
Oliver Ive – Amanz’ abantu Services
P Kanise – Impilo Yabantu Services
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Background

• Started piloting social franchising of water services in Butterworth in 2009 under the brand of Impilo Yabantu Services.
• Impilo Yabantu means “Hygiene for People” in isi-Xhosa
Social franchising is: “the application of commercial franchising concepts to achieve socially beneficial ends” (Montagu 2002)
The Department of Water and Sanitation (DWS), Department of Environmental Affairs (DEA), Department of Health (DoH) and the Department of Agriculture (DoA) all have a regulatory role to play in the beneficial use of sludge.

Primarily three legislative instruments, namely Environmental Authorisation (NEMA), Air Emission Licence (NEM: AQA), and Waste Management Licence (NEM: Waste Act)
- National Environmental Management: Waste Management Act
- Hazardous Substances Act (Act No 15 of 1973)

- National Environmental Management Act: EIA Regulations
- National Environmental Management Act: Air Quality Act, 2004 (Act No. 39 Of 2004): Declaration Of A Small -Scale Char And Small -Scale Charcoal Plants As Controlled Emitters And Establishment Of Emission Standards

- NEM:AQ Listed Activities
- National Policy On Thermal Treatment Of General And Hazardous Waste
- Fertilizer, Farm Feed, Agricultural Remedies and Stock Remedies Act
- Hazardous Substances Act (Act No 15 of 1973)
- National Health Act (Act 61 of 2003)
Options Considered

1: La De Pa Sludge Processing and Marketing
2: Wastewater Treatment Works Disposal
3: Lime Treatment and On-site Disposal
4: Biomass Portable Biogenic Refinery
5: Low Tech Biochar Production (Selected)
Sludge Disposal
LaDePa

Detritus Separators
Variable screw speed

Exhaust Heat from Genset

Medium-wave Infrared Radiators
Variable Intensity

Existing PSS Patent
Pasteurised sludge

Air Flow

Inlet

Outlet

Porous Steel Belt approx 16 m between pulleys.
Normal time under MWIR emitters 8 minutes
Variable speed

Rotation
Biomass Portable Biogenic Refinery

Biomass Portable Biogenic Refinery Processes
Why Low-tech carbonising

• Labour intensive
• Simple operating
• Easy maintenance for remote locations
• Low capital cost
• Low external energy requirement
Why Thermal Treatment?

- Destruction of pathogenic contamination including helminth eggs etc.
- Transformation of Faecal Sludge from a hazardous waste to a safe and beneficial product for use in the communities where it is sourced.
Faecal Sludge to “Biochar”.

- Biochar is the char product that is created through the heating of organic biomass in a low or no-oxygen environment through a process called pyrolysis, and is then applied to agricultural or forest soils

(Department of Environmental Affairs 2015).
Why Biochar?

- Biochar supports agricultural sustainability, food security and livelihoods for resource-poor farmers in Africa and beyond
- Use of biochar is not only for soil enrichment but also for the contribution as a carbon sink and its value in carbon sequestration (Leach et al. 2012).
Benefits of Biochar

Thermal Process: Slow pyrolysis

Products:
- Biochar
- Char or Charcoal
- By-products

Benefits:
- Increase Crop Yield
  - Increased water retention
  - Increased nutrient retention
  - Increased organic carbon content
- Soil Amendment
  - Increased pH in acidic soils
  - Increased nutrient retention
- GHG Mitigation
  - High phosphorus application
  - Accelerated decomposition rate
- Carbon Sequestration
  - Modified soil biota

Faecal sludge beneficiation options for consideration by Social Franchises in the East London areas (Wilkenson, 2019)
Chemistry and Physical Properties

- NPK capturing – particularly Phospherous and Nitrogen found in faecal biochar.
- Large surface area of char physical characteristic is conducive due to a “holding” of nutrient retention in the soil.
- High pH useful for soil conditioning reduce lime addition.
Process

Feedstock → Drying Process → Kiln (Pyrolysis) → Product

- Gas
- Char
- Bio-oil
Process

Faecal Sludge

Solar Drying

Kiln Drying

Carbonisation (Pyrolysis)

Gas

Char / Biochar

Tars / Bio Oil

Ash
Batch Carbonising Kiln / Retort
Single Batch Tests

- Initial tests used batch unlined steel kilns and 200ltr steel drums to carbonise the sludge
- Once proven, the carbonising continued for a period under management of franchisees
Next Steps

• Improvements in the conservation of the energy available from the pyrolysis of sludge together with the downstream use of heat in the flue gasses can provide additional benefit for drying

• Refining the kiln design to incorporate refractory bricks or and insulation for heat retention would allow for the reduction of wood fuel stock.

• Further refinements includes the addition of steel ducting and pressure controls required to transfer the heat from the pyrolysing kilns to be used in the drying kilns or special developed drying chambers.
Gas flows
Way forward

- Prove process efficiency and effectiveness
- Field test product range – soil amendment
- Deregister processed faecal sludge
- Verify Economic and Agronomic data
- Add sludge drying stages
- Product testing and production quality assurance
Conclusion

● This is a work in progress and we are very encouraged by results so far.
● Thermal treatment of faecal sludge treatment and beneficiation offers many advantages when coupled with the social franchising model,
Thank You

For more information:

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