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### Overview of Treatment Processes

- **Preliminary & Primary Treatment**
- Physical / chemical processes to *prepare* wastewater for *biological treatment*
- *Removal of solids mainly*
- *Usually cheaper/ easier than secondary processes*
- *Examples:*
  - a. equalisation (flow and load),*
  - b. neutralisation,*
  - c. settling of solids,*
  - d. flotation of oil and grease,*
  - e. filtration etc*



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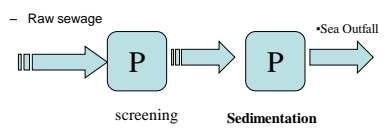
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# Screening

- Merupakan tahap awal dalam pengolahan limbah.
- Tujuan untuk memisahkan bahan2 seperti kayu, kertas, plastik dan sebagainya sehingga tidak mengganggu proses berikutnya
- Tipe screens: bar screens, drum screens, cutting screens dan band screens.

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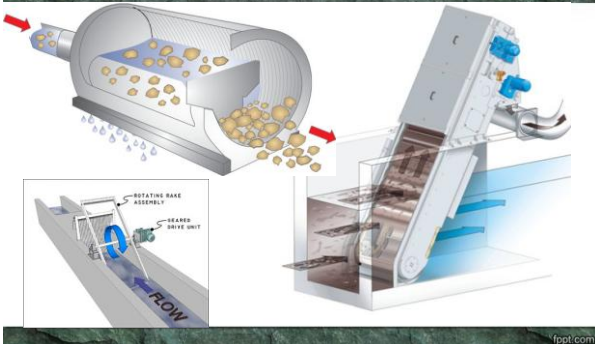
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## Tipe screens: bar screens, drum screens, cutting screens dan band screens



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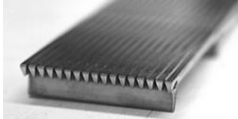
## Solids Removal: Screens

- Static or manually moving
- Manually or automatically raked

Static screen: loading volume/m<sup>2</sup>.time



Wedge wire screen (0.2-1 mm)



- Larger solids separated
- Small solids washed through

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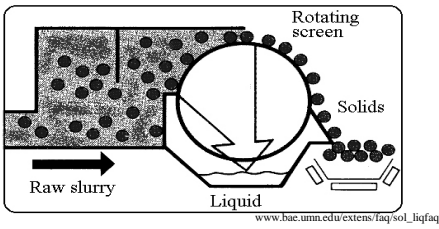
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- Rotary screens
- – common in domestic and industrial wwt
- –Rotating Drum Screen:



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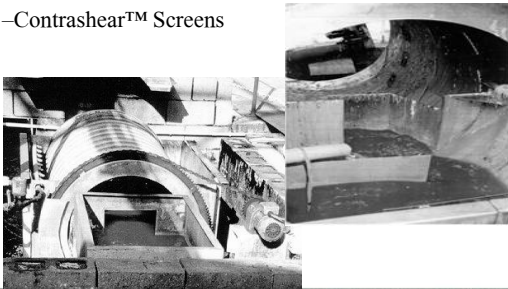
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- Rotary screens
- –Contrashear™ Screens



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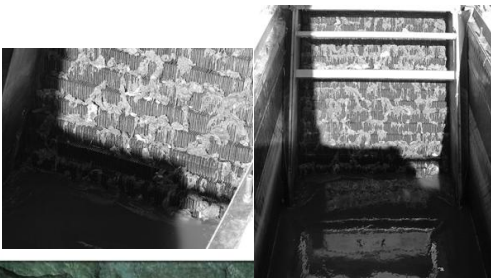
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- Step screens ; 2-5mm opening



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# Sedimentation

- Is the separation of solids based on difference between densities of solids and wastewater due to gravity.
- Stoke's law
- $V_s = (gd^2/18V)(S_s - 1)$
- Where  $V_s$  = discrete particle terminal velocity;  $g$  is acceleration due to gravity;  $d$ = diameter of the particle ;  $V$  = kinematic viscosity of water
- $S_s$  = specific gravity of the particle
- Practical consideration in settlement of the discrete suspension involves concept of ideal settling basin in which it is assumed that the following conditions exists.




