United States Department of Agriculture - Agricultural Research Service

Northwest Irrigation & Soils Research Lab, Kimberly, ID

Self Cleaning Trash Screens for Irrigation Water

The Problem

Irrigation water from open ditches carries trash that blows in, grows in, washes in, and collects in the ditches. The trash plugs up siphon tubes, gated pipe gates, and sprinkler nozzles. Plugged tubes, gates, and nozzles cause skips and poor water distribution, and force irrigators to recheck their water sets often. Weed seeds from upstream fields and ditch banks also spread with the water across fields.

Plugged gates cause uneven watering and skips. Click on image to enlarge.

Screening out trash from irrigation water is easy. However, manually keeping trash screens clean requires constant attention. Water-driven mechanical trash screens have been used in open ditches for many years. However, mechanical devices in dirty irrigation water requires regular maintenance and often end up as part of the problem rather than the solution.

Mechanical screens are often maintenance problems. Click on image to enlarge.

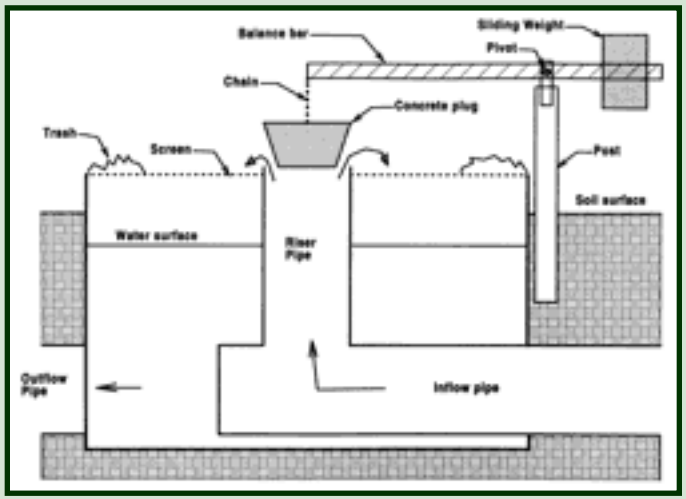
Bubbler Screen Construction

- Use a sharp bend into the riser such as a welded 90 degree "miter" bend or a blocked-off tee, rather than a curved elbow fitting. Make the riser at least 2 feet long to evenly distribute the flow from the end.
- Maintain at least 2? ft/sec water velocity in the riser. The table below shows required riser sizes. Constricting orifices inserted over the end of the riser can maintain the required velocity when flows decrease.
- Use about 20 mesh stainless steel screen. This screen will remove the larger weed seeds but still will pass the silt. Screens clogged with calcium deposits can be cleaned with a weak acid such as Muratic.
- Screen diameter should be large enough so that water doesn?t splash off. The table below gives recommended screen sizes.

Recommended Dimensions			
Flow Rate		Riser Size	Screen Diameter
(cfs)	(inches)	(in.)	(ft.)
1	50	8	4
2	100	10	5
3	150	12	5
4	200	15	6

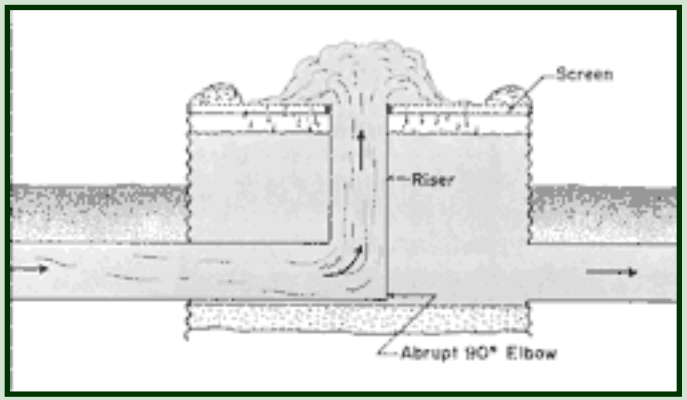
Bubbler Screens and Overfall Screens both require at least 8 inches of head loss or drop in the water surface to operate properly. Sometimes sufficient head can be gained by piping the water for a couple hundred feet.

If sufficient head cannot be generated, a mechanical screen must be used.

