Market Development of Domestic Biogas Plants through Technical Innovation

On behalf of Expert Group on Technical Innovation



Overview

- Background
- Objectives of working group
- Methodology
- Key Findings and Recommendations

Background

Some 44.5 millions of households in Asia have installed biogas plants till now:

- China - 40 million
- India - 4 million
- Nepal - 250,000
- Vietnam – 200,000
- Bangladesh – 40,000
- Cambodia – 15,000

Market potential is roughly estimated at 110 million households in Asia : Still a large untapped market.

Objective of the Expert Group

The objective of the Expert Group was to provide the E4ALL Working Group on Domestic Biogas with informed recommendations on technical innovation on domestic biogas plants (i) **to reduce costs**, (ii) **to increase reliability** and (iii) **to meet untapped market demands**.

Market Demand

The Expert Group related possible innovations to the following four product/market combinations:

1. Improvement/development of the existing product for the existing market
2. New/developed product for potential users living in areas with high water table;
3. New/developed product for potential users who have limited space to install the biogas plant;
4. New/developed product for potential users who have limited feedstock (minimum 10 to 15 kg of animal manure per day) available to feed the biogas plant.

Methodologies

1. Review of literature covering innovations in different parts of the world
2. Face to face meetings (3 meetings)
3. Involvement of key respondents/informants, not limited to Asia
4. Field visits to investigate and verify promising technical innovations
5. Rough design sketches of innovative products for each market

Major Focus

Possibilities of Cost reduction through:

- Efficiency Improvement (i) Decreasing dilution factor and thereby increasing HRT or reducing plant volume (ii) Improve mixing of the feedstock and thereby improving hydrolysis process (iii) Recycling of digested effluents (iv) Maintaining or raising temperature of the digester (v) Feeding of other wastes: co-digestion (vi) Optimising HRT (vii) Sealing of the gas storage partition (viii) Addition of special enzymes
- Optimisation of Process and Structural Design: (i) Optimisation of volumes of different zones, (ii) Optimisation of surface area vs the digester volume and other components (iii) Use of alternative construction materials

Penetration into the unexplored/new market : (i) Areas with High Water Table (ii) HHs with 10-15 kg/day feeding (iii) HHs with space limitation

Recommendations

- Cost Reduction and Improving Efficiency

Because of their short life and other technical problems related to gas pressure etc. plastic bag digesters are out of consideration.

Keeping in view the finding of research in Nepal and Vietnam, there is a possibility for cost reduction by 15 to 20% and increase quantity of gas production with the recycling of bioslurry coming out of biogas plant. This reduces the size of biogas plant as HRT can be reduced considerably.

Special enzymes like Effective Microorganisms are being used successfully for expediting the production of compost manure (also in Biogas Plants in Vietnam). Use of such enzymes in biogas plant will decrease the HRT and reduce the cost of biogas plants by 15 to 20%, however, the availability, accessibility and cost factors may limit the application.

Recommendations

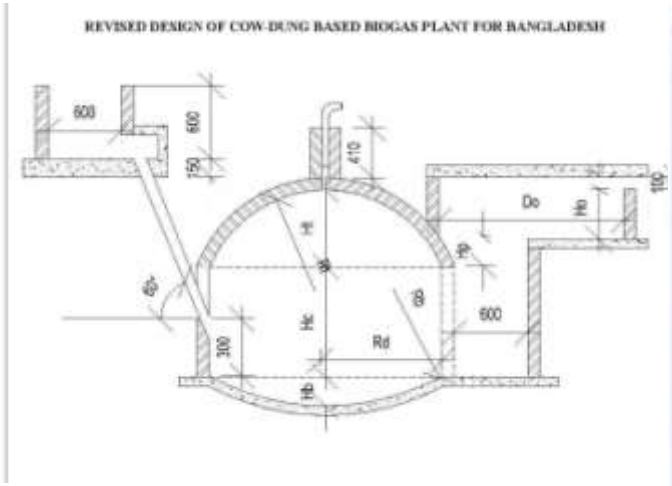
- Improving Efficiency
  - Special sealants for making biogas gas-tight are being produced in China. The initial outcomes of performance of such sealant in Cambodia and Nepal has been found to be encouraging. The resulting saving has been estimated to be US$ 15 to 20 in Cambodia for a 6 cum plant

