

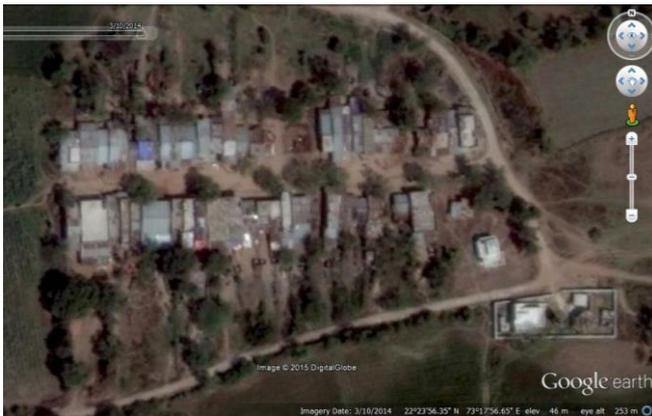
**The Model Village:  
Creating a Sustainable ODF Village:  
Jambudiyapura, Gujarat**

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# Jambudiyapura Village, Gujarat

## The Village

Gujarat Road and Infrastructure Co. Ltd. a SPV between IL&FS and the Gujarat Government as part of their CSR initiatives has adopted a number of villages along their road concession between Vadodara and Halol in Gujarat. As a part of this initiative IL&FS identified the village of Jambudiyapura as a test bed for the creation of a model ODF village and requested Clearford Water Systems Inc. through its Indian subsidiary Clearford India Pvt. Ltd. to install the Clearford One™ system there.



Jambudiyapura Village, Gujarat



Typical House Backyard



Stagnant Water from Bathing Area

The Village itself is a poor Scheduled Tribe village with 56 houses, a school and an *Anganwadi* with a population ranging between 250-300 people. The majority of the villager's source of income is either agriculture or manual labour. When IL&FS first looked at the village only 2 houses had toilets and the majority of the population practised open defecation in the fields around the village. In addition, while a few of the houses had proper bathing areas, the majority of the village bathed outdoors on stone slab platforms with cloth screens for privacy. The wastewater being generated from these platforms was found to collect in open pits nearby adding to the unhygienic conditions present. All these issues resulted in at least one member in

every household being affected by water borne diseases such as diarrhoea monthly with severe cases requiring costly medical treatment in nearby towns.

Prior to the identification of Clearford as the ideal partner IL&FS had experimented using alternate technologies in this village including the DRDO BioDigester, a Twin Pit system and a *Deenbandhu* (Biogas) system designed to handle human waste alongside cow manure. Analysis of the results showed that while the *Deenbandhu* system was working due to social issues the gas was only being used to heat water during the winter months and not for cooking as originally envisioned. The DRDO BioDigester worked but as it only dealt with the toilet wastewater the households chosen still were surrounded by unhygienic conditions caused by the pooling of bath and utensil/laundry wastewater. Further there were concerns of its long term ability to work as the villagers used strong cleaning liquids to clean their toilets that could kill the cultured bacteria in the unit. Surprisingly, the one solution the villagers were most opposed to was the Swachh Bharat recommended Twin Pit as they realized that it collected only the solids and released the liquid component into the surrounding soil. As the local area has black cotton soil with low absorbability it meant that during the monsoons the twin pits would flood and the contaminated water would pool on the rain flooded ground surface forcing the villagers to cross contaminated water to use their toilets.

### **Project Targets**

As the overall objective of this CSR initiative was to create a locally sustainable ODF village that not only eliminates open defecation but also improves the long term health of the villagers; it was decided that in Jambudiyapura Clearford would:

1. Build model toilet and bathroom complexes for individual homes.
2. Collect all the wastewater (toilet, bathroom and laundry/utensil washing) using the Clearford One™ system.
3. Transport the wastewaters after anaerobically reducing the solid organic component in the Clearford ClearDigest™ Smart Digester™ tanks to a low-cost treatment facility.
4. The treated wastewaters should be reusable for irrigation purposes thus allowing the villagers to benefit from increased water availability for their crops especially in the summer months.
5. Annual Operation and Maintenance should be minimized.
6. The installed system should be maintainable by the villagers themselves.
7. Clearford would operate the system for a year after commissioning during which villagers would be trained to operate the system.

## **Interactions & Observations**

When we began this project common refrains we heard from sanitation experts we discussed this project with included:

1. Do not build bathrooms near the toilets.
2. Do not build high quality bathrooms as they will be converted into stores.
3. Use twin pits to process the sewage as they are cheaper.

Our interactions with the villagers on the other hand found them to be aspirational with a strong desire to upgrade the quality of their lives. We found that unlike what we had heard there was no major issue of having bathrooms next to the toilets and that the villagers were strongly against twin pit toilets as they said they flooded during the monsoon and that this rendered toilets unusable exactly when they needed them the most as surrounding areas were waterlogged.

