The Sanitation Research Fund for Africa Project

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Key Strategic Area 3: Water and Waste Management

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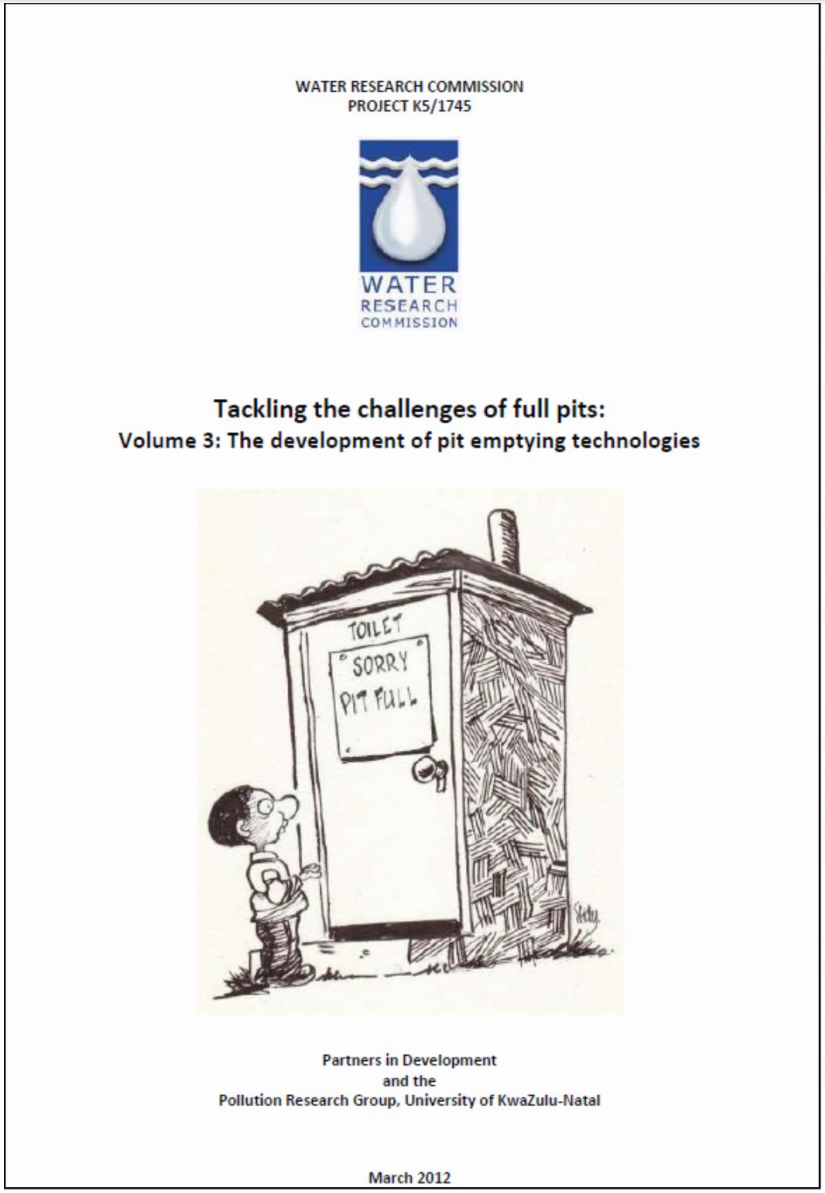
Faecal Sludge Management Challenge

- Service provision push resulted in proliferation of pit latrines
- South Africa – nearly 3 million VIP toilets installed since 1994
- Little attention given after installation
  - Pits eventually fill
  - Risks associated with emptying and disposal
- National "Status of Sanitation" report 2012
- Policy vacuum regarding faecal sludge management
- Not much evidence based research
- Problem not only in South Africa

Role of R&D

Research Report K5/1745 "Tackling the Challenges of Full Pit Latrines"

- Study area: Ethekwini Municipality
- Inheritance of many VIP toilets
- 30,000 VIPs nearly full
- Pits filling faster than design rate
- Research was required to better understand load, pit filling rates, the efficiency of additives, etc.
- Research partnership between municipality, donors, university & WRC
- Other studies: lightweight VIP structures, franchising O&M services, new pedestal designs, deep row entrenchment



