Deep Pond™ System (Hyderabad) Case Study (with Pictures)

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This project involves implementing a low-cost wastewater treatment system in the State of Andhra Pradesh, India. The project consist of an anaerobic, deep pond, which uses a digestion chamber for degrading various types of sewage sludge and the solids from the influent wastewater stream. This system has the potential to generate and capture methane gas for various beneficial uses if the influent solids volumes are high. At the present time the solids volume flowing into the system are quite low and an insignificant amount of methane gas is generated at the facility. The anaerobic digestion of the solids is expected to keep the solids level at or below 3 feet from the bottom of the pond and is not expected to increase beyond the bottom 4 feet of the pond. In similar systems in the U.S. no solids/sludge removal was necessary for over twenty years of operation. The effluent is planned to be used for irrigation of orchard near the treatment facility.

During August 2004, Subijoy Dutta of S & M Engineering visited the site and conducted the system inspection and testing prior to the initial startup of the Deep pond™ system. Delta Business Services, and along with contractors and their field persons completed the final piping, electrical, spillways, and all other ancillary construction work to get the system ready for the startup. Figure 1 shows a schematic of the Deep pond™ system. Figure 2 shows the Deep pond™ (Pond #1). Figure 3 and 4 shows the aeration pond (Pond #2) and the final polishing (solarization) pond (Pond #3). The influent wastewater from the student dormitories, cafeteria, and the administrative buildings enter pond #1 gravity flow. The wastewater from the residential area to the south of the facility is pumped up from the south side to Pond #1 by a grinder pump.

The northern part of the Deep pond™ site (orchard) is home to 4 or 5 pairs of Cobra snakes. The field engineers and the workers have sighted them a number of times, particularly in the early hours of the day and at dask. A number of exotic bird species were also sighted at the site.

Although the efforts and resources of both Indigo Water Recycling and S & M Engineering have already exceeded the expected levels when compared to the original plan, they are continuing to finish the final phase of the startup, observation and adjustment of the system with the most effective technology that we could offer.

Final adjustments, monitoring, and installation of fencing all around the site have been completed recently as shown on the pictures above. Mr. Ram Koduri has been regularly meeting with the local communities and staff of Jawaharlal Nehru Technological University (JNTU).

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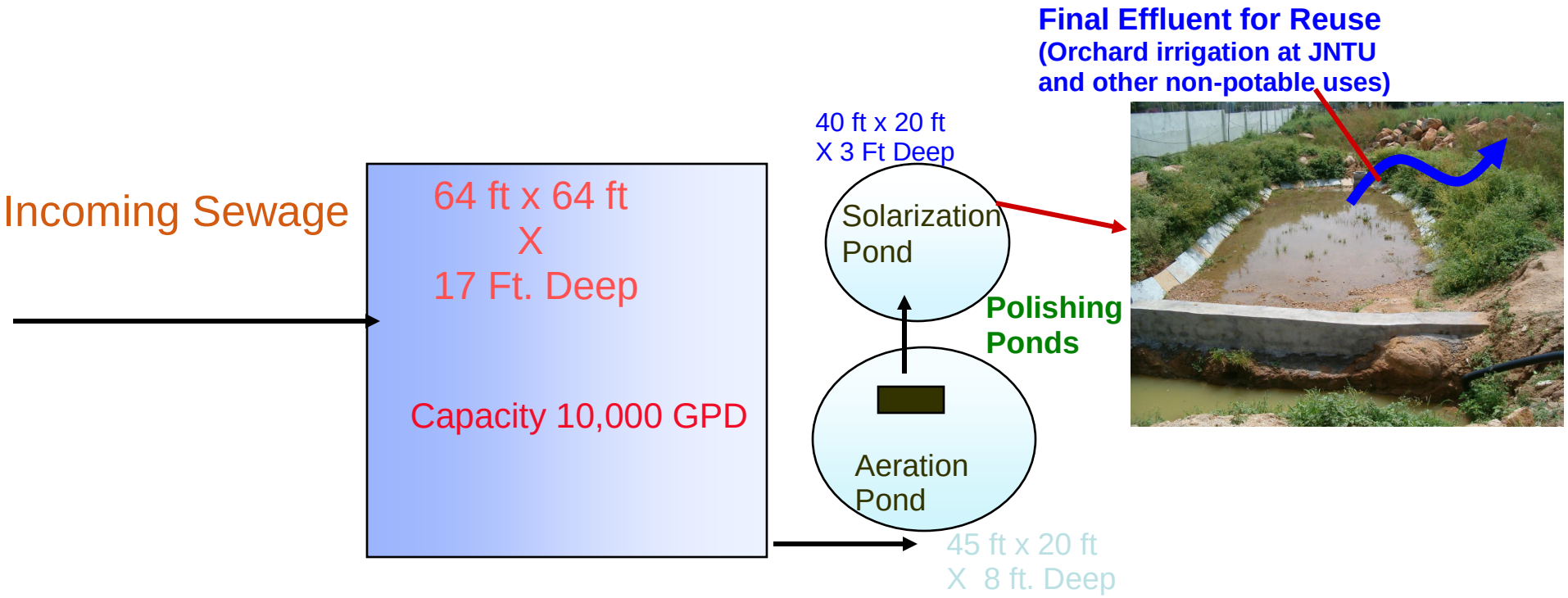

