FINANCIAL SUSTAINABILITY

Financial Drivers of Reverse Osmosis (RO) Water Systems in Rural India

A financially sustainable water system can be defined as one with adequate cash flows to cover operating costs[1] and a monthly maintenance reserve to cover servicing and replacement of parts and components throughout their lifecycle.[2]

This *Field Insight* seeks to provide a better understanding of financial sustainability of reverse osmosis (RO) water systems, using examples from our Stations in India.

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KEY INSIGHTS

- A Station needs to sell 103 cans per day to meet direct operating expenditure.
- Five key variables influence volume and drive financial sustainability: population, household size, household participation, distribution activities, and per capita consumption.

BACKGROUND

At any given time, at least 30% of rural water systems in developing countries are not functioning.[3] Lack of financial success is among the biggest causes of failure, leading to suboptimal performance and steady deterioration of water quality, reliability and system failures. Market-based approaches are increasingly acknowledged for their potential to achieve long-term sustainability with a focus on quality, affordability, and reliability. Safe Water Network has implemented such an approach by establishing locally owned and operated Safe Water Stations that sell water to consumers at a nominal cost. Each Station uses a standardized design, including a housing facility, bore well, piping, and water treatment technology. A multi-staged reverse osmosis treatment system was designed to address the prevalence of fluoride, nitrates and total dissolved solids in the groundwater in the Telangana region of India.[4] The station also includes a remote monitoring system, which uploads real-time data on operational performance. Applying a business model to provide water to rural communities is challenging given the conditions of low, and often erratic, incomes, dispersed populations, and limited local technical services and capability. The initial capital costs to set up a Safe Water Station are detailed in Table 1.

Table 1:
Capitial Costs to Establish a Safe Water Station[5]

Details	USD
Plant Cost (RO Machine, Remote Monitoring System)	$9,597
Land and Building	$4,833
Construction/Renovation	$4,504
Capital Expenditure	**$18,934**
Starting Inventory (250 20L Jerry Cans)	$1,300
Field Staff Costs	$880
Promotions	$700
Startup Costs	**$2,880**

[1] 17% of operating expenses cover a technical assistance service fee for remote support and centralized maintenance, repair and spare parts management.
[2] In this definition, capital costs are funded from an external source. While capital recovery is a desirable objective, we do not consider it a requirement for financial sustainability since ongoing operations and maintenance are the greatest challenges, with start-up and capital costs typically funded by donors and governments.
[3] Moriarty, P.; Smits, S.; Butterworth, J.; and Franceys, R. 2013. "Trends in rural water supply: towards a service delivery approach." Water Alternatives 6(3): 329-349.
[4] Fluoride is estimated to be naturally occurring in groundwater of about 100,000 villages in India. Consumption of contaminated water significantly diminishes the body's ability to absorb nutrients, causing dental fluorosis in children and skeletal fluorosis (an extremely painful and debilitating bone disease) in children and adults.
[5] The entrepreneur contributes the Land, Building and Construction/Renovation costs while Safe Water Network provides the Plant Cost (technology and equipment) and Startup Costs.

ANALYSIS

Methodology

Through our monitoring and evaluation platform we tracked operating and financial data, which were used to conduct the following analyses. Historical data on revenues and costs of Stations operating for more than a year were calendarized[6] for Year 1 of operations. Analyses were then conducted on the 10 oldest and 10 newest Stations to determine their financial performance and drivers. Further analysis of volume drivers such as consumption, population size, distribution volumes, etc. was also performed as these variables were found to be the key differentiators among Station performance.

Comparison of Old and New Stations

Figure 1 shows that new Stations performed better than old Stations – selling higher volumes (cans per day) and generating better profit margins on similar volume. This improvement in financial performance is due to adjustments and refinements of the model.

To compare the operating profit and margin of an average old and new Station, volumes and costs for a Station were averaged for the 10 oldest and 10 newest Stations (see Table 2). In both cases, operating profit and operating margin improved. The gross profit after meeting all direct operating expenses is further utilized to make payments to the entrepreneur (as a return on investment), cover fees for technical assistance and provide for a maintenance reserve.

