



**Reducing UPOPs and Mercury
Releases from The Health Sector in
Africa**

**REPORT ON IMPLEMENTATION OF
PRELIMINARY ACTIVITIES FOR THE CONSTRUCTION OF A BIO-
DIGESTER AT
MWANANYAMALA REGIONAL REFERRAL HOSPITAL
DAR-ES-SALAAM**

GEF Project

**UNITED NATIONS DEVELOPMENT PROGRAMME
(UNDP)**

**Christopher Kellner (Dipl. - Ing.)
Consultant on Biogas and Sanitation
kellnerbiogas@yahoo.com
+255784862495**

12.06.2018

Contents

1	Introduction	3
2	Objective of the measure	3
3	Scope of this report	3
4	Implementation progress	4
5	Design details	6
5.1	Description of activities	6
5.2	Figure 1: Technical Drawing of Digester	7
5.3	Figure 2: Detail of expansion chamber build as tunnel with three manholes	8
5.4	Figure 3: Detailed Drawing for the curved separation wall	9
5.5	Figure 4: Birds Eye view of separation wall	10
5.6	Figure 5: Sewer pipe from 4 toilets and the sluice for placentas	11
5.7	Figure 6: Birds Eye view of toilet connections	12
6	Contacts	13
7	References	14

1. Introduction

UNDP in collaboration with Ministry of Health Community Development, Gender, Elderly and Children (MOHCDGEC), Healthcare Without Harm, and Mwananyamala Regional Referral Hospital are planning to carry out a pilot project to digest placentas, food scraps and some garden waste in a biogas plant, to achieve clean disposal of placenta, food scraps and production of energy.

2. Overall Goal of the Project

To ensure safe disposal of placenta and food scraps by digesting both types of waste to produce energy.

3. Scope of the Assignment

The report refers to: Bio-Digester Designing Consultancy/shopping/2018/019, Dated 14 February 2018.

It is delivered to UNDP Dar-es-Salaam, which is the contractual party assigning the Consultant Christopher Kellner with the task to design and supervise the establishment of this anaerobic treatment system with biogas production for placentas.

The assignment is split in 5 steps:

1. Site Assessment; **February 15, 2018**
2. Provide technical details to feed in the tender document; **February 25, 2018.**
3. Meeting with construction company and Initiation of Bio digester; **June 06-08, 2018**
4. Quality assurance- approval of pressure tests on the piping system, the digester and hand over of the plant to the hospital; **July 2018**
5. Provision of final report; **August 2018**

4. Implementation Progress

In February 2018 the site was visited in order to plan the concept for placenta disposal and the digester position in all detail. This was done in the presence of Dr. Daniel Joseph Nkunku, Mrs. Sifa Issa Mgaya and Deogratias Mkembela (UNDP).

After the visit technical detail for the design of the bio digester were established. The design fed into the development of tender document.

During the second visit of the consultant on June 6, 2018 UNDP conducted a meeting presented an opportunity for the consultant to provide technical details of the project. The meeting was attended by hospital personnel, UNDP, MOHCDGEC, and Wastewater Solutions OSWAMS. During the meeting a final suggestion for the use of the gas produced was presented Medical Officer in -charge. Two locations within the maternity ward where the biogas generated can be used were identified. Both locations require heat energy for boiling and/or sterilization. This was agreed by all stakeholders; therefore, the gas pipe will be guided to maternity ward.

Detailed planning and implementation for the running of the piping system and the position of the gas use equipment will be done by Wastewater Solutions OSWAMS during construction of the digester.



The site for construction was set out and marked on the ground



The picture shows the construction team. The yellow line behind the group is the reference line spanned across the future building site. The stick on the left marks the center of the digester to be constructed.

