

The Sanitation Technology Platform (STeP) partnered with FSG to conduct a study on Market Insights for the Reinvented Toilet (RT) in India. This body of work was designed to identify customer segments, value propositions, and technology insights for deploying the new technology categories of single- and multi-unit Reinvented Toilets into urban residential settings in India. The six-month study provided a robust and unique package of resources and insight to guide both technical and business decisions for a product category that is still emerging. The study helped answer both technical and market questions including the following: Who are my customers? How big are the segments and, by extension, how big is the market? What benefits may drive RT adoption among the segments? What features should the technology have and, equally as important, not have?

The Market Insights for the Reinvented Toilet, India study has been designed to help partners begin to answer these questions and many others at a category level to enable their own technical and market efforts, support investment and strategic decision-making, and inform partnerships. For the purpose of the study, the Multi-Unit Reinvented Toilet (MURT) was defined as a larger scale system that performs on-site, complete treatment of fecal sludge for 10–100 individuals. The findings for the MURT and single-unit RT are presented separately.

| Age of construction | | New construction | | Existing construction | |
|---------------------------------------|-------------------------------------|------------------|--------------------------|-----------------------|--------------------------|
| Usage type | | Residential | Commercial/Institutional | Residential | Commercial/Institutional |
| Primary price/ULB land categorization | Average hours of electricity supply | | | | |
| Premium & Luxury | | 1 | 5 | N/A | 8 |
| Mid-segment | Low electricity (≤ 80% hours) | 2 | | 6 | |
| | High electricity (> 80% hours) | 3 | | | |
| Affordable | | 4 | | 7 | |

| Core Processing Box: MURT | | |
|---------------------------|--------------------------|---|
| Inputs | | Range of options |
| | Electricity | 0–50 kWh/day |
| | Water for initial charge | 0–700 L |
| | Urine and feces | 10–100 ppl |
| | Footprint | 1 m ³ to 2.5 m x 6.5 m |
| | Additives/consumables | 0–12 purchases/year |
| | Maintenance | Monthly to annually |
| | Third-party servicing | Monthly to annually |
| Outputs | | Range of options |
| | Electricity | 0–10 kWh/day |
| | Biogas | 0–70 kWh |
| | Ash | 1–4/year |
| | Non-potable water | 60–600 L/day |
| | Radiant heat | None usable for other than energy and mass balance of unit process—No usable heat outside process |
| | Odor | None to a chemical smell |
| | Noise | 0 to < 65 dB time weighted average |
| | Fire flame | None to contained and exhausted |

STUDY REACH

- 4 cities
- 30+ urban localities
- 245 customer interviews
- 109 institutional customers
- 59 value chain actors
- 230+ person-days of field research

Segment 1

- Vertical residential projects that are categorized as Premium and Luxury¹
- The builder, architect, and specialists make decisions about the septage management solution that is installed for the building. Because they are mandated by law and because their customers expect a solution to be installed, they are actively looking to purchase a septage management system.
- Some projects in this segment are positioned or certified as “green”, and they therefore value complete treatment of fecal sludge and use of the by-products.
- Builders in this segment install aspirational, customer-approved amenities and are highly responsive to feedback on amenities and design from past customers, as word-of-mouth endorsements drive future sales.



Segment 2

Vertical residential projects that are categorized as mid-segment,¹ and are in areas that receive continuous electricity supply $\leq 80\%$ of the time

- The builder and architect make decisions about the septage management solution that is installed for the building. Because they are mandated by law and because their customers expect a solution to be installed, they are actively looking to purchase a septage management system.
- Some builders indicate a propensity to install aspirational amenities, particularly more visible amenities, as they are highly reputation-conscious, and word-of-mouth draws customers.
- The builders value safety and reliability in amenities, as these also affect their reputation and thereby future sales.
- Given the context, a solution that would enable a reduction in electricity-related expenditures is highly valued.



Segment 3

Vertical residential projects that are categorized as mid-segment¹ and are in areas that receive continuous electricity supply $> 80\%$ of the time

- The builder and architect make decisions about the septage management solution that is installed for the building. Because they are mandated by law and because their customers expect a solution to be installed, they are actively looking to purchase a septage management system.
- Some builders indicate a propensity to install aspirational amenities, particularly more visible amenities, as they are highly reputation-conscious, and word-of-mouth draws customers.
- The builders value safety and reliability in amenities, as these also affect their reputation and thereby future sales.



Segment 4

Vertical residential projects that are categorized as affordable¹

- The builder and architect make decisions about the septage management solution that is installed for the building. Because they are mandated by law and because their customers expect a solution to be installed, they are actively looking to purchase a septage management system.
- The builders are highly cost-conscious and have low willingness to install amenities that reduce margins, which means that installation of common amenities is primarily driven by regulatory compliance.
- The builders are not interested in long-term benefits or savings from low OPEX or use of by-products as they do not accrue to them, but are realized by the owners/tenants.



Segment 5

New commercial projects/buildings

- The builder and architect or builder and contractor make decisions about the septage management solution that is installed for the building. Because they are mandated by law to provide a solution, they are actively looking to purchase a septage management system.
- Given the use of the system in a commercial building, septage management systems typically have lower processing capacity and primarily process urine.
- The buildings are used by the general public, which makes maintenance difficult and unprofitable; therefore, owners desire minimum investment and innovation in their septage management system.



