

## Sanergy, Inc - Final Report

### November 30, 2018

#### Introduction

Thanks to the support of Oxfam, we have made great progress and gathered valuable learning to improve the design of our Fresh Fit in-home toilet and its service delivery model, with attention to both the user and collector experience. We worked with a local designer who has experience working with Sanergy on sanitation solutions and the version 3 of our design is now finalized.

We currently have a network of 91 active Fresh Fit toilets. In total since the launch of this new product in 2016, we have launched 154 Fresh Fit toilets with a 83% renewal rate on the first and second months of operation, which then increases to 90% renewal rate after the first three months, proving that our customers value our product and service delivery model.

#### Project Implementation

The goal of the project was to design version 3 of the Fresh Fit toilet with the following objectives:

- Ease the manufacturing, assembling and collection processes, taking into account stakeholders' feedback and lessons learnt of the Version 2 (V2) product, especially in terms of conveniency for storage, collection and cleaning of containers.
- Reduce production costs (manufacturing and assembling) to have an in-home toilet affordable to produce and distribute at scale.
- Be adaptable to other contexts for low-income communities and in humanitarian contexts.

During the project, we conducted a market survey research to understand different customer and non-customer preferences for the Fresh Fit as a sanitation option and gathered the following findings:

- 69% of our current customers (who used a non-Fresh Life Toilet before getting their Fresh Fit toilet) like the personalization of the Fresh Fit services at their convenience (use, collection, customer support, maintenance, etc) as opposed to having a shared utility. 100% of the customers regard the Fresh Fit as affordable and safe to use within their house. We also noted that most of our users are composed of more children than adults.
- Non-customers ranked lack of space as the biggest constraint and viewed the Fresh Fit as a luxury product. Most non-customers had more adults as compared to children in their households.

This research helped us conclude that there is an important market for a small, container-based sanitation solution: households (especially those with children) that do not have space for residential FLT's.

#### ***Fresh Fit redesign***

Thanks to Oxfam's support, we worked with a local company called Implements Sustainable Solutions to make modifications to Fresh Fit V2.

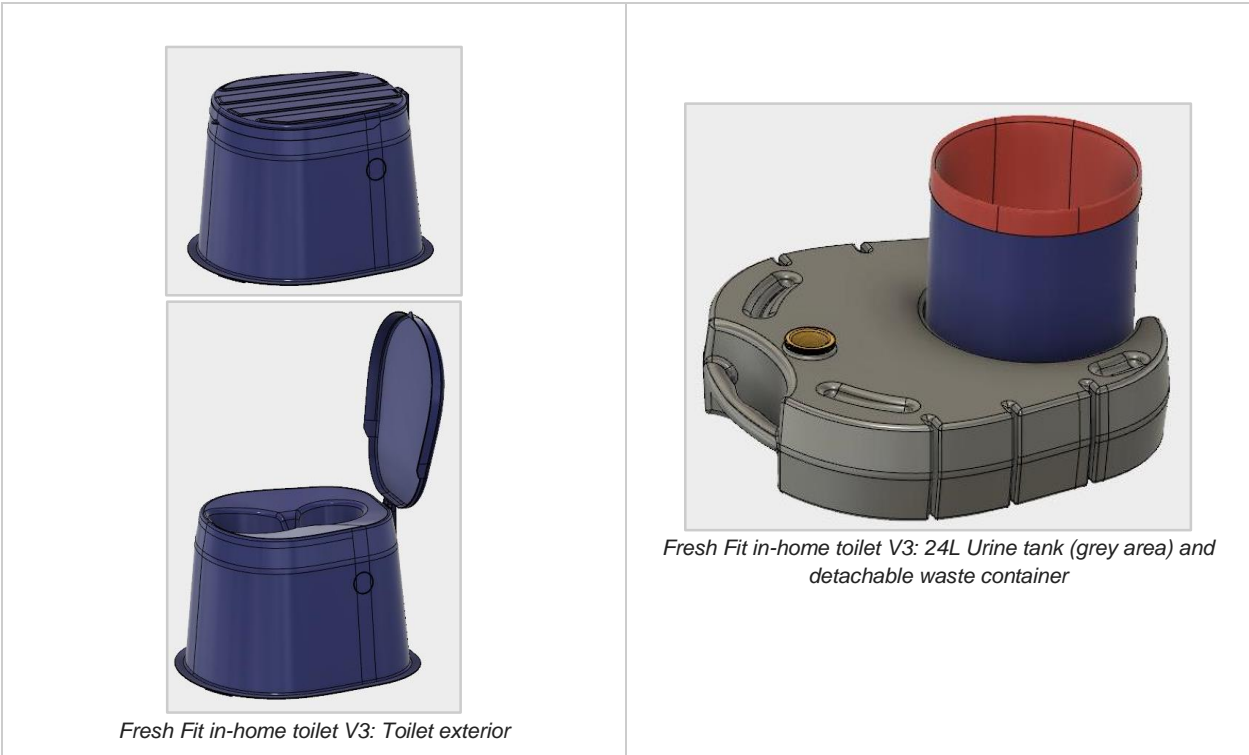
We used the learning from our previous project supported by Oxfam and feedback from our customers, collectors and customer service team to implement the following modifications to the design:

- We modified the urine tank drain for easier emptying that ensures safe and complete emptying of the urine tank. The urine tanks of the V2 design were difficult to clean thoroughly and had to be soaked for several hours, which increased cost of collection and washing of the model.
- We reduced the urine funnel front rib for better toilet body nesting and enlarged the urine tank handle for better transportation during collections. The urine tank now holds up to 24 liters as compared to 16 liters with the current V2 design.