WATER RESEARCH COMMISSION
PROJECT K5/1745

WATER RESEARCH COMMISSION

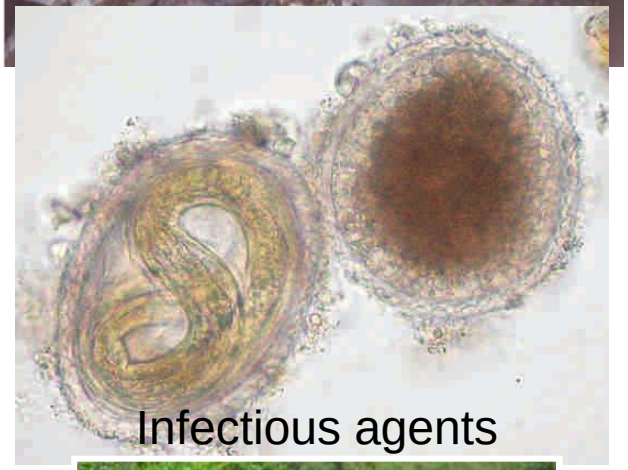
Tackling the challenges of full pits:
Volume 3: The development of pit emptying technologies

Partners in Development
and the
Pollution Research Group, University of KwaZulu-Natal

March 2012

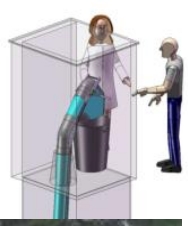
What we know…

- Characteristics
  - One pit ~ 1 megalitre of sewerage
  - High concentration of pollutants
- Emptying challenge
  - Trash
  - Tools lacking
  - Need further development
- Disposal challenge
  - Pits eventually fill
  - Risks associated with emptying and disposal
- Cost
  - ~ ZAR 3,000 per pit



PeTs

Hand Tools



bbler

Bangalore Screwer

Pit Screw Auger

Vacutug

The SRFA Project

- Lack of institutional/organisation capacity
- Joint fund by BMGF & WRC
- Project to run over 2.5 years (2013 to 2015)
- The +40 year old WRC research model to
- 12 projects
- Two focus areas:
  - Pit Characterisation
  - Developing Innovative Tools for Desludging and Beneficiation
- Capacity Building: Post-graduate students (PhDs, MSc) is compulsory

What we hope to achieve

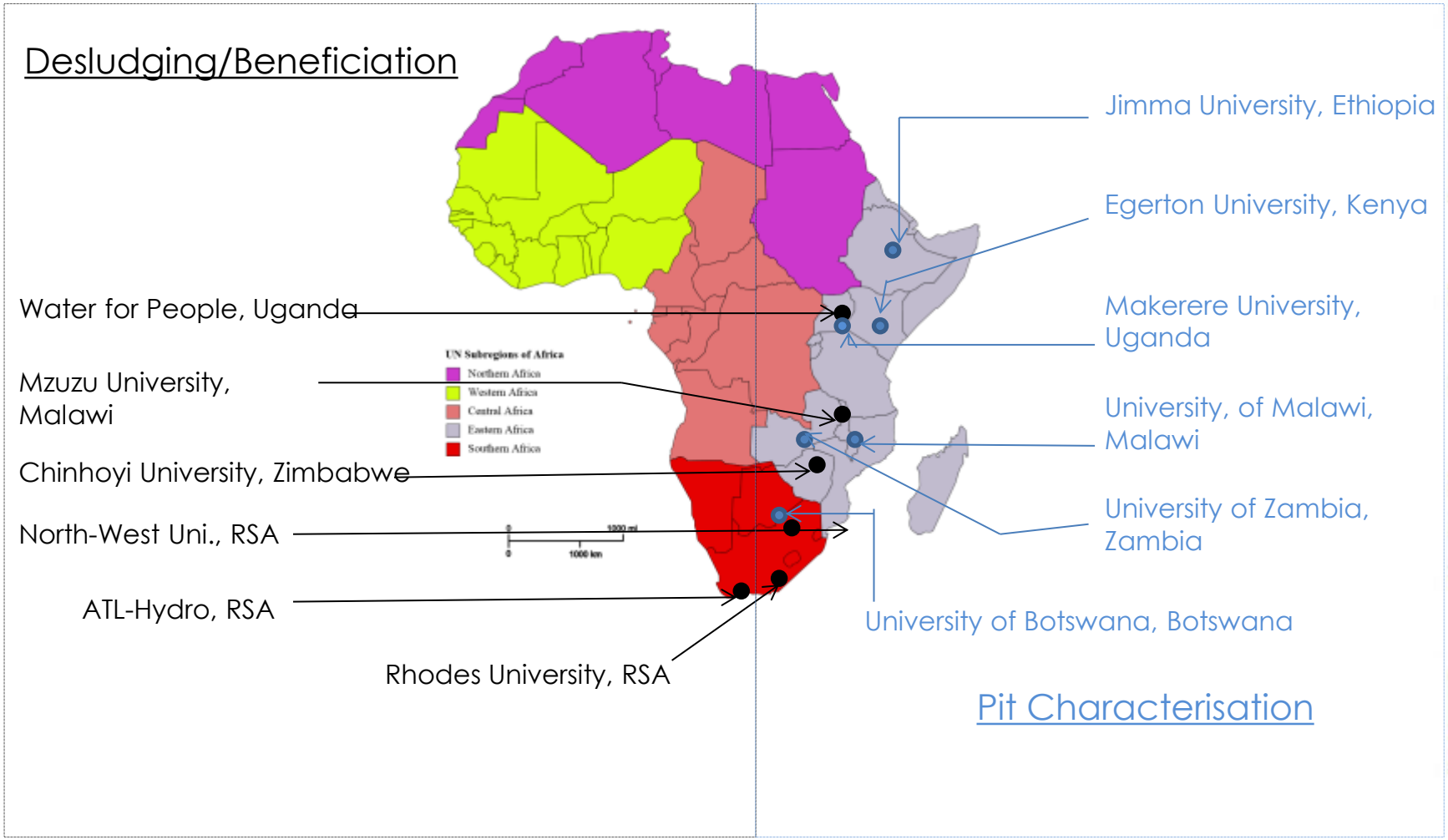
- **Increase FSM capacity in Africa**
  - Local solutions by local researchers
- **Guide policy**
- **Increased knowledge base**
  - Different behaviours, diets, etc. on sludge characteristics
  - Understand the processes occurring pit latrines
  - To design appropriate desludging tools
  - Papers, publications, etc
- **Desludging**
  - Cost-effective (fabrication, maintained, repaired)
  - Simplistic and easy to use
- **Beneficiation**
  - To reduce costs
  - To promote resource efficiency
  - To stimulate entrepreneurship





