



STeP

Sanitation Technology
Platform

BUSINESS MODEL ASSESSMENT OF SEWAGE TREATMENT PLANTS

Secondary and Primary Data Capture, India

APRIL 2016

The Sanitation Technology Platform

Please Note: This report is a good faith effort by RTI International to accurately represent information available via secondary and primary sources at the time of the information capture. Visit the Resource Center at <http://stepsforsanitation.org/> for this and other STeP resources.



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Stakeholder Landscape

For Partners, STeP has explored common business models associated with Sewage Treatment Plants.

The Sanitation and Technology Platform (STeP) worked with Quicksand and an independent consult to conduct primary and secondary research to identify and analysis common business models that are used by sewage treatment plant (STP) and wastewater treatment system vendors in India. STeP's objective was to understand what models exist and how these models fit within the value chain.

Additionally, we have sought to understand the prevalent channels to market and relevant stakeholders to determine the best paths to market for new STP systems.

This report serves as an overview of the types of companies and market channels in this space and is not an exhaustive list. We consider it a living document to be modified overtime.

This report may also be useful to commercial and technology partners of STeP as they orient themselves to the companies offering products in the space, compare technical features, and explore pricing and business models.

Company profiles have been created and business models have been evaluated against the Business Model Canvas.

STeP has identified and characterized business models for STP system marketing, sales, installation, and servicing, and constructed representative (not comprehensive) company profiles in India.

This report is based on a secondary analysis and primary interviews.

This PowerPoint report includes:

- Company profiles of representative firms actively marketing, selling, installing, and servicing STP systems in India;
- Business model canvases of the prevalent models—end-to-end vendors, outsource operations and maintenance (OM) and/or sales and marketing (SM) vendors, key parts suppliers, technology partners, and packaged system vendors;
- When available, data that include cost, capacity, and business model insights; and
- Go-to-market recommendations.

The analysis includes secondary data analysis and limited primary insights.

STeP's technical approach included:

- Aggregating secondary information sources,
- Analyzing publicly available data,
- Conducting primary research,
- Mapping marketing and sales channels, and
- Characterizing major business models in India.

Data sources included:

- Organization Web sites,
- Published reports,
- Subject matter experts,
- Key stakeholders, and
- Relevant companies.

We generally scheduled interviews starting from the end customer and worked our way back down the value chain.

Subject matter experts

understand the general stakeholder landscape.

Buyers (builders)

understand motivations and stakeholder interfaces.

Key system designers and implementers (consultants)

understand key buyer decision drivers, and gain a general industry overview.

Vendors

examine the STP vendors themselves.

We interviewed builders to gain insights on motivations for installing STP systems and the end buyer perspective.

BUILDERS

We sought to understand:

- Motivations,
- The technology landscape, and
- The ecosystem for new technologies.

Motivations

- When/Why do you install an STP system?
- How do you choose what STP system to install? Key criteria?

Technology Landscape

- What STP systems are on the market?
- Which ones have you used?

New Technology Ecosystem

- How would you recommend a new technology enter the market? (What business model? With whom to partner?)
- What new technologies or companies have you seen enter the market? How did they do?



We interviewed EPC* consultants to gain insights on vendor motivations, technology landscape, and buyers.

EPC CONSULTANTS

We sought to understand:

- Buyer perspective,
- The STP technology landscape,
- The ecosystem for new technologies, and
- Vendors' motivations (outside perspective).

Buyer Perspective

- What are your key criteria when choosing which STP technology to recommend?
- What is your tender process?
- How do you choose a vendor?
- How do you interact with the buyer?
- How much does the buyer know about STP?

Technology Landscape

- What popular STP systems are on the market?
- Of the last 10 STP systems you installed, how many were xyz technology?
- What are the pros/cons/use cases of each technology?
- What are the costs?

New Technology Ecosystem

- How would you recommend a new technology enter the market? What business model? With whom to partner?
- What new technologies or companies have you seen enter the market? How did they do?

Vendor Motivations

- Do vendors prefer OM or installation?
- Which is more profitable?

*EPC = engineering, procurement and construction

We interviewed STP vendors to gain primary insights on partnership potential, vertical integration, and technology landscape.

STP VENDORS

We sought to understand:

- STP vendor business models,
- The STP technology landscape,
- The ecosystem for new technologies, and
- Vendor motivations in potential partnerships.

Business Models

- What functions do you outsource vs. do in-house?
- What are the advantages of outsourcing xyz function?
- With which other stakeholders do you interact, and how?
- How do you do sales and marketing?

Technology Landscape

- What STP systems are on the market?
- Of the last 10 STP systems you installed, how many were xyz technology?
- What are the pros/cons/use cases of each technology?
- What are the costs?

New Technology Ecosystem

- How would you recommend a new technology enter the market? What business model? With whom to partner?
- What new technologies or companies have you seen enter the market? How did they do?

Vendor Motivations

- If you were to partner with a company that had a new STP system or technology, what would be your preferred role?
- What would you want to see in the technology (keys to success for a new STP system or technology)?

Each stakeholder is responsible for different function in the STP system creation process.



	Responsibilities	Typical Stakeholders
Macro-level Requirements	<ul style="list-style-type: none"> • Budget • Space available • Number of flats and size of requirement 	Builder/Buyer
Macro-level Specifications	<ul style="list-style-type: none"> • Design of integrated water systems • Throughput requirements (MLD) • Technology specifications 	EPC/mechanical, electrical & plumbing (MEP) consultant
STP Implementation	<ul style="list-style-type: none"> • STP design • Manufacturing • Assembly • Installation • Commission • OM 	STP vendors, contractors, and equipment manufacturers

Vendors outsource or perform in-house a number of key STP implementation functions.

Component	System
SM	SM
Design	Design
Manufacturing	Manufacturing
	Assembling
	Installation
	Commissioning
	OM

SM —Interface with end buyers

Design —Engineering design of part/system

Manufacturing —Physical fabrication of part/system

Assembling —Integration of component parts

Installation —Physical delivery of system, with its accompanying assemblies, accessories, and parts; includes connection to required services

Commissioning —Testing to verify if system functions according to its design objectives and specifications

OM —Upkeep of installed system, often via annual maintenance contract (AMC)

STP system implementers can be roughly categorized into categories based on the key implementation functions they outsource.

End-to-end vendors

perform all functions from design to commission, SM, and OM.

Outsource OM vendors

perform functions from design to commission, but outsource OM.

Outsource SM vendors

perform functions from design to commission, but outsource SM.

Outsource SM and OM vendors

perform functions from design to commission, but outsource SM and OM.

Key parts suppliers

manufacture key parts, and sell products to the vendors.

Technology partners

transfer engineering design to licensed vendors that manufacture and install.

Packaged system vendors

design and manufacture, and sell to vendors that do the installation and maintenance.

Note: STP companies are extremely fluid in the above models they follow. They often switch between models from project to project. Thus, the categories give an indication of vendor preferences but are not strictly adhered to. Some companies are listed under multiple categories.

End-to-end vendors are often quality-focused and well staffed.

Component	System
SM	SM
Design	Design
Manufacturing	Manufacturing
	Assembling
	Installation
	Commissioning
	OM

Description

End-to-end vendors perform all functions from design to commission, SM, and OM.

Motivating Factors

Profit: If the vendor has the capability and desire, then the more functions that are performed in-house, the more revenue the vendor can generate.

Reputation: For some, there is a cultural preference toward the appearance of doing everything oneself.

- “When jobs are small, many companies do everything...outsourcing is not looked on favorably in India.” (Sharat Rao, Engineering Creations Consultants)

Quality Focus: End-to-end vendors often cited the need to ensure proper implementation and to guard their reputation as key reasons for not outsourcing OM. Similarly, for quality-focused vendors, control over SM helps them to build trust with their customers, and, over time, they often are able to increase the business they are doing with those customers.

- “Vendor usually does the OM, too. If OM were outsourced, the OM company could easily blame a maintenance problem on the designers.”
- “We prefer to do the OM ourselves, as operators could give bad names for our units.”

