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Improving the Efficiency Account Hydraulic of Water Supply Sprinklers

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Annotation: *The article contains the calculation of sedimentation tanks. The principle of operation of horizontal, vertical and radial sedimentation tanks is considered.*

Keywords: *sump, horizontal, vertical, radial, dept.*

INTRODUCTION

Depending on the technology of wastewater and drinking water treatment and processing of sediments, the geological conditions of the facilities, the geological conditions, the level of groundwater and so on, the types of sediments are adopted. Vertical clarifiers are used when wastewater consumption exceeds 2000 m^3 / day, horizontal -1500 m^3 / day, radial - 20000 m^3 / day. However, horizontal sediments are not used in loose and submerged soils, while vertical sediments are not used in cases where groundwater is high. Horizontal silencers can be designed as a separate type of object or as a device consisting of several sections running in parallel.

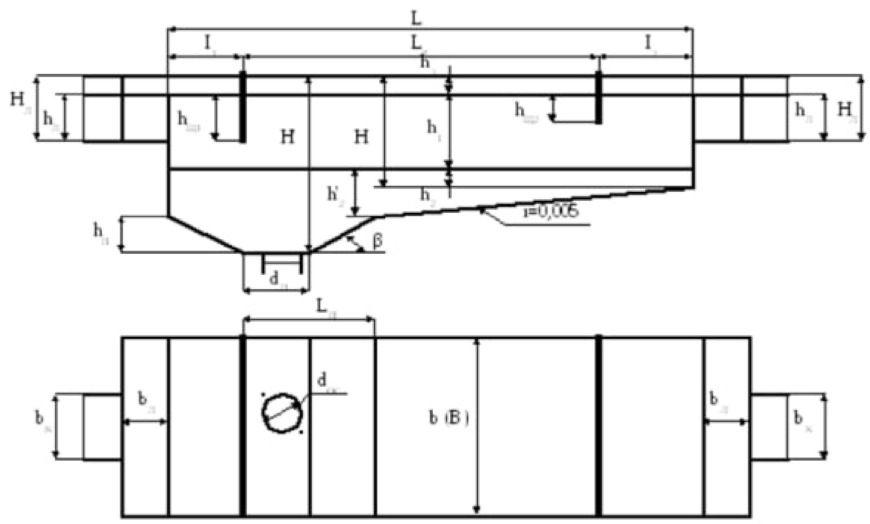

Fig 1

The width of the sections of the breaker $b = \frac{9}{36n\square_1 v}$

Here: n – number of working sections, at least two;

h_1– height of working section, 1,5 ... 4 м.

v – velocity of water in the working section, 5 ... 10 m/s.

The overall width of the breaker:

$$B = Nb, \quad (1)$$

Here: N – the total number of sections in the damper.

The total length of the working part of the breaker

$$L_p = \frac{Xh_1}{KU_0} \quad (2)$$

Here: K – the coefficient of utilization of the volume of the condenser,

U_0 – hydraulic size of suspended bodies,

The total length of the breaker, m,

$$L = L_p + l_1 + l_2 \quad (3)$$

Here: l_1- the distance from the entrance to the settling tank to the water distribution point, 0,5 ... 0,7 m.

l_2 - the distance from the tray coming out of the sink to the half-sunken shit, 0,3 ... 0,5 m.

Sink depth of semi-submerged sediments, m:

$$h_{ш1} = K_{ш1} * h_1, \quad (4)$$

$$h_{ш2} = K_{ш2} * h_1, \quad (5)$$

Here:$K_{ш1}$ ... $0{,}4$; $K_{ш2} = 0{,}1 \dots 0{,}2$.

Depth of sinkhole, m.

$$h_2 = \frac{V_{oc1}}{\eta_{oc} LB} \quad (6)$$

Here: V_{oc1} - sediment volume per section m^3 / day;

η_{oc} – the number of sediments received per day,

The total depth of the trench, m,

$$H = h_1 + h_2 + h_3 \quad (7)$$

Here: h_3 - the height of the sidewalls,

0,3 ... 0,5 м.

The total surface area of the horizontal horizontals in the plan

$$F_{go} = \frac{\alpha_{o6} * Q_{soat}}{3{,}6\ U_0}, \quad (8)$$

Here: Q_{hour} - calculated water consumption per section, m^3/ h

U_o- sedimentation rate m/s

$\alpha_{об}$ – volumetric utilization factor of sediments, 1,3 equal.

The width of one stop

$$B = \frac{Q_{hour}}{3{,}6 * v_{o\prime rt} HN}, \text{ m} \qquad (9)$$

Here: H – the height of the sedimentary field 2,5-3,5 m;

$v_{o\prime rt}$ - the average horizontal velocity of water in the settling tank is mm/ s, the value of which is as follows; the turbidity level of water is 50 mg/l

6–8 mm/s; to

$7 -$10 mm/c; 50-250 mg/l

$9 -$12 – 250 mg/g

N – calculated number of silencers,

Slab contraction joints should intersect at the openings for columns of up to 6 m.