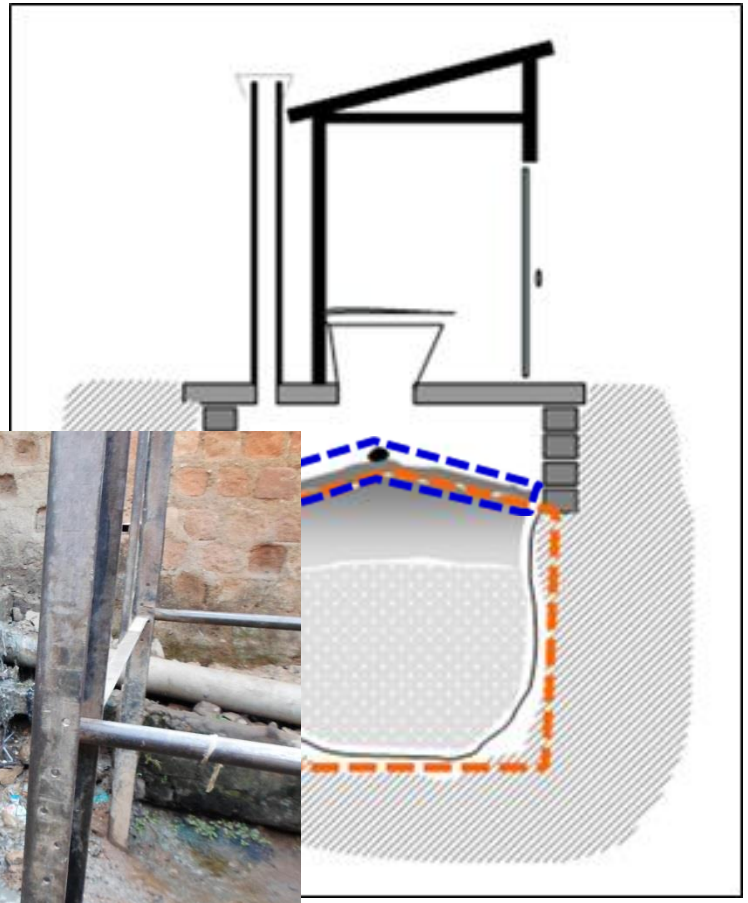
Research Teams

- Twelve research organisations / institutions



Pit Characterisation

- Processes/Degradation
  - Different climatic conditions, diets
  - Different layers
  - Pit age
  - Pit filling rates
- Mechanical properties
  - Shear determined
  - Different layers
- Health & Safety
  - Pathogen
  - Groundwa
  - During em
  - Beneficiati