End-to-end vendors engage in OM on several levels.

AMC

Often, an AMC is included as part of the tender issued by the builder, in which the vendor agrees to operate and maintain the STP system for a set amount of time. For example, one consultant typically includes a 5-year AMC as part of the tender.

Build Operate Transfer (BOT)

A common model is for the STP vendor to transfer the OM of the system to the builder or to an outsourced OM contractor following the initial AMC period. A related model, typically used in larger, municipal projects, is Build Own Operate Transfer (BOOT), in which the STP vendor owns the STP facility for a set number of years before transferring ownership.

Training of Key Personnel

Following OM transfer, the vendor would train key personnel for a smooth transition.

Warranty

A common warranty period that we heard during stakeholder interviews was 1 year.

Outsource OM vendors outsource or maintain minimal involvement in OM.

Component	System
SM	SM
Design	Design
Manufacturing	Manufacturing
	Assembling
	Installation
	Commissioning
	OM

Description

Vendors that outsource OM perform the same functions as end-to-end vendors, except they prefer to outsource OM (typically to a contractor).

Motivating Factors

Ease of Business/Scalability: Keeping OM in-house requires a company to stay engaged in a project for the long term, with engagements often going 5–6 years. Vendors such as these prefer to install the system and walk away.

- “We have an outsource partner for OM. OM is a lot of hassle.”
- “Many vendors don’t prefer OM because it requires too much interaction.”

Lack of Manpower: For most STP systems, OM is manual and labor-intensive. For vendors that do not want to employ large amounts of manual labor, they can choose to outsource OM. Outsourcing OM can be appealing to vendors that want to be able to take on a large number of projects.

- “Manpower is hard to come by. People these days don’t want to do the manual labor. They prefer a white collar over a blue collar job. If it is MBBR [moving bed biofilm reactor], we might do it only because it is easy.”
- “We prefer not to do OM. Cost-to-benefit ratio is low and we would need more employees...our area of expertise is design and implementation.”

Outsource SM vendors choose to focus on engineering.

Component	System
SM	SM
Design	Design
Manufacturing	Manufacturing
	Assembling
	Installation
	Commissioning
	OM

Description

Outsource vendors perform the same functions as end-to-end vendors but prefer to outsource SM. SM can be outsourced in a number of ways such as engaging channel partners that find business for vendors for a percent commission, or becoming a subcontractor on larger projects.

Motivating Factors

Design Focus: Vendors such as EnviCare Technologies consider themselves design-focused and choose to outsource SM so they can focus on their core competency.

- *“We prefer to design, manufacture, and install only. We outsource marketing when we can because we want to focus on our core competency—design. We are engineers first.”*

Limited Experience in Indian Market: As will be described in a case study later in this report, some vendors, often new to the Indian context, may choose to outsource marketing because they are either unable or unwilling to navigate certain aspects of the industry such as tenders or government regulations.

Need to Increase Marketing Reach: Specialized channel partners or larger vendors may have greater marketing reach than the STP vendor. Thus, outsourcing marketing can give access to greater number of projects for the vendor.

Some vendors outsource OM and SM.

Component	System
SM	SM
Design	Design
Manufacturing	Manufacturing
	Assembling
	Installation
	Commissioning
	OM

Description

Some vendors perform the same functions as end-to-end vendors but prefer to outsource both OM and SM.

Motivating Factors

Motivating factors for outsourcing OM and SM are a combination of the factors discussed in previous slides. Here, we discuss why a vendor may be fluid between the models of outsourcing SM only and outsourcing both OM and SM.

Difficulty in Outsourcing OM: Although companies such as EnviCare Technologies prefer to outsource both OM and SM, sometimes, they cannot outsource OM. Residential customers often prefer that the vendor that performs the installation also performs the OM for reasons similar to those discussed in the “End-to-End Vendor” business model slide (Slide 22).

- “We prefer to outsource OM. That is how we do it for industrial customers. Sometimes, we do OM for residential customers because that is what they prefer.”
- “We include a 5-year OM contract as part of the tender.”

Innovative OM Systems: Some companies that would otherwise outsource OM have found innovative technology solutions to manage OM without taking on a manpower burden. In doing so, they can increase profits (see case study).

Key parts suppliers manufacture components crucial to the STP system.

Component	System
SM	SM
Design	Design
Manufacturing	Manufacturing
	Assembling
	Installation
	Commissioning
	OM

Description

Key parts suppliers manufacture key parts, often patented, and sell these parts to STP vendors.

Motivating Factors

Proprietary Technology: Technology-focused companies can achieve great scale and profit by developing proprietary parts that are vital to STP systems. A company that is the sole manufacturer of a patented, crucial component can command a high price in the market.

- *“GE is well known to have the best MBR [membrane bioreactor] filters on the market, so people import from them.”*

Scaled Customer Base: Since these companies do not need to be “on-the-ground” or install their products for customers, they can easily maintain a global customer base without having to operate in every geography. For example, many of the manufacturers of MBR that sell components to India-based vendors are foreign companies.

Technology developers may transfer the technology to vendor partners.

Component	System
SM	SM
Design	Design
Manufacturing	Manufacturing
	Assembling
	Installation
	Commissioning
	OM

Description

Some companies or individuals create a new technology and partner with vendors through agreements such as those for licensing. These companies can conduct a technology transfer to the vendor that would then manufacture and sell the system incorporating the licensed technology to the customers.

Motivating Factors

Affordability: Imported technologies are often cost-prohibitive to local customers. As a result, one way to keep overall system price affordable is to perform all manufacturing domestically in India. In this situation, a foreign company can do a technology transfer to a local vendor.

Lack of Manufacturing Capability: New STP technologies are often created in academic or similar settings. The innovators of STP technologies are not always in the position to bring their technologies to market because they lack manufacturing, business, and/or operational capabilities.

Example

One vendor developed and patented a biosanitizer, which uses plant enzymes to reduce pollutants and can be used in conjunction with other STP. This vendor is the exclusive distributor of this technology.

Packaged system vendors sell premade systems directly to the vendors.

Component	System
SM	SM
Design	Design
Manufacturing	Manufacturing
	Assembling
	Installation
	Commissioning
	OM

Description

Some companies design and manufacture systems but then sell them to other vendors that install the systems and coordinate maintenance. This could be in the form of white labeling or branded, prepackaged solutions. The vendor conducts training and support as needed.

Motivating Factors

Lack of Customer Contact: Due to geographic constraints or lack of SM reach, a company may need to go through other vendors to achieve sales.

