Evaluation of a composting toilet prototype for people in slum area in Indonesia

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Kiara Condong, Bundong, Republic of Indonesia
• Domestic coverage of WC: 87%
• Direct discharge: 53%, Septic tank: 47%

People is satisfied in the toilet
The reality is:
- Most of excreta goes to the channel
- Installed septic tanks don’t work.

Government and local government has less power to improve sanitation
How do we encourage the people to use our composting toilet?

Acceptance of the toilet from the people

Value chain sanitation system

- Reproduce of valuable things from wastes of non value
- All stakeholders must have benefit.
Prototype of composting toilet

- Feces-urine-water separation system
- Long toilet bowl
- Compact composting reactor with ventilation
- No heater for water controlling
- Automatic system for mixing and closing shutter
- Design based on human engineering

Size: 50cm (w) x 60cm (d) x 60cm (h)
Setting reactor
Objectives

- To find points and direction for modification
- To find current situation of Indonesian people around toilet
- To evaluate of feeling on new toilet

<<Items>>

- Change of operation
  - Operation of lever
  - Cleaning every time
- Impressions on new toilet by Indonesian people
  - Feeling on toilet
  - Materials on toilet body
  - Feeling on seat
  - Feeling on change of reactor
Hearing survey

1. Situations
   - Tools
   - Detergents
   - Cleaning spots

2. Change on operation
   - Lever
   - Every time cleaning

3. Feeling on new toilet
   - Toilet body
   - Materials of body
   - Seat
   - Changing reactor

Survey
- LIPI (Indonesia)
- Mosque in Sapporo (Japan)

Structure of survey
1. Personal information
2. Questions on practice in current toilet (1)
3. Questions on new toilet (2 and 3)
Results

- **LIPI**
  - Respondents: 8 (staffs in LIPI)
  - Female: 25%, male: 75%
  - Toilet in house: squatting type

- **Mosque in Sapporo**
  - Respondents: 12 (Living near there)
  - Female: 33.3%, male 66.7%
  - Toilet in their country:
    - Squatting type 83.3%
    - Sitting type 41.7%

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**Age distribution**

- LIPI
  - 20-29: 50%
  - 30-39: 41.7%
  - 40-49: 8.3%

- Mosque in Sapporo
  - 20-29: 50%
  - 30-39: 12.5%
  - 40-49: 12.5%
  - 60+: 25%
Results

Situation in current toilet

A) Cleaning tools
• Cleaning toilet bowl ⇒ Flat blush

B) Detergents
• Contains HCl solution, alcohol
  ⇒ metal materials will be corroded

C) Cleaning points

- Floor
- Toilet bowl
- Foot mark
- Hole in toilet bowl

✓ Smooth shape for viewable parts
✓ Possibility of complicated shape for behind
Check points on dirtiness

1. Bad odor, 2. Slime on the floor or wall, 3. Mould on the floor or wall, 4. Black colored spots, 5. Wet floor, 6. Remain of feces or urine

Forced ventilation can control the problems of odor, mould, slime and wet floor.

We need to ask clean toilet bowl every time to avoid remain of feces and urine.
Cleaning toilet

- 5% Every time
- 5% Bother, but clean every time
- 20% Some time
- 20% Don’t clean
- 50% No answer

Cleaning frequency

Difficult for cleaning every time
⇒ Change design of toilet bowl
Actions in the toilet

Actions in the current toilet

- Entering
- (Clean toilet bowl)
- Sit on seat
- Defecation
- Wash body*1
- Flush *2
- (Clean toilet)
- Leaving

Actions in the new toilet

- Entering
- Flush toilet bowl
- Sit on seat
- Defecation
- Lever operation for flushing
- Wash body
- Flush toilet
- Leaving

Change of material from ceramic to plastic (FRP) for low cost
Contamination of solid-liquid separator

Order of *1 and *2 depends on people.
Change in actions

New operation

No problem
Impression on new toilet

Good and acceptable ⇒ 90%

BUT

✓ Unsatisfaction on size: 70%
  • Too big to install in house
  • Too big seat

✓ Bad color of cover
  → Yellow: Dirty and garbage

Some wanted to squat on seat.
Impressions on seat

Feeling of seat

- Comfortable (40%)
- Big (45%)
- Small (15%)

• Some feels falling down, although the width is same as current

Improve by adjusting height of step
Conclusion

◆ Summary

1. **Situations**
   - Corrosive detergents
   - No problem on materials
   - Cleaning visible parts

2. **Change in operation**
   - Some feels heavy for lever operation.
   - Half don’t want to clean every time.

3. **Impressions on new toilet**
   - Big size
   - Bad image on yellow color
   - Feeling to fall down
   - Small space for washing body
   - No touch to compost
   - No unplug electric cables

◆ Suggestions for next model

- To consider the materials for corrosion issue
- To redesign the visible parts for easier cleaning
- To consider small body
- To change image color
- To adjust height of seat and step
- To induce sitting deep
- To modify connector
Acknowledgements

This study was supported by the research institute for humanity and nature (RIHN), Japan.

We thank to staffs in the Indonesian institute of science (LIPI) for supporting our survey and to be as respondents.

We also thank to Deposit Toilet Project to develop the prototype of the composting toilet.
Thank you for kind attention.