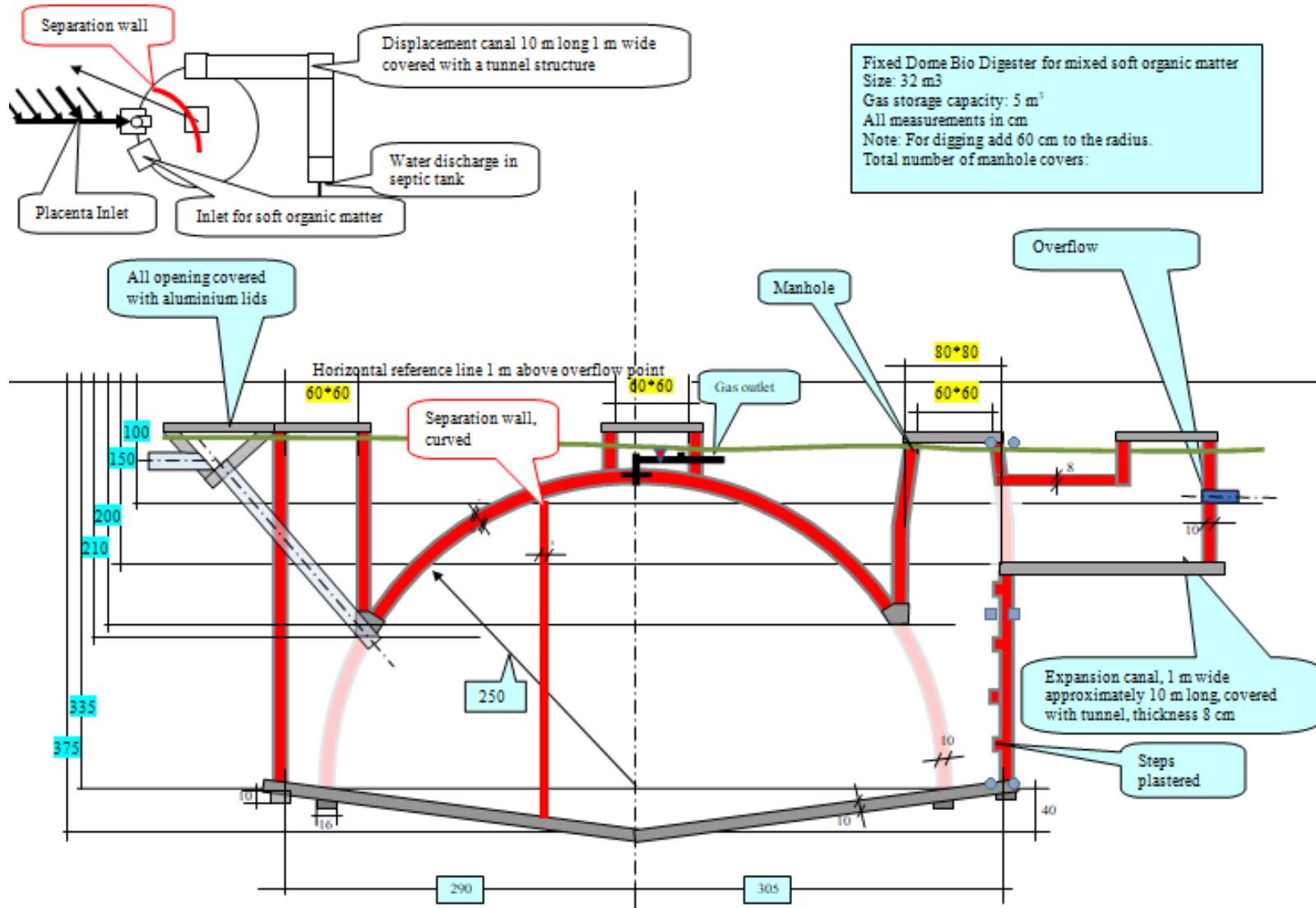
5. Design details

5.1 Description of activities

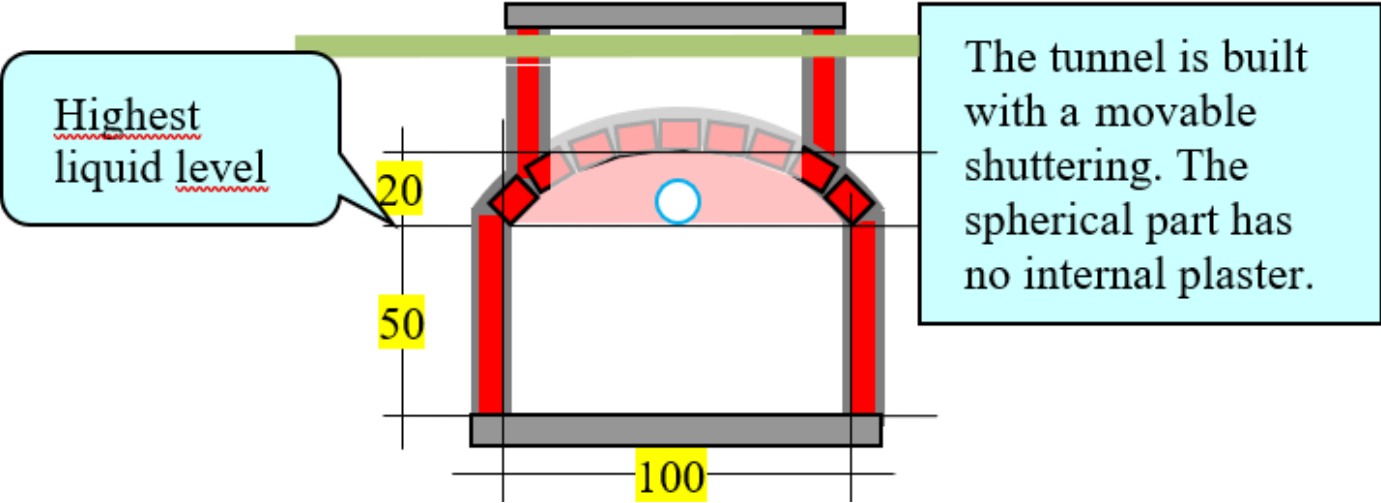
- Construct a hemispherical fixed dome biogas plant of 32 m³ (nominal size) as shown on site sketch **(Figure 1)** on the premises of Mwananyamala Hospital, with the following features:
 - Inner radius of 2.5 m as shown on technical drawing **(Figure 1)**
 - Reconnect all pipes and underground structures, which appear during digging, to fulfill their function
 - Thickness of wall of hemisphere before internal and external plaster: 10 – 12 cm
 - Construction material for all structures full concrete blocks
 - Construct expansion canal, volume 5 m³, tunnel design as shown on site sketch **(Figure 2)**
 - Access to expansion chamber at three points as on-site sketch **(Figure 2)**
 - All 6 manhole covers cast aluminum 50*50 cm
 - Provide one 6” inlet pipe for placentas (sinking) and sewage from the maternity ward toilets with manhole cover **(2)**. It must be possible to poke the inlet pipe conveniently with a stick of 3.5 m length, when manhole cover is removed.
 - One square vegetable inlet for food waste soft organic waste, paper and card board **(Figure 4)**. It must be possible to poke the inlet with a stick when manhole cover is removed.
 - Internal separation wall as on detailed drawing **(Figure 3 and 4)**, bent, to be built after all internal gastight plaster are applied, separation wall not plastered.
 - Maximum gas pressure 100 cm Water Column **(Figure 22)**
 - Connected overflow from biogas plant to existing sewer system.
- Renovate 5 toilet cubical at the maternity ward, discharging in the digester with reliable flush system with water-saving button (No drawing provided, as this is matter of flushing accessories commercially available).
- Provide user instruction signs at the toilets (DON'T THROW SOLID WASTE IN THE TOILET or similar)
- Provide collection pipe for sewage from 5 toilets and connect to 4” pipes from 4 toilets **(Figure 4 and 5)**.
- Provide 6” pipe connection for placenta sluice toilet for smooth transition of placentas when flushed down.
- Provide gas piping system to the 2 sites indicated by the hospital management
- Inoculate (start up the system with sewage from the existing septic tanks (can be within the framework of cleaning the septic tanks).
- Train sanitation workers in operation of the system.
- Follow up the function of the system through monthly visits (Customer Care and Monitoring) for six months.

