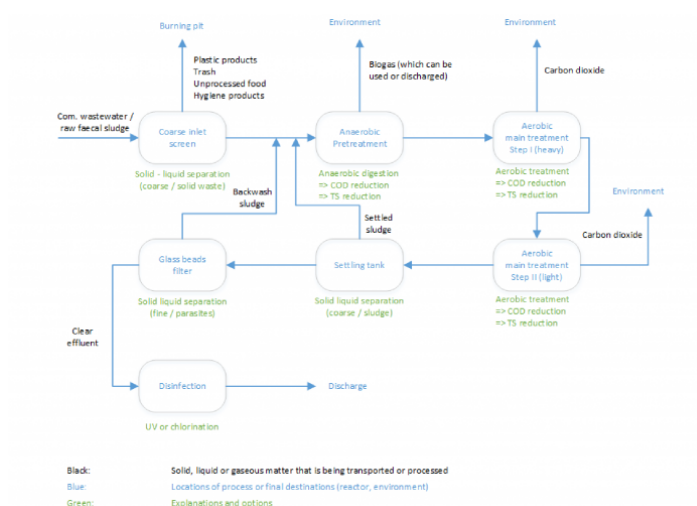




## Aerobic Treatment



16 August 2019

Organisation that implemented the case study

IFRC

### Geographic location

Cox's Bazar -  
Bangladesh

### Main treatment objectives

BOD / COD Reduction  
Nutrient reduction  
Pathogen reduction

### Technologies employed

Activated sludge  
Anaerobic baffled reactor  
Disinfection  
Glass beads filter  
Settling-thickening tank

### Design population

20000 persons

### Source of sludge

Pit latrines affected by groundwater infiltration

### Final outputs

Effluent

Sludge

### Time construction and commissioning

### TS Reduction

78.00 %

### Opex per real input flow

5.00 USD/m<sup>3</sup>

### Required space

0.02 m<sup>2</sup>/m<sup>3</sup> of design input flow

### Design input flow

10.00 m<sup>3</sup>/day

### Skills level

FSM specialist for construction

FSM specialist for design

FSM specialist for operation and maintenance

### COD Reduction

88.00 %

### Resources needed for operation

Chemicals

Electricity

### Capex / design input flow

2022.00 USD/m<sup>3</sup>/day

### Real input flow

2.20 m<sup>3</sup>/day

## Description of the emergency context

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## Description of the treatment process

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The anaerobic baffled reactor is used as pretreatment, to remove solids from the waste stream. The waste then moves to two reactor tanks in series. The aeration of the incoming faecal sludge in the a reactor tanks leads to the breeding of bacteria that metabolize the organic content (COD/TOC (Total Organic Content)) together with the oxygen, turning the organic content into a gas (carbon dioxide).

The supernatant from the two reactor tanks is transferred to a settling tank, where the remaining solids are separated. The supernatant of the settling tank is then passed through a glass bead filter, which is regularly backwashed, for the removal of parasites and parasite eggs. Finally, the liquid is disinfected by chlorine or UV. Sludge from the settling tank is added to the reactor tank. Reactor tank sludge is treated by anaerobic digestion or lime treatment.

## Assessment & design (feasibility)

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The plant is located next to a creek line that has been widened. It is a topography composed of plains and plateaus.

The site has yet to be flooded, however potential flooding could occur in large rainfall event (e.g. 1 in 50 years).

## Construction

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Equipment package comes with 12 kVA genset and wiring for connection to renewable energy. Water is needed for inception and backwash. The aerator and olid are coming from Germany, the Oxfam tanks are also imported from abroad. The construction lasts 2-5 days and the inception time is about 4 weeks or more depending on waste characteristics. The cost is \$180,000 per treatment line (\$9.00 per person) excluding works, plus local materials (e.g. fencing, gravel). It includes genset rather than renewable energy source. The skills required for set up and oversight is aerobic treatment expertise.

## Operation and maintenance

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The skills required for daily operation and maintenance is basic mechanical and electric skills & low skill labour. Water is needed for inception and backwash. A fully functional faecal sludge quality laboratory is a requirement for this unit. The cost is \$5 per m<sup>3</sup> treated, reduced with use of renewable energy. It excludes sludge transport cost.

There is a 2.2m<sup>3</sup> inflow every day, and 2.5m<sup>3</sup> of output is produced every 3 days, with a 10% solids (100 kg / m<sup>3</sup>). The output sludge production in comparison to sludge input flow is 38 kg/m<sup>3</sup>. BOD is not measured. The COD average influent concentration is 23,600 mg/L and the COD average effluent concentration is 1,100 mg/L. The COD reduction is 88%. The faecal coliforms are fully removed due to current chlorination dosage. The average TS influent concentration is 22 g/kg and the outlet concentration is 5 kg/kg. The TS reduction is 78%.

The average pH for influent is 8.1 and the average pH for effluent is 7.9. The helminth eggs

average influent concentration is 266 eggs/g and the helminth eggs average effluent concentration is 3 eggs/g. The helminth eggs reduction is 98%.

The unit does not produce strong odours or attract insects but the unit should be as far from settlement as possible while still allowing for efficient delivery of faecal waste. Washing facilities and PPEs are available. Drainage is implemented. The site is fenced. Fencing and security are needed for health and safety and theft prevention. An estimated 0.1 m<sup>3</sup> of dried sludge and 10 m<sup>3</sup> of treated wastewater is discharged per day (wastewater can safely be used for irrigation or added to a surface waterway)

## Lessons learned

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## Strengths

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- Odour and solid reduction
- Low land use
- Effective and efficient

## Weaknesses

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## Image Gallery

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