Onsite Domestic Wastewater Treatment Using A Modified Septic Tank

Effect of Hydraulic Mixing on Pollutant Removal

Rajesh Ramamoorthy

with support from Clearford India Pvt. Ltd.

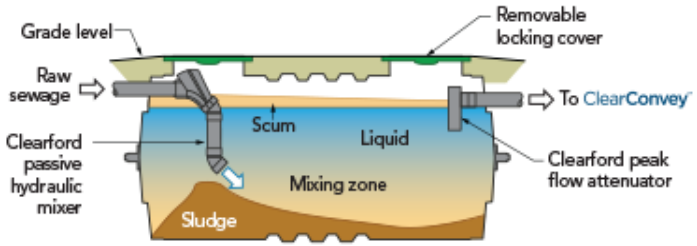
Conventional Septic tank

- Commonly used anaerobic system due to
  - Economic affordability
  - Design
  - Operational simplicity
  - Electricity free operation
- Major concerns remain
  - Dormant tank that maximizes settling process
  - Low treatment efficiency typically 30 - 50% removal
  - Incapability to handle hydraulic shock loads

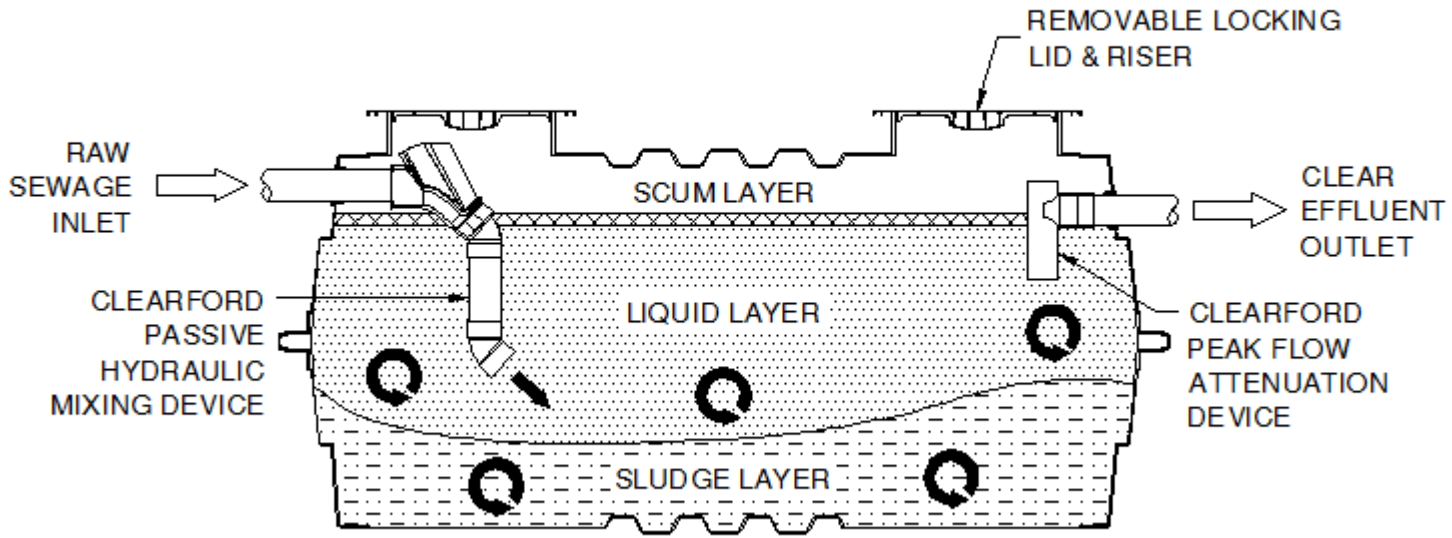
ClearConvey™ System Access Point

- Ground-level access to underground SBS®
- Convenient camera inspection and maintenance

ClearDigest™ Smart Digester



CLEARFORD SMART DIGESTER™



Tre

Including:

- Lagoor
- Constructed wetlands
- Filtration beds
- Fixed-film bioreactors (MBBR, SBR)
- Membrane bioreactors (MBR)

6

Treated effluent for discharge or reuse

5

ClearConvey™ Collector Main

- Small diameter gravity sewer
- Thermally fused joints for watertightness
- Flexible installation in shallow trenches

1 Raw sewage connection from building

2 ClearDigest™ Smart Digester

3 ClearConvey™ Lateral

4 ClearConvey™ System Access Point

5 ClearConvey™ Collector Main

6 ClearRecover™ Treatment Package

FSM4

Hydraulic Mixing

What's that?

