# Development of an oil trap system for wastewater handling

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**ABSTRACT** – Removal of oil and fat waste into the sewerage system at the cafeteria of Politeknik Tuanku Syed Sirajuddin (PTSS) has been a major cause of water pollution to the environment. Among the identified sources were the released of solid food waste, oil, and grease from the food premises into the drainage systems. To address the problem of water pollution, a new modified oil trap system was developed and installed at the cafeteria sewage system. By installing the oil trap system, results obtained showed that wastewater quality was improved while the solid waste and oil residuals were filtered into a dedicated storage compartment and prevented from entering the sewerage system.

## 1. INTRODUCTION

Reduction or prevention of pollution at the source is a key element in any pollution control strategy [1]. Effluents produced by the restaurant trade, the dairy industry and food processing are a small sample of those that present potential problems in terms of wastewater management [2].

Improper act by the cafeteria owner to drain the waste of food, oil, and grease has been a major problem, especially at the cafeteria of Politeknik Tuanku Syed Sirajuddin (PTSS) Perlis. Based on the observations carried out, the oily food wastage will be drained into the outlet and indirectly will emit a type of stinky odor, causing bad environmental image to the PTSS cafeteria wastewater handling performance. Hence, this project was initiated with the objective to filter and channel the sewage wastes at PTSS cafeteria and improve the wastewater quality before being discharged into the drainage system. An innovative and simple oil trap system was designed and installed to the current cafeteria sink system. Performance evaluation was conducted to assess the oil trap system performance through visual observation on the wastewater quality and amount of trapped solid waste and oil residues.

## 2. METHODOLOGY

As shown in Figure 2.1, the new oil trap system developed in this project was installed at the end of the residual wastewater from the sink before the sewage water was discharged into the drain. The waste water from the sink flows into the inlet and pass through the filtering process where the food waste is segregated from the water by using filter. The segregation method is based on the simple principle whereby low density oil and fat will "float" at the surface of the mixture, leaving clean water at the bottom of the mixture and be discharged out from the holding tank. The samplings of drainage wastewater were also performed to assess the performance of the oil trap system installed.

Figure 2.1 The modified oil trap system design

Based on Figure 2.2, the working mechanism for the oil trap system are explained as follows:-

(i) The dregs were trapped first inside compartment A, while the oil and wastewater mixture will flow to compartment B and C.
(ii) Oil will float and be on top of the mixture region. The rest of oil floating on the surface of compartment B will overflow into the oil storage tank.
(iii) The wastewater remained after oil is filtered from the mixture is channeled to the sewage system.

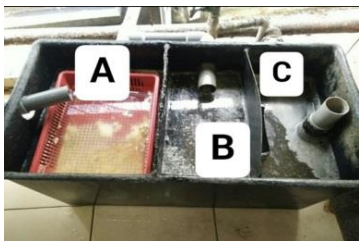


Figure 3.1 Oil trap system configuration with three storage compartments of A, B and C

## 3. RESULTS AND DISCUSSION

Table 3.1 summarized the visual observation on the wastewater quality before and after the installation of the oil trap system. In addition, Figure 3.1 shows the results on the wastewater samples taken with and without the implementation of the oil trap system.

Table 3.1 The differences before and after the installation of oil trap system

| Before the installation of oil trap system | After the installation of oil trap system |
|---|---|
| Food waste residue in the wastewater is taken in large quantities. | After installation, it can be seen that the food waste residue is reduced. |
| The color of the wastewater is yellowish. | The change in color of the wastewater can also be seen in more brighter and less yellowish. |
| Oil and grease flow into the sewage system with sewage wastewater. | Oil and grease are trapped and stored in oil and grease storage tanks, where the discharged wastewater is free from oils and grease. |
| Wastes contain residual oils and grease can be seen on the surface of the water. | No oil on the surface of the water. |

(a) (b)

Figure 3.1 Wastewater quality (a) before, and (b) after installation of the oil trap system.

Based on results shown in Table 3.1, it was identified the root cause of the stinky odor problem faced is caused by the oil and grease wastes flowing from the existing oil trap in the cafeteria. The wastewater from the cafeteria contains relatively high fat and oil quantities emanated from cooking.

In addition, the color of the wastewater becomes yellowish and glazed as there were mixtures of waste oil and grease. The oil layer on the surface will disrupt the microorganisms in the water because the layer blocks oxygen from air into the water. The size of the existing oil trap system was not capable of accommodating the waste oil discharge. Furthermore, it was found that the existing pipe system cannot flow smoothly due to mixed wastewater with oil and grease residues. The less efficient of the existing oil trap filtering has resulted in wastewater draining out mixed oil and grease. It has also caused unpleasant odor problem arising from the oil and grease which were mixed with the wastewater.

After the installation of modified oil trap system (with the addition of oil storage tanks), it was found that wastewater from the system outlet was cleaner than before. In addition, the color of the wastewater was also cleaner, caused there was no food waste mix and no oil layer on the surface (Figure 3.1). In addition, with the modified oil trap system, it can accommodate the great quantity of oils due to the smooth flow of the flushing system. The efficient refinement of the new oil trap system was able to isolate wastewater from drain outlet which was not mixed with the rest of oil and grease. Furthermore, there was no unpleasant smell behind at the cafeteria because the wastewater has been isolated from the oil and grease.

Other notable improvements obtained by using the oil trap system as compared to the existing system are summarized in Table 3.2 below.

Table 3.2 Comparison of performance between existing and modified oil trap system

| Existing System | Modified System |
|---|---|
| It stinks if it is not maintained properly | Smooth waste disposal system |
| Oils and fats residual can cause damage to the sludge fan of the ventilation system. | All waste and oil residuals can be stored in a single compartment. |
| If the trap outlet is clogged and not well maintained, wastewater will overflow. | Able to accommodate more than the existing tank. |

## 4. CONCLUSIONS

A new oil trap system for wastewater improvement was successfully designed and implemented in this project. The modified oil trap system was able to prevent the blockage pipeline caused by the formation of solid fats in the drainage piping system. In addition, it also made it easy to do maintenance work, as well as able to contain large quantity of oils and wastewater during operation. The additional oil storage tank can also isolate waste oil and grease from wastewater more effectively to obtain better wastewater quality and cleaner oil trap system.

## REFERENCES

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