User Manual - Pit Vaq

FSM Action Research Project



Operation and Maintenance Guide

This manual provides instructions on the safe and proper operation of a Pit Vaq , including setup, use, cleaning, and maintenance.

https://fsmaction.org

Pit Vaq



The Pitvaq (formerly -the eVac) is a portable pit emptying technology that works by creating a vacuum inside a collection tank, drawing sludge through a suction hose. When the tank is full, the vacuum is released and the sludge is discharged into a sealed drum for safe transport and disposal.

How it works

The Pitvaq uses an engine-driven vacuum pump to create a vacuum inside a 75-litre tank. When the vacuum release valve is closed, suction draws sludge through the suction hose into the tank. As the tank fills, a rubber float rises to indicate the sludge level.Once the tank is full, the vacuum release valve is opened to release the vacuum. The discharge valve at the bottom of the vacuum tank is then opened, allowing the sludge to flow into sealed drum positioned beneath the tank stand

CapEx	USD 4,000 (Ex Factory). Final landed cost will depend on the destination country, shipping charges and applicable taxes.
OpEx	Petrol, engine oil, and periodic servicing.
Operators	Best operated by a 2–4 people: one handles the vacuum tank valves, one manages the sludge hose, and two transport full sludge tanks to transport vehicles.
Add-ons	Containment drums, transport system, hoses

