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Coanda-Effect Overflow Screens Reduce Maintenance Costs

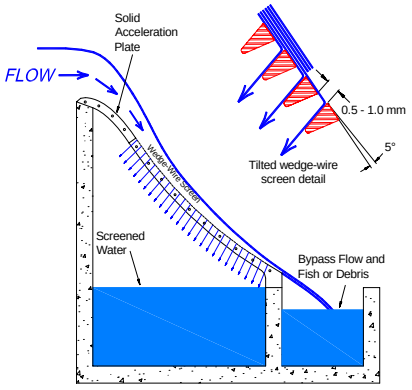
Self-cleaning screen technology removes fine debris while reducing the need for manual cleaning

What Is The Problem?

Water diverted from reservoirs and streams contains debris such as sediment, leaves, sticks, algae, and other aquatic vegetation. This debris can limit the use of water when it fills conveyance facilities or clogs irrigation equipment, such as flow meters, gated pipe, or sprinkler nozzles. Irrigators converting flood irrigation to more efficient application methods have particularly high needs for removal of fine debris, but screens capable of removing fine debris are often expensive to construct and require very frequent cleaning. With traditional small opening screens, it has been challenging and costly to keep them clean from fine debris.

What Is The Solution?

Coanda-effect overflow screens offer a high-capacity, low-maintenance method of separating fine debris from water. Development of these screens began during the 1980's and Reclamation has recently developed a computer program for sizing and designing the screens. Screen sizes vary as a function of capacity and structure geometry, and multiple screens can be used for large diversion structures.



With these screens, debris is separated as water drops and accelerates across a specially built inclined wedge-wire panel. Clean water passes between the finely spaced wires, while debris is swept across the top of the screen, producing a self-cleaning hydraulic action. The key to screen performance lies in the wedge-wire panel where each wire is tilted slightly downstream. This configuration creates the Coanda-effect, which is a fluid and air flow phenomena that results in optimum flow through the screen. Although the slots are very small (0.5 to 1.0 mm), the high flow capacity and velocity over the top of the screen keep the screen relatively clean.

The switch to Coanda-effect overflow screens from traditional screens typically reduces cleaning intervals from several times per day to once in several days. This saves time and money and improves safety. These screens also have relatively high capacity per unit of screen area, so they are less costly to construct than traditional screens. Finally, the ability to screen fine debris effectively and economically enables the adoption of high efficiency irrigation methods, which produces water savings.

Who Can Benefit?

Irrigators, hydropower and municipal water utilities, and water districts that are adding screening capability or trying to reduce the maintenance associated with existing debris screens can benefit from this technology. Fish screening applications are also possible, but further research is needed to address concerns about survival, injury, disorientation, etc.

Where Have We Applied This Solution?

Coanda-effect overflow screens have been installed at numerous locations in recent years to screen irrigation water, small hydropower diversions, and municipal water supplies. Notable recent installations include the Pioneer Ditch Company (Colorado-Nebraska), Rocky Mountain Arsenal (Denver, Colorado), Boise Board of Control (Idaho), and small agricultural diversions in western Colorado.

Coanda-effect screen removing fine debris from a piped irrigation delivery

Future Development Plans

Tests to evaluate the performance of screens with flatter slopes and reduced drop heights are planned. Field demonstration projects that integrate fish passage and low-slope Coanda-effect fish screens are also underway.

More Information

Publications that describe past laboratory testing and design guidance for screen applications are provided at http://www.usbr.gov/pmts/hydraulics_lab/twahl/coanda/. The site also provides Windows-based design and sizing software for analyzing Coanda-effect screen performance

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Collaborators

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