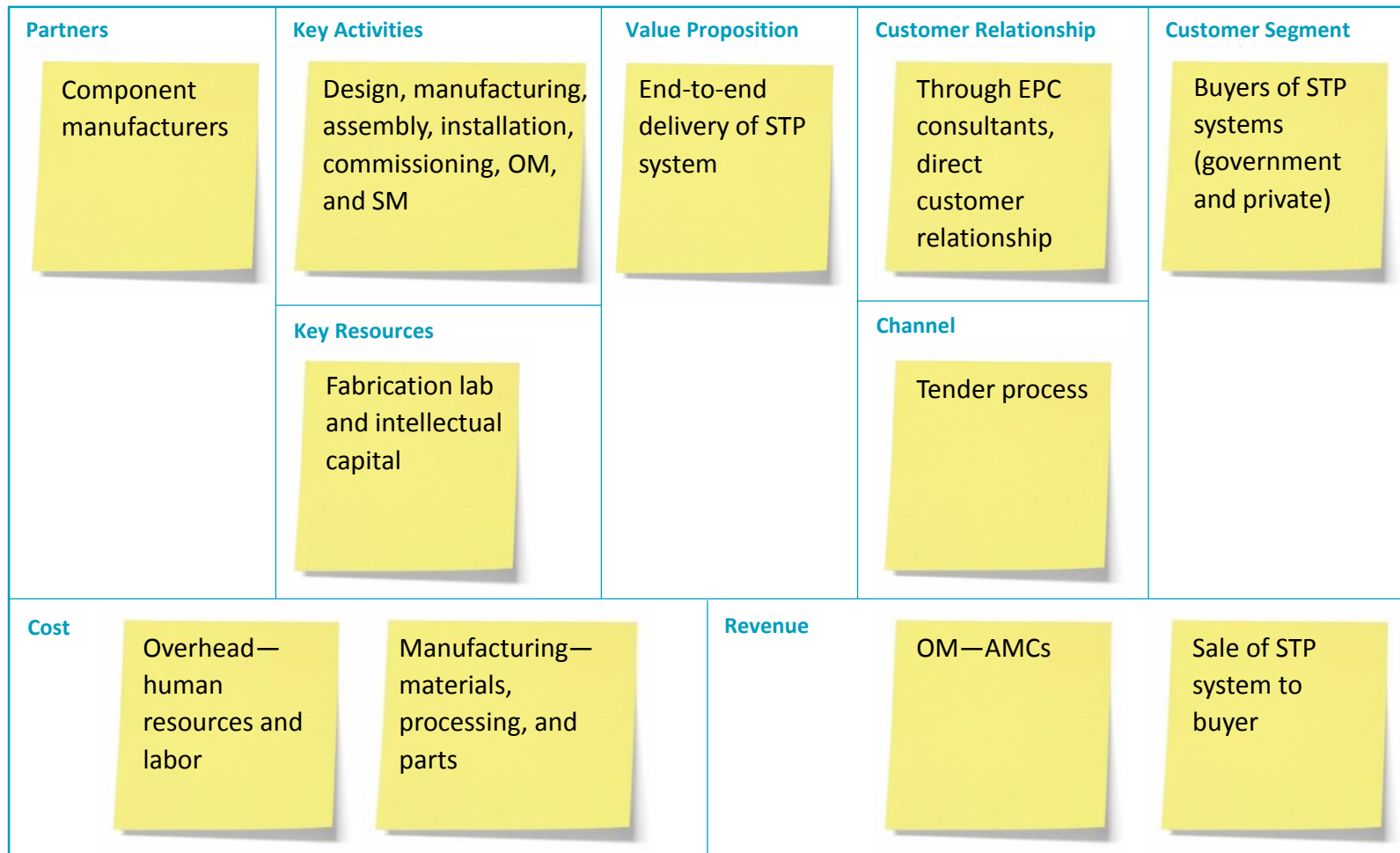
Scalability: For companies that have developed easy-to-install, prepackaged solutions, distributing these solutions through other vendors can be a way to efficiently achieve scale.

Limiting Factors

We did not come across many vendors operating under this business model. All of the STP vendors that we met did their own installation and commissioning. This model may be less popular for most domestic players due to factors such as widespread knowledge of the technology and vendors wanting to install to ensure the proper setup of their systems.

- *“Typically, if a vendor builds it, then they will install it. The technology is fairly simple, so there is no need for this ‘trader’-type model.”*

The business model of end-to-end vendors delivers a total solution to the customer.





ERA Hydro-Biotech Pvt Ltd (ERA-HBT) is an example of an end-to-end STP vendor with an eco-friendly focus.

Company Profile

ERA-HBT is focused on eco-friendly development through water and wastewater treatment and recycling, water and rain water conservation systems, and renewable energy generation and efficient energy use.

Location: Pune, Maharashtra

Primary Customers: Industrial, municipal, residential, STP vendors

Marketing: Tenders, subcontracting

Business Model: ERA-HBT has four verticals that span the water and energy conservation value chain—consultancy, project execution, product supply, and facility management. Its preference is end-to-end. As customer needs dictate, ERA-HBT is flexible to other models such as subcontracting with other vendors.

Web site: <http://erahydrobiotech.com/>

Products

- **Consultancy:** Ecohousing and green development, planning and designing, tender preparation and bid evaluation, water and energy audits, training
- **Project Execution:** Rainwater harvesting systems, STPs, water treatment plants (WTPs), sludge dewatering systems, biogas plants, solar and renewable energy, augmentation of existing plants, vermiculture
- **Product Supply:** Rainwater harvesting filters, package STP, package water treatment units, prefabricated biogas plants, tube settlers/oil removal systems, treatment plant components, solar and wind energy systems
- **Facility Management:** Annual OM contracts, mobile water treatment systems, township/company maintenance



CH4 Energy Solutions is an end-to-end vendor offering multiple product types to its customers.

Company Profile

CH4 Energy Solutions is dedicated to working for a green and clean environment in the field of waste management.

Location: Pune, Maharashtra

Primary Customers: Industrial, municipal, residential

Marketing: Tenders

Business Model: CH4 offers designing, engineering, manufacturing, installation, commissioning, and maintenance services for its plants. Its preference is end-to-end, but it is open to technology transfer partnerships.

Web site: <http://www.chfourenergy.com/>

Products

- **Biogas Plants (Solid Waste to Energy Plants):** Food waste, dung-based, municipal-solid-waste-based, prefabricated package, critical effluents, sludge-based
- **WTPs:** Demineralization, reverse osmosis, water softener, filtration, automated, hotel- and restaurant-focused
- **STPs:** MBBR, sequential batch reactor (SBR), MBR, combined sewage cum effluent treatment, packaged STP with ozonation, integrated STP
- **Effluent Treatment Plants (ETPs):** Packaged, integrated, zero liquid discharge, vehicle washing, hospital, slaughter house, food industry, brewery, pharmaceutical, electroplating, textile, paint booth, engineering, sugar distillery



Bharadwaj Ecotech is an end-to-end vendor with a patented technology.

Company Profile

Bharadwaj Ecotech is the exclusive distributor/implementer of the patented BERL biosanitizer STP technology. The company retrofits and installs new systems that use these biosanitizers as part of a range of products, mainly related to water and wastewater treatment.

Location: Nashik, Maharashtra

Primary Customers: Industrial, municipal, residential

Marketing: Tenders, word-of-mouth

Business Model: Bharadwaj Ecotech has an exclusive licensing agreement to design and retrofit systems with biosanitizer technology. The company does the designing, engineering, manufacturing, installation, commissioning, and maintenance services for its plants. It sources its key parts from BERL.

