

PERFORMANCE EVALUATION OF DISSOLVED AIR FLOTATION UNITS IN SLOUGHTER HOUSE SEWAGE TREATMENT UNIT

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ABSTRACT

Poultry processing generates relatively large quantities of wastewater containing blood, flesh, soluble protein and waste material which is high in biological oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS) and fat, oil and grease (FOG). The DAF efficiency depends on the removal percentage and this percentage can give an indicator for some mechanical equipments. COD and BOD Chemical analysis of wastewater samples collected from influent and effluent wastewater El-Watania slaughterhouse revealed that removing of BOD. The efficiency fluctuated between the high and low positive values. The highest positive efficient value percent was recorded in wastewater samples collected in March (18.46 mg/l). COD content in El-Wtania wastewater in the influent of DAF unit ranged between 3197 mg/l in June to 4674 in November with average of 3665 mg/l at the five samples that collected for selected months.

Keywords: *Air flotation; slaughter house and sewage*

INTRODUCTION

The principal objective of wastewater treatment is generally to allow human and industrial effluents to be disposed without danger to human health or unacceptable damage to the natural environment. Poultry processing generates relatively large quantities of wastewater containing blood, flesh, soluble protein and waste material which is high in biological oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS) and fat, oil and grease (FOG) (Environment Agency, 2009). The principal advantage of DAF over gravity settling is its ability to remove very small or light particles (including grease) more completely and in a shorter time (Metcalf and Eddy, 1991). In DAF, the entire influent, some fraction of the influent, or some fraction of the recycled DAF effluent is saturated with air at a pressure of 40 to 50 pounds per square inch (psi), and then introduced into the flotation tank (Martin and Martin, 1991). The method of operation might cause operating costs to differ slightly, but process performance is essentially equal among the three modes of operation (USEPA, 1974, 1975). From 15 to 120 percent of the influent flow may be recycled in larger units (Metcalf and Eddy, 1991). A skimmer mechanism continually removes the floating solids, and a bottom sludge collector removes any solids that settle. Although unit shape is not important, a more even distribution of air bubbles allows for a shallower flotation tank. Optimum depth settings are between 4 and 9 feet (1.2 to 2.7 meters) (Martin and Martin, 1991).

MATERIALS AND METHODS

The samples were taken of Al-Watania wastewater treatment during five months (March, April, May, June and November 2014) and for three places influent DAF unit, effluent DAF unit and plant final effluent and all samples were tested by Al-Watania laboratories. The Temperature, pH values were analyzed in the field. Biochemical oxygen demand, Chemical oxygen demand and Total suspended solids were analyzed according to Standard Methods for Water and Wastewater 21 ed.

RESULTS AND DISCUSSION

1-Biochemical oxygen demand (BOD) in influent wastewater DAF unit:

Biochemical oxygen demand (BOD) of wastewater is an expression for the amount of oxygen consumed by the decomposition of organic matter in a biochemical process. BOD content in wastewater in the influent of DAF unit ranged between 1579 mg/l in June to 2555 in November with average of 2037 mg/l at the five samples that collected for selected months (Fig. 1).

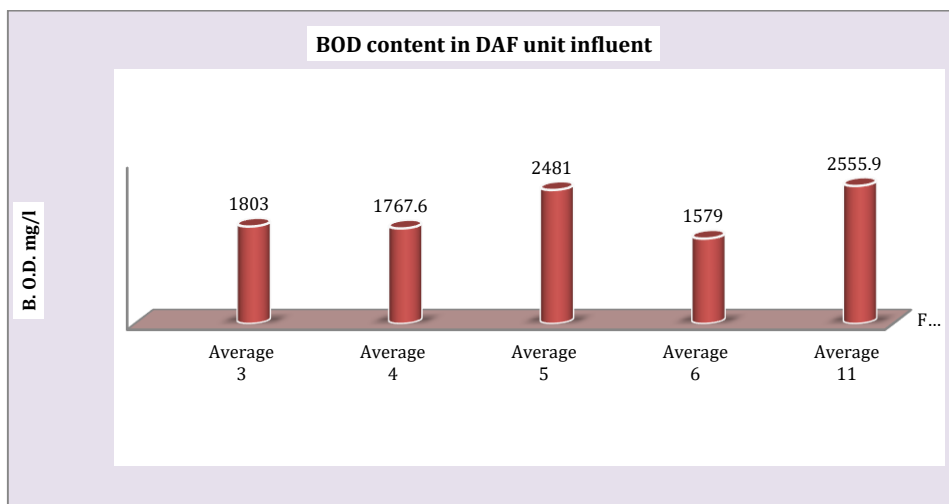


Fig. (1): BOD content in industrial wastewater before influent DAF unit.

2-Biochemical oxygen demand (BOD) in effluent wastewater DAF unit:

BOD content in the effluent wastewater of the DAF unit ranged between 1470 mg/l in March to 2685 in May with average of 1940 mg/l at the five samples that collected for different months (Fig. (2)).

