



PuPu PUMP

PROFESSIONALIZING GLOBAL PIT EMPTYING SERVICES

GUIDELINE FOR WORKING WITH THE PUPU PUMP
MODULE 1 | OPERATING THE PUMP



PuPu PUMP

For more information, visit www.pupu-pump.com



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The instruction guide is available in English and French and has been developed for use in technical training courses for the intended users. In case you want to organize such a training, you may contact Practica for further information and support

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The PuPu PUMP is a product developed by Practica

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FOREWORD

PRACTICA develops technologies for major global challenges. A very clear one is the need for better sanitation services and products in the coming decades with the rapid population growth in urban centers.

Half of the world's population use on-site sanitation systems like pit latrines and septic tanks. These get full and need to be emptied regularly. Over 60% of the urban population in Africa and Asia rely on manual emptying services because vacuum trucks cannot access certain areas, services are absent or costs are too high. Vacuum trucks require large investments and keeping them up and running is a challenge. Pits can have a high degree of solids and trash, making it a very difficult job to do. Manual emptiers use shovels and buckets and may need to go inside the latrine to remove the fecal sludge. The job is dangerous, degrading and poses health risks to emptiers and households, while poor dumping practices effects the environment, especially its water resources.

The PuPu pump operates as a Pull/Push system and provides a complementary solution for global pit emptying. It is portable, affordable, simple to operate and equips NGO's, utilities and emptying businesses in a clean and professional way for pit emptying. The repairability lowers operational barriers, while the speed of operation increases the number of pits that can be emptied daily. It can operate in densely populated areas and serve pits with accessibility issues, thick sludge and debris.

During emptying, it can pump the sludge directly to a tank of any size on a vehicle of choice. This way, sludge transportation for safe disposal and treatment becomes very simple.

Reach out to the PuPu team if you have suggestions, questions or need for training. We're here to help.

Available modules in this guide

Module 1

Operating the pump

This module describes the PuPu pump specifications and configurations. It explains how to operate the equipment for emptying, fluidization and mixing and the linkage to various types of transport. It is meant for NGO's, emptying businesses, utilities, and governments that want to professionalize pit emptying.

Module 2

Pump assembly

Module 2 provides a step by step guide to assemble the pump unit and compressor unit. It provides references for distributors and other users.

Module 1

Operating the pump



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System components

Pump unit
Compressor unit
Pressure hose set and pipes for water and air injection
Pigging balls
Spares, oil & tools set
Clamps for lay flat hose
Delivery bend to tank with pig catcher
Sludge delivery hose (4 inch lay flat type) (20 + 10 meter)
Sludge suction hose (4 inch reinforced type, 6 meter)



System specifications

System specifications	
Weight	Pump (44kg), Compressor (48kg), accessories and spares (90kg)
Operating pressure	-0,8 bar to 2,5 Bar. The system safety valve is adjusted on 2,5 bar pressure
Max suction depth	8 meters
Pumping distance lay-flat	0 to 100 meters, depending on viscosity of the sludge
Yield	1 to 7 m ³ /hour, depending on viscosity of the sludge
Diameter hoses	100 mm (4")
Length hoses	Suction hose (6 meters), Lay-flat delivery hose (total 30 meters). Hose sections can be added based on preferences and needs
Thickness and debris	The pump can handle sludge of various consistencies under the condition there is sufficient liquid to make it pumpable. Flexible valves enable the pumping of debris that may be mixed with the sludge. The inlet side has a blow-back system in case of blockages.
Accessories	The system can be used to inject water and/or air to support the mixing of sludge to make it more pumpable.
Portability	Highly portable system. Wheels can be removed to reduce the width of the system
Warranty	1 year

1 Getting started



STEP 1: Fill engine with **petrol**



STEP 2: Fill engine and compressor with **oil (10W40)**.



TIP: The amount of oil is sufficient when it is between level marks of oil glass or dip stick. For the engine, fill until overflow.

Make sure engine and compressor have oil at all times, otherwise it may be damaged. Check this regularly!

Connection between pump and compressor

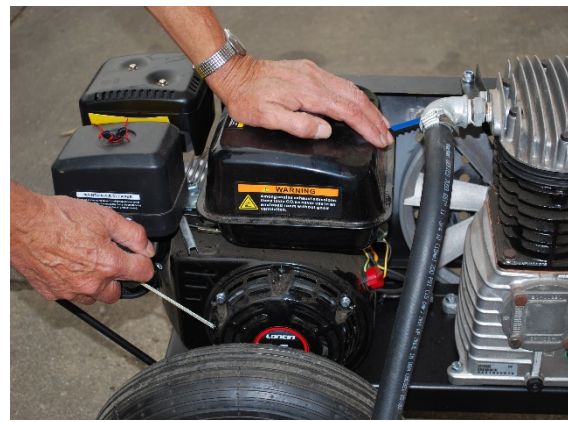


Pressure hoses connect the pump with the compressor. The camlock couplings can only fit one-way

Starting the engine



STEP 1: Open fuel valve and choke valve and switch engine to 'ON'. Then pull the rope to start



STEP 2: When the engine runs, move choke lever forward.

