

THERE IS HOPE FOR THOUSANDS OF MANUAL PIT EMPTIERS

Pit emptiers say goodbye to their buckets to remove sludge from toilets. The innovative PuPu pump from the Netherlands is going to do the dirty job.



A bucket of sludge moves to the surface. Image Practica.

It is hard to imagine for many people, but such emptying services are the common practice in many cities in low income countries. The toilet is standing above a hole of 1 to 4 meters deep. To empty such a toilet, emptiers often have to lower themselves into the sludge. In between the human excreta anything imaginable can be found such as rags of clothes that served as sanitary napkins, needles, condoms, bottles and medicines; things you do not want to show your neighbors. Manual emptiers use buckets and shovels to remove this stinking liquid out of the pit. No wonder they often get sick from infectious diseases, worms and other parasites. The sanitary conditions, including collection of solid waste is often in poor and unhygienic condition.

This is the reality in many African and Asian countries explains Robert Vuik of Practica, a non-profit development organization

that works on the development & dissemination of high impact innovations for developing countries. Practica works closely with partners such local governments, local private businesses and organizations such as the Red Cross, Woord and Daad, ZOA and Unicef. With the PuPu pump, the emptying of latrines and septic tanks becomes easy, quick and clean. www.pupu-pump.com.



PuPu operators in Burkina Faso. Image Practica.

Households in middle income areas, shops and hotels often have flush toilets connected to a septic tank. These are emptied by vacuum trucks in which the sludge can be safely removed and transported. Vuik: „In most African cities there is no sewerage system. 30-50% of the houses are generally accessible for trucks. Low income areas and unplanned settlements grow incredibly fast in these cities and as a result; the sanitation service infrastructure is facing a problem of magnitude. Pit emptiers need to operate with buckets and sludge is dumped in a freshly dug hole next to the toilet or ends up in rivers and nature. An average of 2m³ per pit. Because emptying is cheaper than building a new toilet.”

Thick Sludge

A French colleague from Madagascar, Xavier Gras describes the challenge to the Practica team. „Can you work on a solution? He asked”, remembers Gert Jan Bom, Founder of Practica. „ They had to deal with pits that contained quite a lot of dry material mixed with trash.”

In recent years, significant investments and scientific research on global level has been done towards finding solutions for pit emptying, but to date not many products have entered the market that really work explains technical expert Aart den Breejen. Yes, it’s a complex problem, but many attempts have stayed in the academic sphere of ‘concepts’ and ‘trials’ without a deep understanding of the combination between technology, markets and field conditions. „We stand with our feet in the shit, and look at solutions from a practical perspective. We were able to make significant steps to validate iteration steps by working with local operators. I have seen it as a blessed process”

Bom and Den Breejen decide quite early in the process that the pump should be able to pump as much as possible. „This seemed to be the right track. The earlier pumping concepts primarily used filters and were unable to pump rags and other debris.” But the developers were not done yet. What kind of valve do you use for example? Nothing should block a valve as this can cause blockages. Bom shows a flexible rubber tube that is flattened on one side, a so called duckbill valve. „I had some earlier experiences with these type of valves, which still close properly when trash is in between.”

Cat litter

They observe that poop drop holes are often 10 centimeters in diameter. „Then all trash should pass through a hose with a diameter of 10 centimeters. The smaller the diameter, the bigger

the risk of a blockage to happen”, explains Den Breejen. The men test the system in Papendrecht using cat litter which they mix with water. By adding more litter, the viscosity increases to simulate sludge in pits.

The first problem arises quickly. „How do you empty the actual hose after emptying the pit? If you have 60 meter of hose, it contains about 400 liters of slurry. Using water for cleaning would add a dirty pool of water that also needs to be transported, explains Bom.” A friend of Den Breejen comes with a solution: try pushing a plug, a so called pig through the hose. But easier said than done. „It caused enormous pressure behind the pig and they shoot out as a cannonballs, but the hose was emptied. That is how we washed our first pigs”, says Bom. During testing in Madagascar we received the feedback from Xavier that this is not an acceptable solution. It caused real shit explosions during the cleaning process explains Bom with a smile. Xavier has a valid point, says Den Breejen. He comes up with an explosion blocker, a so called pig catcher. From contacts working in the concrete industry it seems that balls made out of a sponge type material work better. „This is now going very well.”

Prototype models of the poop pump made in the workshop should be send as quick as possible to the field, says Vuik. Iteration processes require the feedback of users.” During Corona in 2021 a first model was send to Madagascar. This has been one of the more difficult locations for testing”, explains Den Breejen. There are quite some elevation differences in slums of these cities, causing backpressures towards the pump. Furthermore, households have the habit of throwing charcoal into their toilets. „they say it reduces unwanted smells. In only works to some extent, but does cause sharp charcoal pieces to accumulate around rags during pumping. This makes the slurry very thick and difficult to pump towards a tank on for example a tuktuk or truck.”

Hose Manager

The delivery hose got blocked frequently, but by adapting the hose couplings and managing the 'bends' in the hose the problems are solved. Den Breejen: „And we have introduced a hose manager, that has to check if there are no kinks in the hose during pumping.”

Pits often have a dry crust on top of the slurry or thick sludge below a liquid layer. This makes pumping difficult. „Our initial thoughts were towards stirring inside the pit, but that is not a pleasant job to do”, expects Bom. A sanitation expert from Germany has a suggestion: Blow air inside through a metal rod to create air bubbles. „We already had air available from the compressor of the pump. The idea worked above expectations to mix layers.



The developers of the PuPu-pomp f.l.t.r.: Robert Vuik, Aart den Breejen en Gert Jan Bom.

The pump got the name PuPu and is derived from the applied technology, explains Bom. The pump **pulls** the sludge from the pit and **pushes** the sludge under air pressure to a tank. Pull and Push is shortened to PuPu and the linkage to Poo is easily made. „In Uganda people were laughing out loud when I walked around with a t-shirt displaying the name PuPu”, explains Den Breejen. „They made the direct linkage with Poo or Poop.”

Den Breejen and Practica made around 15 PuPu pumps during the field testing period. They cost around 5000 euro each. The manufacturing of larger series is currently being established in India at a manufacturing partner of Practica, that is also producing our solar water pumps for irrigation. Through this combination we can guarantee quality, scale and continuity. Our goal was a 50% cost reduction and that seems to be feasible in India.

Vuik: „In 2022 and 2023 we worked with pit emptiers in 5 countries to empty 600+ pits as part of the testing and iteration phase. One of the big advantages of the system is that the slurry is directly pumped to a tank of any size on a transport of choice. This way it promotes the safe transport and deposition after emptying.” With the development phase completed, Practica will continue its journey by working on the dissemination and skills development to bring the pump on the local market with partners in several countries. Sometimes a hundred small companies can be present in a large city in Africa to provide sanitation services. For them, the PuPu is a great step forward in providing professional and clean services. Instead of using a bucket and working a full day on emptying a pit, they can now pump for 1 hour and finish the job. We hope they can do 3 pits per day in the future.

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