Practical Advances in Pit Latrine Emptying Technology

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Where we started (c. 2009)

Chain and Scoop

Screw Auger
Moving parts, sludge and trash are not a great combination!
Back to vacuum . . .
The Vacutug –
Developed by UN Habitat in 1995
500 litre vacuum tank, 6 kW engine, 5 km/hr travel speed
The Vacutug weighs 1 ton – not so easy to move around if travelling more than short distances.
The Vacutug cannot be used on steep or very uneven terrain
The components of a vacuum suction machine

1. Vacuum vessel
2. Vacuum pump
3. Motor/engine

These components do not need to be all mounted on one chassis.
The Mapet –
Developed by WASTE,
Dar es Salaam
early 1990s
Nanovac – mini vacuum pump based on the Mapet concept
Experimenting with vacuum vessel design
Portable 40 litre vacuum vessels

- Suck only design
- Suck and blow design
Portable 40 litre vacuum vessels

Sight glass to check sludge level
The first eVac - 2012
The eVac Mk 2 - 2014
The eVac Mk 3 - 2016
Anatomy of the eVac

15 m power cable with 3 pin plug
Exhaust port

Motor control box with on/off switch
Motor

Vacuum gauge

Motor

Oil reservoir and feed

Vane pump

Moisture trap

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But isn’t it too small to be effective?
Powered by a 2hp motor

The metric horsepower
1 hp = 735.5 watts

\[ \Delta t = 1 \text{s} \]
\[ \Delta h = 1 \text{ m} \]
\[ m = 75 \text{ kg} \]
Sizing a vacuum pump

- In vacuum pumping power demand increases as air flow increases
- Therefore a big vacuum tank and a long hose needs a powerful vacuum pump
- A short hose and a small pit side vacuum tank does not need such a powerful pump
- The suction force at the end of the vacuum hose is the same as long as the vacuum pressure is the same (vacuum pressure x area = suction force)
Use of the eVac in practice
Additions for Rwandan eVac
Operating the eVac
But, its not all as straightforward as it may seem
If it can break, it will break...
<table>
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<tr>
<th><strong>Pros</strong></th>
<th><strong>Cons</strong></th>
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<tr>
<td>− Can pump to 4-5 m depth</td>
<td>− Must continue to ‘fish’ for trash</td>
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<tr>
<td>− Easy to operate, clean, and maintain</td>
<td>− Will leave large solids behind</td>
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<tr>
<td>− Easy to unclog when blocked</td>
<td>− Needs a power source</td>
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<td>− Customer/operator not exposed to sludge</td>
<td>− High capital cost (~$4000+)</td>
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<td>− Can be locally manufactured</td>
<td>− Breaks easily without well trained workers</td>
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Will not revolutionise your business unless you already have a business case!
So – why use the eVac?

LEGITIMACY
The Box Mk1

Faecal Sludge Updates
Dickens, Emanuel Wsup Kis 2, Stella Wsup Ke...

Dickens

Hi team members, today we are working @ Nyalenda then tomorrow Manyatta.
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