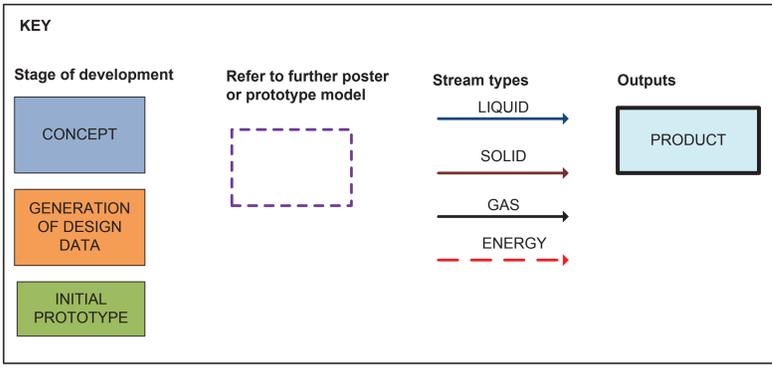
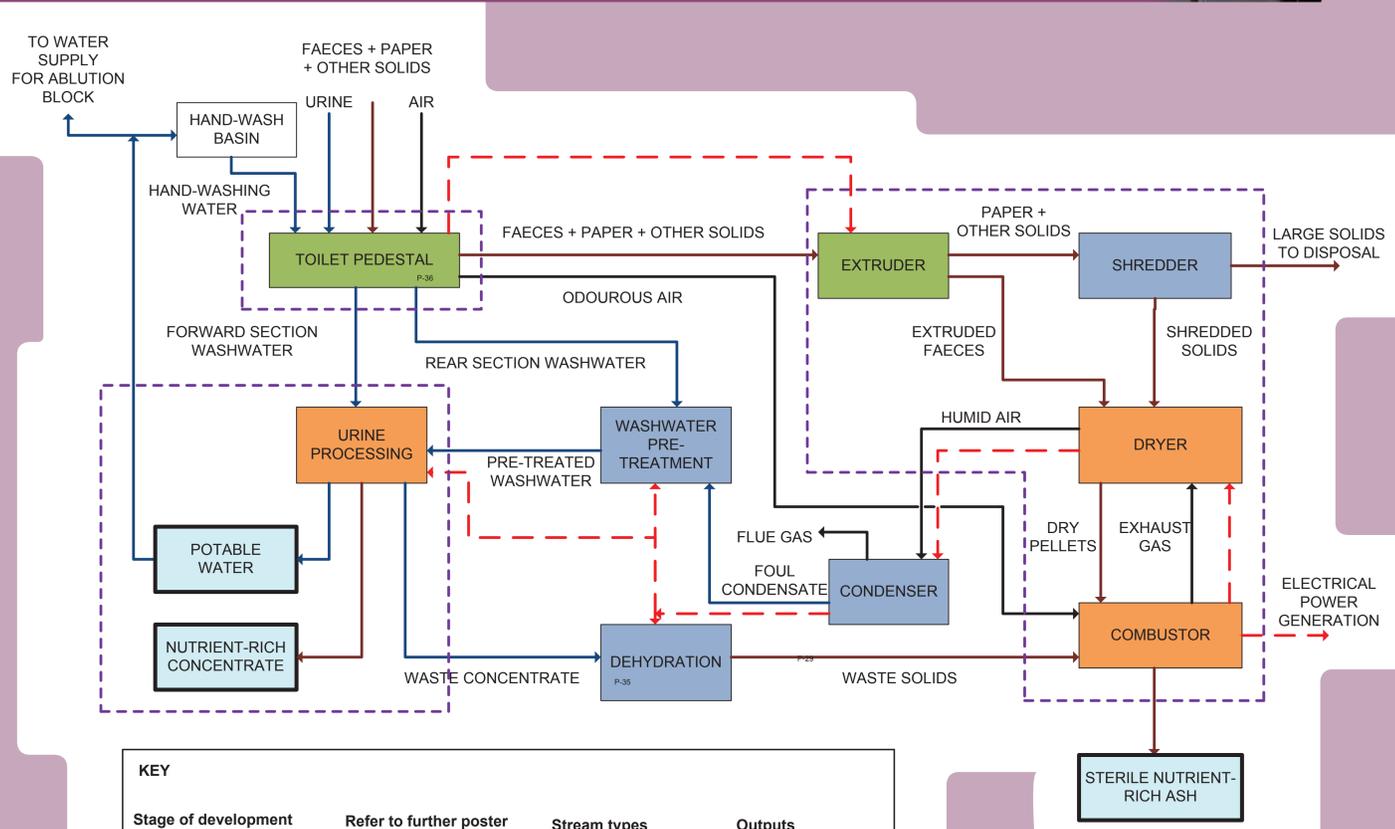
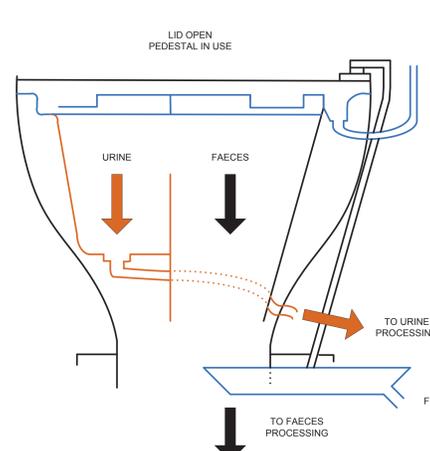


