

OPERATIONAL AND HYGIENE PROBLEMS DUE TO POOR FLOOR DRAIN DESIGN AND INSTALLATION IN A MEAT PROCESSING

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Abstract

The proper design and installation of the floor drain, not only in meat processing but also in a major food establishment, were often given lack of thought in relation to food properties, processing environment and it is treated as a common drainage system just like in other industries. Subsequently, poor drainage is built, which does not meet the operational and hygienic requirement. This study has investigated the severity of floor drainage problem to the operation of a food factory in Malaysia producing frozen meat patties.

The hydraulic efficiency of the drain was determined based on the changing wastewater head above the drain and open grate area, while the cleaning efficacy was analyzed based on adenosine triphosphate (ATP) bioluminescence assay expressed in relative light units (RLU), and standard plate count method for: aerobic mesophilic bacteria, *Escherichia coli*, *Salmonella* spp., *Listeria* spp. and *Listeria monocytogenes*.

The study found that the poor design of the drain-grate has led to rapid blockages and caused hydraulic efficiency to reduce to 21.37% during operation. The wastewater later flooded the floor surfaces up to 15.1 mm which posed slip, trip and fall risk to the workers and fatigue in walking especially when carrying loads. Additionally, the inappropriate installation and absence of hygienic design caused the drain to be ineffectively cleaned. This resulted in unacceptable surface contamination, ranging from 3,793 to 11,657 RLU/100 cm². The drain was also highly contaminated with aerobic mesophilic bacteria (8.1×10^4 - 5.3×10^6 CFU/cm²), *Escherichia coli* (up to 25 CFU/cm²) and the presence of *Listeria* spp. *Salmonella* spp. and *Listeria monocytogenes* were however not detected. Consequently, the factory has experienced daily production interruption, labour wastage due to the need for frequent drain cleaning, fatigued operators, falling incidents, unsatisfactory food safety audit and cross-contamination.

The study ended with the development and provision of checklists, consisting of multiple comprehensive criteria to guide the studied factory in monitoring the design and installation of their future gully-drain for preventing inefficient drainage and contamination. The checklists can also be adopted by other food manufacturers with similar processing.

Key words: Contamination, Floor drain, Food safety, Hygiene, Hygienic design.