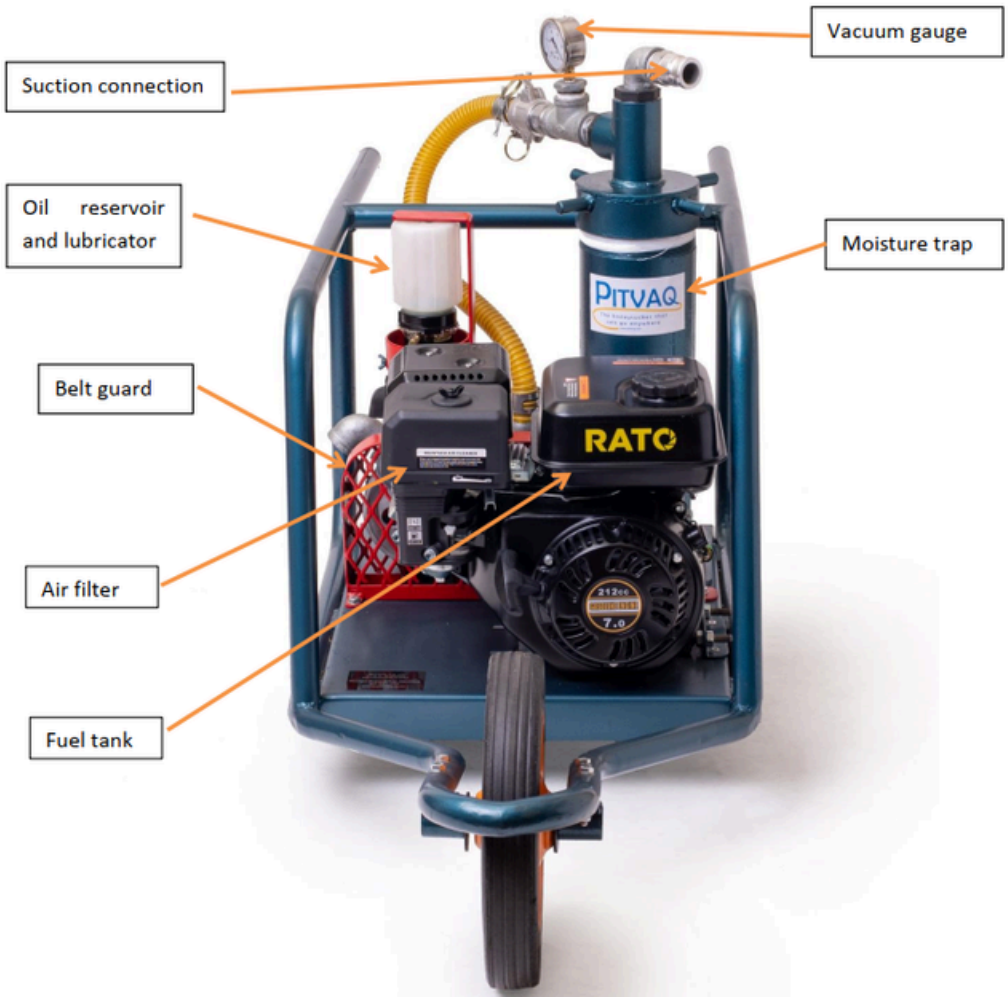
Advantages

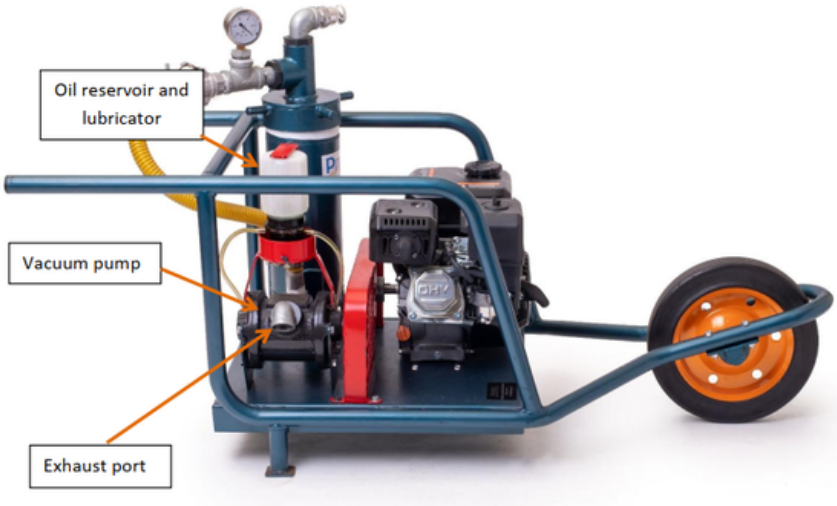
- Portable – Ideal for dense areas with limited accessibility.
- Can handle thick waste - Cannot handle dry sludge that does not flow
- Simple to operate

Limitations

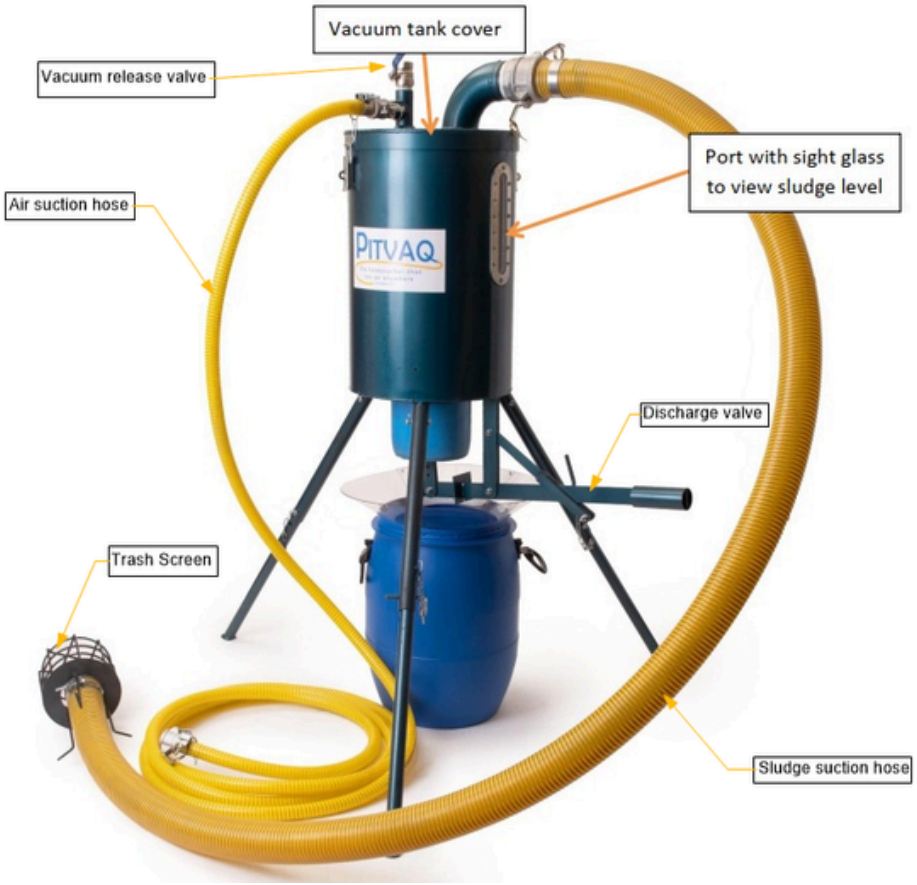
- Still requires the operators to carry the drums to the transport system
- Additional Equipment Needed – drums and transportation system
- Ongoing Maintenance Costs – Regular engine servicing is required.

