# Development of an affordable household water treatment for use in LEDCs

## Introduction

The aim of this project is primarily to research the feasibility of developing a method of water treatment for use in rural Uganda. With over 1 billion people in the world without access to a safe water supply there is an important need for development of suitable technologies. Water is mainly treated to reduce the bacteria that cause diarrhoeal diseases such as, cholera, typhoid and dysentery which, are common across the developing world with approximately 5,000 children dying every day. There is a particular problem within poor rural areas due mainly to problems of sustainability of existing services, low coverage and not being amenable to economies of scale.


Figure 1

**Specification:** In order to make the product accessible to rural households cost is a significant factor. The aim is to achieve a low cost solution using locally sourced materials and a simplified manufacturing process.

## Laboratory Work

Primarily work was undertaken to determine the ratio of clay, sawdust and water required for the ceramic, taking into consideration the flow rates, workability of the mix and effectiveness of the filter.

## Method

1. Mix clay, sawdust and water and leave for 24 hours.
2. Press the mix into the mould using testometric (in the laboratory) and put in oven to dry.
3. Bake in the kiln for 6-7 hours at 1000°C
4. Test filter and test water

## Continuation in the laboratory

A significant problem encountered in Uganda was the filter dissolved in water. The likely possibilities are either a problem with the material or the manufacturing process. As a result further work was carried out in the laboratory to determine the composition of the clay (using sieving and x-ray deflection) as well as a manufacturing comparison between the Ugandan and UK materials. This involved making identical filters with both materials and comparing the water after filtration.

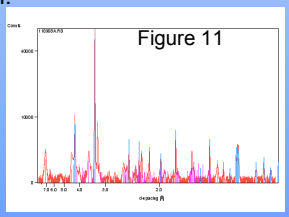
Figure 11


Figure 12

## Conclusion

The main conclusion is that there is a significant difference in the two clay materials. The Ugandan clay has a high proportion of sand (approx 55-65%) which makes it less suitable for use as a filter. As a result rural manufacture is difficult but due to better quality control of the materials larger scale city production has potential.

## Field Work in Uganda

Manufacture was designed for rural Uganda and as a result the materials were sourced locally and a kiln was built at the campus. The mould and the ceramic filters were designed and manufactured on site. The available tools and materials were limited which restricted the mould design causing a trade off between the complexity and quality of the design and the ability to manufacture.

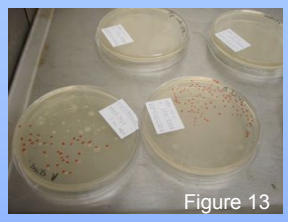
Figure 13

## Results

The testing of the water filters in Uganda were unable to produce satisfactory results. The water was still tested and three local wells gave FC quality of 138, 100 and 67 FC/100ml (WHO high risk) showing a need for water treatment in the area.

The laboratory tests showed that the filters made with the UK clay reduced the colonies of bacterial by approximately 50 whereas the Ugandan clay filters had no effect. The prominent cause of this is the cracks which occurred during firing, demonstrating a problem with the material.

Figure 2

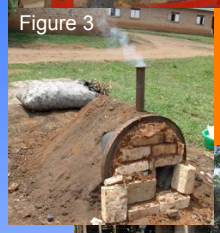
Figure 3


Figure 4


Figure 5

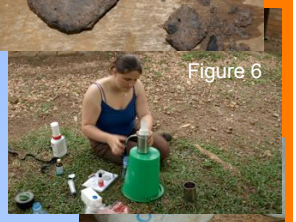
Figure 6


Figure 7

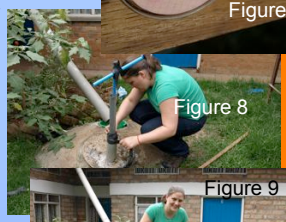
Figure 8


Figure 9


Figure 10

**Figures:**
1. Laboratory tests of different filters, 2. Pressing the filter in Uganda, 3. Kiln in Uganda, 4. Taking the temperature, 5. Problem filter after firing, 6. Testing water in the field, 7. The colonies of bacteria from testing, 8. and 9. Mending a water pump in Uganda, 10. UK and Ugandan filters after firing, 11. Results from the X-ray deflection, 12. Sedimentation of the Ugandan clay, 13. Lab water testing


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