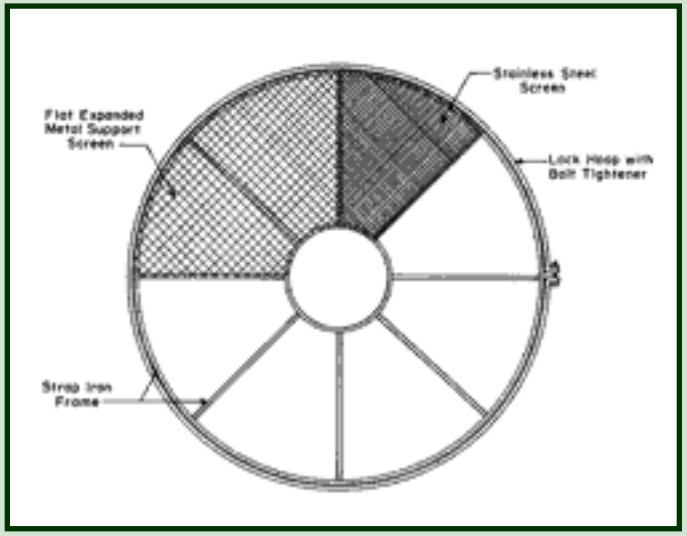


A suspended-plug turbulence generator for fountain screens, which helps to maintain turbulence at low-flow conditions. The sliding weight is used to

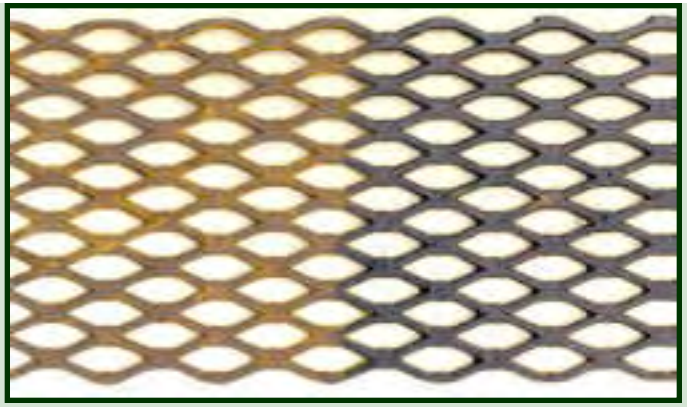
adjust the effective weight of the plug. Click on image to enlarge.



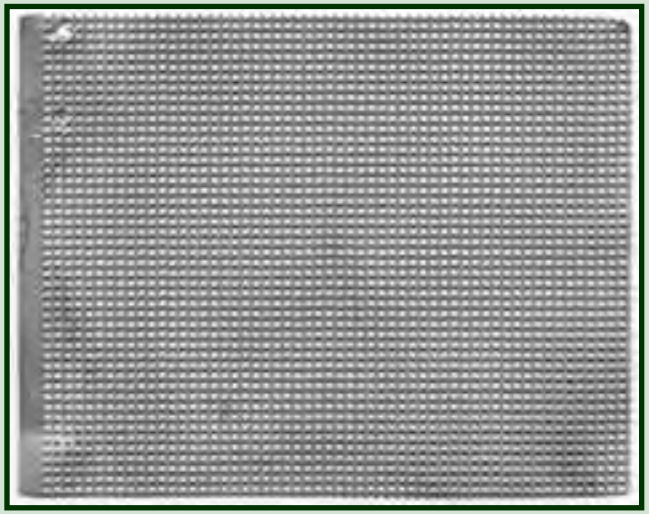
Cross section of a bubbler screen built from a corrugated pipe with a poured concrete base. Click on image to enlarge.



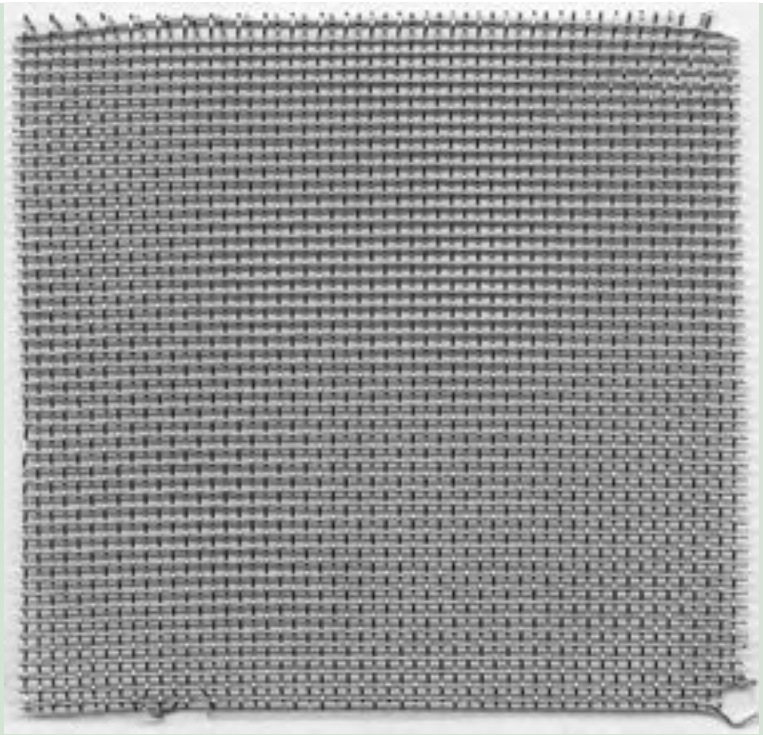
Detail of Bubbler Screen construction. Click on image to enlarge.