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## Ideal settling basin

- Quiescent settlement in the settling zone
- Uniform flow through the settling zone
- Uniform solids concentrations entering the settling zone.
- Solids entering the sludge zone are not resuspended.




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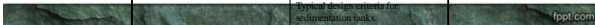
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## Design criteria

<b>Horizontal and radial flow units</b>	
Surface overflow rate	1- 1.5 m/h
Retention time	2 hr
Outlet weir loading	< 12.5 cu.m / mh
Width : length	
Rectangular units	1:4 to 1: 8
<b>Vertical Flow units</b>	
Surface overflow rate	1- 1.8 m/h
Retention time	2-3 hr
Outlet weir loading	< 12.5 cu.m /mh
<b>Final settlement after biological treatment</b>	
surface overflow rate	1.5 m/h
Retention time	2 hr
Outlet weir loading	< 10 cu.m / mh




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Types of sedimentation tank		
parameter	Rectangular	circular
Max. height	90m	
Max. width	50m	
depth	2-2.5	2-3.5 m
Range of length/width ratio	1.5-7.5	
Range of length/depth ratio	5-25	
Bottom slope	1%	7.5 - 10% ( from periphery to center)
Max. diameter		30m
inlet	multiple pipes on the width side with baffle boards of depth 0.5 m and 0.8 m in front of the pipe inlets and surface for scum passover	central inlet pipe with concentric inlet baffle of diameter 15% of tank diameter and extending 1m below surface
Outlet	Overflow weir with V-notches to Provide uniform flow at low heads. Scum baffles provide ahead of weir for wastewater installations wastewater installation	peripheral weir provided with V- notch. Scum baffle extending 0.3 m below water surface provided ahead of effluent weir for
Peak velocity	Depends upon feed	
Scraper arms velocity	0.2 m.min	

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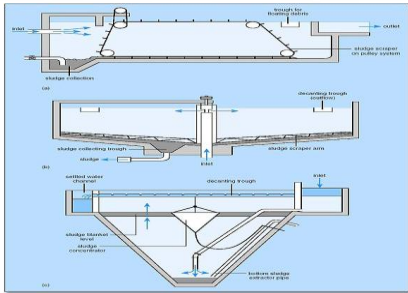
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## Types of sedimentation tank

- Typical sedimentation tanks: (a) rectangular horizontal flow tank; (b) circular, radial-flow tank; (c) hopper-bottomed, upward flow tank




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## Important parts of a sedimentation tanks

- (a) Inlet zone – at the central well, which has a round baffle plate, the flow is established in a uniform radial direction so that short-circuiting does not take place.
- (b) Settling zone – where settling is assumed to occur as the water flows towards the outlet.
- (c) Outlet zone – in which the flow converges up and over the decanting weirs.
- (d) Sludge zone – where settled material collects and is pumped out.

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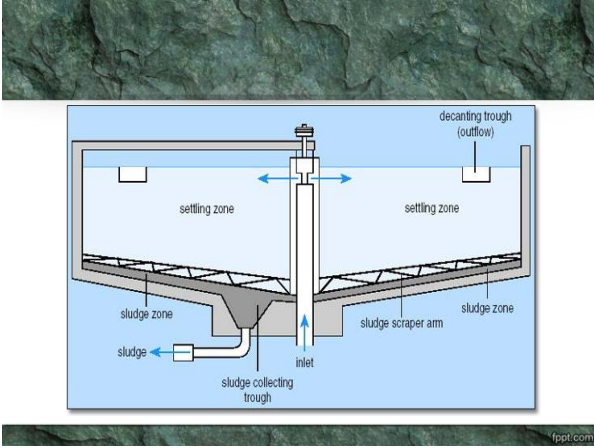
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