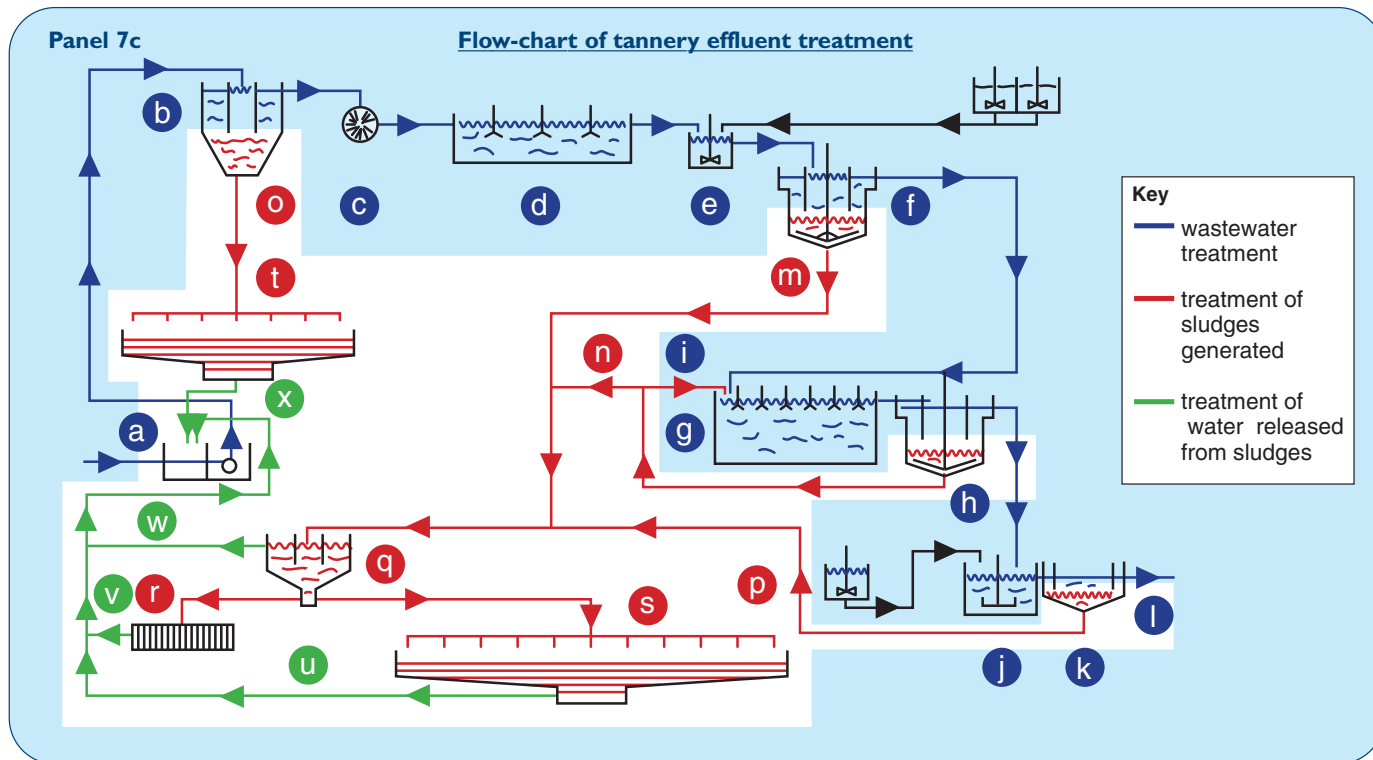




Sludge handling



o t PRIMARY SLUDGE

Gross solids as sludges from primary settling are pumped from the base of the settling tank (*o*). Having a solids content of about 4%, these require dewatering before disposal. In hot climates this dewatering is commonly performed in sludge drying beds using a mix of drainage and evaporation.

As these sludges contain coarse and fibrous solids the dewatering is relatively rapid. If these sludges contain chrome, when solid enough to handle they are disposed of in an appropriate landfill situated within the site or by controlled landfill.

m q SLUDGE FROM PRIMARY CLARIFICATION

Sludges are pumped from the base of the secondary clarifier (*m*) either to dewatering beds (*s*), or for sludge thickening (*q*). A combination of sludge movement during evacuation, followed by a secondary settling in a holding tank, results in further water release, separation, and a more dense sludge.

Drying beds (*s*) or mechanical dewatering systems (*r*) are then used to further dewater to form a compact cake of

low moisture content for either landfill or land application.

Sometimes, these sludges are blended with primary sludge in the sludge thickening process.

n SLUDGE FROM SECONDARY CLARIFICATION

As the solids content of biological sludge is only 1-2%, the volume of sludge from secondary treatment is large. These sludges are difficult to dewater, but after drying they may be used for soil conditioning and

their nutrient value, as the sludges are fully degradable. In this event they can be delivered directly for drying. However, they are often blended with sludges from primary clarification as this improves water release within sludge thickening, and during drying or mechanical dewatering.

p SLUDGE FROM TERTIARY CLARIFICATION

These sludges are very fine and low in solids content compared with the other sludges. They may be fed directly to drying



Concrete channels can be used for sludge delivery from the base of the settling tank or the selected section of the drying bed.



When dry, the solids can be readily handled. Part of the drying is by filtration through the fine sand base of the drying bed.