Figure 1: Comparison of Old and New Stations[7]

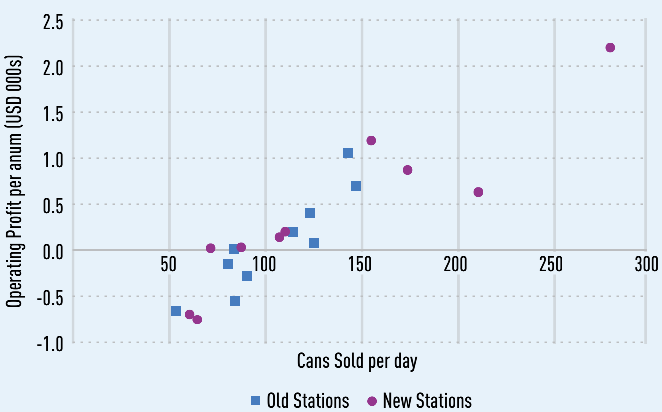


Table 2: Annual Profit and Loss for Average Old and New Stations[8]

Annual	Old Stations	New Stations
Volume (L)	768,623	969,118
	USD	**USD**
Revenue (cash collected)	$2,345	$2,979
Variable Costs		
Water Delivered Cost	54	2
Operator Incentive	1	52
Filters	18	31
Electricity/Borewell charges	578	669
Travel	5	–
Chemicals	66	127
Repairs/Plant Maintenance	119	171
Entrepreneur Return*	341	430
Fixed Costs		
Insurance	–	–
Technical assistance service fee	194	194
All Other Opex	137	59
Total Direct Operating Costs	***$2,081***	***$2,414***
Operating Profit	**$264**	**$565**
Operating Margin	**11%**	**19%**

*Return provided to the Entrepreneur for their share of the initial investment (land, building and construction). Since it is proportionate to volumes sold, it has been included as a variable cost.

A reverse osmosis (RO) water treatment system in a Station.

[6] Data from each Station was consolidated into 12 month periods to obtain consistency and facilitate comparisons.
[7] Includes the fees for technical assistance as an operating expense.
[8] Costs for New Stations are higher than Old Stations as we have not included the impact of inflation for this analysis, given that our price has remained the same over time.

Drivers of Financial Performance

The primary financial driver that accounts for the improvement in financial performance is volume, as the price is market determined and remains unchanged over time and the operating costs are consistent across Stations. Price is determined by the market, INR 4 ($0.07) per 20 liters – and also sufficiently low to meet our affordability targets for inclusiveness in the communities served. There are also practical limitations of increasing price levels when denominations are so small – an increase of INR 1 (US$0.016) represents a 25% increase in unit price, which would significantly challenge our affordability objectives especially for bottom of the pyramid consumers. Most operating costs, such as electricity and salaries, are determined by policy or market economics and are consistent across stations and therefore, not differentiators.

VOLUME

The volume of water sold is a function of village population, household size, household participation, distribution activities, and consumption per capita per day.

Our impact objectives are twofold, bringing in additional customers and increasing per capita consumption. The improvement observed in new Station performance (Figure 1) contributed to the identification of the drivers of volume as key to financial sustainability. Over time we have worked towards increasing volume sold, by refining our village selection criteria to better identify villages which are likely to have sufficient demand for water. Additionally, effective consumer activation programs, affordable service solutions and determining ability and willingness to pay have contributed to improved village identification and increased consumption of water, driving an increase in volume sold (see *Field Insights* on Consumer Activation and Distribution). Table 3 below compares key metrics for two sets of Stations analyzed.

Table 3: Drivers of Volume and Financial Performance

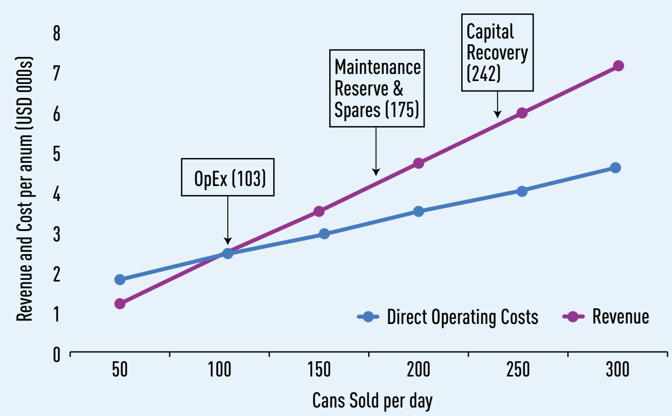
Metric	Old Stations	New Stations
Population	2,818	3,443
% Households registered	53%	59%
Liters per Capita per Day	1.46	1.43
% of Villages with Distribution	60%	100%