Technical drawing of 32m³ digester, 6 aluminum manhole covers displacement tank 90° cranked, 2 inlets, curved separation wall (see detail).

5.2 Figure 1 Technical drawing of digester



5.3 Figure 2: Detail of expansion chamber build as tunnel with three manholes



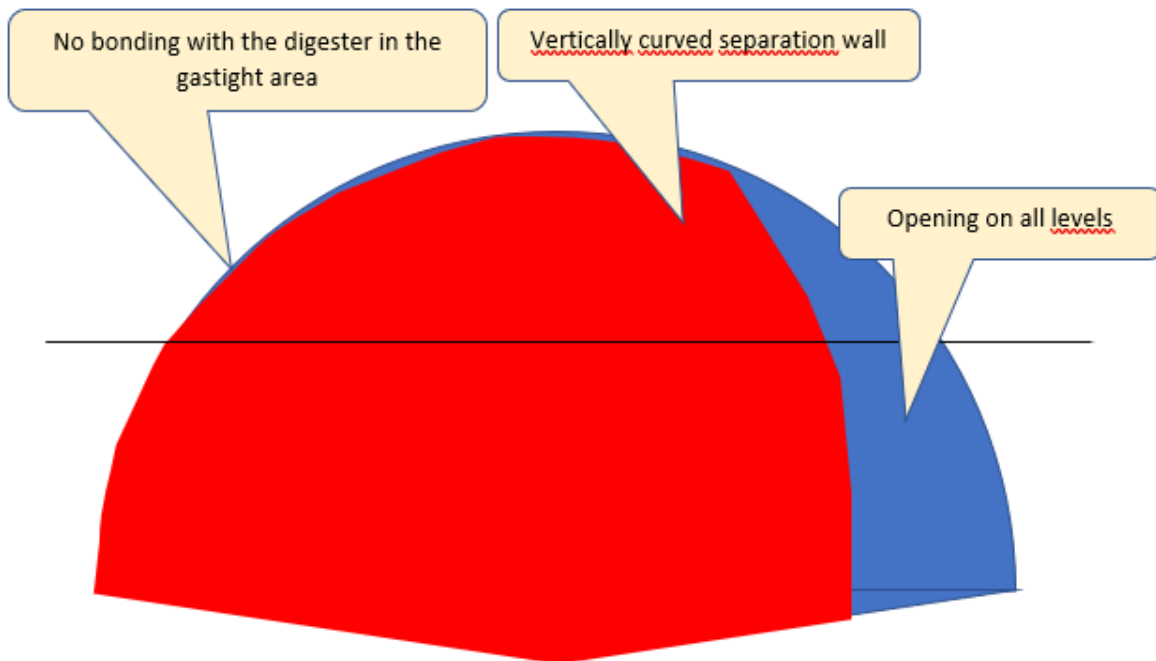
5.4 Figure 3: Detailed drawing for the curved separation wall.

The wall is constructed in the digester after all other works are completed. It is important that the gastight plaster is completed first. For the separation wall the plaster should not be chiseled or disturbed.

