

Reedbed Technology for Waste Water Treatment in a Global Context

1 Introduction

Target 10 of the Millennium Development Goals is to halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation.

Much of the developing world continues to struggle from a lack of planned development, and suffers a massive shortage of resources for civil waste water treatment systems.

It is difficult to see how target 10 can be achieved in this climate, and so there is a pressing need for appropriate and affordable interventions which can build towards the millennium goal they also save resources and money.

2 Constructed Wetlands

Reedbeds and other constructed wetlands are widely used in some developed countries for situations where civil infrastructure is limited, and can offer an alternative to large scale civil engineering interventions through relatively low cost unitary treatment of waste water discharge from both domestic and commercial premises.

Reedbeds use naturally occurring processes in an engineered and controlled environment to reduce the polluting potential of waste water discharges to a significant degree.

If correctly designed and constructed, operation and maintenance is relatively straightforward with a minimum training requirement.

3 Reedbeds and their Use

Constructed reedbeds can be created for most scales of operation, from the very large to the very small. Principally the size is determined by the wastewater to be treated, the volume, the organic / pollution loading of the liquid and the location.



***Plate 1 - Floating
Reedbeds at an
International Airport***

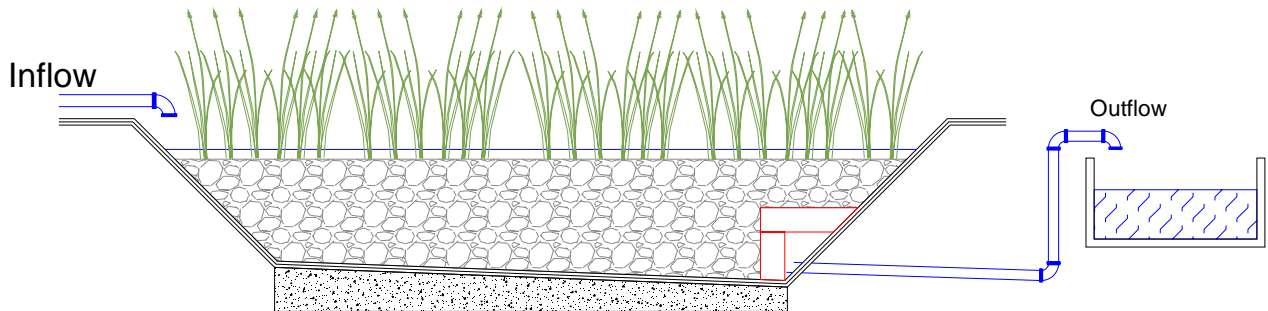
AARDVARK EM Limited

Commercial environmentalism for Water –Waste – Energy – Environment

www.aardvarkem.co.uk

4 Construction

In general reedbeds are constructed out of natural local resources, such as earth banks and clay liners or they can be “more constructed” using some form of containment wall, such a concrete blocks or timber frame with an impermeable rubber/butyl liner.



The void space is generally filled with graded gravel or soil gravel matrix and planted with *Phragmites australis* or other hydrophytes at close spacing. These plants encourage opening up of void spaces to allow waste water to progress through the matrix, as well as facilitating oxygen transfer to aerobic zones in the matrix and providing a sink for nutrients.



Plate 2 – Timber framed reedbeds at a Milk Processing Plant

Reedbed Technology for Waste Water Treatment in a Global Context

There are several types of constructed reedbed, but the two main types being horizontal and vertical flow, each performing slightly different tasks. Ideally reedbed systems should be constructed to make the most use of any fall to allow the movement of water through the system via gravity, this reduces operating costs and the reliance on power for pumps and flow systems.

5 Treatment

In essence constructed reedbeds purify liquid waste by removing organic matter, oxidising ammonia, reducing nitrate and removing phosphorus. The processes are complex involving bacterial oxidation, filtration, sedimentation and chemical precipitation.

The hydrophytes grow and develop a large root zone, which provides an extensive habitat for microbial activity. As the wastewater passes through the reedbed it comes into contact with a system of aerobic, anaerobic and anoxic zones. Around the plant roots is an aerobic zone generated by the plant passing oxygen down through its roots and rhizomes where large populations of aerobic bacteria effect the biodegradation of the organic matter in the effluent.

The rhizomes and roots grow vertically and horizontally opening up the bed to provide a passage for wastewaters. Soil and gravel provides a growing media for the plants as well as providing a medium to which complex ions attach, aiding their removal from the waste. This will remove heavy metals and additional contaminants from the waste stream.



Plate 3- Reedbed used for treating sewage discharge water in Cambodia

AARDVARK EM Limited

Commercial environmentalism for Water –Waste – Energy – Environment

www.aardvarkem.co.uk

Reedbed Technology for Waste Water Treatment in a Global Context

Soil has a diverse microbial fauna. Research work has shown that microbial species that find reedbed conditions attractive, (microbes such as bacteria, fungi, algae and protozoa), are capable of naturally biodegrading synthetic chemicals such as pesticides, chlorinated hydrocarbons, and even phenol, methanol, acetone and amines from industrial effluents.

These microbes can also act as predators to pathogenic organisms that can cause disease in animals and humans, as well as utilising and altering nutrient sources present. Suspended solids from the waste stream collect at the surface and are aerobically composted in the above ground debris of the bed.

6 Uses

Reedbeds have been used to treat a variety of liquid wastes from acid mine discharge to domestic sewage (as part of a hybrid system). There have been many examples of the use of reedbeds throughout the World including in Asia.



Plate 4 - Water reused for a Lotus Pool in Siem Reap

7 Other Components

In general reedbeds form part of a biological treatment system with other components being, lagoons, ponds, wetland areas and irrigation crops.

AARDVARK EM Limited

Commercial environmentalism for Water –Waste – Energy – Environment

www.aardvarkem.co.uk