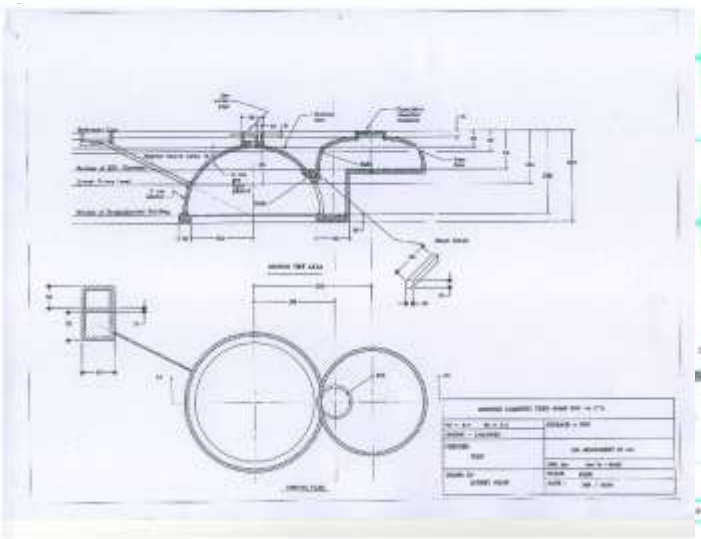
Recommendations

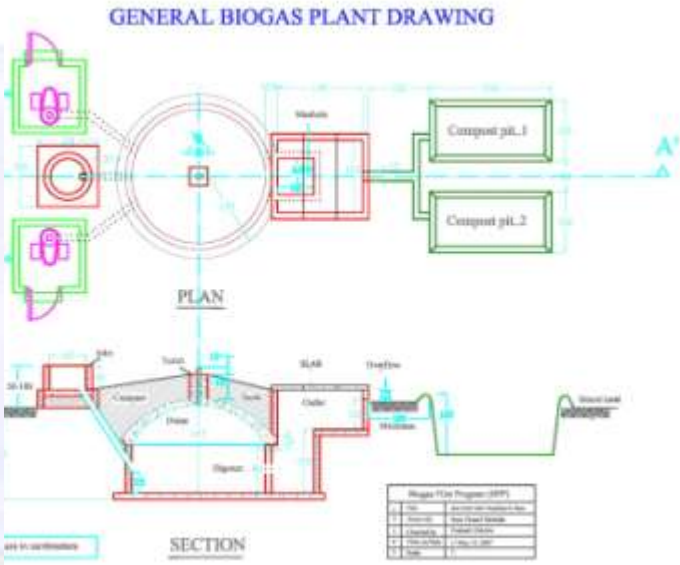
- Improving Efficiency
  - Proper mixing of the substrate enhances the micro-biological hydrolysis process. It is therefore recommended that long-lasting, user-friendly, and cost-effective mixing devices are developed. Many of the existing mixing devices have the problems with durability.

Process Design

- There are little rooms for optimisation of volumes of different components of most of the existing designs of biogas plants being used in wider scale. These designs have already gone through optimisation processes in the past.







Structural Design

It is recommended to monitor the outcome of the pilots being carried out in Africa on use of alternative low-cost construction materials such as Interlocking Stabilised Soil Bricks (ISSB), and use of lime-cement mortar.