The length of the breaker

$$L = \frac{F_{2.0}}{BN}, \text{ м}, \qquad (10)$$

In this case L/H=10:25 should be.

There should be a sediment removal device without stopping the horizontal settling operation.

Perforated pipes are used for hydraulic cleaning of sediment. This set of pipes allows you to clean the sediment in 20-30 minutes. The distance between the axes of the drainage pipes should not exceed 3 m, the distance between them and the walls of the drain should not exceed 1.5 m. The velocity of the sediment at the end of the pipe is assumed to be 1 m / s, the velocity in the cracks is 1.5-2 m/s, the diameter of the hole is at least 25 mm, and the distance between the holes is 300-500 mm. The holes should be in a checkerboard pattern.

The ratio of the total surface area of the holes to the pipe cutting surface should be 0.5-0.7.

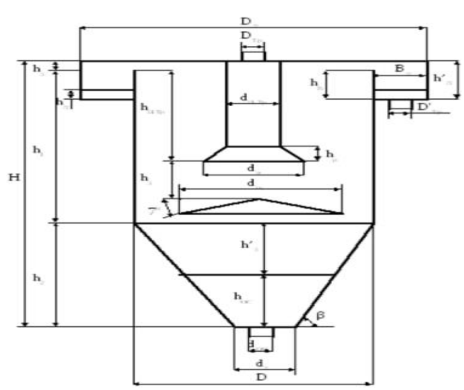

Fig. 2 Calculation of vertical spacers.

According to the proposed scheme, the diameter of the settling tank, m,

$$D = 2\sqrt{\frac{q}{3{,}6\,\pi n K U_0} + d_{\text{м}kg}} \qquad (11)$$

Here: q – maximum wastewater consumption, m^3/day

n – number of working restraints, at least two;

K – the coefficient of utilization of the sediment volume, equal to 0.35.

U_o - hydraulic size of suspended bodies, mm/s;

$d_{\text{м}kg}$– central pipe diameter, m.

Hydraulic size, mm/s

$$U_0 = \frac{1000\,Kh_1}{\alpha t(\frac{Kh_1}{h})^{n_2}} - \omega \qquad (12)$$

Бу ерда; h_1 – depth of the inner part of the settler, m, 2.7 ... 3.8 m;

$\alpha -$ coefficient taking into account the effect of water temperature on its viscosity;

$n_2 -$ degree indicator;

$\omega -$ the vertical component of the velocity of the effluent in the settling tank is 0.2 ... 0.5 mm / s.

Central inlet pipe diameter, m,

$$d_{mkg} = \sqrt{\frac{4q}{3{,}6\pi n v_{m.q}}} \qquad (13)$$

Here: $V_{m.q} -$ the velocity of the effluent in the inlet pipe is mm / s, not more than 30 mm / s.

Central inlet pipe diameter 4 m height m,

$$d_p = h_{p_1} = 1{,}35\, d_{mq} \qquad (14)$$

Depth of inlet pipe, m,

$$h_{\text{мк}} = 0{,}9\, h_1 \qquad (15)$$

Calculation of radial spacers.

Radial dampers can be in a way that drains from the edge or center.

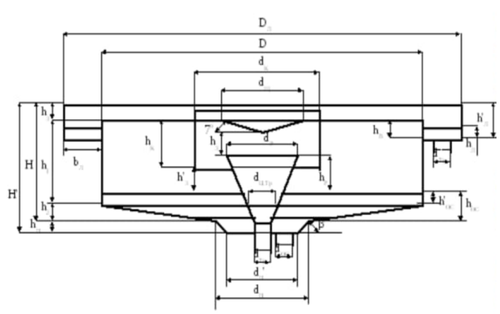

Fig. 3 The method of centralized wastewater transfer is widely used.

Diameter of the working part of the drill, m.

$$D = \sqrt{\frac{4\,q}{11{,}3\;Kn\,U_0} + d_k^2} \qquad (16)$$

$K -$ coefficient of utilization of sediment volume,

$K = 0{,}45$

n – is the number of working dampers;

U_0 – is the hydraulic size of the suspended bodies.

d_k – is the diameter of the semi-submerged sheath, m

$$d_k = \sqrt{\frac{4\,q}{3{,}6\;\pi v_c * n} + d_p^2} \qquad (17)$$

V_c – velocity of water in the receiving chamber, 30 mm / s,

D_p – is the diameter of the central pipe, m.

$d_p = h_p = 1{,}35\; d_{mq}$

d_{mq} – diameter of the macraze pipe, m

$$d_{\text{мк}} = \sqrt{\frac{4\,q}{3600\pi n v_{\text{мк}}}} \qquad (18)$$

Here: $v_{m.q}$ – velocity of sewage in the central pipe, 0.8 ... 1.0 m / s

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