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Up-rating underground sedimentation tanks subject to hydraulic overloading

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and $d = v(dt).\cos\alpha$

$$V = \pi\tan\alpha/3[\ 3(v(dt)\cos\alpha.\{r_0 - v(dt)/\tan\alpha\}^2/\sin\alpha + 3(v(dt))^2(\cos\alpha)^2\{r_0 - v(dt)/\tan\alpha\}/(\sin\alpha)^2 + (v(dt).\cos\alpha)^3/(\sin\alpha)^3\ ] - \pi r^2 v(dt)$$

$$V = \pi/3[\ 3v(dt)\{(r_0)^2 - 2r_0 v(dt)/\tan\alpha + (v(dt))^2/(\tan\alpha)^2\ \} + 3(v(dt))^2 r_0/\tan\alpha - 3(v(dt))^3/(\tan\alpha)^2 + (v(dt))^3/(\tan\alpha)^2\ ] - \pi r^2 v(dt)$$

Assuming that second and third order differentials are negligible, ie. $dt >> (dt)^2$ and $(dt)^3$:

$$V = (v(dt)).[\ \pi(r_0)^2 - \pi r^2\ ]$$

21.0 APPENDIX J. METHOD OF MEASUREMENT OF SUSPENDED SOLIDS

The suspended solids (SS) concentrations of the influents, effluents and sludges were determined according to the standard method "209D. Total Nonfiltrable Residue Dried at 103 - 105°C" given in the Standard Methods for the Examination of Water and Wastewater, 15th Edition, 1980.

Apparatus:

i) Buchner funnel

ii) Buchner flask

iii) Vacuum pump

iv) Glass fibre filters - 4,7cm diameter (Type Whatmann GF/C, 984H or MN85/90. These are all recommended types for water and wastewater applications)

v) Oven kept at 103 - 105°C

vi) Desiccator

vii) Analytical balance (Mettler H1000, 1000g capacity, capable of measuring to 0,1mg)

viii) Pipette

ix) Tweezers

x) Evaporating dishes

Procedure:

Place the glass fibre filter in the Buchner funnel. Connect the Buchner funnel and the flask to the vacuum pump. Apply a vacuum (15 inches or 381 mmHg) and wash the filter with three successive 20ml portions of distilled water. Remove the filter from the Buchner funnel and place in an evaporating dish and transfer to the oven. Allow to dry for 1hr. Store in the desiccator until required. Weigh the filter disc immediately before use.

Filter a well mixed sample of a known volume, 50 - 100ml depending on the amount of suspended matter that will not cause excessive blocking under vacuum. Carefully remove the filter from the filter funnel and place in an evaporating dish. Transfer to the oven for 1hr and then allow to cool to balance temperature in the desiccator. Weigh the filter disk and calculate the amount of total suspended matter as follows:

$$(\text{mg SS})/\text{litre} = (A-B)\times 1000/\text{sample volume, ml}$$

where A = mass of filter + residue, mg
B = mass of filter, mg

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