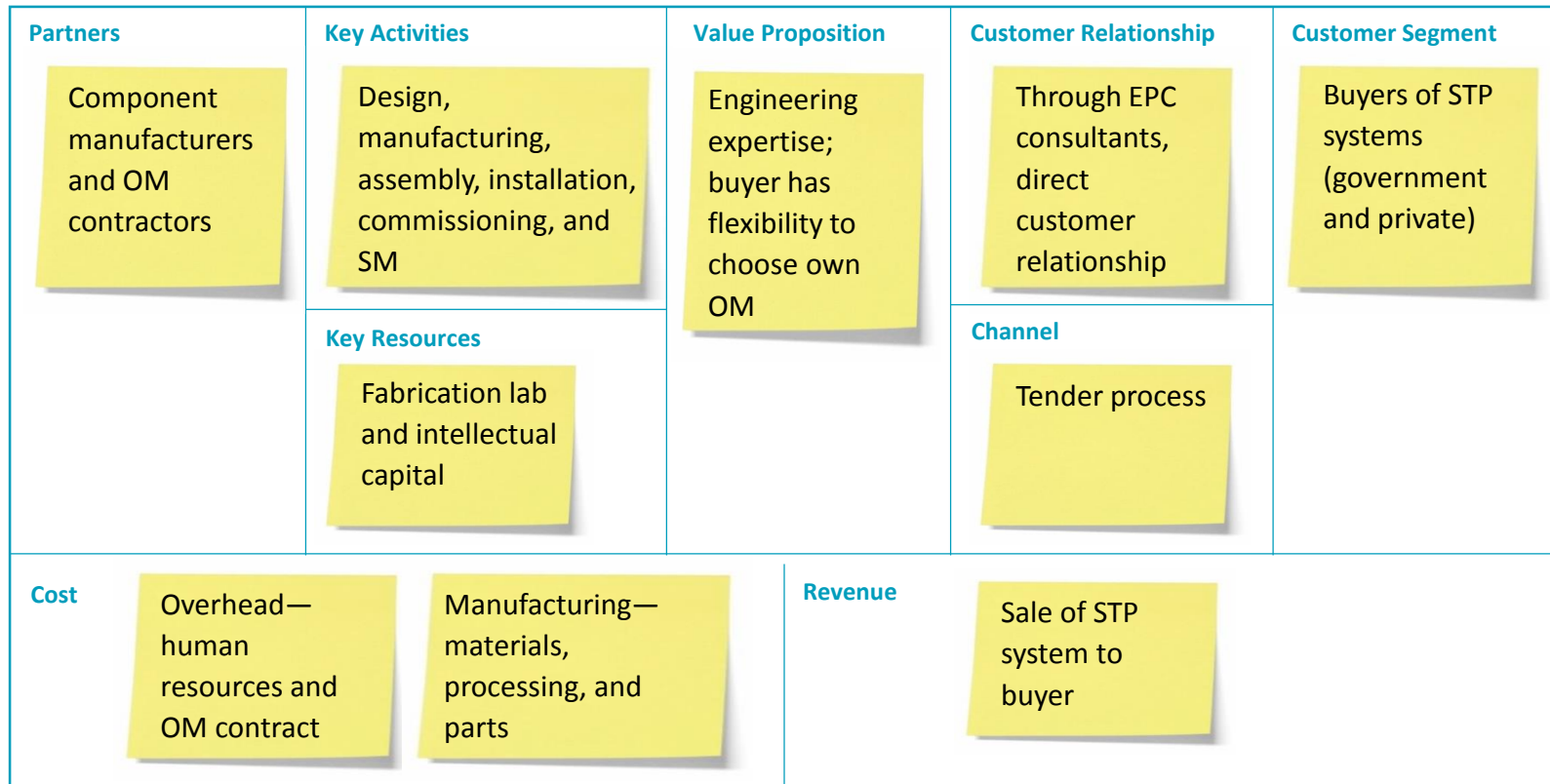
Web site: <http://www.indiamart.com/bharadwaj-ecotech-nashik/>

Products

- **Consumer Products:** Environmental biosanitizer
- **Systems/Plants:** WTPs, biowater production system, wastewater treatment plant, ETP
- **Retrofitting Existing Systems/Plants**



Outsource OM vendors do not perform the OM but instead deliver engineering expertise allowing the customer to choose the OM.





Fluid Systems outsources their OM while offering customers a range of technology choices.

Company Profile

Fluid Systems is a manufacturer of water and wastewater systems.

Location: Pune, Maharashtra

Primary Customers: Industrial (70%), municipal, residential

Marketing: Existing relationships

Business Model: Fluid Systems does the design/engineering, manufacturing, installation, and commissioning of its plants. Its preference is to outsource OM, except in select circumstances when OM would be hassle-free, such as with MBBR.

Web site: <http://www.fluidsystems.in/>

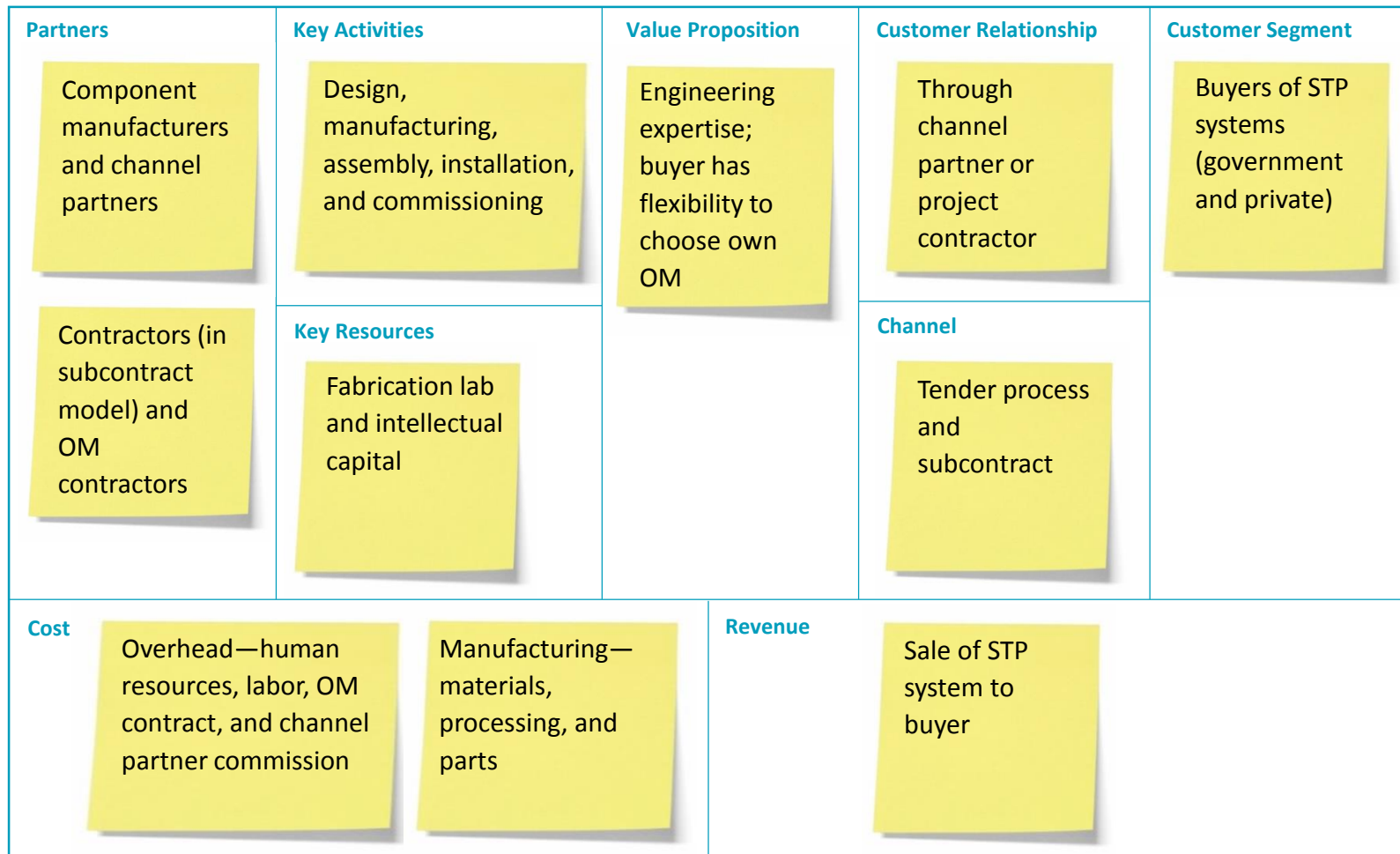
Products

- **STPs:** MBBR, SBR, upflow anaerobic sludge blanket (UASB), activated sludge process (ASP), sewage cum effluent, integrated
- **ETPs**
- **WTPs**
- **Other Systems/Plants:** Demineralization, reverse osmosis, water softeners, ultraviolet, chemical dosing, swimming pool filtration, pressure boosting
- **Components:** Multiport valves, filter media, water treatment spares, filters, clarifiers

Outsource SM vendors focus on the engineering expertise they bring and often reach their customer through tender or subcontract.

<p>Partners</p> <p>Component manufacturers and channel partners</p> <p>Contractors (in subcontract model)</p>	<p>Key Activities</p> <p>Design, manufacturing, assembly, installation, commissioning, and OM</p> <p>Key Resources</p> <p>Fabrication lab and intellectual capital</p>	<p>Value Proposition</p> <p>Engineering expertise; seamless design to OM</p>	<p>Customer Relationship</p> <p>Through channel partner or project contractor</p> <p>Channel</p> <p>Tender process and subcontract</p>	<p>Customer Segment</p> <p>Buyers of STP systems (government and private)</p>
<p>Cost</p> <p>Overhead—human resources, labor, and channel partner commission</p> <p>Manufacturing—materials, processing, and parts</p>		<p>Revenue</p> <p>OM—AMCs</p> <p>Sale of STP system to buyer</p>		

Outsource SM and OM vendors are solely focused on the engineering and installation elements.





