FACTSHEET

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LARGE SOLID REMOVAL FOR EFFECTIVE TREATMENT

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Introduction

The removal of large chunks from vegetable washwater prior to treatment will increase the efficacy of various technologies by preventing clogging. This can be accomplished by using a parabolic filter screen, hydrosieve, or chopper pump. A parabolic filter screen removes solid waste through the use of a curved screen. It can be either enclosed or open system and sized according to the operation's specific requirements. Larger, open systems are commonly referred to as "hydrosieves". The focus of this factsheet is on parabolic systems followed by a short summary of the use of chopping pumps.

Description

Hydrosieves and parabolic filter screens operate by the same principle; hydrosieves tend to be large, open units which can be seasonally placed outdoors whereas parabolics are smaller indoor units. Some parabolic filters screens may be enclosed as opposed to large systems capable of treating high volumes and flows that can be open; enclosed units tend to have more steps to handle overflow situations.

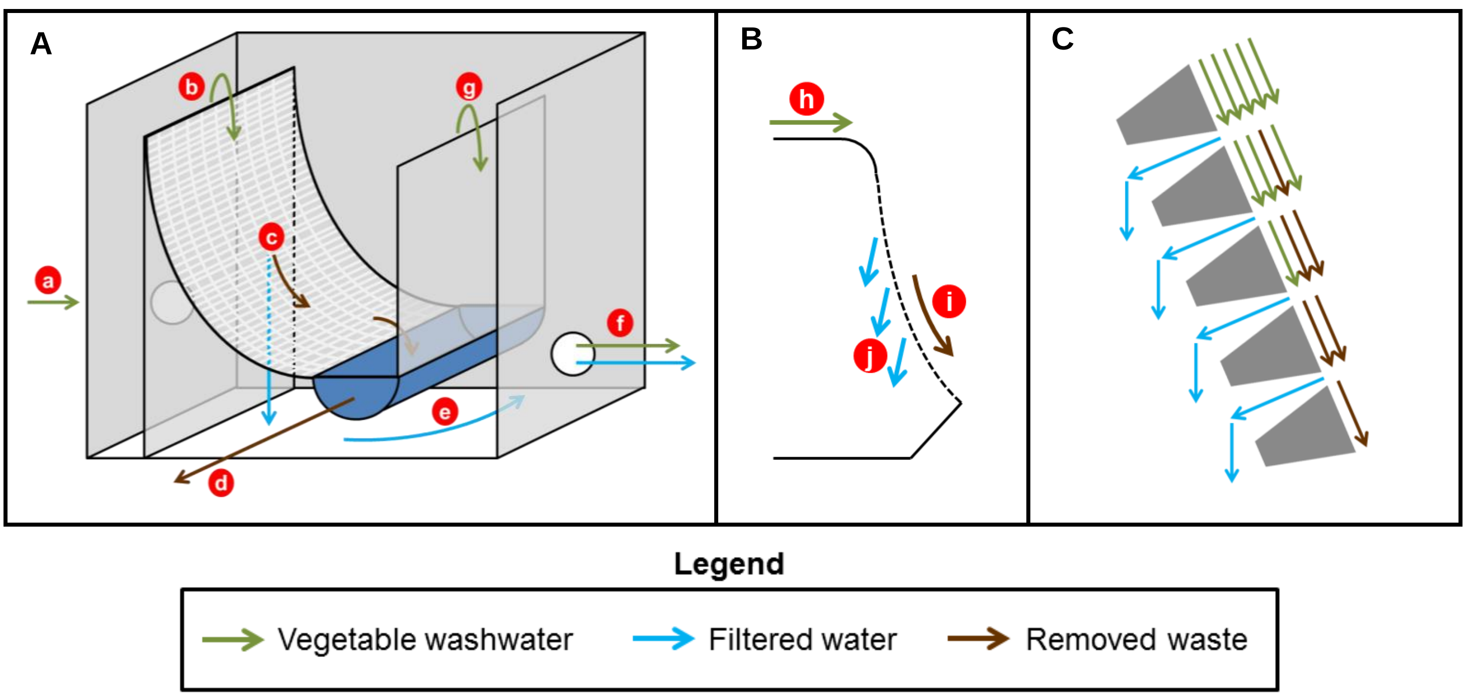

Figure 1 Diagram of (A) a fully enclosed parabolic filter screen, (B) a hydrosieve, and (C) the coanda effect with labelled flow of vegetable washwater, filtered water, and removed waste (HMGA Water Project)

Vegetable washwater enters the filter system through the inlet (Figure 1A(a), B(h)). The water rises until it overflows over onto the parabolic filter screen made from wedge wire (Figure 1A(b)) An additional horizontal plate can be added to slow the water and force it down onto the screen (Figure 2).

