# Deployable Digesting Toilet

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# Public Health Crisis

World Health Organization Fact Sheet.

- Diarrheal Diseases are the leading causes of death in developing countries.
  - Commonly caused by water contaminated by human waste
- Risk for disease and death due to dehydration and diarrhea in emergency/refugee camps are exacerbated by a lack of sanitation.

# Deployable Sanitation Unit

- Problems:
  - Expenisve
  - Hard to build
  - **WATER!**

# Composting and Digesting Toilets

- Already a very common intervention by NGOs and aid groups in the developing world
  - Gendarme Sanitation Solutions (GSS)
  - SOIL (Haiti)
    - Working with Oxfam to set up emergency composting toilets
- Provide multiple benefits.
  - They divert human waste away from the water supply
  - Provides fertilizer through compost or effluent
  - Can provide energy for cooking and heating through digestion

# Composting Toilet in Haiti (SOIL)

# Composting Toilet in Haiti (SOIL)

# Digesting Toilets in Botswana (GSS)

# Digesting Toilet in Rural China

# Tailored for Deployment

- Shortfalls of Current Technology
  - Permanent Structures
  - Take a long time to build
  - Can be very costly
- Goal of My Project
  - Deployable
    - Can be compact for transport
  - Takes little time to put together
    - Multiple units built in one day
  - Does not require specialty materials and is inexpensive
  - Should be strong and durable
  - Require very few tools

# Frame Design

- Frame design was successful
- Common Materials used
  - Pressure Treated Pine
  - Bolts
  - PVC
- Build time was less than 20 minutes without a single tool
- Takes up small space when taken apart
  - Could fit 10 into a shipping container

# Time 00:00

# 4 minutes

# 7 minutes

# 12 minutes

# 15 minutes

# 17 minutes

18 Minutes

# Digester

- Digester design was developed with the help of Ryan Graunke, Camillo Cornejo, and Flora Vinson
- 30 gallon drum that is top loaded directly from toilet.
- The effluent spout surrounds the mixing mechanism, minimizing the amount of holes that could eventually develop leaks
- Needs further testing

# Urine Diversion

- Has many useful applications
- Can slow the digestion process if it is not diluted
  - John Hunter Hardy (Botswana)
  - Biogas Handbook by David House
- Currently testing the potential for various dilutions to produce Biogas.

# Conclusion

- Digester needs to be tested and the design could be improved
  - Limited by equipment
- Frame was very successful and would currently work as a composting toilet
- Both composting and digestion would be beneficial tools for mitigating the public health problems that plague aid camps.
  - Florida USAR

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