Figure 1. Schematic of the deep pond™ system

Figure 2. Deep pond™ (Pond #1), (photo: Srikant, Indigo Water Recycling, Dec 26, 2004).

Figure 3. Northern Part of the Aeration Pond (Pond #2), showing the discharge from Pond #1 into it (Photo: Srikant, Dec 26, 2004)

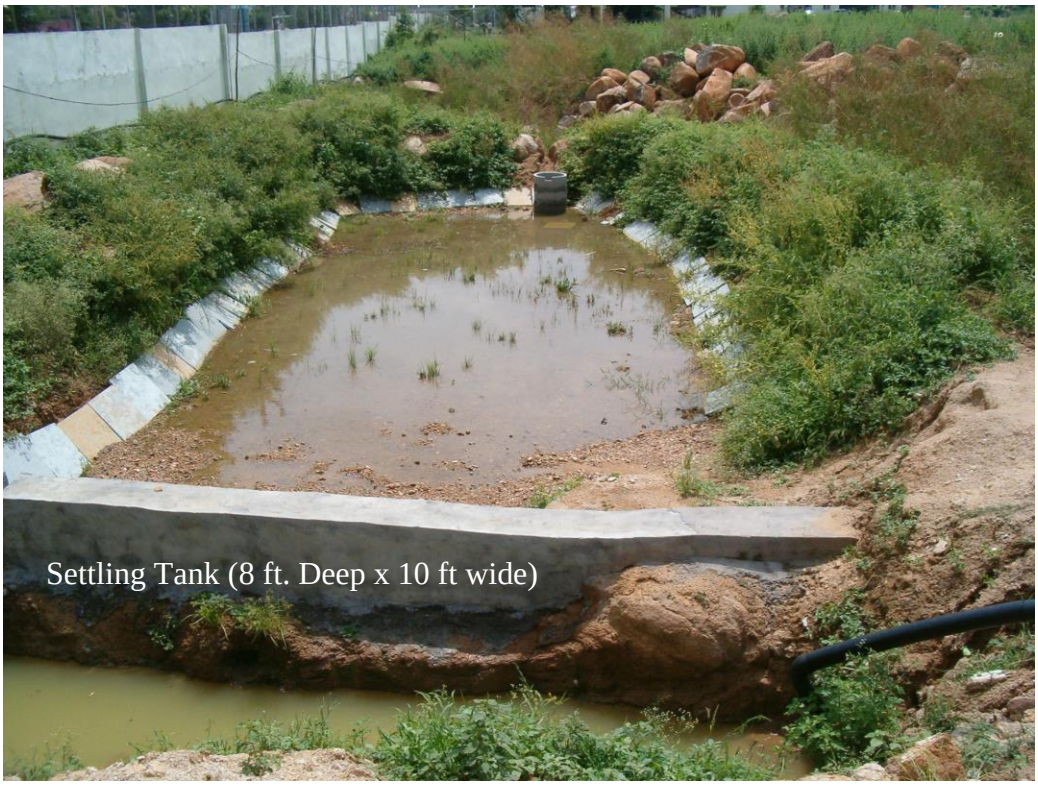

Figure 4. Solarization Pond (Pond #3) (Photo: Subijoy Dutta, Sep 21, 2004)