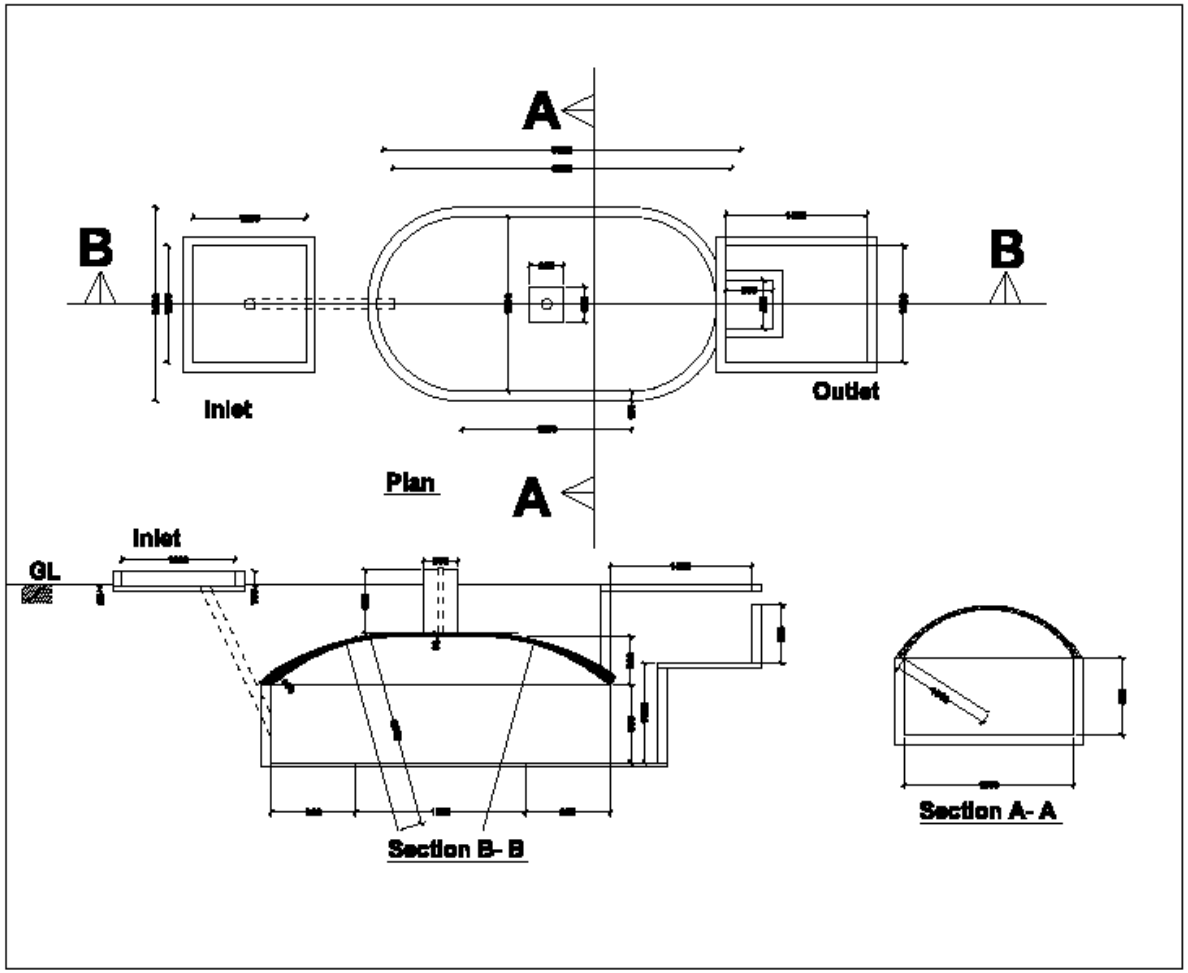
Structural Design

- Fibre-glass reinforced plastic (FRP) biogas plants could be an alternative to conventional biogas plants. For FRPs produced manually at local levels, it is strongly recommended to formulate quality standards for manufacturing and installation. In this regards, efforts are already initiated in Bangladesh under Energy for All Partnership. It is recommended to monitor the outcomes of this initiative.

