FACT SHEET

DEWATERING SLUDGE

Sludge Handling and Management Investigation
Fact Sheet Series
May 2014

Solid-liquid Separation of Sludge

It is often desirable to dewater the removed sludge to reduce handling costs before utilisation. This is particularly applicable if the final utilisation site is some distance from the source. Handling and transporting sludge is easier if the moisture content is low. The sludge removed from ponds is usually dewatered using free drainage and/or evaporation in bays or tubes. These methods include:

- Long-term bulk storage
- Short-term drying bays
- Sedimentation and Evaporation Pond Systems (SEPS)
- Geotextile tubes.

Long-term Bulk Storage

The most common method of sludge dewatering is simply to place the sludge in a large bunded area for an extended period (>2 years). The maximum height of the stockpile should be <2 m to allow sufficient drying. Ideally, the drying bay will enable the sludge to be reduced in moisture content from 85–95 per cent to 50 per cent or less, which is suitable for composting or direct application. Figure 1 shows a typical long-term, large-volume sludge dewatering storage.

Figure 1 – Long-term sludge drying bay

The major problem with this method is that it takes a long time (many months or years) for the sludge to dry. Typically, a dry crust forms on the surface, reducing the sludge evaporation rate. If storage time is not an issue, this is a viable solution for dewatering sludge. To minimise the risk of groundwater contamination, the beds of the drying bays should be compacted to the National Piggery Guidelines design permeability of 1x10-9 m/s for a depth of 300 mm. Drainage water or leachate is directed into effluent ponds.

Short-term Drying Bays

Sludge can be dewatered more quickly by placement in dedicated drying bays. These bays are shallow (<0.4-0.8 m of sludge), have a smaller overall volume and are designed to drain as much water as possible. The bays collect and dry runoff effluent from the pond. Sludge is removed after about 9 months of drying. To minimise the risk of groundwater contamination, the beds of the drying bays should also be compacted to the National Piggery Guidelines (1x10-9 m/s).

Figure 2 – Narrow drying bay

Research by GHD (2008) investigated three variations of shallow sludge drying bays. The first was a basic design was a narrow clay-lined bay with a depth of 0.8 m, similar to Figure 2. The second variation had a sand base with slotted drainage pipes to enhance drainage from the base of the drying bay. The third variation was a bay lined with shade cloth that extended up on all sides.

There was a 75 mm sand base with 50 mm drainage pipes in the sand. It was concluded that, although the sand and shade cloth bays achieved a marginally better drying rate, the results were not significantly different to the standard clay-lined drying bay.

Sedimentation and Evaporation Pond Systems (SEPS)

The Sedimentation and Evaporation Pond System (SEPS) is a low-capital effluent management system based primarily on shallow pond sedimentation of effluent solids and annual evaporation of the liquid to allow retrieval of the solids. SEPS bays also collect and contain runoff pond effluent. The SEPS consist of two or three parallel earthen channels that are long, narrow, shallow and trafficable. They are typically 7 m wide and 0.8 m deep and are laid out along the contour (Figure 3). The shallow depth allows for rapid drying although a crust forms on the surface. This crust can be disrupted by rolling with tractor tyres or a wheeled device. Dried solids can then be removed by excavators or front-end loaders (Figure 4). To minimise the risk of groundwater contamination, the beds of the SEPS bays should be compacted to the National Piggery Guidelines standard.

Figure 3 – SEPS bays

These bays were originally designed as part of a waste treatment system, but are suited to operate as a sludge dewatering system. Depending on the TS content of the influent sludge, the capacity of the SEPS bay and/or local rainfall and evaporation conditions, it may be necessary to have a system at the outflow of the SEPS to retain excess drained effluent.

Figure 4 – Solids removal from dried SEPS bay

The main difference between short-term drying bays and SEPS is that short-term drying bays are generally smaller and are fully loaded for each drying period. SEPS can be continuously loaded over an extended period (e.g. six months). The specific needs of the situation would determine whether batch-loading of several individual bays would be preferred over continuous loading of a large SEPS bay.

Geotextile Tubes

Solids can be removed from sludge by filtration through a geotextile membrane. Researchers have tested the removal efficiency of geotextile filtration on dairy and pig manure and pond sludge. Removal efficiency for pond sludge was about 88 per cent of solids. The removal efficiency for dairy manure was about 47 per cent for solids while for pig manure, it was about 70 per cent for solids. Chemical coagulants and flocculants can be added to the influent to enhance solid and nutrient removal and to hasten the rate of liquid drainage. The geotextile tubes must be designed to handle the collection of runoff effluent from the pond.

There is a range of commercial geotextile products available for the dewatering of sludge and slurries, examples include: Dredging Solutions, Apex Envirocare, UAT Geobags, Geosynthetics ProTube and Geotube. In all cases, the slurry is pumped into a geotextile tube and dewatering occurs by drainage and some minor evaporation (Photograph 6).

Advantages over short-term drying bays or SEPS include:

- The tubes are suited to constrained sites
- The tubes can be used in sites where the topography does not allow the construction of drying bays or SEPS
- The tubes can be used in environmentally sensitive sites, e.g. in public view or close to receptors
- Dewatering is usually more rapid than with drying bays.

Disadvantages over short-term drying bays or SEPS include:

- A prepared pad (concrete or compacted material) is required to site the geotextile on
- Provision must be made for the containment and collection of the drained effluent
- Costs are higher than open drying bays, particularly if coagulants or flocculants are used.

Most piggeries and feedlots are not located in environmentally sensitive areas and usually have large areas of land available near to the effluent source. Hence, in most situations, dewatering of removed sludge can be done more economically using drying bays or SEPS rather than geotextile tubes.

Figure 6 – Dewatering sludge using geotextile tubes (Dredging Solutions)

Key Points

- **Sludge is dewatered using free drainage and or evaporation in bays or tubes**
- **Long-term drying bays – common method involving placing sludge in a large area and leaving to dry. Time consuming**
- **Short-term drying bays – specific drying bays (shallow) allow the sludge to drain and dry much faster**
- **Geotextile tubes – solids can be removed from sludge and slurries by filtration through a geotextile membrane**
- **Sedimentation and Evaporation Pond Systems (SEPS) – low-capital effluent management system based primarily on shallow pond sedimentation of effluent solids and annual evaporation of the liquid to allow retrieval of the solids.**

References and Further Reading

GHD 2008, In-situ desludging of anaerobic lagoons and sludge drying, APL Project Final Report, Australian Pork Ltd, Canberra, ACT.

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Worley, J et al. 2008, 'Use of geotextile tubes with chemical amendments to dewater dairy lagoon solids', Bioresource technology, vol. 99, no. 10, pp. 4451-4459.

Other Fact Sheets in this Series

- Characteristics and Accumulation of Sludge
- Removal of Sludge from Ponds.