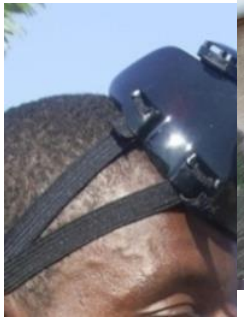


Figure 5: An overflowing pit latrine in one of the slum areas but it is still being used by residents

KLING THE CHALLENGES OF FULL PIT LATRINES
tion in VIPs and strategies for emptying full pits

Challenges

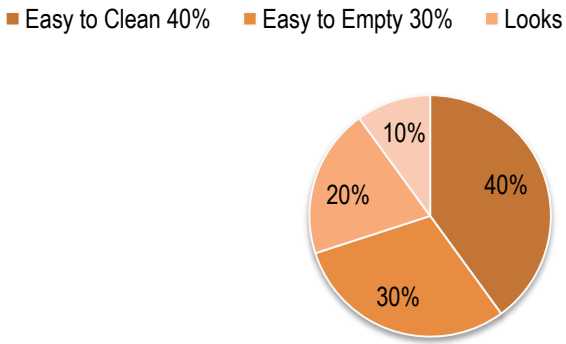
- Clear policy vacuum
- Definition of pit toilet, VIP
- Ownership issues eg Uganda
- Poor construction
- Additive or chlorine added to pits
- Lack of standardisation
- Common that sludge removed and transported to WWTP

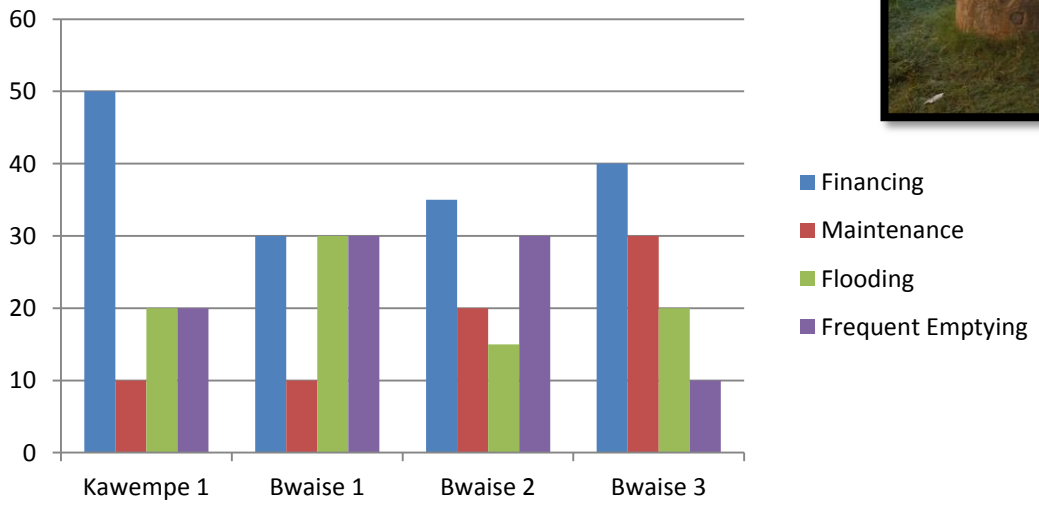
Innovations

Pour Flush - Kampala

P Trap name	Number of synthetic faeces to pass through pour flush system			
	Test 1	Test 2	Test 3	Average
PVC Pipe bends	3	2	3	3
4inch ceramic	5	3	4	4
3inch ceramic	5	5	5	5