New Products for Untapped Market

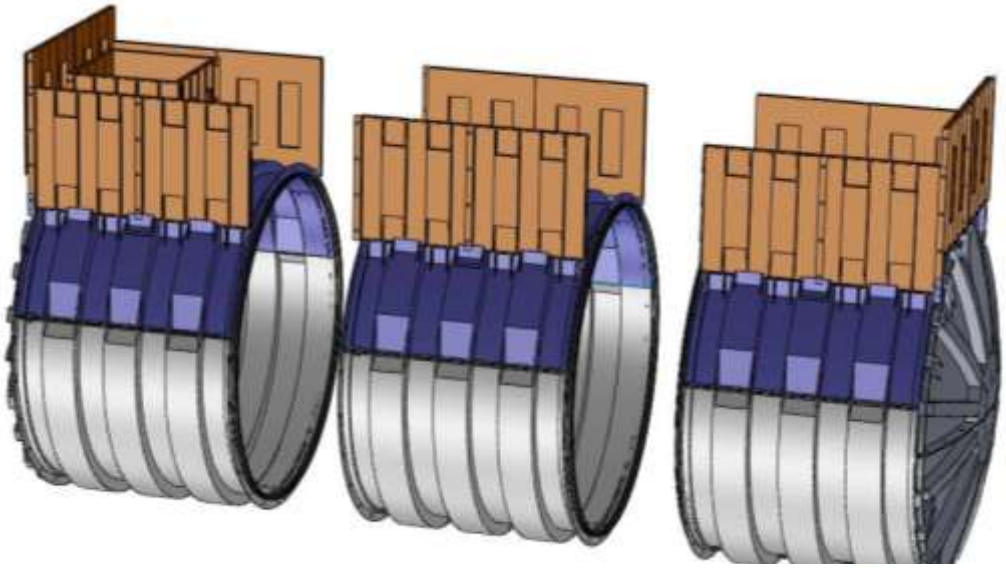
Areas with High Water Table

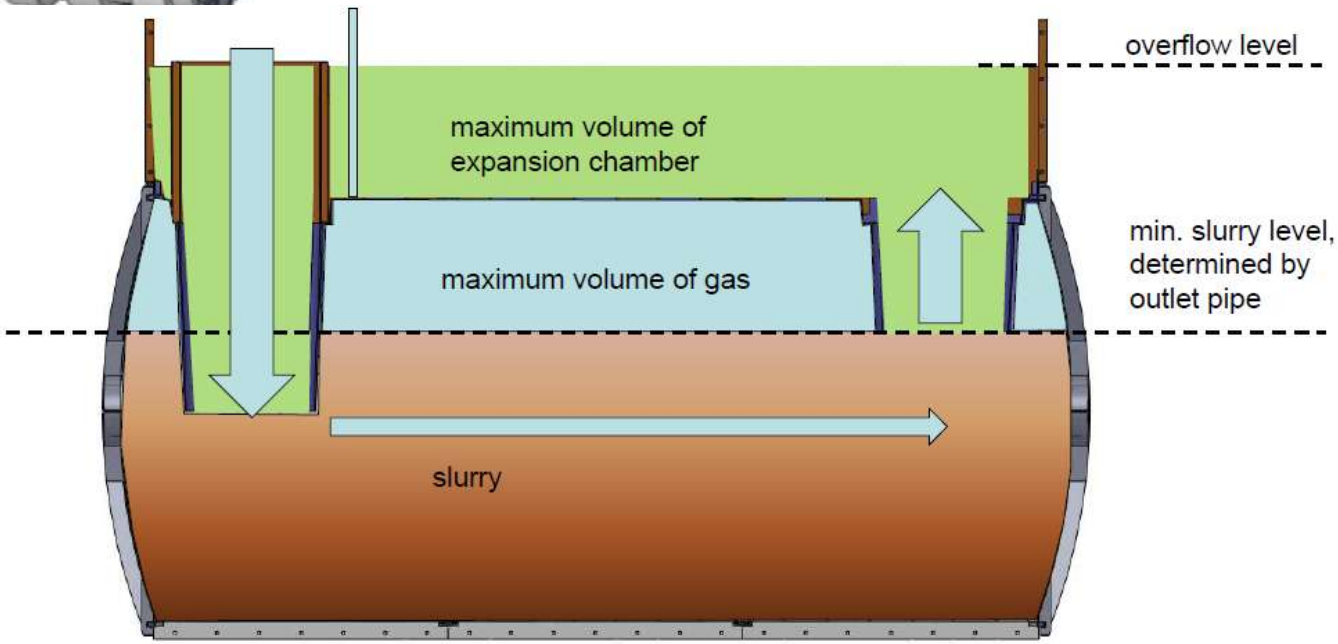
