the PuPu pump was capable of emptying 80% of the pits tested, with time for emptying more than halved and a reduction of staff required from 5 to 3. As such, the PuPu is deemed an appropriate technology for safe pit latrine emptying. Beyond the initial trial of 200 pits, the emptying teams have continued to use the PuPu pump without hesitation.

Introduction

Pit latrines are the most widely used sanitation facility for the urban poor in Sub-Saharan Africa and when full, require emptying. Exhauster trucks typically cannot empty pit latrines primarily due to challenges of (i) solid waste, (ii) thick sludge content, and (iii) physical accessibility in densely populated urban areas. As a result, manual pit latrine emptying is the most common method of sludge removal but it is typically unsafe for the service provider, the customer, and the wider community. This dominance of manual pit latrine emptying 'paralyzes' the development of fecal sludge emptying and transport networks and as such the service cannot be scaled to provide safely managed sanitation services for all.

To improve fecal sludge management (FSM), use of the correct tools and technologies need to be adopted to improve working conditions of pit latrine emptiers resulting in hygienic and clean practices. To address this, the Practica Foundation developed a new fecal sludge pump called the PuPu (Pull/Push) pump that is lightweight and mobile. Near commercial prototypes have been developed and are being trialed in a variety of contexts including Burkina Faso, India, Ethiopia and Kenya with plans to further test it in Sudan, Bangladesh and India in the next 6 months. This paper will share results of the technology trials conducted with the OPERO WASH Technology Hub and Finish Mondial in Kenya, Ethiopia and Bangladesh.

Methods/ approaches

The objective of this work is to assess the applicability of the technology and its market potential. To understand this, the technology was tested under several technical, and financial criteria. Technical considerations included the pumping distance, set up and disassembly time, sludge viscosity that can be handled, volume and type of trash that can be pumped, pumping time and fuel consumed for a specific volume of pumped sludge. The financial criteria examined the cost of operating and maintaining the PuPu pump and the impact of these factors on the overall cost to both the business, and the customer, for emptying a pit latrine.

A testing protocol was developed and data was collected using the Mwater data collection tool by the emptying team. More than 200 pits have been emptied by the time of writing.

Results

Based on the analyses of data from the pits emptied, the results obtained show that the PuPu pump is a very applicable technology for Kenya and beyond. The average volume of waste removed per emptying during this research was 3000 liters and the average time taken to empty the pit was 40minutes.

The outcomes of the study have also shown that:

- After one week of training, the team found the pump convenient and straightforward to use
- The technology can satisfactorily handle sludge of different consistencies. With thick and dry waste, fluidization, addition of water and bubbling is necessary to make the sludge pumpable
- A hose length of up to 50m is appropriate in most settings and the pump does not struggle to pump this distance
- Overall, approximately 80% of pits were emptiable using the PuPu pump, but a proportion of 20% could not be emptied due to the poor structural integrity of the pit and/or the volume of solid waste within the pit
- The technology has significantly reduced the emptying time from 4-6 hrs to 30 min for 3000 liters of sludge removed
- The PuPu pump uses approximately $1 of fuel to pump 3000 liters of sludge
- The number of people required to empty a pit latrine has decreased from 5 to 3 when using the technology
- The pump increased the ability of the emptying team to service multiple pits in one day based on (i) minimizing physical effort in emptying a pit, and (ii) reducing the time taken to empty a pit
- The pump has resulted in a cost reduction of $60 per trip to $45 per trip for pit latrine emptying in Kisumu - increasing the affordability of the service
- Spare parts for the pump have been locally accessible in most cases, but the latest design of the pump is a steel model version, allowing for in-country production & repairs

- In some cases, some manual removal of trash is still required before pumping and this can take up to 30 minutes

Overall, the pit emptying teams have found the PuPu pump to be a strong addition to their pit latrine emptying business. The teams were initially contracted to use the pump as a trial, but have continued to use the pump beyond the trial without incentive. In fact, the teams are engaged in a lease-to-own model where the pump will be purchased over the course of 6 months. Beyond this trial, both teams believe the PuPu pump has the potential to become a leading tool in the transition from manual to mechanical emptying globally.

Conclusion

The PuPu pump has proven an effective pit latrine emptying tool for Kenya, Ethiopia and Bangladesh and transforms both the technical and financial elements of emptying pit latrines. The OPERO WASH Technology Hub and Finish Mondial team confidently endorse the unit performance and anticipate that the PuPu pump will become an instrumental tool in emptying pit latrines globally.

References

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