Project Objectives and Goals:

The following goals and objective of the project and their respective status is furnished below:

1. Constructing, operating and maintaining the Deep pond™ system and the receiver ponds for treating the effluent from the JNTU campus.
2. Selecting and procuring the different biomass wastes, and combination of wastes, to be digested;
3. Setting up a schedule and procedure for periodic and systematic monitoring and concluding results for the operation and functioning of the system and the productive use of the products;
4. Finding the most effective local use for any gas generated, the effluent and the residuals from the Deep pond™ ;
5. Developing the economics and business aspects of Deep pond™ system; and educating local people and other professionals about the benefits of anaerobic digestion.

Advantages and Benefits of Using a Deep pond™ System:

1. This system can be used in most places around the world with multiple benefits of clean water, energy production and other beneficial uses such as irrigation, fish culture and recreation.
2. It is relatively simple to install, operate and maintain. It has a very low maintenance cost and requires lesser manpower to operate and maintain.
3. The Deep pond™ system installed in Hyderabad is treating 10,000 Gallons per Day with only three (3) moving parts.
4. No chemicals are used for treatment, so there is no hazard to human, plant or animal life. The treated water can be reused with very little post-treatment or polishing.
5. This system does not produce any sludge, since anaerobic digestion causes the sludge to be transformed into methane, carbon dioxide, and water. Past experience with this system in US required no sludge removal for 20+ years.
6. This system is flexible. Once it is installed, its treatment capacity can be increased by adding ponds in parallel trains.

System Performance and Preliminary Results:

Since the Deep pond™ system has a total detention time of about 45-50 days, depending upon the influent load, the functionality of the full system is yet to be reached after the initial start of the system about 45 days ago on November 10, 2005. According to the latest communication from the Deep pond™ site in Hyderabad conveyed Mr. Koduri, the aeration pond has reached the discharge height set at about 7.5 feet from the bottom of the pond and started to discharge treated effluent to the settling tank. Water samples were collected in the 3rd week of December, 2004 and the sampling results were sent to S & M Engineering Services, Maryland.

The results from this very first water quality sampling event are summarized in Table 1. The following preliminary observations from these data are furnished below:

- It seems that the system did not reach steady state yet because of the low flow volume into the system. Due to school closings and vacations, the system was receiving less than 20% of the designed flow for the past three weeks resulting in a high retention time (lack of sewage) and presence of algae in the pond.

- The results seems to indicate that the Deep Pond (Pond #1) and the aeration pond (pond #2) is working very effectively. The direct effect of aeration by the diffusers helped almost double the oxygen level (DO) of the water (from 3.3 mg/l to 6.4 mg/l) while passing through the aeration pond (Pond #2).

Table 1. Preliminary Results from the Deep pond™ Site (Hyderabad, India) December 27, 2004 .

Number	**Sampling Point**	**Electrical conductivity** (µmho/cm)	**PH** (SU)	**Total solids** (mg/L)	**Organic solids** (mg/L)	**BOD**** (mg/L)	**COD**** (mg/L)	**DO**** (mg/L)
1	Inlet Of Deep Pond (Pond #1)	762	7.28	600	140	18	24	3.9
2	Outlet Of Deep Pond	756	6.9	620	160	3.6	48	3.3
	(Inlet Of Pond#2)							
3	Outlet Of Pond #2	765	7.1	760	200	9.6	39	6.4 ++
4	Inlet of Settling Tank (Structure upstream of Pond #3)	724	7.06	680	220	3.0	16	4.9

** BOD – Biochemical Oxygen Demand; COD – Chemical Oxygen Demand; DO – Dissolved Oxygen

++ - Note the effect of aeration – The Oxygen content is almost doubled at the effluent of Pond #2