TOILET SYSTEM OVERVIEW



SOURCE SEPARATION

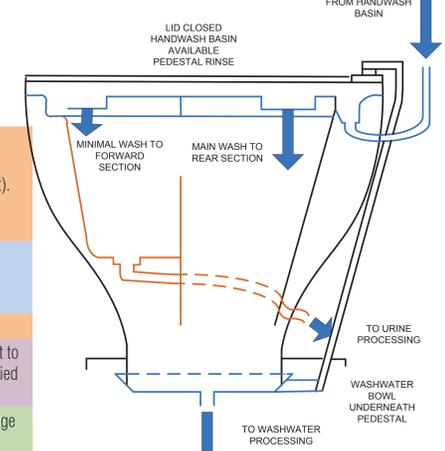
- ### DESIGN PRINCIPLES
- A Maintain components that constitute useful resources (nutrients and energy sources) in as concentrated form as possible and segregated from unlike components – reduces downstream energy requirements for resource-recovery.
 - B Combine streams for processing when concentrations of the streams are as similar as possible.
 - C Confine undesired components (e.g. pathogenic material and components with potential to disrupt the treatment process) to the lowest number of streams possible
 - D Pedestal and toilet unit processes designed to fail safe if any influent stream mis-directed to wrong section of pedestal or if non-excreta components are disposed of via the toilet



Urine

Up to 88% of excreted nitrogen and 67% of phosphorus are excreted from the body in the urine stream (proportions are dependent on diet). Potassium and sulphate ions are also present (Mihelcic et al 2011).

- Low pathogen content
- Relatively low fouling potential for membrane treatment processes
- Small washwater volume to minimise dilution
- Waste concentrate from urine processing is sent to further dehydration and then combusted with dried faeces.
- Urine processing system incorporates a first stage screening step to remove faecal contamination



Washwater

- Maintain faeces as dry as possible to reduce energy requirements for drying
- Maintain urine as concentrated as possible
- Minimise faecal contamination of urine (reduced pathogen content and potential for membrane fouling)
- Divert soap and detergent products that could interfere with membrane treatment processes for urine
- Washwater pre-treated before passing to appropriate stage of membrane system for urine treatment.
- Waste concentrate from washwater pre-treatment is sent to further dehydration and then combusted with dried faeces.
- Movement of washwater bowl under pedestal is interlocked with closing of toilet seat and will be interlocked with uncovering of the handwash basin – prevents accidental addition of water to the faeces stream. Manual hook mechanism for bowl will be provided to allow user to clean pedestal and still divert washwater.
- Waste concentrate from washwater pre-treatment is sent to further dehydration and then combusted with dried faeces.