Fortitude Enviro Team is a manufacture and supplier who uses channel partners and word-of-mouth to gain customers.

Company Profile

Fortitude Enviro Team is a manufacturer and supplier of water purifiers and water and wastewater systems.

Location: Nashik, Maharashtra

Primary Customers: Industrial, municipal, residential

Marketing: Word-of-mouth, channel partners

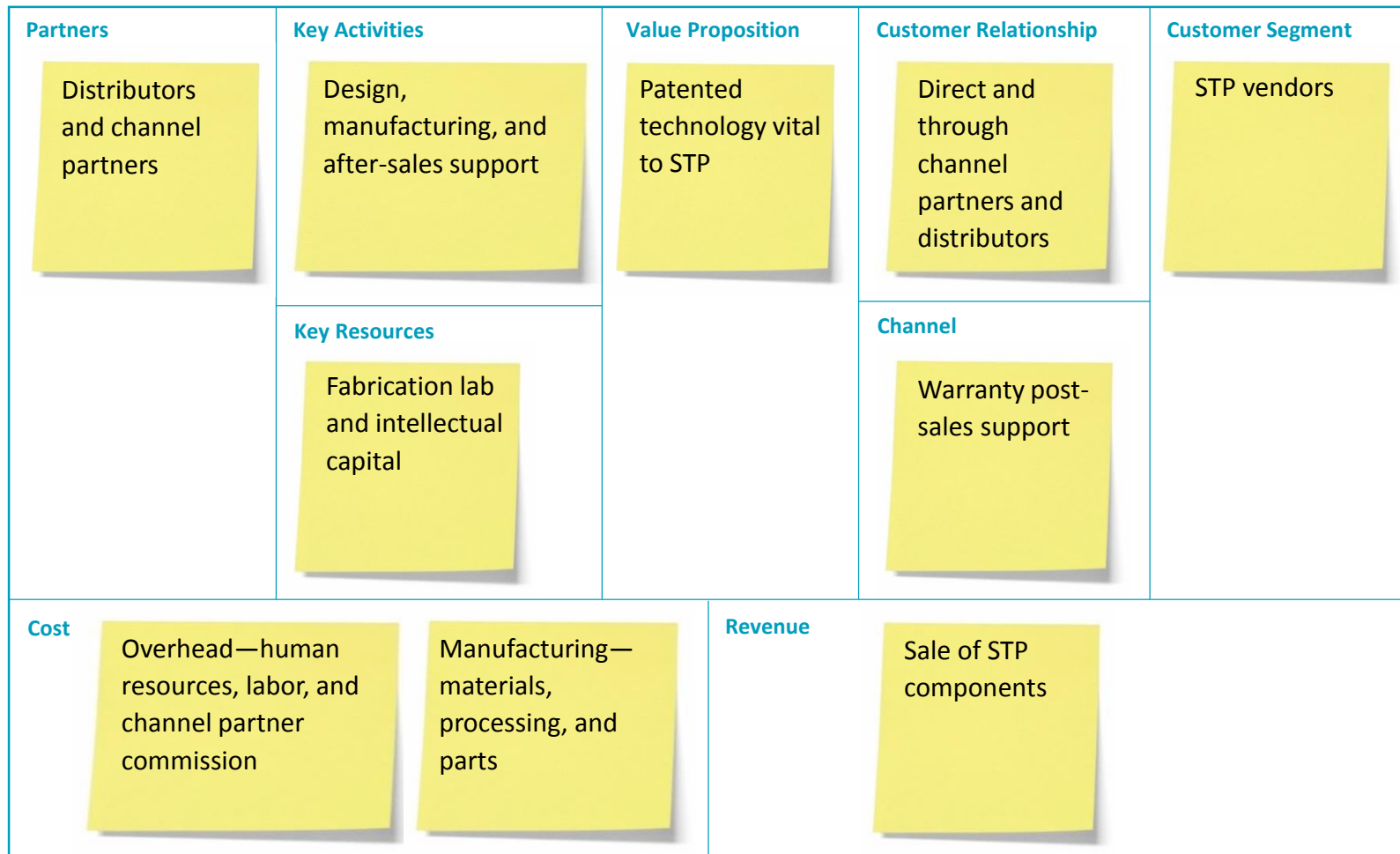
Business Model: Fortitude Enviro Team does the design/engineering, manufacturing, installation, and commissioning of its plants. Its preference is to outsource OM and SM, but the company handles OM and SM itself as needed. Currently, most of its work comes through word-of-mouth.

Web site: <http://www.indiamart.com/fortitude-enviroteam-nasik/>

Products

- **STPs:** Effluent, tertiary, flocculation
- **WTPs**
- **Demineralizer Plants**
- **Filtration Plants**
- **Rainwater Harvesting**
- **Components:** Water purifiers, filter media supplies
- **Environment Consultancy**
- **Maintenance Services**

Key parts supplier provide essential components of the system to STP vendors.





GE Power Water and Process Technologies offer technology-driven components to the STP vendors.

Company Profile

GE Power Water and Process Technologies provides water treatment, wastewater treatment, and process system solutions.

Location: Pennsylvania, United States

Primary Customers: Industrial, municipal, residential, STP vendors

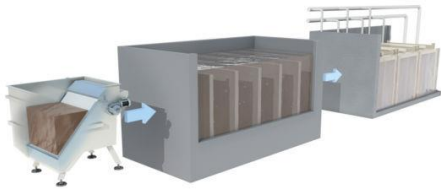
Marketing: Various

Business Model: GE operates with a variety of business models in the STP space from the design/engineering, manufacturing, installation, and commissioning of plants, to consulting services and key parts suppliers. We highlight GE as a key parts supplier because multiple vendors cited the company as the manufacturer and supplier of the highest quality MBR filters available on the market.