Tip: The speed of the engine can be controlled with this handle.

2 Water and air injection

The system can be used to inject water or air into the fecal sludge to make emptying easier.

- If the sludge is thick, inject water
- Injecting air (bubbling) supports the mixing of sludge layers.

This can be done before and during emptying

Water injection

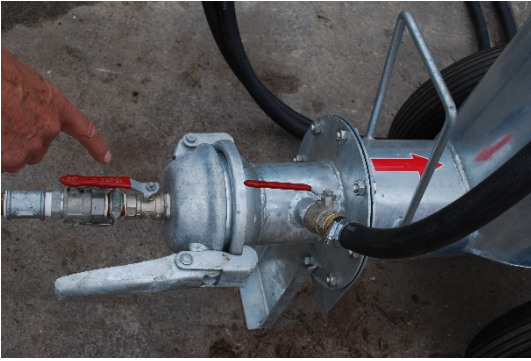


Connect the end caps to the outlets of the pump. **TIP: Make couplings wet before use, this will make it easier to connect**

- Fill a jerry can or other containment with clean water
- Connect the short hose (1m) to the suction side (red arrow) and into the jerrycan
- Connect the long hose (5m) to the metal pipes and pressure side (blue arrow) of the pump



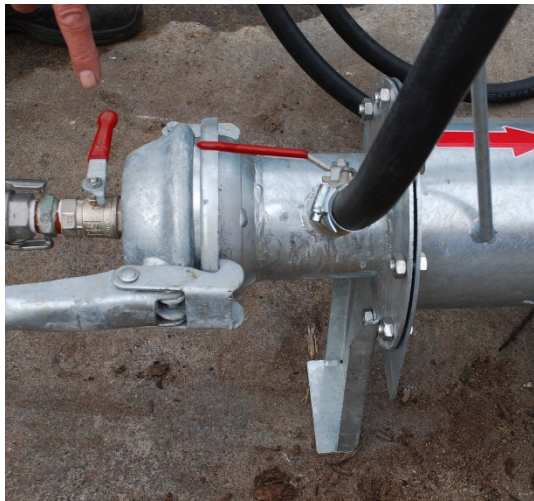
STEP 1: Insert metal pipe in sludge and put operation handle in neutral position



STEP 2: Opened valve suction side, closed valve pressure side



STEP 3: Start engine. Move lever to suction position to draw up water until float in plastic tube is up



STEP 3: Close suction valve and move lever to pressure position



STEP 4: Build up pressure first, then open pressure valve. Water now ejects from the metal pipe



TIP: These steps can be repeated at any time until enough water is injected

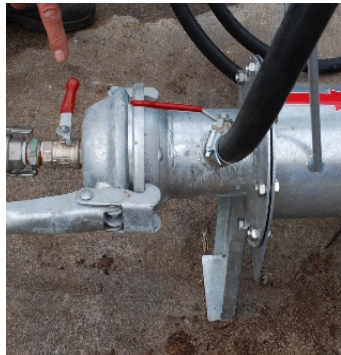
Air injection (bubbling)



STEP 1: Connect the end caps to the pump. Then, connect the 5m pressure hose to the metal pipes and to the pressure side (blue arrow) of the pump.



STEP 2: Insert metal pipe in the sludge, operation handle in neutral



STEP 3: open valve on pressure side, closed valve on suction side



STEP 4: start engine and move lever to pressure position. Air now keeps ejecting from the metal pipe



TIP: Take sufficient time for air injection as the mixing of layers makes pit emptying much easier

3 Pit emptying



The PuPu system pumps sludge in an intermittent movement (pull/push) to any type of storage containment. Examples are old water tankers, plastic tanks on trucks or tricycles or metal drums etc.

Set-up for pit emptying

- Connect the stiff hose on the suction side (red arrow). And place the other end into the pit latrine. The hose needs to stay submerged during pumping
- Connect the lay-flay hose on the pressure side (blue arrow)



- Connect the bend to the end of the lay-flat hose and insert it in a storage unit (in this case a plastic IBC tank of 1m³) The pin of the bend points upwards during pumping.