Faeces & solids

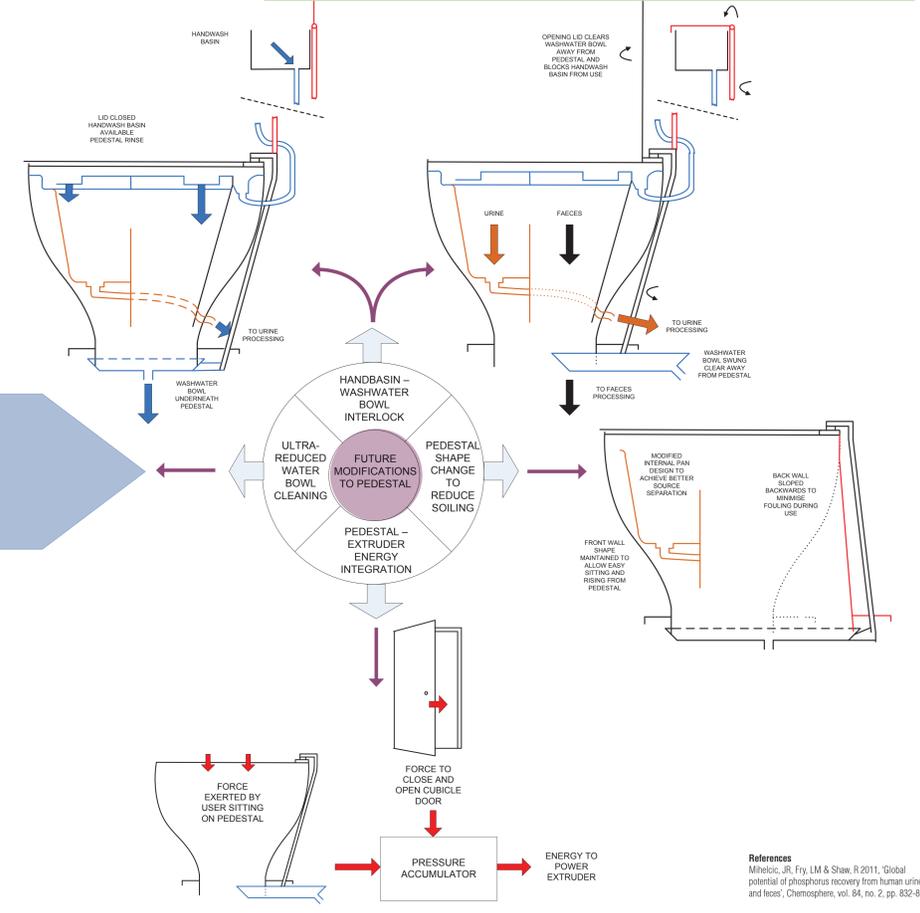
In low-income communities assumption that faeces has a relatively low in water content does not hold – therefore cannot rely on liquid-solid separation processes (e.g. sieves) to segregate urine from faeces streams.

Segregation of the energy source (faeces) stream

- Confine majority of pathogenic material to one stream
- Receive waste solid streams from urine and washwater processing for combustion with dried faeces

For the community ablation block context assumption must be made that a variety of non-faecal solids will enter the toilet apart from toilet paper (e.g. newspaper, plastics, clothing) – these are separated at the extruder stage of the process.

PEDESTAL DEVELOPMENT



Compressed air & very low water flush
Non stick coatings for pedestal bowl

References
Mihelcic, J.R., Fry, J.M. & Shaw, R. 2011, 'Global potential of phosphorus recovery from human urine and feces', Chemosphere, vol. 84, no. 2, pp. 832-839.