Extended Dome – Shallower Plant



Pumping

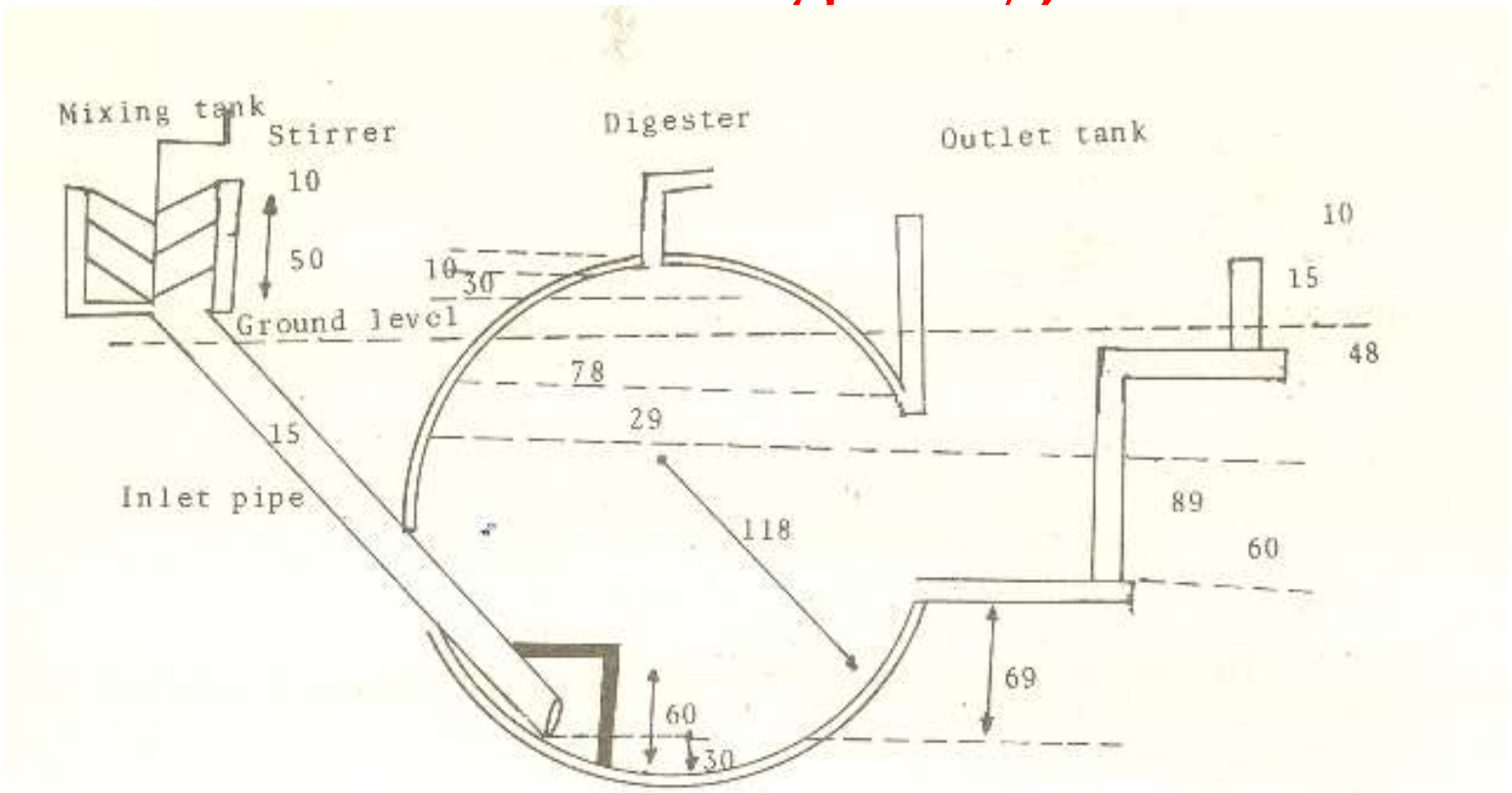
New Products for Untapped Market