One of the interesting observations that came out of the interviews was that there were two groups of people who were most opposed to stopping open defecation. These groups include elderly men habituated to using the outdoors and surprisingly young girls in the 12-16 age bracket who expressed misgivings as going in groups was to them an opportunity to socialize as well as to get out of the house and housework. These issues were addressed by both talking to the individuals directly and explaining the benefits of achieving ODF status in terms of social status, health and hygiene.

After a series of interviews with villagers as well as Gram Sabha meetings to ascertain their desire to make the village ODF; it was decided mutually:

1. That each household not having a Toilet and/or Bathroom would get one. These new constructions would have attached *Mori's* or washing areas where clothes and utensils could be washed.
2. To make sure the village had the funds to manage these installations and as well to create a feeling of ownership the Gram Sabha and the villagers also agreed to pay Rs. 5000 per household into a common bank account specifically setup to manage the O&M phase.
2. The Rs. 12,000/Household received by the villagers from the government for building the Toilets would also be put into this Bank account and not retained by the villagers.
3. A Sanitation Committee would be setup by the villagers to manage these funds.
4. This Sanitation Committee members would divide the village into individual zones of responsibility to better make sure households were using and maintaining the facilities properly.
5. Clearford along with IL&FS and GRICL will jointly train the villagers in the proper usage and maintenance of the facilities.

6. A local person would be trained to maintain the treatment sewage collection, transport and treatment facilities.

In addition, we discovered, that the villagers were also extremely concerned about the quality of the work being done. This is best exemplified by the collection rate of the per household contribution where initially just 3 of the 56 homes deposited the required funds. When we began construction and even before the first toilet complex was completed, the remaining villagers having seen that quality of workmanship paid up within a week. This suggests that if quality of construction is emphasized a lot of the reluctance to use toilets may be mitigated.

### **The Clearford One™ System**

The Clearford One™ system designed for Jambudiyapura will remove sewage solids at source in ClearDigest™ Smart Digesters™ before releasing liquid effluent into the SBS® ClearConvey™, a network of smaller diameter pipes that carries liquid sewage to an optimized CAMUS SBT Wastewater Treatment facility for final processing. Recovered water will be safely returned to the environment for use in irrigation as required by the villagers.

To achieve this at this village and after multiple rounds of discussion with the villagers themselves to understand their needs; it was decided as a part of this project that new toilet & bathroom units would be built for those houses that lacked them. These units would also have attached *mori*'s (platforms) where laundry and utensils could be washed allowing the collection of all the wastewater generated in the village.



Toilet, Bathroom & Mori Complex

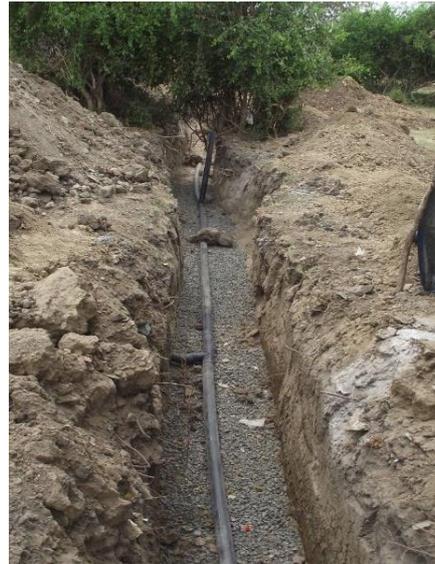
The wastewaters and sewage generated would be collected and transported to the Clearford One™ system's ClearDigest™ Smart Digester™ tanks which provide decentralised pre-treatment of the organic component of wastewater through anaerobic digestion, while retaining inert solids in the tank. These Smart Digesters™ greatly reduce the solids and organic loading in the liquid effluent while continuously decomposing sewage solids.

After exiting the tanks, the Clearford One™ system's ClearConvey™ Small Bore Sewers® (SBS®) network of HDPE pipes convey the liquid effluent away to the wastewater treatment facility by gravity. The flexible small diameter pipes used allows for adaptable installations in shallow trenches with less material requirements. Additionally, the seamless fusion of pipe sections eliminates infiltration of rainwater into the system and stops leakage of sewage into the environment.

As the ClearDigest™ Smart Digester™ tanks significantly pre-treat the incoming sewage and wastewaters, the requirement for final treatment is significantly reduced compared to conventional systems as solids (TSS) and organic matter (BOD) are reduced by over 65%. This reduction in TSS and BOD provided Clearford with an opportunity to work with Vision Earth Care to specifically tailor their VEC CAMUS SBT treatment facility to the requirements at Jambudiyapura and achieve significant operation and maintenance savings.