Components and parts





Components and parts

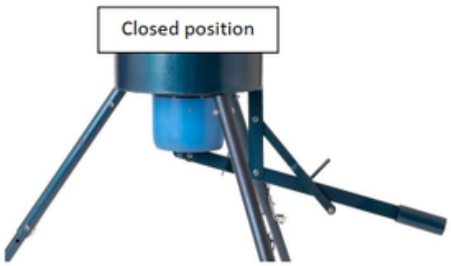


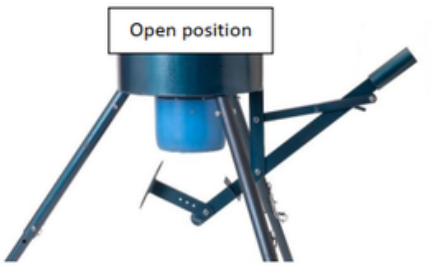


Vacuum release valve open



Vacuum release valve closed





Vacuum tank discharge valve

Step-by-Step Operating Procedures

Pre-operation Inspection

Before each use, inspect the Pit Vaq to confirm it is clean, undamaged, and in proper working order. Complete all checks below before starting the engine.

Frame and chassis	No cracks, bends, corrosion, or structural damage.
Engine	Air filter clean; spark plug secure; no unusual wear or debris.
Fuel Level	Tank filled to recommended level with correct fuel grade.
Engine oil level	At or between MIN and MAX marks on dipstick.
Pump assembly	Impeller housing intact; no cracks or blockages.
Suction and discharge hoses	No cracks, holes, kinks, or abrasion.
Pipe fittings and clamps	Tight and secure; O-rings in good condition.
Valves	Fuel valve and any isolation valves move freely and seal properly.
Wheels and axle	Tyres inflated; wheels spin freely; axle not bent.
Handle	Secure, not bent or loose; folds/locks correctly.
Check for leaks	No fuel, oil, or water leaks at any connection point.
Check for loose parts	all bolts, nuts, and fasteners tight.
Check for visible damage	no dents, missing guards, or broken components.

Do not operate the Pit Vaq if any item fails inspection. Repair or replace faulty components before use.

Step-by-Step Operating Procedures

Operating the Pump

1 PRE-OPERATION INSPECTION & POSITIONING



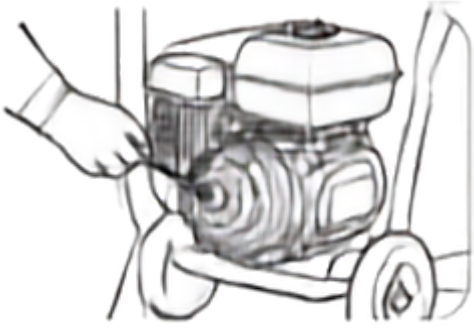
✔️ Check machine for damage or leaks.
✔️ Ensure all fittings are tight.
✔️ Position near the source on a flat surface
✔️ Place an empty collection drum directly under the discharge valve before starting.