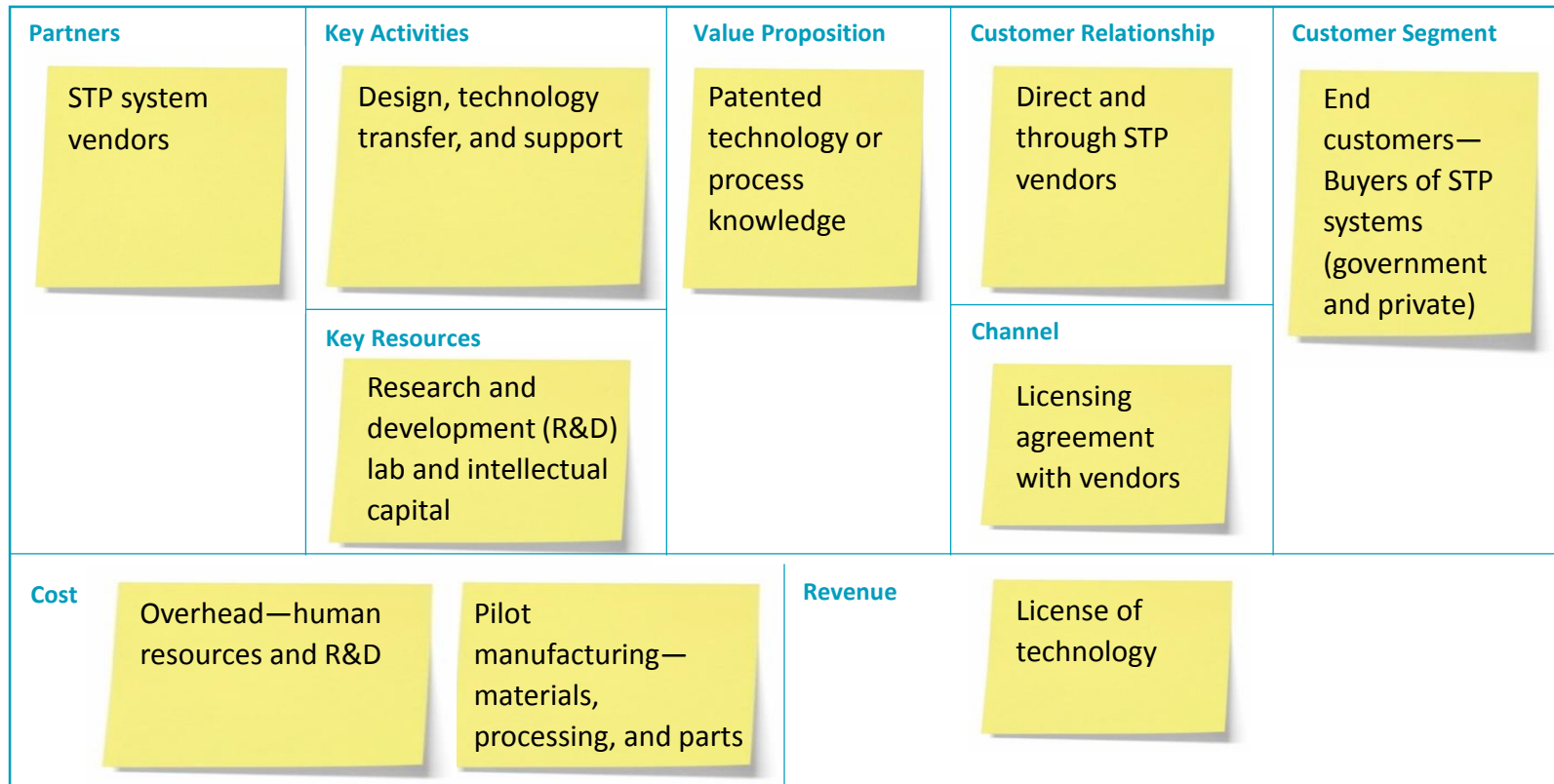
Web site: <http://www.gewater.com/>

Products

- **Components:** Filters and membranes, anaerobic technology, analytical instruments dust control, hydrocarbon treatment, Electrodeionization (EDI), Electrodialysis Reversal (EDR), Electrodialysis (ED), fuel treatment, hydrocarbon treatment, membrane chemicals, sanitizers, thermal and zero liquid discharge, ultrafiltration and membrane bioreactors, upstream oil and gas chemicals, wastewater treatment
- **Systems/Plants:** Reverse osmosis, boiler water treatment, cooling water treatment, mobile and outsourced water
- **Services:** Monitoring



Technology partners enter license agreements with STP vendors who use their patented technologies in the systems.





BERI is a technology partner that developed a novel “ecochip” technology for use by STP vendors.

Company Profile

BERI is a company based on the research of Dr. Bhawalkar, who has developed biosanitizer ecochips, which are natural crystals that convert toxic organics, odor, pathogens, and pests into organic water and air.

Location: Pune, Maharashtra

Primary Customers: Industrial, municipal, residential (through licensed vendor)

Marketing: Licensed vendors, word-of-mouth

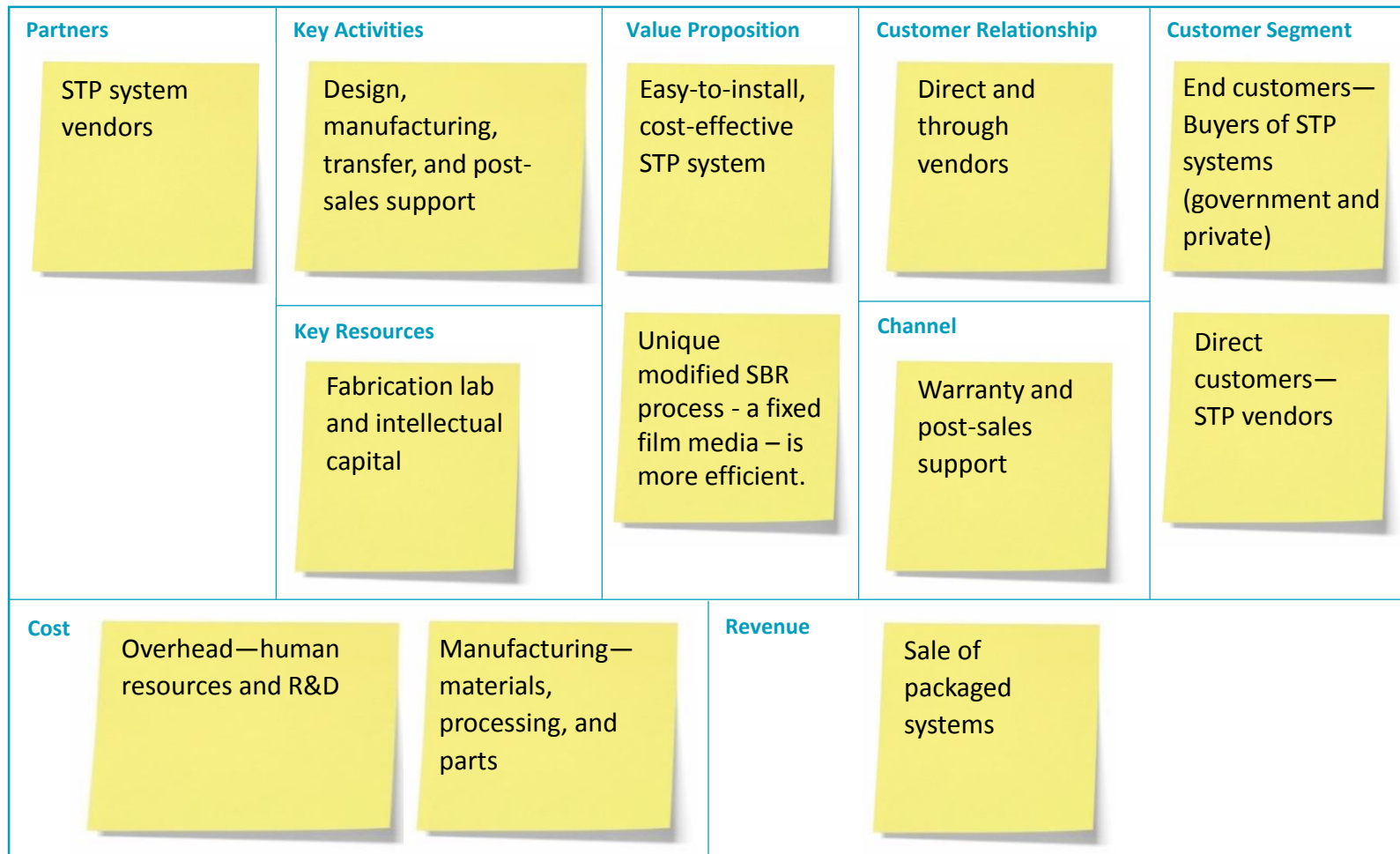
Business Model: Dr. Bhawalkar has designed and patented the biosanitizer and distributes it through an exclusive licensed vendor, Bharadwaj Ecotech. BERI has performed a technology transfer to Bharadwaj on licensing agreement and also sells the biosanitizer products, which Bharadwaj Ecotech uses to create products and STP systems/plants.

Web site: <http://biosanitizer.org/>

Products

- Biosanitizer ecochips

Packaged system vendors develop complete, drop-in systems for installation by STP vendors.





CromaFlow is a US-based vendor of packaged systems that supplies into Indian STP vendors.

Company Profile

CromaFlow is a U.S. company that specializes in manufacturing state-of-the-art water and wastewater treatment systems.

Location: Pennsylvania, United States

Primary Customers: Industrial, municipal, residential, STP vendors

Marketing: Licensed vendors, direct

Business Model: CromaFlow designs and manufactures packaged STP systems based on SBR technology. These systems are shipped directly to customers or sold through licensed vendors. CromaFlow provides training and installation support along with its products. CromaFlow has also recently begun doing customized water treatment systems.