The step-by-step process thus offers many advantages to the villagers including:

2. The Clearford One SBS™ system collects and transports sewage without causing blockages in the low water supply regime (70 LPCD) present which conventional sewers would not have been able to achieve.
3. The Smart Digesters do not use electricity, added bacteria or chemicals but digest the solid organic sewage using naturally present anaerobic bacteria. As a result, there is significantly less sludge in our tanks effectively eliminating the frequent sludge removal and disposal requirements of alternate systems like septic tanks. This reduces annual operating costs.
4. The significantly cleaner liquid effluent requires less additional treatment at a wastewater treatment facility to reach irrigation standards once again saving costs.
5. The cleaner and attenuated effluent delivered by the Clearford One™ system will result in the CAMUS SBT Wastewater Treatment Plant having a smaller footprint and requiring lower electricity consumption for its pumps.
6. The ClearConvey™ HDPE pipe network requires shallower trenching, can often be dug with local manual labour reducing excavation costs and allowing sewerage networks to be installed faster.
7. The ClearConvey™ HDPE network is sealed eliminating the sewage leakages into the surrounding environment common with other pipe types. This significantly reduces the chances of groundwater contamination and sewage entering wells, water supply pipes and natural water bodies.
8. It allows the installation of community based sewage solutions and the reuse of treated wastewater which is critical as shifting responsibility to the Panchayat will ensure that individual households do not relapse once ODF status is achieved.
9. It will generate a significant quantity of treated water daily that can be used for irrigation purposes reducing freshwater and/or groundwater requirements and thus in effect increasing the total water supply available locally.



Clearford One™ ClearDigest™ Smart Digester™ (L) and Clearford One™ ClearConvey™ network of HDPE pipes (R) under construction



Modified CAMUS SBT Sewage Treatment Facility

## **Operation & Maintenance**

While CAPEX is a onetime expenditure, the critical component that often determines the success or failure of a sanitation project is a combination of ease of maintenance and use as well as the quantum of recurring expenditure.

It is in terms of Operating and Maintenance that the true benefit of utilizing the Clearford One™ system is visible with the collection and treatment of both the greywater as well as the sewage requiring minimal to no maintenance for years to come. In addition, the VEC CAMUS SBT treatment facility optimally designed to work with the Clearford One™ system at Jambudiyapura uses just 15 kWh/day of electricity and with most maintenance work requiring no more skill than that possessed by a gardener or a handyman. This low operational cost which works out to an average of Rs. 2300-2400/month for the entire village when combined with the pool of funding contributed by the villagers and the government means that the O&M phase of the project will be sustainable for many years to come.

## **Observed Impact**

During the three years that have passed since the completion and commissioning of this project in May 2016 there have been many observed changes in the village that can be directly and indirectly linked to this unique Total Sanitation project. Many of these changes were completely unexpected and surprised both government officials and the IL&FS team that supervised the projects execution. These impacts observed included the following:

1. The village has been Outdoor Defecation Free since May 2016.
2. At their own expense the Villagers extended their piped water connections to the *Mori*'s so that they can benefit from getting their water in a clean area.
3. Begun dismantling their existing outdoor bathing and utensil washing platforms.
4. The Village Sanitation Committee has on its own divided the village into individual member management zones to better ensure proper maintenance and usage of the new facilities as well as maintenance of ODF status.
5. Individual farmers have begun transporting the treated sewage to their farms for irrigation reuse.
6. In the two years post commissioning monitoring of the village by the IL&FS team revealed that the number of diarrheal cases dropped from one per home per month to just three in the entire village; with all three cases traced back to people eating food outside the village at a local fair.
7. 37 of the 56 households to date have paid their Property Tax dues totalling Rs. 40,000 so that they could get their properties registered as they did not want to lose their new facilities. This led the local Talhati to comment that he could not remember such high compliance ever happening before.

These indicator behavioural changes we feel will ensure that the facilities are utilized for their designed purposes and the village after attaining ODF status will maintain it. They also demonstrate that if a quality holistic and sustainable solution is given the villagers appreciate it and co-operate.

In addition, estimates calculated on the basis of discussions with the villagers suggest that mildly severe cases of diarrheal illnesses cost them approximately Rs. 1000 per incidence to treat while severe cases cost thousands. As local income sources were primarily related to agriculture or manual labour this cost likely translated into 25% plus of a family's monthly income assuming only one adult male was working. The savings resulting from the reduction of illness while difficult to measure directly, is likely to have had a significant impact in the lives of the villagers as can be seen in the improved quality of the houses and vehicles present in the village today

It is these human elements when combined with the successful installation and operation of the Clearford One™ system at Jambudiyapura that provides total sanitation advocates with a new yet proven tool in the effort to end open defecation in India sustainably.



Jambudiyapura Village with complete system installed

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