Cost Recovery: Breakeven Analysis

To be financially sustainable, a Station must cover operating expenses and a contribution to a maintenance reserve for replacement. We calculated the breakeven volume (cans per day) for these two costs and also for repayment of capital cost. As shown in Figure 2, an average Station needs:

- 103 cans per day to cover operating expenses such as operators' salaries, electricity, repairs, a service fee for technical assistance and a reasonable return to the entrepreneur;
- 175 cans per day to contribute to a maintenance reserve to replace major parts over their life cycle;
- 242 cans per day to pay back capital costs without any interest (plant cost in Table 1).

Figure 2: Breakeven Points for a Station to Cover Three Cost Levels

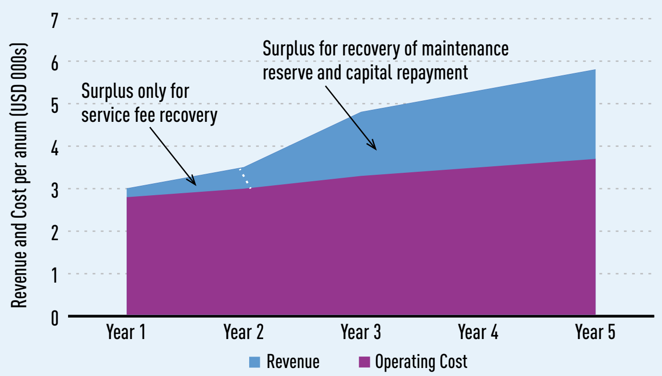


Performance Over Time

To examine Station performance over time, we projected revenues and costs for an average Station over five years (Figure 3) and observed the time frame to cover each of the cost levels described earlier. Our analysis indicates that an average Station starts covering direct operating expenses as soon as it begins operations. By the end of Year 2, it generates adequate profits to cover the service fee for technical assistance. Starting from Year 3, additional profits after covering these costs can be utilized towards building a reserve and repaying the capital cost.[9]

[9] As a next step, we plan to determine the amount of excess cash flow (post operating expenses and service fee) generated by an entire group/cluster of Stations to assess the amount available to reserve for replacement and potential for investment in expansion or new Stations.

Figure 3: Performance of an Average Station Over 5 Years[10]



A mother and daughter purchasing water from a Station in Warangal, Telangana

NEXT STEPS

As we continue our efforts to fully understand the financial sustainability of Safe Water Stations, several areas warrant deeper investigation.

Sensitivity of Volume to Each of the Drivers

Having identified the drivers of volume in this *Field Insight*, we will further use sensitivity analysis to determine the impact of each of the drivers and our ability to influence them.

Price

Given the practical limits to adjusting price, we will only be able to study the impact that adjusting price has on purchases by poorer members of the community when a price increase is implemented. As a proxy, we will compare through a short-term survey the socioeconomics of consumers who are buying water from retail distribution points that are selling our Station water at higher prices (to cover their costs) with those who are buying water at our Stations. Together, these studies will provide further insight into how price affects demand for water among consumer segments.

Costs

Currently underway is further exploration of the structure and governance of the maintenance reserve, including an analysis of the lifecycle costs of Station parts and components. The maintenance reserve will support long-term sustainability and self-sufficiency of the Station.

Since electricity is a large financial driver, we are also exploring alternative energy sources, such as solar power.

We will expand the entity providing technical assistance and refine our analysis to measure the impacts on efficiencies, volumes, and costs.

[10] The revenue is based on the assumption that we will increase price of water by 25% in year 3. Operating costs exclude the technical assistance service fee as the time to recover that cost has been shown separately in Figure 3.

CONTACT US

For more information, please visit **www.safewaternetwork.org**, or email the authors at **info@safewaternetwork.org.**

ABOUT SAFE WATER NETWORK

Safe Water Network develops market-based, community-level solutions that deliver safe, affordable and reliable water to populations in need. We engage the diverse capabilities of our public- and private-sector partners to advance our model for broad replication, and document and share our insights through forums, workshops, and reports. Our operating footprint of over 100 safe water systems, providing safe water access to over 400,000 people in Ghana and India, forms the basis for research and innovation to systematically address the challenges of local sustainability. Safe Water Network was co-founded in 2006 by actor and philanthropist Paul Newman, along with prominent civic and business leaders.

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