2

SEPTIC TANKS

2.1 DESCRIPTION

Septic tanks are the most familiar and common NWT system in the UK and elsewhere. They have been widely used in the UK since Cameron and Cummins patented the system in 1895 (Cooper, 2001a). Developments of the septic tank include Imhoff tanks in 1906 (Seeger, 1999) and, more recently, upflow anaerobic sludge blanket (UASB) reactors in 1977 (van Haandel and Lettinga, 1994).

Septic tanks are anaerobic treatment systems, although in UK winters they act essentially as solids settlement and storage units as anaerobic microbial activity is close to zero at low winter temperatures. They are fully described in a separate CIWEM Manual of Practice (forthcoming). Large septic tanks are briefly described here as these are suitable for the primary treatment of wastewater from small villages in the UK (see also US Environmental Protection Agency, 2000).

2.2 SEPTIC TANKS FOR VILLAGES IN THE UK

Septic tank design in the UK is formally set out in British Standard BS6297:1983 *Code of Practice for Design and Installation of Small Sewage Treatment Works and Cesspools*.[1] The relationship between tank size (*C*, litres) and population served (*P*) is given as:

$$C = 180P + 2000 \qquad (2.1)$$

subject to a minimum size of 2720 (i.e., to serve up to four persons).

This sizing is confirmed for England and Wales in 'Approved Document H' of the *Building Regulations 2000* (Office of the Deputy Prime Minister, 2002), and for Scotland in the *Building (Scotland) Regulations 2004* (Scottish Building Standards Agency, 2004).

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[1] This standard is currently under revision. See also Payne and Butler (1993) (who estimated that there were then around 819 000 septic tanks in England and Wales).

Large prefabricated septic tanks (2.6 m diameter) are available in the UK up to a size of 72 000 litres (Figure 2.1).[2] A 72 000-litre tank followed in series by one of 36 000 litres would, according to equation 2.1, serve a population of:

$$P = \frac{(72\ 000 + 36\ 000) - 2000}{180} = 580$$

However, in accordance with the recommendations of British Water (2005) (see Chapter 1), the wastewater flow should now be taken as 200 litres per person per day, so that the population served by these two septic tanks in series is:

$$P = \frac{(72\ 000 + 36\ 000) - 2000}{200} = 530\ \text{(say, 500)}$$

Figure 2.1. 18 000-litre prefabricated cylindrical septic tank.
Photograph courtesy of Titan Pollution Control.

There are many villages in the UK with populations below this level where large septic tanks could be advantageously used for primary treatment before constructed wetlands (Chapter 3) or waste stabilization ponds (Chapter 4). Costs are low: for example, the cost

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[2] Titan Pollution Control, West Portway, Andover, Hampshire SP10 3LF (www.titanpc.co.uk).

(including delivery and installation) of the two tanks (76 000 and 36 000 litres) for a village of ~500 people is around £75 per person.

For populations of 500−2000[3] Imhoff tanks can be advantageously used (they are sometimes used, for example, in France prior to treatment in waste stabilization ponds). They may be regarded as 'old-fashioned' but this is a mistaken view, at least on the grounds of cost and performance.[4] However, UASBs (van Haandel and Lettinga, 1994) are much too complex for small treatment works where their operational benefits (particularly biogas separation and recovery) are not really relevant.

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[3] 2000 is the limit of 'small' in the Urban Waste Water Treatment Directive (Council of the European Communities, 1991).
[4] Prefabricated concrete Imhoff tanks for up to 1000 p.e. are manufactured by, for example, Gazebo s.p.a., Gatteo (FC), Italy (www.gazebo.it/doc_ing/fosse_imhoff.htm).