SimGas Design

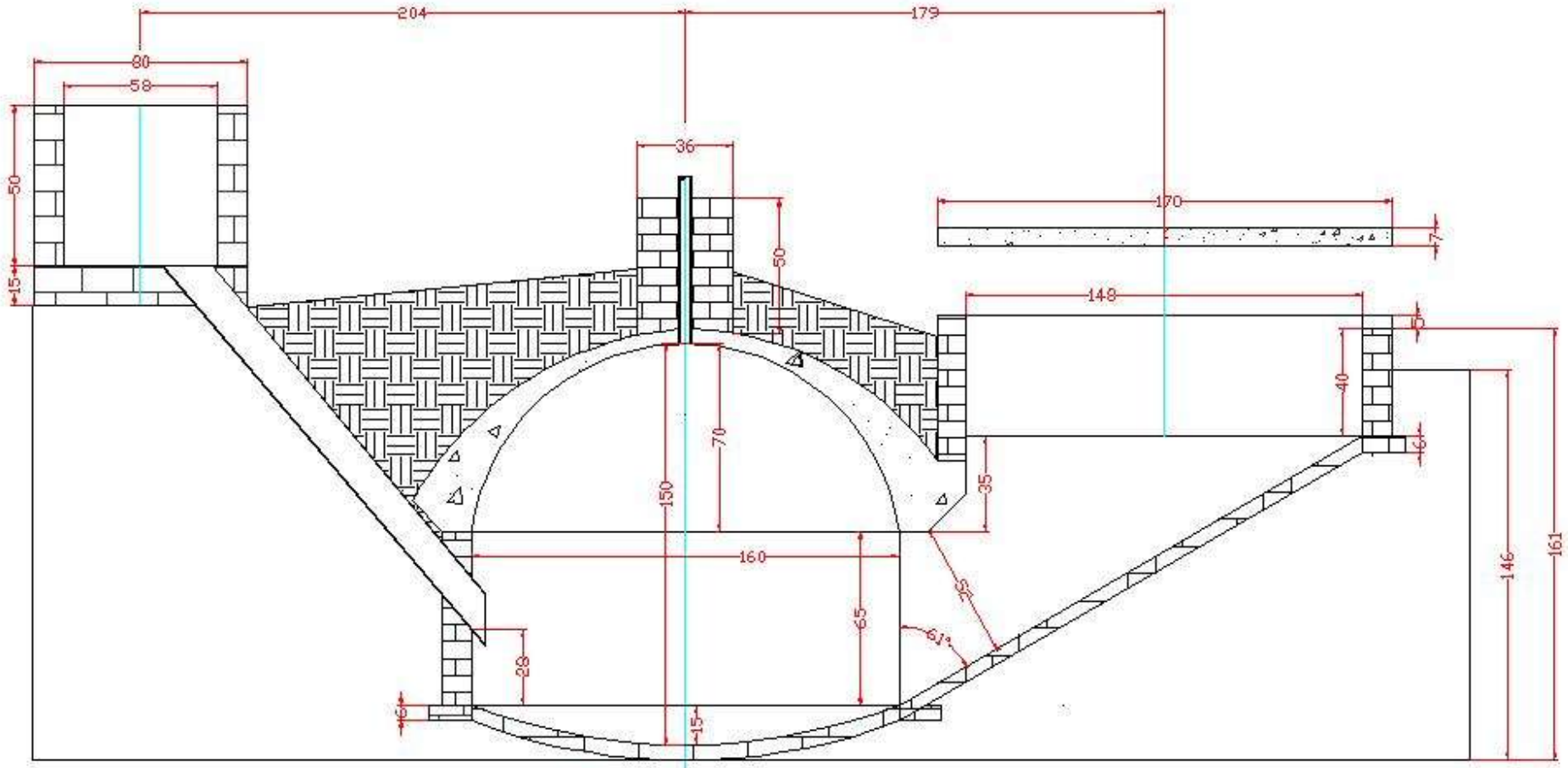
Households with limited Feedstock (less than 20 kgs/day)



