PASTEURISATION AND DRYING OF FAECAL SLUDGE BY USE OF MEDIUM WAVE INFRARED (MIR) RADIATION

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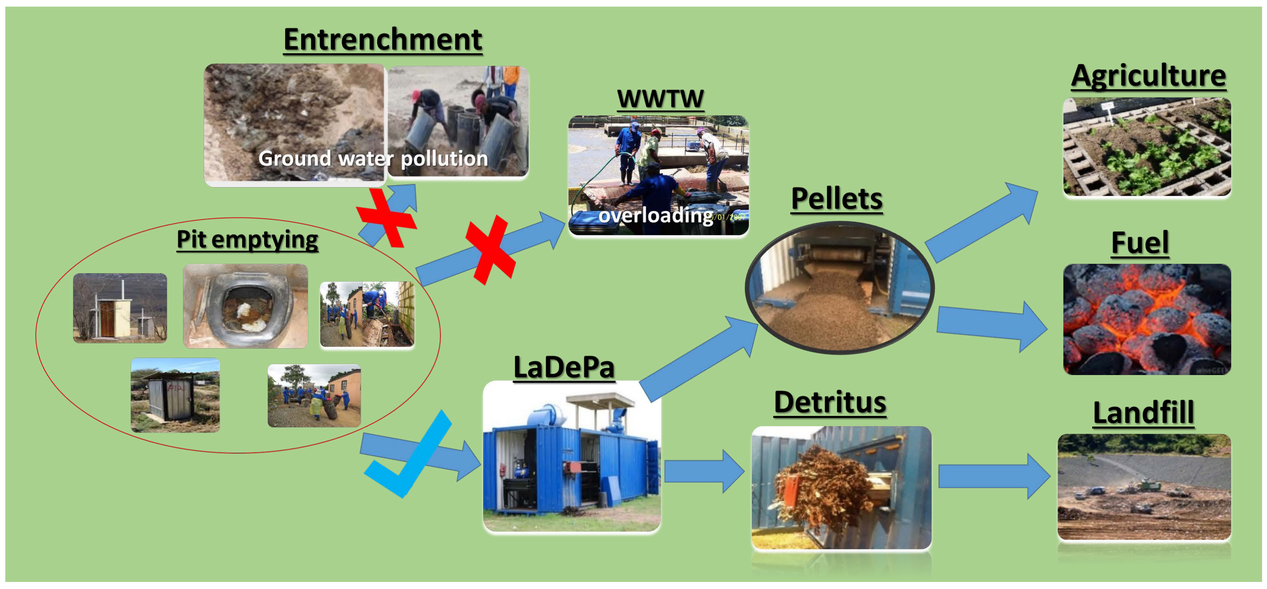
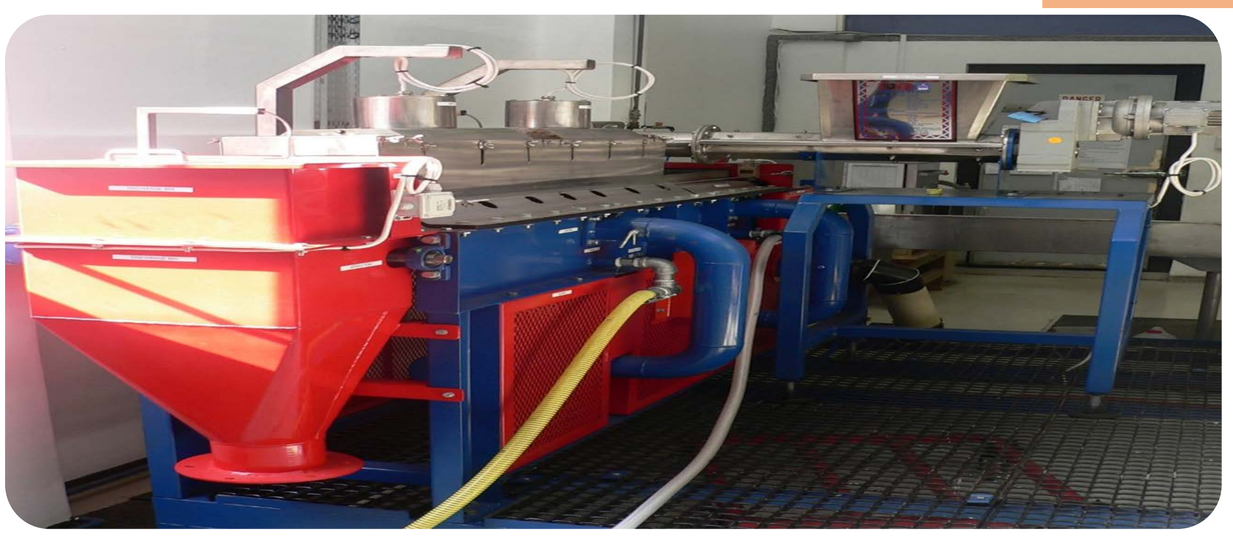
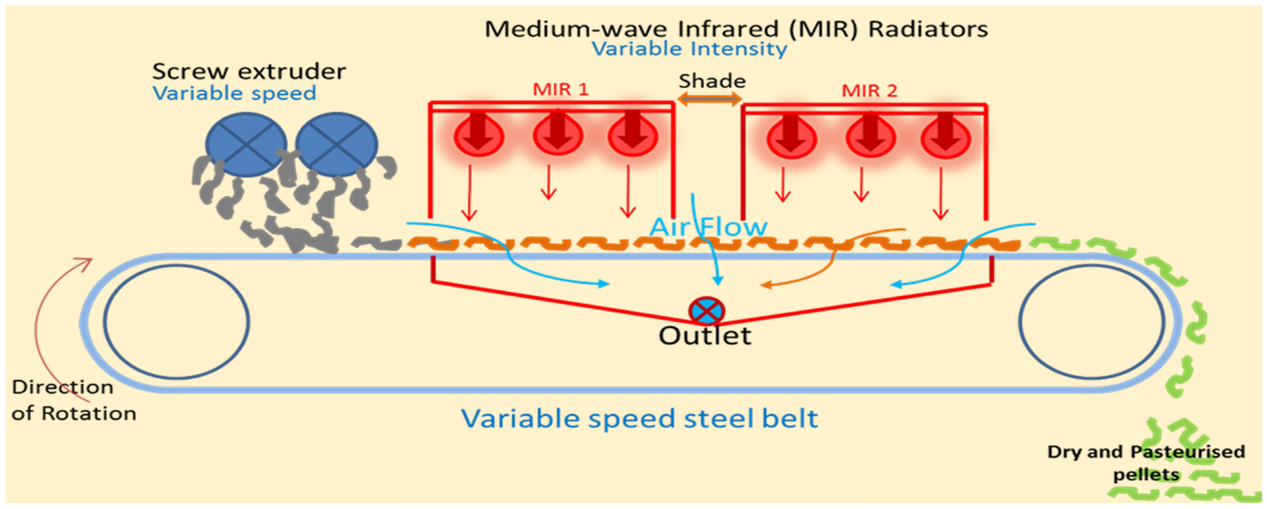
INTRODUCTION