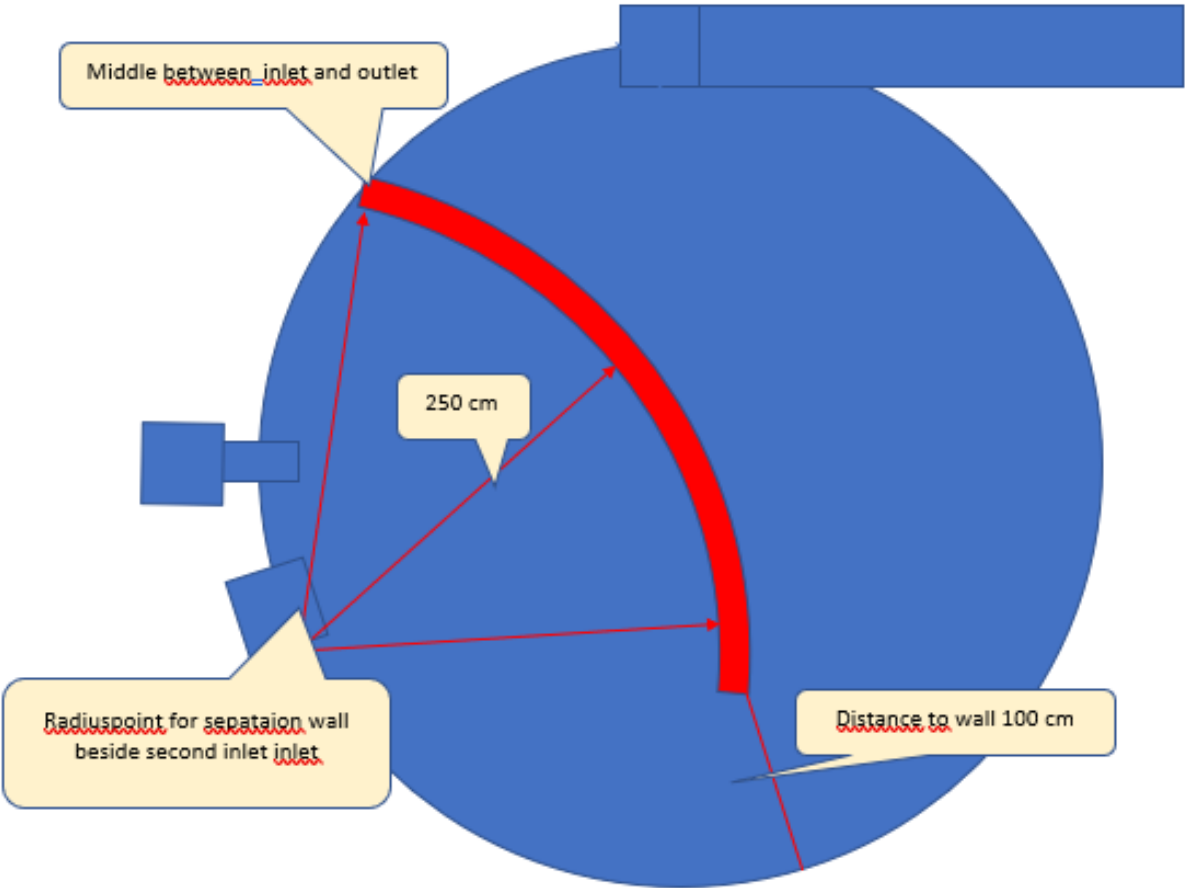
The stoical stability of the wall originates from its curved shape, so it is stable also without touching the gastight dome.

The purpose of the wall is to guide the fed material a long way through the hemisphere and minimize the chances of shortcuts of any material being fed in.