Segment 6

Vertical residential buildings that have been handed over to HOA, in localities in mid-category bands

- Homeowners' Associations (HOA) make decisions about the septage management solution for the building. HOAs require residents' consensus to move forward and raise funds to make repairs or install new amenities.
- Residents upgrade over time to add amenities not provided by the builder, which in a few cases may be infrastructural amenities. Existing infrastructural amenities are typically replaced or retrofitted in case of dysfunction or failure.
- HOAs value by-products that result in reduction of common expenses such as electricity as well as a system that offers reliability, safety, and no disturbance, as queries and grievances come to them.



Segment 7

Vertical residential buildings that have been handed over to HOA, in localities in low-category bands

- HOAs make decisions about the septage management solution for the building. Repairs and maintenance for common amenities are often not undertaken because of insufficient funds.
- Existing infrastructural amenities are typically only replaced or retrofitted in case of dysfunction or failure; residents rarely upgrade over time to add amenities not provided by the builder.
- HOAs value by-products that result in reduction of common expenses, as well as a system that is highly affordable, robust, and low-maintenance, particularly one that can be self-maintained and repaired by residents or on-site staff.



Segment 8







Commercial buildings that have been handed over to the final owner/ manager

- Buildings are either owner-managed or builder-managed, creating a single decision-maker regarding the septage management system.
- Existing infrastructural amenities are typically only replaced or retrofitted in case of dysfunction or failure; owners rarely upgrade over time to add large infrastructural amenities not provided by the builder.
- Owners value by-products that result in benefits or cost-savings, even those that may accrue over the long term.
- Owners value a system that is highly affordable, robust, and low-maintenance as usage is heavy.



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| PARAMETER | CUSTOMER INSIGHTS FOR TECHNOLOGY | TECHNOLOGY IMPLICATIONS |
|--|--|---|
| Processing Unit  | <ul style="list-style-type: none"> Layouts and available space vary significantly by project location and building design. Some builders expressed a desire for a system that can be placed underground. Customers prefer a simple installation process to minimize risks, particularly if installation is to be done by local technicians. Customers prefer unassembled units to minimize damage in shipment, and ease transport through relatively narrow spaces to the back or side offset.. Operating hours for the device are perceived to be related to the cost, and hence are built into choices. | <ul style="list-style-type: none"> Builders desire designs that enable flexible placement depending on building layout and space available on the ground floor, underground placement, flexible shape to accommodate for differences in building offsets, and unassembled delivery and easy installation. HOAs desire designs that enable retrofitting into a pre-constructed excavation, flexible placement depending on building layout and space available on the ground floor, preassembled delivery, and easy installation. Installation is completed by the unit's supplier. Resource-efficient operations minimize on-going costs. |
| Maintenance  | <ul style="list-style-type: none"> Builders want a system that is low-tech or requires low-skill maintenance in order to keep down costs. If the device is maintained by the building workforce, the use of screwdrivers and gloves are acceptable; however, in general maintenance activity, choice is determined by perceived hazard of dealing with fecal matter by-product and the complexity of the task. Builders see maintenance frequency as a proxy for robustness. The presence or absence of a full-time building workforce drives acceptability of duration and maintenance frequency ranges. Acceptable maintenance cost was driven by who was responsible for the activity with a willingness to pay higher amounts for third-party servicing. Except segment 4, builders have low concern for operating expenses as they will hand over responsibility to the HOA. | <ul style="list-style-type: none"> The simple maintenance process does not require technical expertise to execute minimal actions from the residents or part-time building workforce. The maintenance process is designed to avoid exposure to, and contact with, fecal waste. Clear maintenances instructions printed on the device can be self-taught. Unit should be able to handle a few days of delay in maintenance. The technology includes a simple reminder mechanism (e.g., indicator light) to remind the building workforce or residents that it is time for unit maintenance. |
| Noise  | <ul style="list-style-type: none"> Noise levels equivalent to or more than that of portable gen-sets are not acceptable. If noise is unavoidable, residents prefer discontinuous, low noise generation during the daytime only. | <ul style="list-style-type: none"> If noise levels are greater than a gen-set, the design allows for minimum operation time. Consider using silencers, similar to those used on gen-sets, to reduce noise. |
| Radiant Heat  | <ul style="list-style-type: none"> Radiant heat is acceptable for short periods of times and preferable at night so as minimize discomfort to residents. An open flame is not acceptable, but a concealed visible flame was an indication that the system was working. | <ul style="list-style-type: none"> A ventilation system minimizes heat accumulation. (builders) Flexible operations allow the unit to run at intervals. An indicator light shows the device is operational. The technology contains a concealed fire flame |
| Water Production and Disposal  | <ul style="list-style-type: none"> Treated water is perceived to be useful, particularly for landscaping purposes where gardens exist. Drains and soak pits are considered appropriate disposal choices. | <ul style="list-style-type: none"> The flexible design enables a direct connection to drains or a soak pit, including retrofitting into the existing drainage infrastructure. Automated disposal does not require any additional manual effort from the building workforce or residents. Continuous outflow of water minimizes the risk of saturating disposal channel. |
| Ash  | <ul style="list-style-type: none"> Customers do not want a removal process that involves significant effort, as they believe that this would result in higher costs. Association of ash with fecal sludge means that builders want to minimize contact of ash with workforce and environment. Customers prefer clearance of ash in small manageable quantities and with regular frequency in order to avoid the significant effort that would be required to carry large volumes of ash over time.. | <ul style="list-style-type: none"> Design ash clearance mechanism minimizes spillage and contact, which could include extraction in a closed container or a re-usable container that can be sealed and used for disposal. Design a small storage space for ash accumulation that does not add significant size to the unit. Consider the compression of ash produced in situ. |