- eThekwini Water and Sanitation (EWS) are committed to providing adequate sanitation in urban, peri-urban and rural areas of the municipality
- Sanitation facilities that require emptying
  - ➢160 000 VIP latrines within municipality
  - ➢ Emptying of pits in a 5-year cycle
- Need to dispose of sludge in an environmentally safe way
  - ➢ Disposal of sludge in wastewater treatment works (WWTW) not viable due to overloading
  - ➢ Deep row entrenchment can cause ground water pollution and is a waste of nutrients
- Latrine Dehydration and Pasteurisation (LaDePa) full-scale pelletiser developed by EWS and Particle Separation Systems (PSS)
- Laboratory-scale LaDePa developed to study operation
  - ➢ Phenomenological process
  - ➢ Nutrient content and thermal properties important for agriculture and fuel application



EXPERIMENTAL FACILITY





EXPERIMENTAL METHODOLOGY

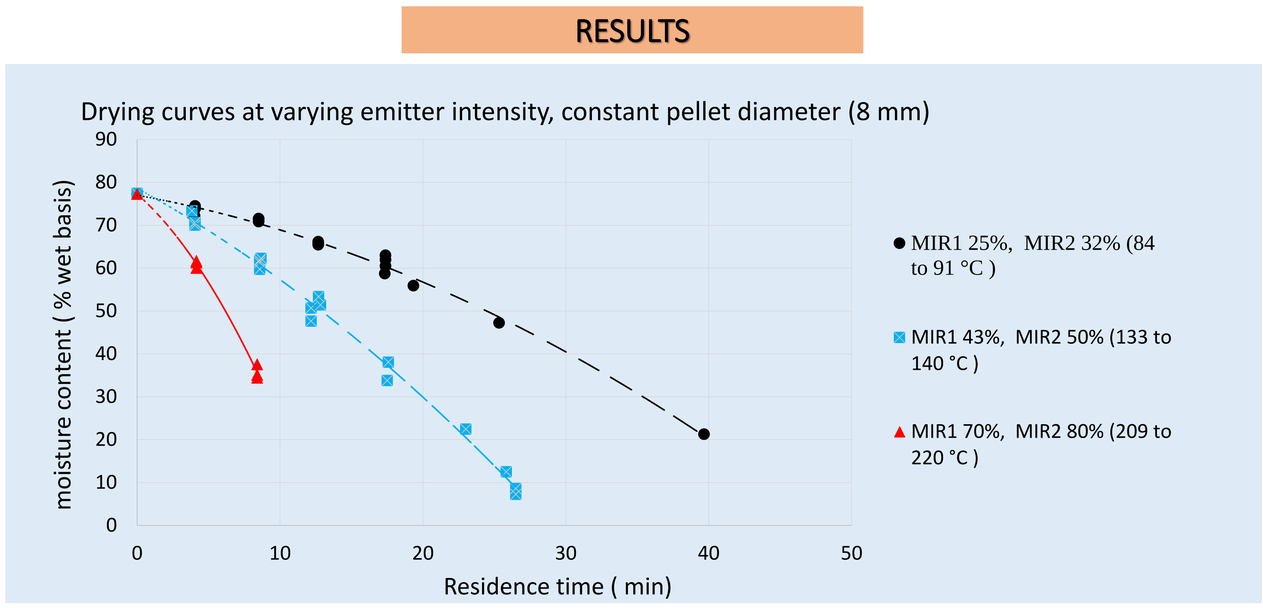
1) Study on the phenomenological process

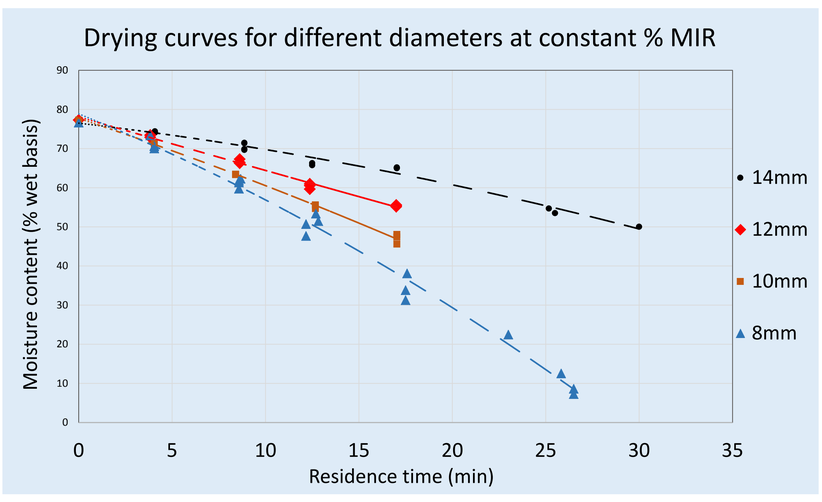
- ➢ The effect of MIR intensity from emitters on drying (changing dial reading between 0 to 100%)
- ➢ The effect of pellet diameter (8mm, 10mm, 12mm and 14mm) on drying