- Passive technology to improve the digestion performance
- Utilizes the kinetic energy of the incoming sewage to effectively mix the raw sewage with bacteria in the tank
- Create a small mixing zone where organic matter and bacteria will be in contact for longer period of time

Objectives of the study

- Examine the performance of the modified septic tank with respect to pollutant removal efficiency
- Study period – January to April 2016

Proof of Concept project for Agra cantonment board

- Three households connected serving total of 14 residents using pour flush toilets and buckets for showers.
- Previously using an open drain to discharge their wastewater into a nearby pond
- Standard septic tank of 4000L capacity installed with two inlet hydraulic mixers and one flow attenuator

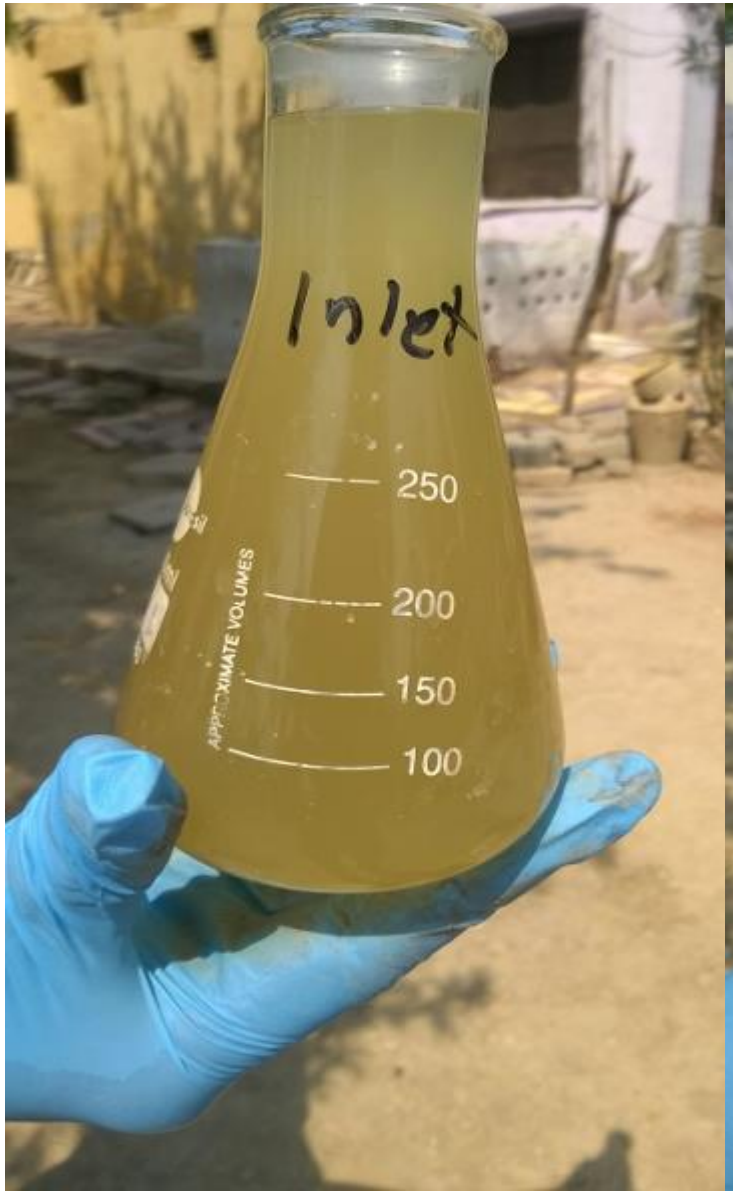
Sampling

Sampling frequency

- Twice a week during the first month, once a week in the second month and fortnightly for the third and fourth month

Composite sampling

- Grab samples were collected to align with household usage patterns to make a composite sample (Twice out of Morning, Afternoon & Evening)


Inlet
250
200
150
100


250
200
150
100

Results

	TSS			COD					
	Influent (mg/L)	Effluent (mg/L)	Removal Efficiency %	Influent (mg/L)	Effluent (mg/L)	Removal Efficiency %	Influent (mg/L)	Effluent (mg/L)	Removal Efficiency %
Min	126	60	36.5	99	41	37	285	110	35.9
Max	1288	276	86.8	1250	370	91.7	3453	1095	90.6
Avg	557	137.4	66.7	412.6	117	62.4	1140.6	328.2	61.3
SD	409.6	67.6	16.4	381.6	79.5	16	1057.2	227	16.3

Conclusion

- Pollutant removal efficiencies for TSS, BOD & and COD parameters were 66.7%, 62.4% & 61.3% during the first four months of operation
- Typically, pollutant removal efficiencies improve as the system matures
- Another study in Bangalore showed that the Smart Digester will have a pump-out interval of approximately 3 times longer than the conventional septic tank
- (Fares Almomani 2015)

Customer Reference site - Jambadiyapura, Gujarat

- IL & FS CSR initiative to create a locally sustainable ODF village at Jambudiyapura near Baroda, Gujarat
- Built toilet and bathroom complex with kitchen washing facility for individual homes
- Clearford system along with CAMUS - Soil Bio Technology for final treatment was employed
- Treated wastewater used for irrigation

Thank you for your attention

rajesh.ramamoorthy@gmail.com