Make sure there are no bends and kinks in the lay-flat hose as this will cause blockages and pressure build-up. It should be positioned with smooth corners



The pumping process



STEP 1: Put operation handle in neutral and start the engine.

TIP: To support the priming of the pump, it can help to step on the lay-flat hose

STEP 2: Operate the Pull/Push cycle A to D



A

B

C

D

- A. Move handle to suction (red), float/ indicator will start to go up
- B. When float/indicator is up top, move operation handle to pressure (blue)
- C. Float/ indicator will now go down
- D. When float/indicator is down, it can be moved again to suction (red)

Keep operating this cycle continuously until the pit is emptied or your storage containment almost full. A full pumping cycle takes a few seconds. When sludge is thicker, it will take a little bit longer.

Keep an eye at the float at all times. Sludge cannot enter the transparent tube! If sludge comes up, put to pressure immediately. Otherwise it can damage the compressor.



4 Hose cleaning (Pigging)

When you are finished with pit emptying, the hoses are still full of sludge. The lay-flat hose can be cleaned using a sponge ball (pig). This is being pushed through the hose by air from the compressor.

Tip: each meter of lay-flat hose contains 8 liters of sludge. A hose of 20 m long contains an additional 160 liters of sludge. Make sure to have enough space for that in the tank.



STEP 1: Lift the suction hose out of the latrine and empty that by normal pumping.

STEP 2: Lift up the pump on the suction side to empty pump. Then disconnect the suction hose



STEP 3: Fit suction cap with closed valve



STEP 3: Check the volume in the tank. With enough space, the operation handle can be put to pushing (blue). Keep it running for a while.

STEP 4: Put handle in neutral and place a clamp on the lay-flat hose

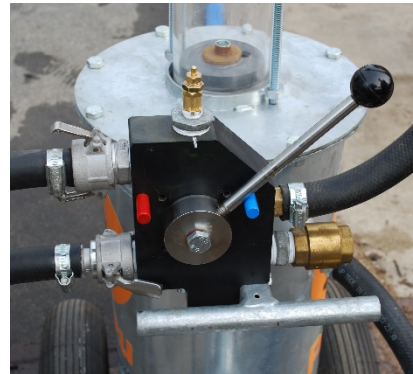




STEP 5: Open the coupling and insert the pigging ball firmly in the lay-flat hose



STEP 6: Close the coupling and remove the clamp. Then put the handle to pressure



STEP 7: Walk along the hose and guide the pig where needed by kicking the hose.

When pig reaches the end, insert the pin in the bend (so it does not go in the tank)





STEP 8: When pig is through, put handle in neutral and let pressure come back to zero. Turn off the engine.



STEP 9: Open the bend and recover the pig



STEP 10: Disconnect the lay-flat hose and put on end caps for transport



5 Troubleshooting

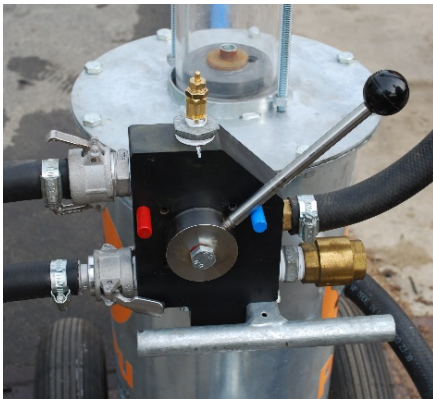
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When emptying latrines, a blockage can occur due to the debris that is often found inside. Here are some tips that help you to solve some problems.

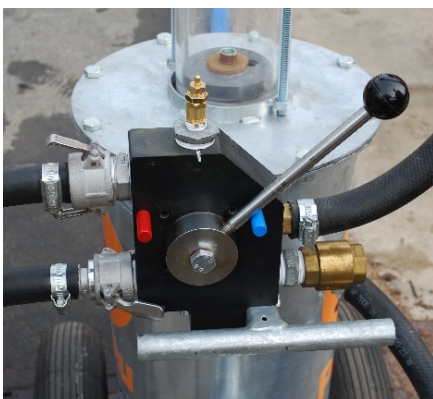
Blockage on inlet side

Is the float not going up or is it dancing/shaking? – Then you either have a blockage on the inlet side or you are sucking air.

- Move the suction hose up and down and make sure it is submerged and not sucking air.
- Is the float going up and down again? Then problem solved
- If not, check the gauge. Is the vacuum high -> there may be a blockage in the inlet.