2 CONNECT AND SECURE THE HOSES



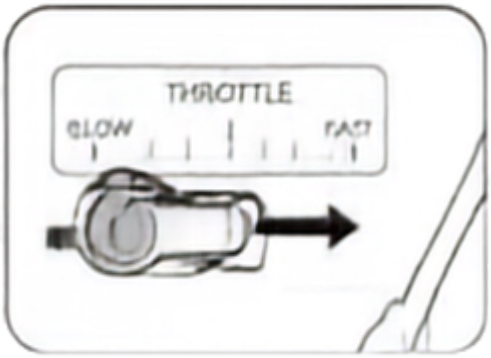
✔️ Connect suction hose to the vacuum tank cover Inlet - 3 inch hose
✔️ Place the suction hose in the source.
✔️Connect air suction hose from the pump to the vacuum tank cover to the vacuum tank cover Inlet - 1 inch hose
✔️ Secure all hose clamps and fittings tightly
✔️ Ensure vacuum release valve is closed

3 START THE ENGINE



✔️ Open the fuel valve (see Step 8)
✔️ Move the choke lever to CLOSED if the engine is cold.
✔️ Turn the ignition key to the "ON" position and pull the handle.
✔️ Move choke to OPEN once running.

4 MOVE THE THROTTLE TO FAST FOR SELF-PRIMING

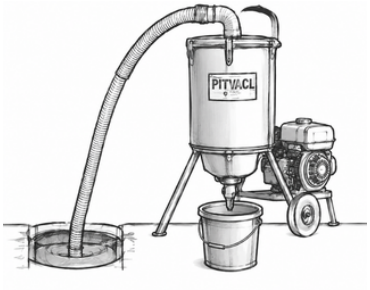


✔️ Move the throttle lever to FAST. Pump output is controlled by adjusting engine speed. Moving the throttle lever in the FAST direction will increase pump output,

Step-by-Step Operating Procedures

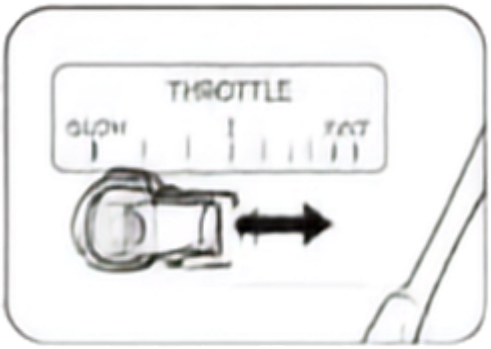
Operating the Pump

5 MONITOR PUMP OUTPUT DURING PUMPING



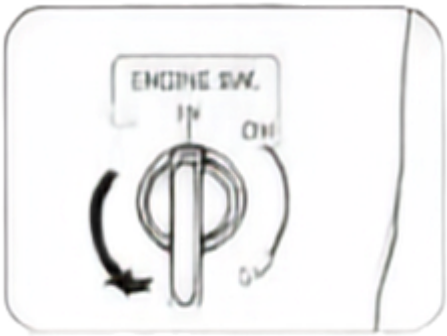
✔ Once engine starts, monitor the level of the sludge on the sight-glass on the vacuum tank.(Watch for changes in sound)
✔ Once full (not to the top) open the vacuum release valve
✔ Gently pull the handle to open the bottom discharge valve partially, allowing sludge to drain smoothly into the drum below.
✔ Once the drum is full, close the discharge valve and replace the container with an empty one
✔Ensure no debris or solid trash is trapped in the rubber seal groove as this will result in spillages
✔Repeat until pit is empty

6 MOVE THE THROTTLE TO SLOW WHEN FINISHING



✔ Move the throttle lever to SLOW.This reduces engine speed before shutdown.

7 SWITCH THE IGNITION OFF



✔ Turn the ignition switch to OFF. The engine will stop.

8 TURN THE FUEL VALVE OFF



✔ Turn the fuel valve lever to OFF. This prevents fuel leaks and flooding.