Due to the coanda effect, the shape of the screen allows the water to fall through the length of the screen while waste remains on the screen's surface, shown in Figure 1B(i,j) (Pentair, 2015). The coanda effect is the tendency of a flow of water to follow a surface even if it curves away from the original path along the mesh (Fluidics, 2015; Pentair, 2015). Water, shown in Figure 1C, wraps around the surface of the wire that makes up the screen, while the solids continue down the screen.

The size of solids caught is dependent on the screen size (Figure 1C). Waste captured by the filter is removed through a trough; augers can be added to pull the waste out as required (Figure 1A(d)).

Coarsely filtered water flows towards the outlet which can lead to further treatment. In some systems, a float can be added under the screen to regulate water levels. If the water level rises due to a lack of water movement through the outlet, the flow of incoming washwater can be halted. Filtered water continues to the next stage, where it can receive further treatment, recirculated, or discharged to the environment (Figure 1A(f)). In fully enclosed systems, if the water flow is too high for the screen to handle or waste has plugged the screen, the washwater can overflow and join the filtered water in leaving the system (Figure 1A(g)) until the screen is manually cleaned.

System Placement

This technology is meant for removal of large solids such as chunks of vegetables, tops, soil clumps, and other large vegetative matter. It should be placed prior to other treatment systems since the water exiting will most likely require further treatment prior to discharge.

Figure 2: A parabolic filter screen fitted with a plate to direct the water flow onto the screen; no water flow is shown on the top and water flowing through on the bottom (Photo: HMGA Water Project)

Considerations

If the water is not flowing along the surface of the screen and falling over it, the opportunity to filter the water is missed along that section of the surface area (Figure 3). The solution to this problem could be to manipulate the curvature at the top of the screen or to add a plate to direct the water flow back down onto the screen (Figure 2).

A parabolic filter screen requires a 'fall' for the screen to function properly so it must be placed in an area where there is vertical space. It should be placed in a visible area to allow workers to visually monitor its performance.

Figure 3: An example of a hydrosieve that is not running at full capacity (Photo: HMGA Water Project)

The screen will require a regular cleaning; the frequency is based on the flow rate and solid load, to ensure the screen does not become clogged. The waste will need to be disposed of as well. Under heavy flow and loading rates the waste will need to be collected regularly. Parabolic filter screen are designed for coarse solids and will remove aggregated soils and vegetative pieces to prevent the clogging of pumps and treatment systems. It will not, however, remove finer solids.

Performance

The operational performance of this equipment is difficult to quantify as it is intended primarily for the removal of coarser solids. However, a visual inspection confirms its effectiveness as shown in Figure 4.

The usefulness of parabolic filter screens was assessed for its efficacy in removing suspended solids in washwater. HMGA Water Project results showed the unit reduced total suspended solids in a low load situation from 7.9 to 2.3 mg/L. Additional testing using a washwater with a higher solid load would be required to determine the efficacy of lowering suspended solids in regular vegetable washwater. The ability to remove suspended solids is an added benefit on top of the unit's main purpose of removing large solids.

Cost

The volume of water, flow rate, and solid loading is necessary to determine the size of the screen. The size of solids that must be

Figure 4: Solids collected by parabolic filter screen (top) and a hydrosieve (bottom) (Photos: HMGA Water Project)

removed will also affect what micron size of screen is required. A pump is required to direct the water up to the top of the screen where the system is designed for gravitational flow. In such instances, a chopping pump is recommended due to the large number of solids being pumped.

Ongoing costs are minimal with respect to equipment maintenance as no filter replacements are necessary. However, there are operating costs associated with regular cleaning and disposal of solids. This may represent an additional responsibility for maintenance personnel. Accordingly, the equipment should be placed close to washing activities to enable ongoing supervision and cleaning.

Chopper Pumps

Chopping pumps are an alternative to screening washwater prior to treatment. Water is pulled through a cutting system which is able to break up root and cull vegetables into pieces thereby reducing clogging of pumps and filters. Chopper pumps on their own do not provide the same level of coarse solid removal as parabolic filter screens and hydrosieves because the solids are merely made smaller and not removed.

Conclusion

Coarse solid removal is a recommended step to ensure treatment systems are not clogged by large pieces of vegetative matter. A parabolic filter screen or hydrosieve is an efficient way to remove these solids. They do not require much capital investment but will require daily operation and cleaning. Chopper pumps move washwater with large chunks while minimizing the clogging of other downstream treatment systems.

References

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