STEP 1: Put handle to pressure to force sludge out. Then put handle to neutral and place a clamp on the lay-flat hose



STEP 2: Put handle to pressure and wait until there is a pressure build up.

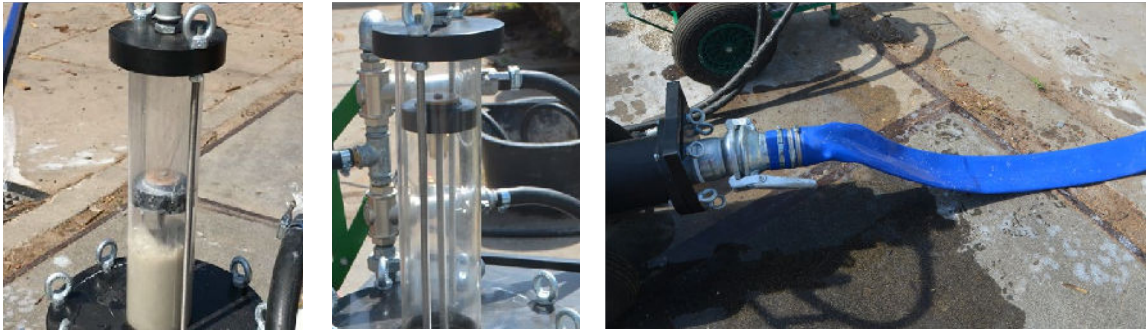


STEP 3: Open the by-pass valve for a blow-back.

Remove clamp and start pumping again
Repeat procedure if necessary.

Make sure to close the by-pass again when you start pumping

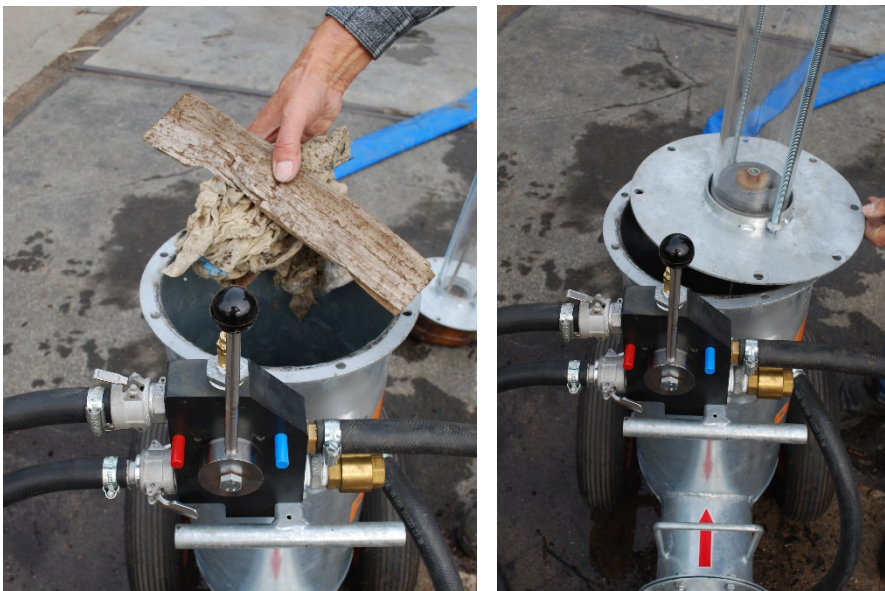
Blockage in pump



Low suction pressure on the gauge but indicator stops moving upward. This indicates that there is debris in the pump which stops the indicator going up. If not noticed in time, this may cause a sudden rise of the sludge in the transparent pipe and sludge being sucked into the compressor. When the indicator stops moving up, switch to pressure. Repeat this until the indicator has returned to normal operation. If repeated pumping short cycles does not remove the debris, open up the pump and remove the debris manually.

STEP 1: Put handle in neutral and switch of the pump

STEP 2: Open the pump cover



STEP 3: remove debris and put back the top cover to resume pumping

Blockage on outlet side



STEP 1: Locate the blockage, where the hose is hard and where not.

STEP 2: Put on clamps and open up hose coupling.

STEP 3: Remove debris and resume pumping

6 Other suggestions

Transport in narrow streets

The wheels and axle can be removed from both pump unit and compressor unit to make it more compact to transport through narrow passages.



Slower than normal operation

Clean the air filter from the suction hose as debris collects from time to time. Check the system on leakages. E.g around the transparent tube. Tighten them (carefully) where needed.



Adjusting the pump pressure

The safety valve can be adjusted using a spanner. A pressure of 2 – 2.5 bar is safe to operate. This can be tested using the end caps.