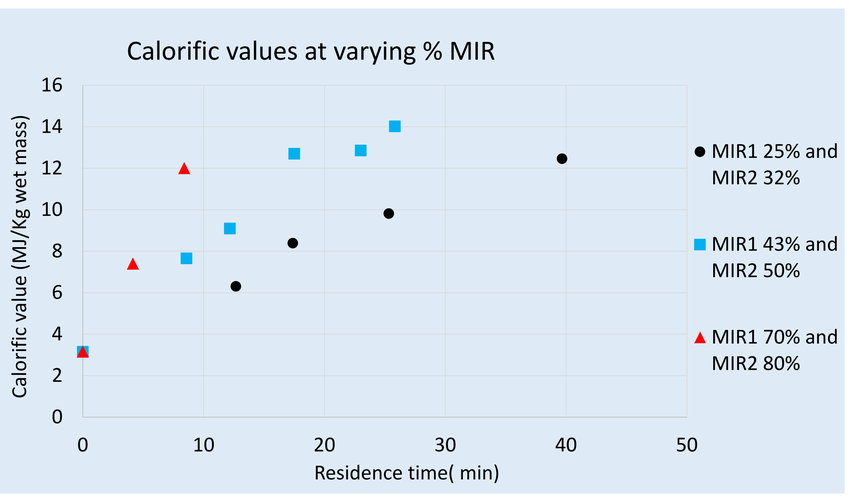
2) Characteristics of resultant pellets

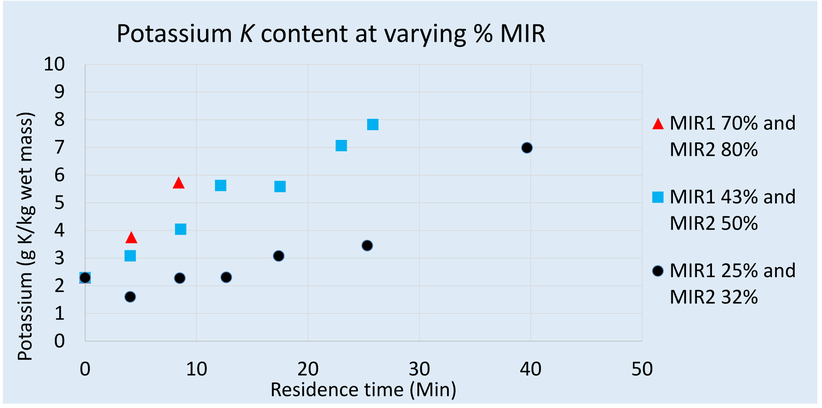
- ➢ Potassium (K) and phosphorous (P) content determined in the MP-AES (Microwave Plasma – Atomic Emission Spectroscope)
- ➢ Calorific value determined in a bomb calorimeter
- ➢ Moisture content (m.c.) determined by oven drying at 105°C for 24hrs

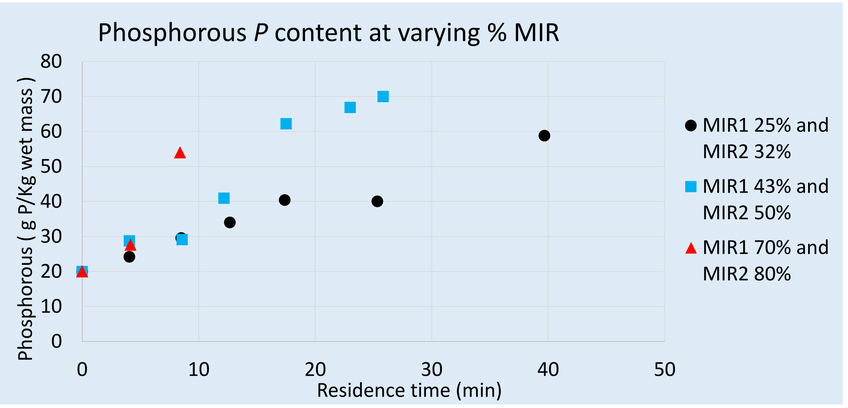
RESULTS











DISCUSSION

- An increase in emitter intensity increases drying temperature and reduces the drying time
  - ➢ At the lowest intensity, drying is relatively slow
  - ➢ At the highest intensity, drying is the fastest, but the chance of charring and burning is considerably increased
  - ➢ Best drying occurs at medium intensity, in an acceptable time to achieve very low m.c. without charring
- Drying time increases with pellet diameter
  - ➢ 30 min to reduce m.c. by 27% for 14 mm pellets
  - ➢ 13 min to reduce m.c. by 27% for 8mm pellets
- Calorific value of pellets increases with decrease in m.c.
  - ➢ Similar to calorific value of wood (16MJ/Kg) at 16% m.c.
  - ➢ About a third of the calorific value of coal (40MJ/Kg) and diesel (46MJ/kg)
- K and P content increases with reduction in moisture content
- Amount of P in pellets (70g/Kg maximum) is very low compared to inorganic fertiliser such as DAP (460g/Kg)

CONCLUSION

- Drying at higher MIR intensities reduces drying time but can cause charring of pellets when temperature exceeds 209°C
- The use of pellets would be beneficial as a soil conditioner rather than a fertiliser due to the lower levels of nutrients
- Dried pellets could be used as a fuel source for energy generation

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