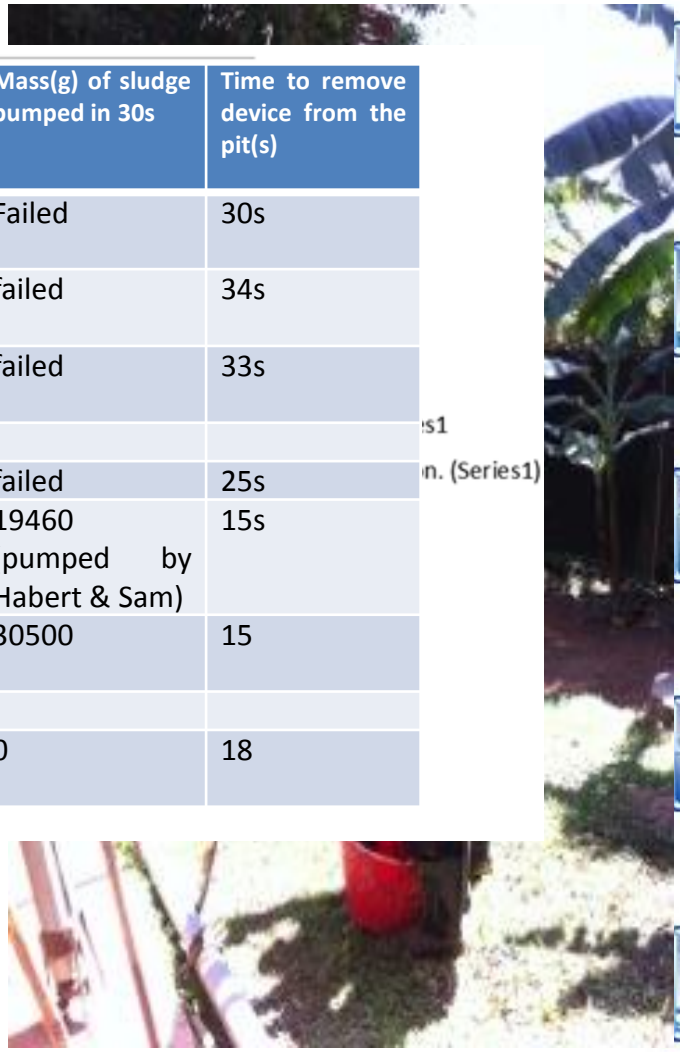
Reasons for Preference

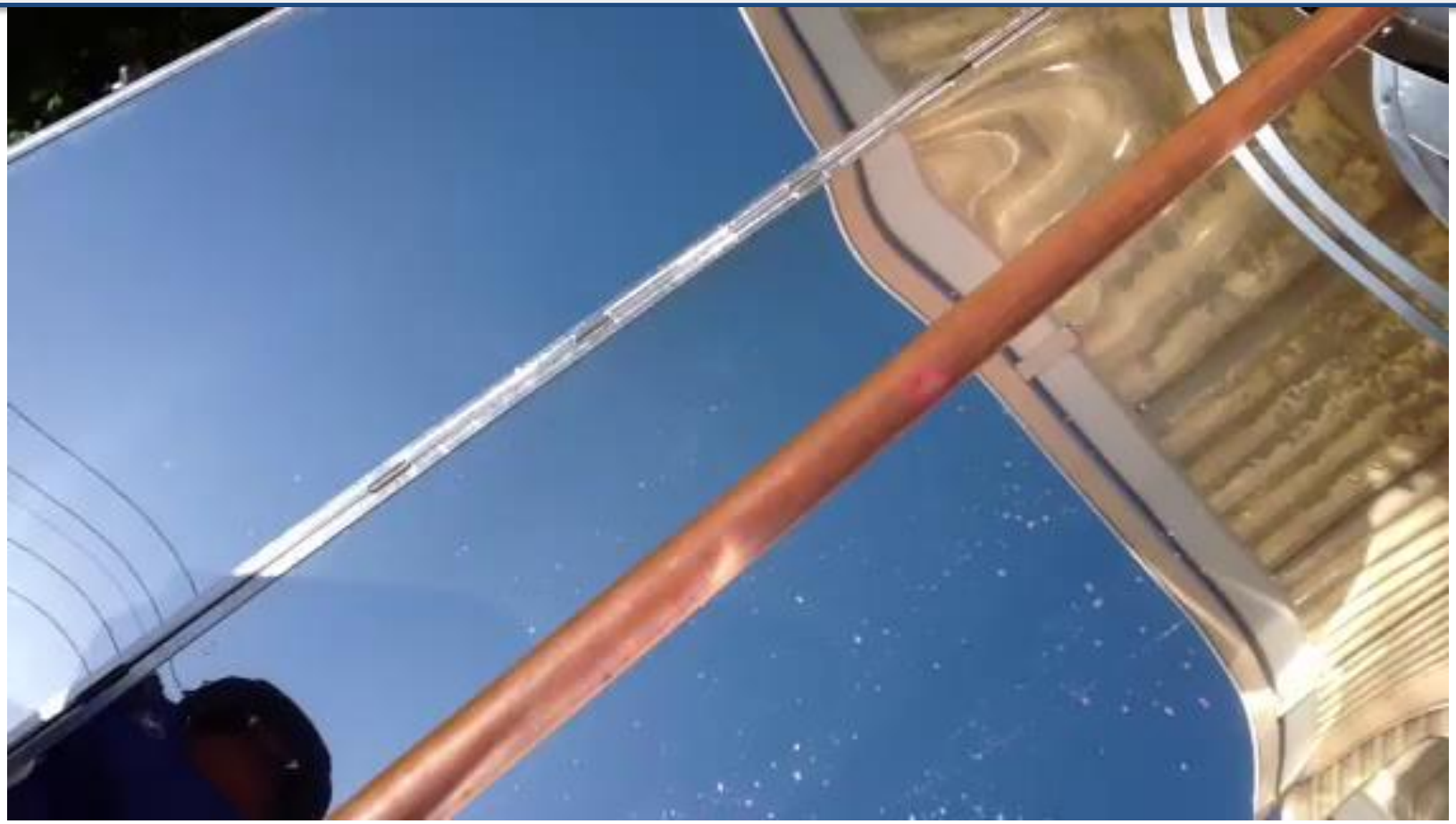




Evaluation of PeTs

Name of the pump	Operator	Time taken to prime /s	Time to insert device into the pit (s)	Mass(g) of sludge pumped in 30s	Time to remove device from the pit(s)
Gulper	Habert A (60 kg)	Failed after 125s trial	14	Failed	30s
Gulper	Samuel M (80 kg)	Failed after 180s trial	14	failed	34s
Gulper	Habert A & Samuel M	Failed after 240s trial	14	failed	33s
Rammer	Habert A (60 kg)	Failed	20	failed	25s
Rammer	Samuel M (80 kg)	214	20	19460 (pumped by Habert & Sam)	15s
Rammer	Habert A & Samuel M	22	20	30500	15
Nibbler	Samuel M (80 kg)	Could not prime	12	0	18