Operations

Safety	• Always wear PPE (gloves, gumboots, overalls,). • Never operate the pump indoors or in enclosed spaces. • Keep children and bystanders away from the work area. • Never refuel the pump while the engine is running or hot. • Avoid direct contact with sludge and wastewater. • Clean any spillages immediately and disinfect the area. • Wash hands thoroughly after completing the job.
Maintenance	• Clean the pump, hoses, and strainer after every job. • Check fuel and engine oil levels before use. • Inspect hoses, clamps, and connections for leaks or damage. • Clean the air filter regularly. • Replace worn or damaged parts promptly. • Store the pump in a clean, dry place when not in use
IMPORTANT TIPS	• The Pit Vaq works best with watery sludge. • It does not work well with thick sludge or large amounts of trash. • Always prime the pump with water before starting. • Never run the pump dry, as this can damage the pump. • If flow reduces, stop pumping and check for blockages or add water to dilute the sludge. • Leave the toilet and work area clean after the job. Clean and disinfect any spillages immediately.

Preventive Maintenance

Daily Checks

Check	Action
Check and top up engine oil	Use correct grade; never run dry
Check and top up engine fuel	Do not overfill; use recommended grade
Check belt condition and tension	Adjust or replace if worn or slack
Inspect all couplings and clamps	Tighten; replace worn O-rings
Clean suction filter	Remove debris; check mesh integrity
Flush hoses and pump casing after use	Prevents residual sludge drying and blocking
Inspect suction and discharge hoses for cracks, holes, or abrasion	Replace immediately if damage found

Preventive Maintenance

Weekly Checks

Check	Action
Lubricate all grease nipples and moving joints	Use manufacturer-recommended grease
Tighten all bolts and fittings on chassis & engine mount	Check after every 20 hours of operation
Clean or replace air filter element	Replace if heavily soiled or damaged
Inspect fuel filter (if fitted)	Replace if blocked or discoloured
Check wheel bearings (if wheeled unit)	No excessive play or noise
Inspect all hoses along full length	Look for UV degradation, internal cracking
Test all coupling seals under operation	Check for leaks or drips during use

Monthly Checks

Check	Action
Change engine oil	Per manufacturer interval; typically every 50–100 hours
Full mechanical inspection of pump and engine	All components; document findings
Inspect and test impeller (if accessible)	Check for wear, cracking, or imbalance
Replace hoses if showing significant wear	Do not operate with cracked or stiff hoses
Inspect pump seal / mechanical seal	Replace if dripping or showing wear
Clean and inspect spark plug (petrol engine)	Adjust gap or replace per spec
Drain and clean fuel tank if contamination suspected	Treat for water ingress
Review and update maintenance and job records	Ensure all logs are complete and signed

Troubleshooting Guide

Problem	Possible Cause	Recommended Solution
Engine will not start	No fuel; fuel valve closed; choke incorrect; low oil safety shut-off triggered	Check fuel, open valve, set choke to start; check oil level; retry start sequence
No vacuum or low vacuum pressure	Vacuum release valve left in OPEN position. Air leaks at hose connections or tank seal.	Turn release ball valve to CLOSED (horizontal) position Check rubber seals; tighten clamp connections and ensure lid sits flat.Close discharge valve; remove any debris stuck in the rubber seal groove
Weak or intermittent flow	Partial suction hose blockage; strainer clogged; suction hose not fully submerged; air entering system	Remove and clear blockage in strainer; check hose submersion; inspect all couplings
Reduced pump performance — lower flow rate than usual	Impeller wear; partial clog; engine running below full speed; worn pump seal	Check throttle is at full speed; inspect impeller; check seal condition
Excessive vibration during operation	Impeller damaged or unbalanced; loose engine mounting bolts; debris caught in impeller	Stop engine; check impeller for damage; tighten all mounting bolts
Vacuum pump overheating or noisy	Moisture/sludge drawn into vacuum pump casing. Insufficient oil	Stop engine immediately; drain moisture trap, clean pump vanes, and inspect internal float valve. Check pump lubrication