Cross section view



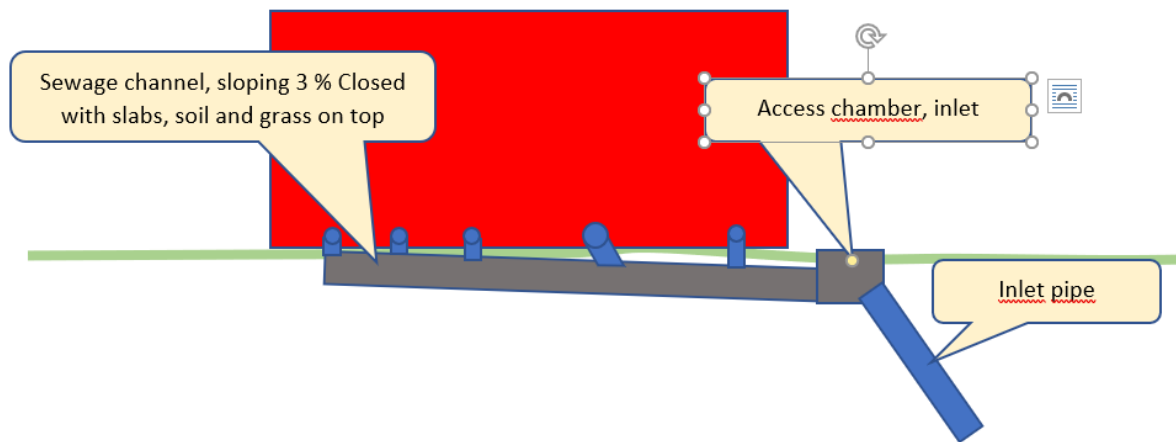
5.5. Figure 4: Bids Eye view of separation wall



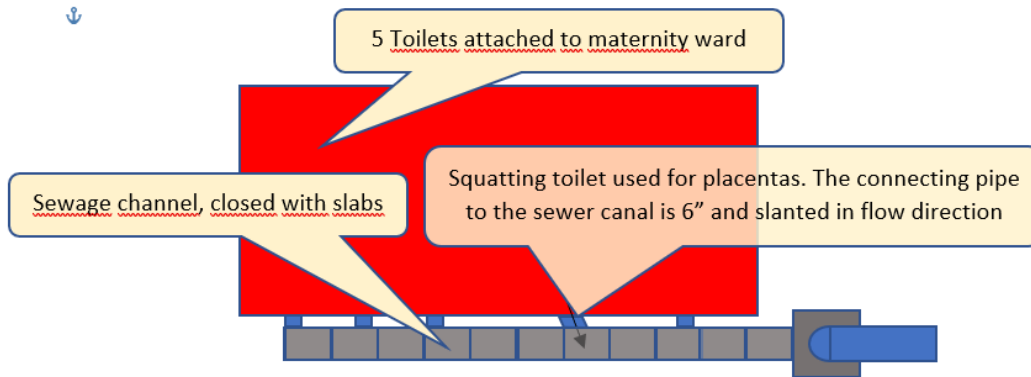
5.6 Figure 5: Sewer pipe from 4 toilets and the sluice for placenta

The channel is built as high as possible for easy flow, convenient operation and cleaning.

Cross section view



5.7 Figure 6: Birds eye view of toilet connections



6. Contacts

Dr. Daniel Joseph Nkunku
Mwananyamala Hospital
Tel: 022-276-0500
Mob: +255 653 211348

Sifa Issa Mgya
Mwananyamala Hospital
Mob: +255 754 316 387
Email: Sifa.kebby@gmail.com

Juma Nassor
Wastewater Solutions, OSWAMS
<http://hivisasa.co.tz/habari/oswams-yawa-muarobaini-wa-maji-taka-nchini>
Mob: +255 656 624 777

Ruth Stringer
International Science and Policy Coordinator
Health Care Without Harm
Tel: +44 20 8144 0812
Skype: RuthHCWH
Email: rstringer@hcwh.org

Deogratias Mkembela
UNDP
Mob: +255 767 800 184

7. References

- 1) BORDA DEWATS, Decentralized Wastewater Treatment Systems
<https://www.scribd.com/document/61809861/BORDA-Dewats-Handbook>
- 2) Placentas for Biogas in Nepal
www.hospitalesporlasaludambiental.net/wp-content/uploads/2016/08/Leadership-Waste-and-Energy-Waste-Management-Paropakar-Maternity-and-Women
- 3) DEWATS Project Fact Sheet St. Paul's Hospital
[Project%20Fact%20Sheet%20St%20Pauls%20Hospital%20Kashikishi.pdf](#)