- We modified the feces cylinder and urine tank recess to the standard 6 inch pipe size.
- We added three extruded points at the bottom of the toilet body and added a chamfer toilet lid for easier cleaning.

The Version 3 Fresh Fit body is now partially stackable. Collectors can now stack up to 10 urine tanks with the V3 as compared to 2 with V2 of the Fresh Fit toilet. This stackable design allows for easier collection when integrated with Fresh Life Toilet waste collections. The lid and hinge are two separate pieces but not removable once attached. They are attached during assembly so that it makes usage easier for households and it ensures lids don't get lost.

See below images of the first V3 design done for field trials:



### 3-D printing of Fresh Fit V3 toilet and field trial in Mukuru slum, Nairobi

We 3-D printed a prototype for the Fresh Fit V3 and we tested it in two different pilot areas in Mukuru slum, taking into account user and collector feedback. We tested the prototype with two types of service delivery models in July 2018:

- Kwa Ruben sub-area: We first organized session with 4 current customers to present the prototype and get their feedback and we then had 2 current customers testing the prototype for one week each with twice a week collections and customers empty the toilets themselves (customer removes the recyclable bag and urine tank hands it to the collector);
- Kayaba suba-area: One customer tested the new design for one week with daily collections and the toilet is emptied by the collectors (collectors empty the Fresh Fit at the doorstep).



*Fresh Fit in-home toilet V3: Exterior - 3D printed*



*Fresh Fit in-home toilet V3: Field trial*

We gathered valuable findings from these field trials:

#### Observation:

- Most customers keep their V2 fresh fit toilet in tight spaces and on uneven ground. The wide base of the V3 prototype toilet and the way that it rests on the rim of the toilet body makes it unsuitable for tight spaces and uneven ground.

#### Modifications:

- We modified the design such that the toilet base sits on the tank and made the tank strong enough to provide the necessary support on uneven ground.
- We narrowed the bottom of the toilet so it can fit better in tight spaces, similar dimensions to V2.

#### Observation:

- Toilets are handled roughly by customers, and the 3-D printed hinge was the first to break.

#### Modifications:

- We made the hinge design more rugged and over-engineered. In the final product, we plan to have an injection-molded plastic hinge, however it may not be strong enough.

Observation:

- Toilets are handled roughly by the waste collection team, and the 3-D printed ¾ inch nipple on the urine tank broke off. The emptiers currently use the vent on the V2 version to completely empty the urine tank.

Modifications:

- We moved the emptying nipple to the top of the tank, where all contents of the tank can still drain, but where the nipple will be more protected. We made the nipple stronger to withstand abuse.

Observation:

- One customer kept the V3 toilet on slanted ground with the back of the toilet lower than the front. The urine started leaking out of the threaded holes for the hinge bolts when the tank got full.

Modifications:

- We added a simple visual indicator to see urine level.

Observation:

- V3 vent and fill cap were broken and/or did not seal. The V3 tanks were being transported with urine with vent caps missing, and plastic bags were used to seal the fill cap and prevent it from leaking.

Modifications:

- We made more robust threads, caps and seals to handle field conditions.

Regarding manufacturing, we settled on injection molding for body and lid parts as it is more feasible to produce in Kenya and the quality of the end-product will be better and more durable with less chances of getting rejects on production compared to rotomolding.

**CAD drawing of final design**

The final CAD design is completed and is available upon request. With the feedback and observations, we got from the trials, we made modifications to the V3 design:



*Fresh Fit in-home toilet V3: Final design*



*Fresh Fit in-home toilet V3: Back view*



Fresh Fit in-home toilet V3: Final design



Fresh Fit in-home toilet V3: Stacked urine tanks

We also finalized the cost analysis of production and our pricing estimation is as follows:

Estimated cost breakdown for mold production:

Items	Estimated Cost
Body (injection molding)	\$30,000
Lid (injection molding)	\$10,000
Tank (rotomolding)	\$30,000
<b>Mold - TOTAL</b>	<b>\$70,000</b>

Body and lid molds can be produced in Kenya. The tank mold can easily be produced in China but shipping and customs costs need to be added. We are also working with manufacturers to see if this mold could be produced in Kenya.

Estimated cost breakdown for the production of 1,200 Fresh Fits:

Items	Estimated Cost
Body	\$8
Lid	\$5.6
Tank (incl. 2 tanks)	\$48
Other parts	\$18
<b>Production - TOTAL</b>	<b>\$79</b>

## Conclusion

We have valued Oxfam’s partnership over the last 5 years and thanks to your support, we have made great progress over the last 8 months to iterate on the Fresh Fit design and create a final design to produce our in-home toilet at scale.