Typical large scale sludge thickening plant.

beds or to sludge thickening. Where lagoons are used for settling, the deposits remain, relying on long term degradation to minimise the volume that eventually needs cleaning out.

Mechanical dewatering

Although drying beds are used extensively in hot climates and where land is available, sludges are generally dewatered by mechanical means. These are especially valuable where space for drying beds is limited, to avoid the problems of dewatering in the wet season, and within temperate climates.

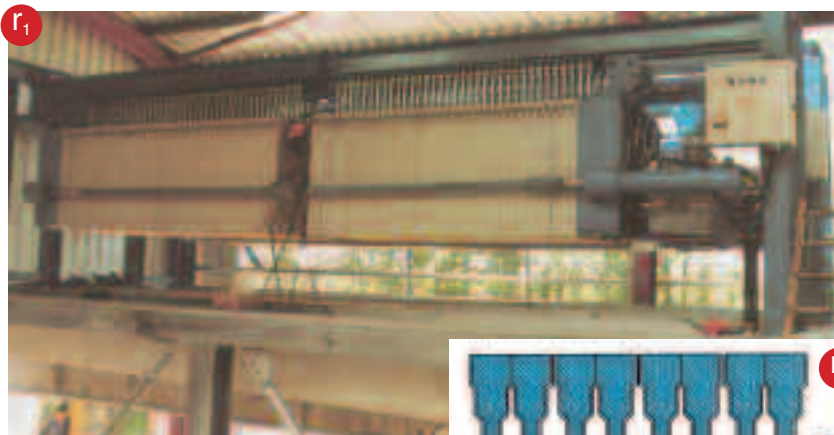
r₁ THE CHAMBER FILTER PRESS

The chamber or recessed filter press consists of a series of recessed plates held together under pressure, with filter cloths fitted between the joined plates. Sludge is pumped through a central feed into the chambers between each pair of plates. The pressure of the pump causes filtration through the cloths, with the filtrate draining from the machine via the specially cut plate surfaces.

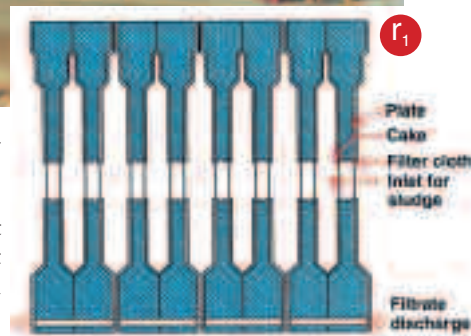
The sludge is thus dewatered within each chamber and, when dry, removed by releasing the pressure, separating the plates, then peeling the 'cake'—being about 40% solids content—from the filter cloths. These presses are normally elevated so that the cake can drop into a container to rationalise handling.

r₂ THE BELT PRESS

The belt press offers the advantages of a feed-through operation. The sludge is treated with flocculating agents and offered to a conveying belt made from a mesh of woven nylon. Some draining can take place, but then pressure is applied to the sludge using a series of pressure rollers, squeezing water away. This dewatering is not so



Example of an 80 plate chamber filter press.

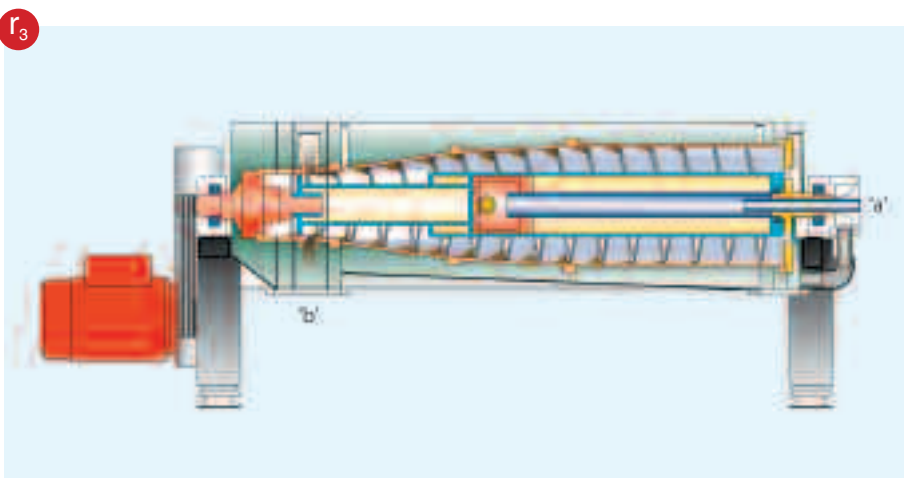


r₃ THE CENTRIFUGE

Centrifuges are also found in sludge management and described in *Figure r₃*.



Pressed solids being peeled from the nylon mesh conveying belt of a belt press.



Effluent feeds into the centrifuge at (a). Centrifugal forces cause a separation of the solids from the effluent, with a build up of these solids on the inner wall of the conical section. The rotation of the scroll, moving slightly faster than the conical section, slowly shifts the solids towards point (b), where it is discharged.

It is noted that in addition to sludge dewatering, the centrifuge can be used in the place of clarification following chemical dosing, and after biological treatment. The solids produced are normally 20-25% solids content.

U V W X Wastewaters from dewatering

All wastewaters from sludge concentration, recovered filtrates from drying beds and mechanical filtration are returned to the reception sump (a) for reprocessing.

Richard Daniels

Part 8: August/September 2004
Part 10: November 2004