Expanded metal support screen. Click on image to enlarge.



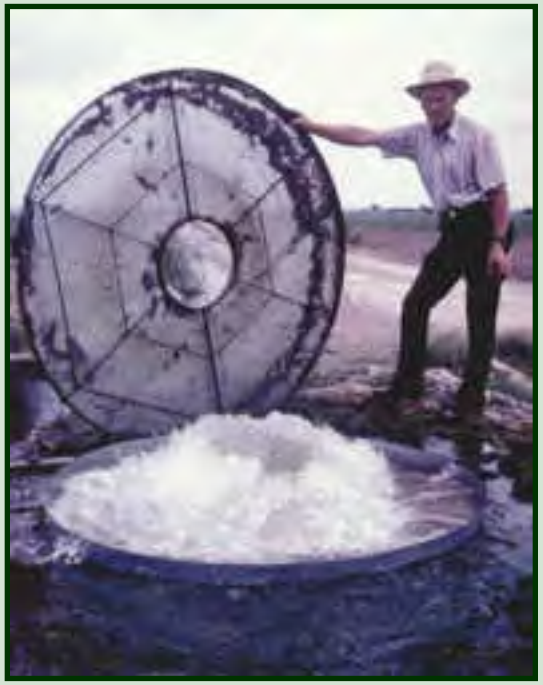
Perforated, stainless steel screen. Click on image to enlarge.



Woven, 20 mesh, stainless steel screen.

Bubbler Screen construction. Click on image to enlarge.

Riser pipe construction. Click on image to enlarge.



Bubbler Screen. Click on image to enlarge.

Typical irrigation water trash. Click on image to enlarge.

Turbulent Fountain "Bubbler" Screens for Piped Water

Bubbler Screen. Click on image to enlarge.

Bubbler Screen. Click on image to enlarge.

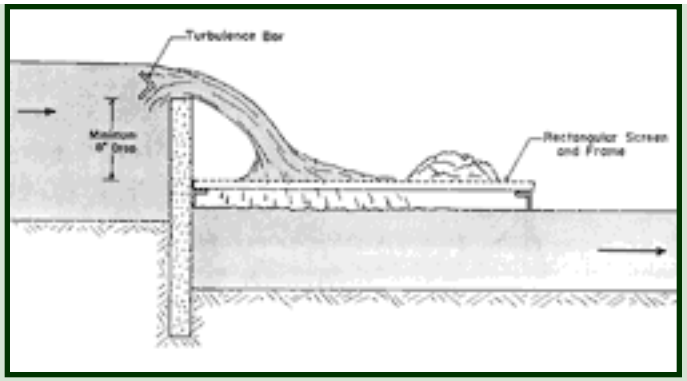
Accumulated trash must be periodically cleared away from the edges of the screen. Click on image to enlarge.

Pond weed accumulated on a bubbler screen. Pond weed is difficult to move off a screen. Perforated screen is smoother and works better with moss and pond weed. Click on image to enlarge.

Horizontal Screens for Ditch Water

Turbulent water falling on a horizontal screen will keep the trash washed off. Turbulence is critical. Water discharging from the end of a pipe or over a weir or check usually does not have enough turbulence to keep a screen clean. However, a bar in flow spread across a check or weir causes "vortex shedding" and creates enough turbulence. Water discharging with enough velocity vertically from a pipe also has enough turbulence. These concepts are the basis for these self-cleaning horizontal and turbulent fountain trash screens.

Turbulent self-cleaning screens were developed by the USDA - Agricultural Research Service in Kimberly, Idaho. Over 500 of these screens are being used by farmers in souther Idaho and eastern Oregon.



Cross section of an Overfall Screen below a check in a ditch showing an angle iron turbulence bar. Overfall screens can also be placed below temporary checks in concrete ditches. Click on image to enlarge.

Overfall Screen in an irrigation lateral check/drop structure. Click on image to enlarge.

Angle iron turbulence bar increases turbulence in the flow. Click on image to enlarge.

Less turbulence in the flow with angle iron bar raised. Click on image to enlarge.

Large Overfall Screen at the sump inlet for several center pivot systems. Click on image to enlarge.

Horizontal Overflow Screens can be placed below canal gates. Click on image to enlarge.

An electric-powered wheel screen at a canal entrance. Click on image to enlarge.

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