Web site: <http://www.cromaflowinc.com/>

Products

- **Packaged SBR Systems**
- **Customized Water Treatment Systems**



We asked stakeholders to estimate relative popularity and describe use cases of common STP technologies.

Technology	Description	Market Share	CAPEX ¹ (INR L/MLD)	OM ¹ (INR L/YR)	Use/Driving Features
MBBR	Moving bed bioreactor	1st—Every stakeholder we met cited MBBR as the most common, with estimates of market share ranging from 50% to 80% of the market	108	33	<ul style="list-style-type: none"> • Small footprint • Affordable because no patents • Used for small capacities • High-power consumption because runs continuously
Submerged Aerated fixed Films (SAFF)		2nd—Similar to MBBR in how popular it is perceived (sometimes vendors grouped SAFF/MBBR)			<ul style="list-style-type: none"> • Similar to MBBR but more economical • Used when fluctuation in the wastewater is high
SBR	Sequential batch reactor	3rd—Was not very popular initially but has been growing in popularity	115	26	<ul style="list-style-type: none"> • High-quality effluent similar to MBR but requires more space • Used for low volume and batch needs (e.g., office park)
MBR	Membrane bioreactor	4th—Less popular due to high cost of imported filters and frequency of maintenance	300	43	<ul style="list-style-type: none"> • Used when high-quality effluent is needed (e.g., hotels)

Indian Institute of Technology, Kanpur. (2010, December). Sewage treatment in Class I towns: Recommendations and guidelines. IIT Consortium. Retrieved from http://www.moef.nic.in/sites/default/files/ngrba/003_EQP_S&R_02.pdf

Stakeholders indicated there is a market for augmenting existing systems.

Disrepair/Poor Performance

On several occasions, stakeholders mentioned that systems often break down or degrade in quality over time because of poor maintenance. Additionally, some customers are unhappy with the performance of their existing system and want to upgrade it. There is business opportunity for vendors that perform augmentation for these customers.

- *“We often perform augmentation for people who are fixing plants that are broken down or who want to update them. Sometimes, these customers are updating because of water scarcity issues.”*
- *“The problem is that many of these systems require continual maintenance, they deteriorate quickly. In year one, they may be getting good quality, reusable effluent. By year two, the water is only good for gardening. By year three, they are not doing anything with the effluent.”*

Complete System Augmentation

We came across a vendor, ERA-HBT, that is doing system augmentation. In a typical case, ERA-HBT will augment a Sintex septic tank using SBR technology.

Biobased Augmentation

We have also come across several references to biobased augmentation, including one company, Bharadwaj Ecotech, which is specifically doing this type of system upgradation as described in its company profile.

- *“The main type of augmentation that is happening is bioaugmentation. This is similar to adding cow dung, which has high levels of biodegrading bacteria.”*

We received consensus on several key questions, but OM differed.

Does the Pollution Control Board maintain a list of approved vendors that would be useful in promoting a new technology or system?

None that we have heard of. We asked each stakeholder this question, and none reported that they were aware of any such list. Furthermore, the consultants conveyed that, in general, they ask the vendors to procure the necessary government approvals for the projects they are installing.

Do the same companies do both water and STP?

Yes, as can be seen in the company profiles, there are many stakeholders that deal with both water treatment and wastewater treatment.

What is more profitable—OM or building/installing?

We received semiconflicting sentiments in our search to understand whether OM or building/installing was more profitable. One consultant mentioned that he believed that OM was more profitable, and several vendors expressed the desire to not do OM because it was not worth the use of their resources.

- *“I would guess that the contractors make more on OM.”*
- *“We prefer not to do OM. Cost-to-benefit ratio is low, and we would need more employees...our area of expertise is design and implementation.”*

Affordability, ease of operation, and familiarity are characteristics that factor into stakeholder’s decision making when considering a new STP system.

Most Popular

Criteria

Affordability

Easy to Operate/Maintain

Proven Technology/Familiarity

Other Responses

Quality of End Effluent

Footprint

Energy Efficiency

Affordability—Make in India

A common recommendation from stakeholders was that because affordability is such a key driving factor for customers in India, any new technology coming to market should get as many components as possible manufactured in India to keep costs down. There seemed to be a perception that “made in India” creates a sense of good value/affordability, whereas “imported” signifies quality.

Easy to Operate/Maintain

Consultants and builders expressed the importance of having a system that they could easily maintain.

Proven Technology/Familiarity

Vendors wanted to work with technologies around which they have at least a base level of expertise.

Other Quotes of Interest

- *“We would be keen to see a product that bridges the gap between MBR and MBBR.”*

Spotlight: Familiarity

The Value of Proven Technology

Vendors placed an emphasis on the importance of familiarity when being introduced to a new technology.

- *“We would have to see the technology proven before we would partner.”*
- *“If your technology is based around something I am familiar with such as MBR, it is easy for me. If it is not, you would have to do a technology transfer to get me comfortable with it.”*

A Way Forward—What Is a New Technology?

The most common answer to “what new STP technologies have you seen?” is that new technologies rarely come. This answer may be helpful in positioning a new technology in light of the learning that most stakeholders want to be familiar with new technology before they implement, purchase, or use it.

- *“Until now, I haven’t seen any new technologies coming to market that I couldn’t design myself. All technologies would fall into aerobic/anaerobic.”*
- *“For STPs, the focus is on the aeration tank and not other accessories. If there is no change in the aeration tank, people do not really perceive a change.”*

Spotlight: Easy to Operate and Maintain

Robust OM Ecosystem—The Value of Choice

Consultants and builders expressed the importance of having a reliable OM ecosystem in place around any new technology to ensure that it would be successful in the long term. In the residential sector, they often expect that the manufacturer/installer would stay on to do the OM work, and value having multiple OM options so that they can be well positioned should the need ever arise to upgrade/update their installed STP system.

- *“A lot depends on how accessible it is—How many people out there could install, maintain, etc. If it is not something that a lot of vendors/contractors knew how to work with, I wouldn’t recommend it [to builders] because they could get stuck with a technology that couldn’t be maintained. It would take time to get to the point where there are multiple people who can deal with your technology.”*

MBR and UASB in India

MBR—Despite widespread acknowledgement of high quality, high cost prohibits widespread adoption

In our conversations with stakeholders, MBR was universally cited for two things—high quality and high cost. Although the system technological know-how exists, the cost of the system is prohibitively high because most quality filters are patented and imported at high cost. One vendor cited Thermax as one company in particular that tried to popularize MBR, motivated by its exclusivity on GE technology, but ran into difficulties because it priced the technology too high.

UASB—Widely popularized through government support, but quality suffering from OM challenges

In 1990, the Indian government launched a program to improve water quality in the Yamuna River Basin called the Yamuna Action Plan (YAP). UASB's technology was specifically chosen because of its low capital cost, easy maintenance, and energy efficiency vis-à-vis other technology options. Following the installation of pilot plants, UASB became popular and was installed in various other locations. Unfortunately, a study conducted in 2014 by the *International Journal of Research in Chemistry and Environment* across 15 installed plants showed that the plants were no longer outputting effluence that complied with applicable standards in large part due to lack of proper OM, which, in turn, stemmed from inadequately trained and inexperienced workers.

Implementation and stakeholder challenges halt a new STP system.

Background

In 2012, a company (name withheld for confidentiality) attempted to enter the Indian market with the value proposition that it designed STP systems that were aesthetically pleasing, space-efficient, and cost-effective.

Failed Market Entry Attempts

1. To gain market entry, the company decided to take on a project end-to-end (everything except civil works) with low margins. It signed with a private Delhi builder to provide an 1,100 m³ STP system. The project ran into trouble when the builder put in extremely substandard civil work that resulted in leakages in the system. The company was forced to stop work.
2. Next, the company tried to bid for government STP projects. It was successful in getting listed in the Manual on Water Supply and Treatment (CPHEEO) but could not get through state agencies such as the Municipal Corporations and Jal Board due to alleged unethical practices. Additionally, its proposition of lower capital and operational expenditures was not appealing because funding for the systems was coming from organizations such as the World Bank.

