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A METHOD AND APPARATUS FOR DEWATERING SLUDGE

THIS INVENTION relates to a method and apparatus for dewatering sludge particularly, though by no means exclusively, activated sludge.

5 For many years activated sludge has been thickened by passage through a settling tank such that the residence time in the tank is of the order of 24 hours. This technique, besides requiring much time and large equipment has the disadvantage that the thickened sludge will have a solid concentration
10 of only 1.5 to 2 per cent by weight.

With a view to obtaining higher levels of solids in the concentrated sludge various techniques have been developed utilising sophisticated equipment such as flotation apparatus where suspended solids
15 contained within the sludge are carried to the surface by small bubbles of gas produced by electrolytic action. Such flotation apparatus is effective in removing water from the sludge so that the concentrated sludge will have 5 per cent by weight of solids or
20 thereabouts. This technique has a number of disadvantages in that the equipment used is costly to purchase and maintain and that the processing costs

are high.

The applicant has conducted an extensive research programme with a view to finding a method of thickening sludge to have a concentration of the order
5 of 5 per cent by weight of solids or more, with simple equipment and in an economic manner.

According to the present invention there is provided a method of dewatering sludge comprising the steps of feeding the sludge onto one end of a moving
10 foraminous conveying surface to permit liquid to drain freely therethrough during conveyance and collecting drained solids from the conveying surface at the output end of the conveying run, characterised in that prior to reaching said output end, the sludge is constrained to
15 leave the belt and to rise up a ramp thus to produce a backwards rolling action for particles of the sludge whilst on the ramp, which in turn imparts to said particles a shearing action thus to release further trapped liquids from between the particles and to allow
20 increased compaction thereof, prior to flowing over said ramp for collection.

The invention also extends to apparatus for carrying out the aforesaid method.

The invention will become further apparent
25 from the following description of the method carried out using one form of apparatus made in accordance with the invention. Such apparatus is illustrated,

by way of example only, in the accompanying drawings in which:-

Fig. 1 is a diagrammatic vertical sectional view of the apparatus in use;

5 Fig. 2 is an enlarged view of part of the apparatus of Fig. 1 showing greater detail;

and Fig. 3 is a plan view of the part of the apparatus shown in Fig. 2.

Referring now to the drawings the apparatus
10 generally comprises a mesh conveying belt 10 driven by or wrapped around a plurality of support rollers 11, 12 and 13. Sludge to be processed is placed onto the moving belt 10 via a ramp 14 fed from a tank 15.

Positioned below the belt 10 are a pair of
15 guide plates 16 and 17 adapted to collect water passing through the belt 10 and to direct the water into a collecting trough 18 for disposal. It will be seen that the water passing from the guide plates 16 and 17 to the trough 18 is caused to pass through
20 the belt 10 in one of its return runs between support rollers 12 and 11, thus washing from the conveying surface of the belt any materials remaining thereon.

A collecting trough 20 is provided below the downstream end of the conveying run of the belt for collection of dewatered solids. Conveniently, a screw conveyor 21, or similar device is used for removing the solids from the trough.

In accordance with the invention, a ramp surface generally indicated at 25 is provided adjacent the downstream end of the conveying run of the belt 10, and a portion 26 (see Fig. 2) of the ramp surface is positioned to serve as a scraper blade to ensure cleaning of the belt. Fixed side plates 27 are provided to constrain the material as it accumulates on the ramp surface 25.

When the apparatus is operating the sludge is fed continuously from the tank 15 onto the belt 10 and is carried along the latter whilst liquids are permitted to drain freely through the belt 10 for collection. At the downstream end of the conveying run the dewatered sludge must rise up the ramp surface 25 before passing over the upper end of the latter and into the trough 20 for collection. The effect of the ramp surface is to cause the particles of material in the sludge to build up and fall backwards onto the belt as indicated by the arrow 30. This causes relative movement between the

solid particles thereby imparting a shearing action to release trapped liquids and hence allow greater compaction. Thus, also, pressure is exerted on the lowermost particles by the weight of particles on the ramp, and by the continuous pressure exerted by oncoming material on the belt. These factors permit further considerable drainage of liquid from the sludge so that the final sludge has a solids concentration of as much as 6.5 per cent by weight, or more.

It has been found by experiment that the angle of inclination of the ramp surface determines the effectiveness of the dewatering action in this region. Generally, the solids concentration is proportional to the angle of the ramp.

Whilst the ramp surface has been shown as being disposed at the output end of the conveying run, it is conceivable that it can be placed part-way along the latter, and that there may be more than one such ramp surface provided along the conveying run.

Referring now to Fig. 3 it will be seen that a further restriction to free forwards movement of the sludge can be provided by inverted V-shaped member 31

positioned on the ramp surface to cause lateral
constriction of the sludge particles as they rise up
the ramp. In some instances this may provide an
improvement, particularly in cases where free
5 drainage of liquid from the sludge through the belt
is not readily achieved during conveyance.



CLAIMS

1. A method of dewatering sludge comprising the steps of feeding the sludge onto one end of a moving foraminous conveying surface to permit liquid to drain freely therethrough during conveyance and collecting drained solids from the conveying surface at the output end of the conveying run, characterised in that prior to reaching said output end, the sludge is constrained to leave the belt and to rise up a ramp thus to produce a backwards rolling action for particles of the sludge whilst on the ramp, which in turn imparts to said particles a shearing action thus to release further trapped liquids from between the particles and to allow increased compaction thereof, prior to flowing over said ramp for collection.

2. A method according to Claim 1, wherein movement of sludge particles on and adjacent said ramp, in a direction transverse to that of the conveying run, is constrained by side plates.

3. A method according to Claim 1 or Claim 2, wherein the sludge particles are laterally constrained as they ascend the ramp, by means

disposed part way across the latter to divide the
sludge stream.

4. A method according to any one of Claims 1
to 3, wherein said sludge is dewatered to a solids
5 concentration in excess of 6 per cent by weight.

5. Apparatus for dewatering sludge,
comprising a moving foraminous conveying belt, means
for feeding sludge onto said belt at the input end
of a conveying run, so that liquid drains through
10 the belt, means for collecting drained solids from
the belt at the output end of the conveying run,
and a ramp disposed above the belt prior to the output
end of the conveying run and directed upwardly from
adjacent the belt surface for restricting forwards
15 movement of the sludge thus to cause the sludge to
leave the belt and rise up the ramp and adapted to
produce a backwards rolling action for the particles
of the sludge whilst on the ramp, thereby to impart to
said particles a shearing action which releases
20 further trapped liquids from between the particles
and allows increased compaction thereof, prior to
flowing over said ramp for collection.



6. Apparatus according to Claim 5, including side plates arranged so as to restrict lateral movement of sludge particles with respect to the direction of conveyance, whilst on and adjacent the ramp.

7. Apparatus according to Claim 5 or Claim 6, wherein a lower portion of said ramp is disposed in close proximity with the conveying surface of said belt to serve as a scraper blade thus cleaning said surface.

8. Apparatus according to Claim 5, including an inverted V-shaped member disposed on the ramp to divide the stream of sludge ascending the ramp thus to impart lateral constriction to the sludge particles.

9. Apparatus according to Claim 5, including guide plates below the conveying run to direct water drained therethrough onto the return run of the belt thus to pass through the latter to wash any residual solids from the conveying surface thereof.

10. A method of dewatering sludge substantially as hereinbefore described.



11. Apparatus for dewatering sludge substantially as hereinbefore described, with reference to, and as illustrated in the accompanying drawings.

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