

Ecological Wastewater Treatment System

award winning 'first time' system for Yorkshire village

As part of the European Community Wastewater Treatment Directive, Yorkshire Water is providing 'first time' sewage treatment schemes to more than sixty villages in their region. These villages are largely served by private septic tanks, which are not considered to be 'appropriate' treatment by EA. Typical treatment would be to provide a small self-contained package plant. However, a different approach was applied for the village of Scrayingham, where an ecological pond wastewater treatment system was designed and built. The capital cost of the system is more advantageous than a package plant, it has low operating costs, the whole life cost gives best value for money AND won a prestigious award from the Institution of Civil Engineers, Yorkshire Region.



Photo shows one of the ecological ponds in the wastewater treatment system

courtesy: Iris Water & Design

The system comprises four elements; a large first pond with a 100mm rock filter at the outlet followed by five smaller ponds, interconnected by 40mm rock filter barriers. A large third pond followed by a final stage of three small ponds interconnected by 40mm rock filter barriers.

Situated 250 metres to the south of the village, the field chosen for the treatment system slopes to the River Derwent. This natural fall is ideal for a pond/wetland gravity operational treatment system. Wastewater is pumped from the village to Pond 1 and exits the treatment system into the river Derwent. One of the benefits of the site over others investigated was that it had a natural slope which kept the need for made up ground and excavation costs to a minimum, also allowing the ponds to blend sympathetically into the landscape. The site is far enough away from dwellings that it should assist in the creation of a wildlife habitat away from human noise and interference.

A selection of native reeds and water plants has been used on the banks and in the rock filter stone areas of the system and a low maintenance grass and wildflower mix has been sown on all banks and areas between the ponds. Replacement of top soil was kept to a bare minimum to promote wild flowers and keep maintenance costs to a minimum.

A main attribute of the Scrayingham Ecological Wastewater Treatment System is that all the effluent is treated within the ponds. The system has been sized so that all solids are digested and converted within Pond 1. Should there be further increases in loading in the future; windmill and/or solar powered aeration may be added. No power is required to the site.

Natural Wastewater Treatment Technology

Iris Water & Design use applied ecology in the design of naturally sustainable wetland ecosystems. This is 'natural' or 'ecological' wastewater treatment.

These systems are characterised by their simple construction and operation, robust and reliable performance, low cost operation and maintenance, high standards of effluent quality and low sludge yields.

They are particularly suitable for rural communities. The high land requirement can usually be offset by the conversion of agricultural land into an environmental asset.

Ecological design

The microorganisms that occur in wetland and aquatic ecosystems develop close associations that can be exploited to enhance the effectiveness of the treatment process.



Part of the Ecological Wastewater Treatment System

courtesy: Iris Water & Design

Iris Water & Design



Final rock filter & pond in the ICE award winning Scrayingham Ecological Wastewater Treatment System

Iris Water & Design are leading providers in Sustainable Ecological Wastewater Treatment Systems for Rural Communities. With over 15 years experience in the unique design and construction of low maintenance Stabilisation Pond Systems, Iris Water successfully utilise wastewater to create landscaped habitats for wildlife to thrive.

Iris Water provide a range of services including:

- Consultancy
- Process Engineering
- Design
- Construction

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Diverse and stable ecological communities of plants and animals will develop if enough of these links can be made. Sometimes these relationships can be of predation in which one life form feeds on another. This is known as a food web or chain and leads to improved treatment.

All life needs energy to thrive. In these systems, the power of the sun and the wind are used. By employing these energy sources, the system is naturally sustainable.

Powered by the sun, algae releases large quantities of oxygen into the water. This is then utilised as a fuel by the purifying bacteria that break down the incoming effluent. The bacteria make nutrients available and generate carbon dioxide, which are both essential for further algal growth. This relationship of mutual benefit converts the biodegradable matter into biomass. This occurs most actively within the first pond and is essential to the treatment process. In the later ponds, lower animals in the food web consume the algal and bacterial biomass and in turn are consumed by the higher animals.

Wind playing over the surface of the ponds also helps to introduce and maintain high levels of oxygen in the surface layers of the pond thus aiding the above processes.

Rock Filter

A rock filter consists of a shallow stone or gravel bed planted with stands of wetland plants. As the effluent flows horizontally through these beds, it is filtered biologically in the gravel media and around the roots of the plants, helping to reduce suspended solids.

The plants improve the performance of the rock filter by maintaining hydraulic pathways around their roots and rhizomes along which the effluent can flow. This tangled network provides an



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ideal home in which purifying microorganisms can thrive. The plants also help to introduce oxygen into the filter and are involved in breaking down and consuming the available nutrients for their own growth needs. The small ponds interspersing the rock filters are designed to keep the wastewater in an aerobic condition.

Landscape & Wildlife

As well as having functional role in treating wastewater the ponds and wetlands can, through sensitive design and detailing, provide an attractive landscape feature in their own right. By using a wide range of wetland plants around the pond edges a rich and varied wetland habitat can be created. This benefits the treatment system by supporting a natural food web and provides a habitat where the wildlife of a full aquatic ecosystem can proliferate.

Common riverside birds, amphibians, and pond life quickly establish themselves in and around the system. In this way, the system can become an environmental and educational asset.

How clean is the water when it comes out?

As the effluent passes through each consecutive stage in a natural treatment system there is a gradual improvement in water quality.

With each improvement, the diversity of micro fauna and flora in the water grows. This is reflected in the final pond where there is the widest range of plants and freshwater life.

Problems which have been the subject of public concern

Questions have been asked about the system which is still

relatively unknown technology in the UK. Other concerns raised were as follows:

a) Smell is always an issue: the public have great difficulty in understanding how you can put raw sewage into a body of water and not create a smell. The reason there is no smell is that the waste water enters the first pond 1m below the surface.

b) Some public concern over insect populations; this is not a problem if a holistic ecosystem is established.

Following discussion with the landowner, (Mr George Winn-Darley RICS), **Yorkshire Water awarded the contract to the landowner and Iris Water & Design to design and build the Ecological Waste Water Treatment System.** The capital cost of the pond system is more advantageous than a package plant and with low operating costs, the whole life cost gives best value for money. ■

Designers

Treatment System:

Iris Water & Design. Castleton, Whitby YO21 2EU

Sewerage Work: Costain Haswell, Leeds Road, Castleford, WF10 4PD.

Contractors: G.M.V. Winn & Co., York YO62 6UE; Iris Water & Design & Costain Haswell.

The Editor & Publishers wish to thank the above participants and Yorkshire Water Services Solutions Manager, Gerry Smith, for providing details of the above innovative sewage treatment scheme, including a full set of pictures of the pool's construction.



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