



REED BEDS AND ENGINEERED WET-LANDS

The difference between a “natural treatment” system, such as a reed bed, and a mechanised biological treatment system, such as a sequencing batch reactor (See Organics DataSheet ODSL01), is that the former proceeds at natural rates without the use of significant amounts of energy input. Such systems offer long-term, sustainable treatment of polluted waters such as domestic wastewater and landfill leachate.

Organics offers two system concepts, the horizontal flow and the vertical flow, each of which may be expanded by the addition of stages and parallel flow paths to finetune performance objectives.



KEY FEATURES

Single stage systems

- *Lowest labour and materials cost*
- *Simple operation*
- *Least land use*
- *Less cooling of wastewater in open surfaces*

Double-stage systems

- *Second-stage acts as a buffer to problems with first stage, such as excess flow or channelling*
- *Can be easier to fit into landscape*
- *Increased level of treatment and pathogen removal*

Multiple-stage systems

- *High levels of treatment possible*
- *Increased complexity of management*
- *Higher land use*
- *Winter freezing may be an issue*

SPECIFICATION DATA

Vertical flow reed bed

Soil: Any
Use in UK: Not common
Fall: 1-2 m required
Power supply: Not required
Odour: Local odour near first stage
Tolerance to infiltration: Poor
Tolerance to load fluctuations: Not harmed by periods of low loading; can be harmed by large peaks
Installation cost: Higher than horizontal flow systems
Maintenance: Weekly alternating of beds and general awareness
Approximate area required: 3m² per person equivalent
Effluent quality: Good to excellent
Visual impact: Can be natural or formal garden style

Horizontal flow reed bed

Soil: Clay may be used instead of liner
Use in UK: Established
Fall: Level sites ideal
Power supply: Not required
Odour: Local odour usual
Tolerance to infiltration: Good
Tolerance to load fluctuations: Very good
Installation cost: Less than vertical flow systems
Maintenance: Weekly alternating of beds and general awareness
Approximate area required: 5-10m² per person equivalent, 1m² per person equivalent for tertiary
Effluent quality: poor to fair BOD₅ removal, no nitrification. Excellent BOD₅ and SS removal for tertiary
Visual impact: Can be natural or formal garden style

Vertical flow systems

Often referred to as the Max Planck or Krefeld process, the vertical flow reed bed passes wastewater down through layers of free-draining sand and gravel.

Two or more beds are usually located side by side thus allowing a regime of rest and loading. This permits the surface, which may become clogged in use, to recover its permeability.

Whilst high levels of treatment can be achieved in a single stage, many systems use two or more vertical stages in series, as well as in combination with secondary settlement tanks and horizontal flow reed beds.

Advantages

- High levels of treatment possible
- Good ammonia removal
- Low area requirement, compared with horizontal flow systems
- Blockages likely to be in the easily removed surface layer
- Tolerant of solids in the wastewater
- Aerobic effluent

Disadvantages

- Requires a fall of 1-2 metres
- Intolerant of hydraulic overload (eg surface runoff)
- Sand and gravel specification is critical
- Construction is critical
- Requires regular maintenance
- Possibility of local odour
- Cannot be flooded for weed control
- Requires secondary settlement

Horizontal flow systems

Otherwise known as the "root zone method" or the subsurface flow system, the wastewater passes horizontally through the planting media and root zone.

The gravel media is usually saturated and may be raised to drown weeds. Oxygen enters the system for aerobic treatment either through the surface or through the reed rhizomes.

Advantages

- Simple construction
- Minimal fall requirement
- Tolerant of hydraulic overload
- Requires little maintenance
- Weed control possible by surface flooding
- Lower cost than vertical flow systems
- Easily engineered into landscape
- Good pathogen removal

Disadvantages

- Minimal ammonia removal
- Anaerobic effluent
- Odour can be an issue
- Solids in the wastewater can cause premature blockage and channelling
- Larger area requirement than horizontal flow systems

For further information about how engineered wetlands may assist you in meeting your sustainable treatment objectives please contact our Technical Sales Department.



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