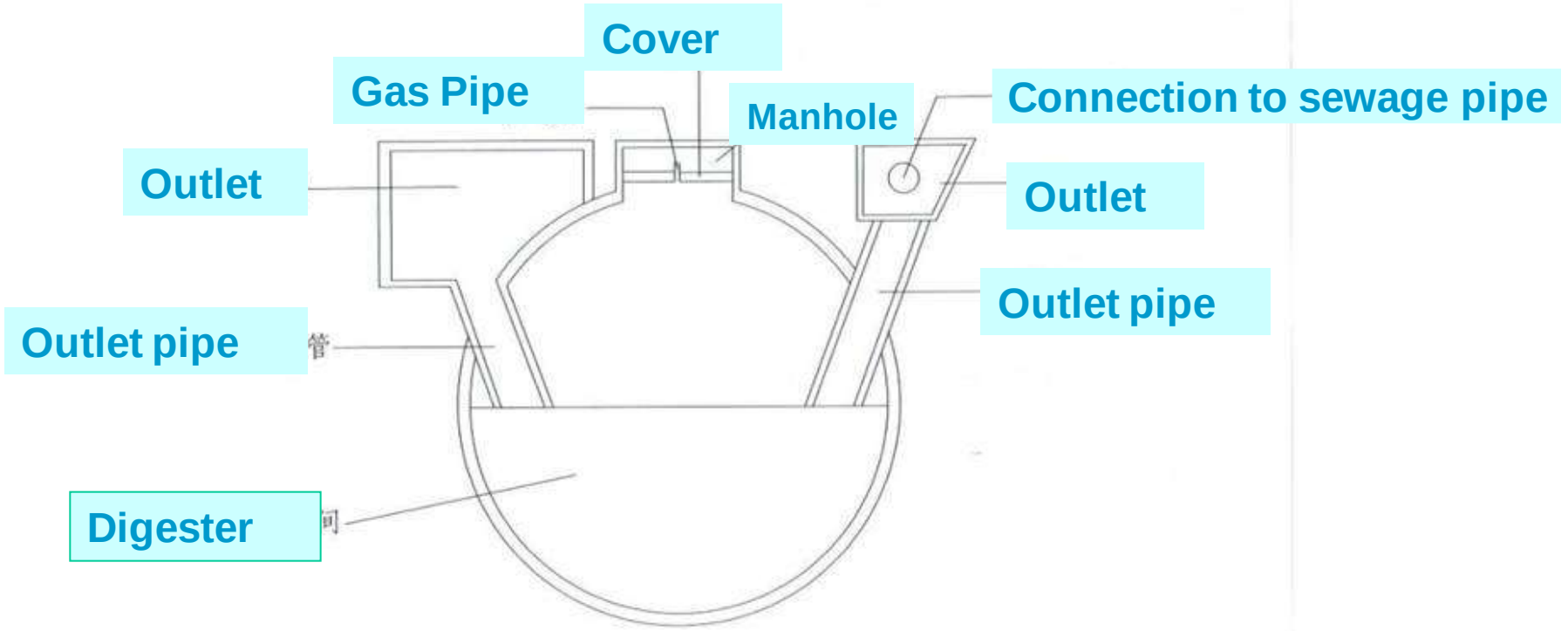
(All dimensions are in c.m)

Sectional elevation

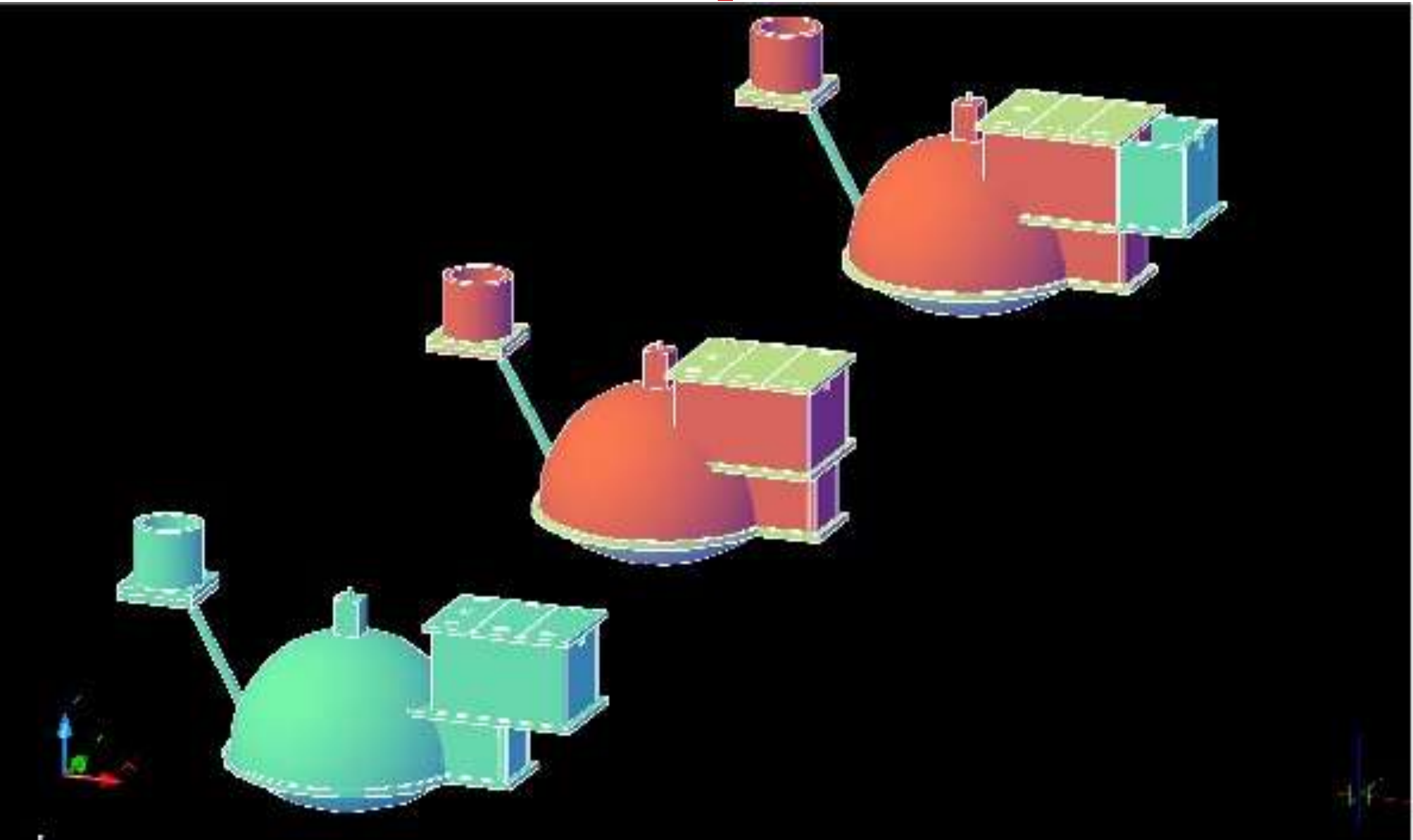
Households with limited Feedstock (less than 20 kgs/day)