A Better Way

The company finally shifted to an outsource OM and SM strategy wherein it worked with contractors (e.g., Larsen & Toubro Ltd., UEM, Tata Projects) instead of directly with end customers in order to decrease cost and time of selling. This strategy seems to be working. Contractors can put together economical systems, win projects and navigate the SM landscape, and the company can focus on what they do best.

Additional Notes

- It protects intellectual property by manufacturing different components across various contract manufacturers and assembling in-house.
- Payment terms are 20% advance payment, 70% when goods leave factory, 5% at commissioning, and 5% after 1 year of commissioning.
- Its design has become so efficient that it is now able to charge operators for submitting a proposal that includes its technology because the design of its system is very time-efficient using its central design system.
- Originally, its major revenue was from the sale of the design and equipment; it stayed out of OM. However, it is now developing a remote monitoring system that would allow it to reduce the number of engineers needed to monitor an STP plant. It hopes to monetize this system.

Several vendors had strong bias against residential as a segment.

Long Timelines and Difficulty with Payments

Multiple vendors cited reasons such as long timelines and difficulty collecting payments on residential projects as reasons that they disliked working in this segment vis-à-vis others such as hotels or industrial.

- *“We do not do many builder projects as they take about 3–4 years for completion and, in some cases, another 2 years for commissioning. Also, getting the final 10–20% of money can be quite difficult. We prefer to work for hotels as those builders are more responsible.”*
- *“Industrial is safer; people pay! We only want to work with systematic builders, people who operate professionally. A common story to hear when working with a residential builder is ‘sorry that we haven’t been able to pay you yet, my flats have not sold, or we are having difficulty collecting payments.’”*

Why Residential?

Despite the difficulties described above, we noticed that these same builders were slowly taking on more residential projects. One builder said that up until 3 years ago, they were doing only industrial projects, but their ratio has switched to 70% industrial, 30% residential. The reason seems to be that this is a segment that people feel has growth potential. They want to get their foot in the door and start building the right relationships to take advantage of this future boom.

- *“We have gotten into residential because there is potential to grow in the future, especially with the new government push behind improving sanitation in this segment.”*

We came across numerous promotional strategies during our research.

Word-of-Mouth

Many of the vendors with which we spoke cited word-of-mouth and existing networks as the most common ways in which they sourced projects. In absence of an existing network, it was recommended to us to attend industry-relevant networking opportunities such as conferences (e.g., WAPTAS) and events by the India Plumbing Association, which has chapters in the major metros.

Internet—Tenders

Vendors conveyed that the majority of tenders can be found on the Internet.

Channel Partners/Subcontracting

There exist numerous, specialized channel partners that will seek out projects according to a company's criteria and assist in the bidding process for those projects on a commission basis. A company can also work with existing vendors that bid on larger projects and partner with them on a subcontract basis.

Connect with Consultants

Consultants play a key role in deciding which vendors get projects.

- *“In the residential space, it is extremely competitive. Connecting with consultants is the only way to go. Find out who is the utility consultant, meet them, and demonstrate your technology; then they might recommend your name. You could also talk to consultants and find out what projects they are working on. Contractors are often recommended by the consultants.”*
- *“For private projects, consultants often have a list of four to five preferred contractors that they pass to the builder, who then contacts the vendors directly to issue the tender.”*

Moving to pay-per-use to increase sales.

Motivating Factor—Perceived Cost

One vendor described that they are moving to a different pricing strategy for their bids to address an issue they are having with the perceived cost of their system. In India, winning bids on STP projects are often driven foremost by cost considerations. For this vendor, that describes their systems as “good value for money but not the cheapest,” this often puts them at a disadvantage when trying to win projects.

- *“We believe in quality; others might bring in a low bid and then when the builder chooses the low bid, they end up with a plant that is not working in 2 to 3 years. As a result, we lose out on a lot of projects because people go with the lowest bidder.”*

How It Works—No Money Upfront

There would be no upfront charge for the STP system for the buyer. The vendor would retain ownership of the STP system after installation and charge on a per-volume-processed or per-volume-of-effluent basis. This is a model that has been used for large government and municipal projects but seemingly less so in residential projects.

General tips and strategies

Live Sites

Take on pilot projects or construct demo sites in order to provide a place where people can see the technology in action.

Patience

Most stakeholders conveyed that it would take time for a new system to take in the market (2–3 years was a common timeframe).

Local Partners Vetted Well

The need to understand the Indian context makes local partners crucial to success; however, it is just as important that the right partners be chosen because of the history of unethical practices in the industry.

- *“You need to have local expertise, people who know the market.”*
- *“See this picture: 75% of these guys are thugs. You have to be sure that you tie up with a trusted partner before entering or they could take you for a ride.”*

Consider Self-Use Buildings

From a payment reliability, quality focus, and willingness to try new technologies perspective, multiple stakeholders recommended self-use buildings as a good target customer.

- *“The only places that could go for new technologies would be self-use buildings.”*
- *“We prefer to work with hotels—the builders themselves take responsibility for the end quality because they are the users.”*
- *“Our target market is hotels and stadiums, people who have a vested interest in keeping costs low, not necessarily builders. Often, they are installing an STP unit because they are told to do so. Maintenance costs get passed on to other people.”*

Manufacture Locally When Possible

- *“If you want to be affordable to the market here, don't put your cost into importing your machinery. Break down the system into what is available locally or not, and source as much as possible locally.”*

Business model

Suggested Models

The exact business model to build depends on the existing capabilities of the company and the exact technology/system being brought to market; however, in general, making the assumption that the company bringing the new technology/system into the Indian context is new to the market, the following are appealing models for the initial phase. The focus should be around leveraging local partners to quickly scale the acceptance of the technology, provide familiarity, and create a support ecosystem. The company could later consider increasing its business model to incorporate more aspects of the value chain.

Technology Transfer and Key Parts Vendor

This would be a good model if a company has proprietary, new, innovative STP components that either improve an existing STP system or are vital to a new STP system, but the company has no existing ability to manufacture and operate in the Indian context. In this model, the company would provide key technology transfer and support to local vendor partners. The company can control manufacturing of key components but should allow common parts to be manufactured locally to keep the system cost affordable. Nonsensitive information around system implementation should be freely distributed in order to allow for easy spread of technology and thus the establishment of the ecosystem around the system that would enable it to propagate. Vendor partners could be limited to a select group of trusted vendors initially to maintain control over quality and implementation and then released as open source at a later time once the technology is proven.

Subcontract Model

This would be a good model if a company's innovation is in its ability to build innovative systems off of existing technology, and the company has the ability to manufacture locally. In this case, it would work with a larger vendor that handles SM and takes on large, multifaceted projects. In this case, the company would provide the vendor with a quality system, and the vendor would navigate the local context.

Example tender requirements (illustrative)

Tender includes:

- Fabrication,
- Installation,
- All necessary approvals, and
- An OM contract.

Tender specifies:

- Aeration,
- Base technology to be quoted, and
- Quality specifications (e.g., types of pumps and connections).

Decision process:

- Typically for private projects, four to five vendors would be recommended by the consultant to the builder for issuing tender.
- Vendors are free to quote the technology specified in the tender, plus any additional alternative technologies that they think fit.
- Consultants evaluate the tenders and present recommendations (pros/cons) to the builder for a final decision.

Builders/Consultants

Why do you put in STP systems?

- *“All buildings >20,000 m² have to have ministry of environment and forest approval, treated water has to be used for back flushing (looking towards zero discharge). We use it for gardening, landscape, flushing.”*
- *“Sometimes, even if not more than 20,000, if it is a very tall building, then the ‘high-rise committee’ dictates that have to have an STP. Some municipalities might say it is required in other circumstances.”*

Why does it make sense for OM and the manufacturer/installer to be the same?

- *“Sometimes, blame becomes an issue. If OM were outsourced, the OM contractor might blame a maintenance problem that arises on the original design, and both parties don’t want to be accountable.”*