Self-cleaning and flow in drainage systems

In food production sites, the floor drains are the interface between hygienic production areas and a contaminated sewer system. Certain product features in drainage systems, such as open-sided gratings, large filter baskets and removable water traps, are to a high extent self-cleaning, and consequently, they can contribute to a high level of hygiene.

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Fast removal of solid waste

For hygiene and safety reasons it is important to remove solid waste from the floor in food processing areas. In most cases, it is flushed into a drainage channel or point drain. To secure easy access to the drainage of these particles, there should not be any barriers to flushing through solid waste. This can be ensured by installing gratings with open sides, as opposed to traditional gratings with frames around the sides (Figure 1). The latter tends to hold back the waste, which remains on the floor around the drainage. It is important to note that channels are more difficult to clean than point drains, and should be used only where necessary when designing a hygienic drainage layout.

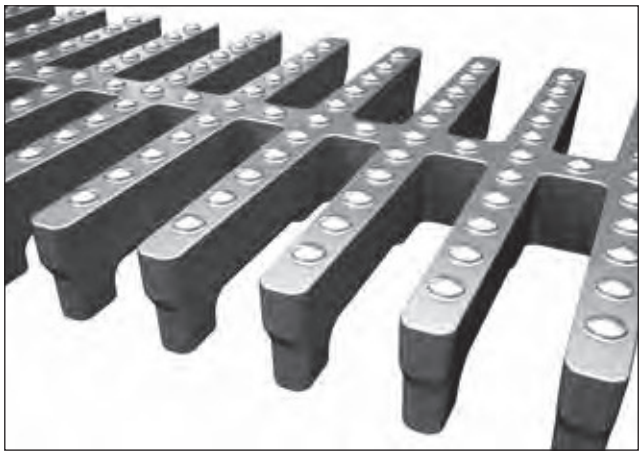

Figure 1. Gratings with open sides allow easy access of solid waste into the drainage system. The frame of some gratings holds back solid waste on the floor.

From the perspective of hygiene and cost-efficient cleaning, solid waste should be manually removed from floors and placed into waste recepticles. However, some solid waste will always be rinsed to drain and drainage systems should be designed so that solid waste is removed manually from one spot only: the filter basket. Flushing the channel to make solid waste in the channel move towards the filter basket is not a good solution, nor is removing the gratings to take out deposited solid waste. Such actions take time and are not very hygienic processes in and of themselves.

The first challenge in improving self-cleaning of drainage channels – a decidedly more hygienic approach – is to ensure that solid waste is transported to the lowest point of the channel, since this will hold an adequate volume of water to flush the solid waste towards the channel outlet. To ensure this, a U-shaped channel is described in the European Hygienic Engineering & Design Group (EHEDG) Guideline Doc. 44, Drains. Due to its steep sides, this channel shape makes the solid material slide towards the bottom where the water is flowing (Figure 2).

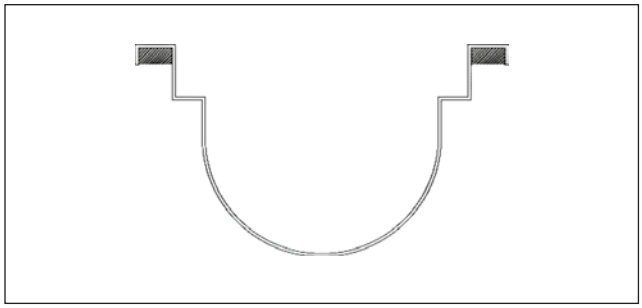

Figure 2. U-shaped channel – EHEDG DOC.44, Figure. 8.7.17.

The second challenge is to ensure a sufficient level of water to lift solid waste with a density lower than water away from the bottom of the channel so that it floats in the water and is more easily transported towards the outlet.

Figure 3. Channel flow testing.

The bottom of a U-shaped channel is rather flat and requires a significant volume of water to lift waste to a certain level. Consequently, if the steep sides of a U-shaped channel can be combined with a V-shaped bottom, then it will take a smaller water volume to create the necessary water level for lifting the solid waste (Figures 3 and 4).

With an increasing focus within the food industry on reducing water consumption, the demands on drainage systems are changing. This should be kept in mind when designing production facilities for the future. If this is not taken into consideration there is a risk that money saved on water consumption will instead be spent on increased cleaning costs. Thus, the expected benefit of the investments in water saving will not be achieved.

Figure 4.U-shaped channel with V-shaped bottom.

Water on the floor

Research shows here is a higher risk of water pooling on the floor in areas with large amounts of solid waste due to restricted flow in the drainage system. In many cases, the reason is limitation of flow through the filter basket. It has become apparent that the amount of solid waste to be expected is often underestimated by decision makers, and often there will not be any plan for emptying filter baskets during the day. Furthermore, flow is often calculated based on an empty filter basket, whereas a full filter basket will restrict the flow dramatically.

For this reason, it is good to use an oversized filter basket rather than a smaller one (Figure 5). A filter unit that can be installed in the drainage channels is commercially available. It can be inserted in target areas where the amount of solid waste is very high, and it leaves space in the outlet filter basket for waste from other areas.

Figure 5. A 7-litre filter basket that is filled halfway allows full flow. A channel filter can hold back waste before it enters the channel.

Typically, the flow capacity in drainage is determined based on the capacity of the water trap, and as mentioned, sometimes the restrictions of flow are actually in other areas. But to secure sufficient flow through the water trap it is important to ascertain that the flow stated by the supplier is in accordance with comparable figures. Therefore the requirements in EHEDG Guideline Doc. 44 for hygiene in buildings using flow tests defined in EN 1253 can serve as an appropriate guideline for utilising a water trap with a documented and comparable flow indication.

Safe and hygienic barrier between sewer system and hygienic area

Traditionally, water traps in drainage systems have been either P-shaped types or welded in as an integral part of the drain. From a plumbing point of view, this is considered an acceptable solution. From a hygienic point of view, however, the presence of contaminated water that cannot be removed from nearby hygienic processing areas is problematic. In some facilities, there have been attempts to solve this by filling the traps with disinfectant, which is not a recommended solution when one considers the higher costs and reduced efficiency. Therefore, water traps that can be removed from the drain bowl and/or drain bowls that can be emptied have become the standard.

All drain points with removable water traps also can be used as cleaning and rodding points, which saves time and money if piping has clogged.

Figure 6. Removable water trap complying with EN 1253.

Removable water traps as we know them today were developed in Denmark in the 1970s. This design offers the advantage of ensuring that the water trap will not run dry even if a sealing ring is leaking. Consequently removable water traps are considered a safer solution than the bell-type water traps. In addition, tests in accordance with EN 1253 standards show good self-cleaning capabilities for these water traps, which translates to less maintenance work for the building owner while maintaining a high level of hygiene (Figure 6).

Even with the promise of reduced water consumption used in cleaning processes in the food production plant, it is important to use products designed for this specific environment. For drainage systems, self-cleaning functionality and an easy-to-clean design are essential in enabling the industry to reach its target of saving water while optimising hygiene.