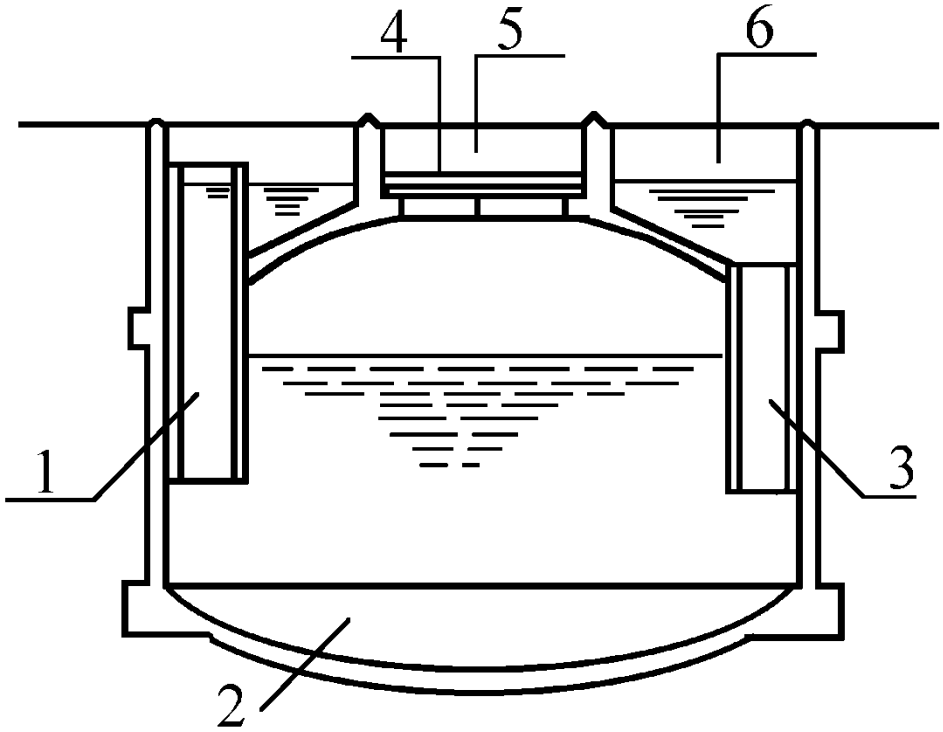
Households with limited Feedstock



Households with Space Limitation – Outlet on top of Gas Holder



Space Saving – Inlet and outlet on top of gas holder




Thank you!