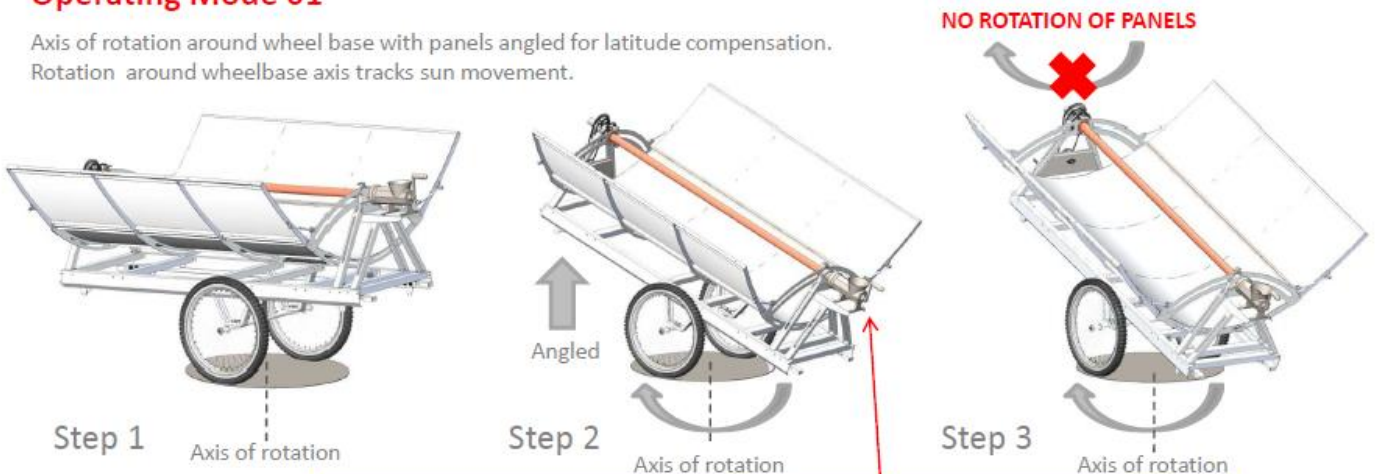




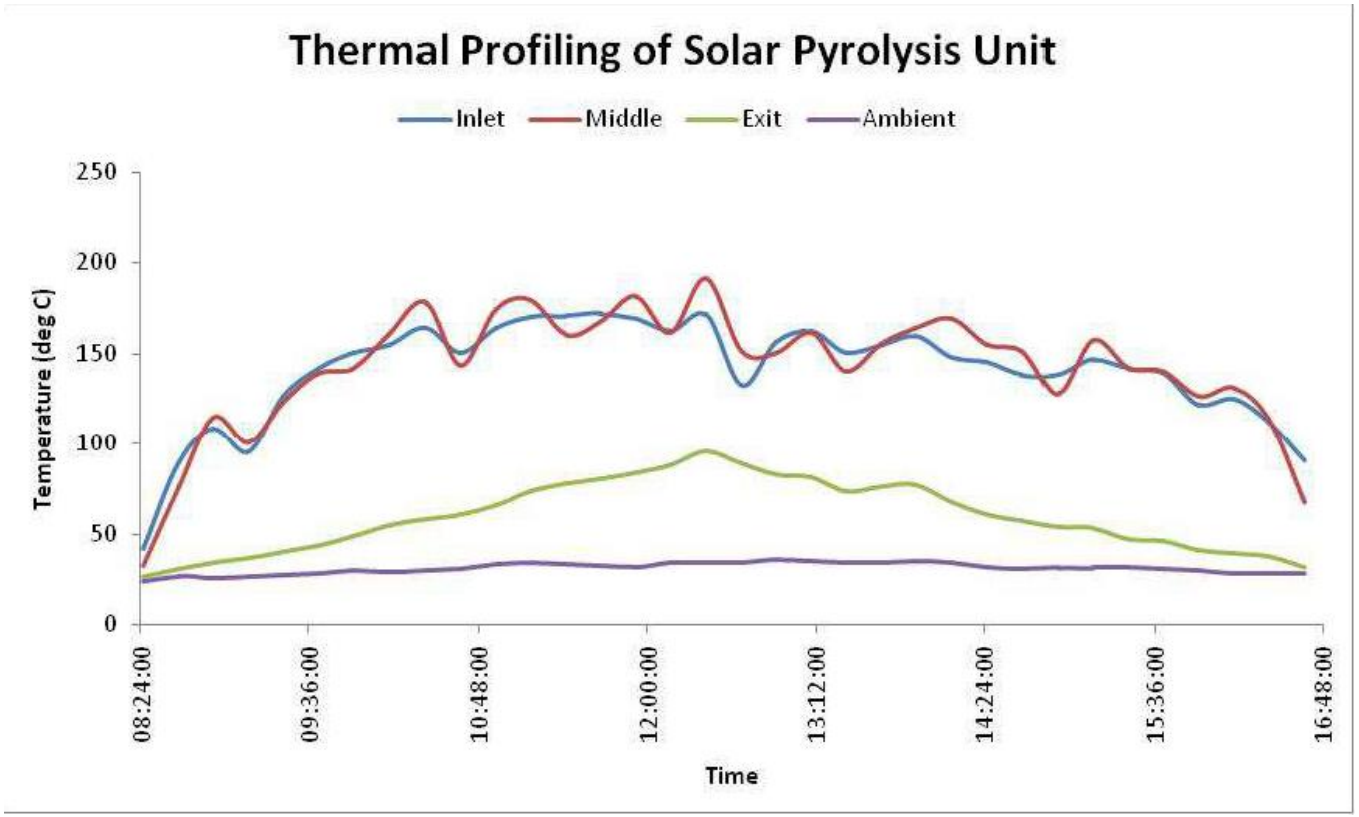
Pyrolysis

Operating Mode 01

Axis of rotation around wheel base with panels angled for latitude compensation.
Rotation around wheelbase axis tracks sun movement.



NOTE: Extruder is at low point of angled panels – sludge is extruded upwards NOT down


Thermal Profiling of Solar Pyrolysis Unit
Inlet
Middle
Exit
Ambient
Temperature (deg C)
250
200
150
100
50
0
08:24:00
09:36:00
10:48:00
12:00:00
13:12:00
14:24:00
15:36:00
16:48:00
Time

Acknowledgements

- The Bill & Melinda Gates Foundation
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