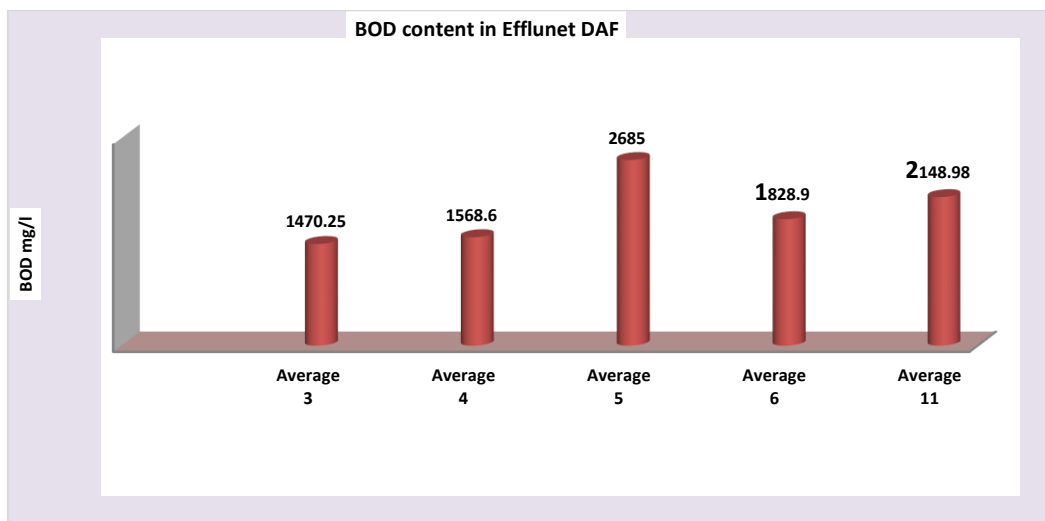


Fig. (2): BOD content in industrial wastewater effluent DAF unit.

3-BOD Removal percent after DAF units:

Chemical analysis of wastewater samples collected from influent and effluent wastewater El-Wataniya slaughterhouse revealed that removing of BOD calculated on basis of the difference between the values before and after the DAF unit / divided by (100). The efficiency fluctuated between the high and low positive values but in some cases decreased to minimum value to record negative values which mean that the DAF unit affect negatively on wastewater treatment (Fig.1.3). The highest positive efficient value percent was recorded in wastewater samples collected in March (18.46 mg/l). The lowest negative efficient value percent was recorded in wastewater samples collected in June (15.90 mg/l).

4- Chemical oxygen demand (COD) in influent wastewater DAF unit:

Chemical oxygen demand (COD) of wastewater is an expression for the amount of oxygen consumed by the decomposition of organic matter in a chemical process through some reagent like dichromate and sulfuric acid. COD content in El-Wtaniya wastewater in the influent of DAF unit ranged between 3197 mg/l in June to 4674 in November with average of 3665 mg/l at the five samples that collected for selected months (Fig. 3).

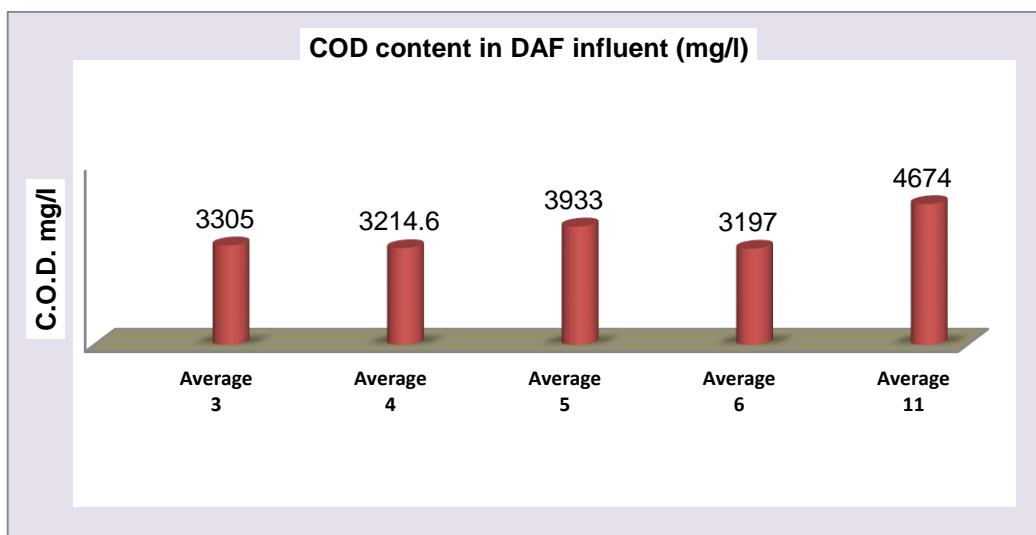


Fig. (3): COD content in industrial wastewater influent DAF unit

5-Chemical oxygen demand (COD) in effluent wastewater DAF unit:

COD content in El-Wtaniya wastewater in the effluent of DAF unit ranged between 2635 mg/l in March to 3925 in November with average of 3414 mg/l at the five samples that collected for selected months (Fig. 4)

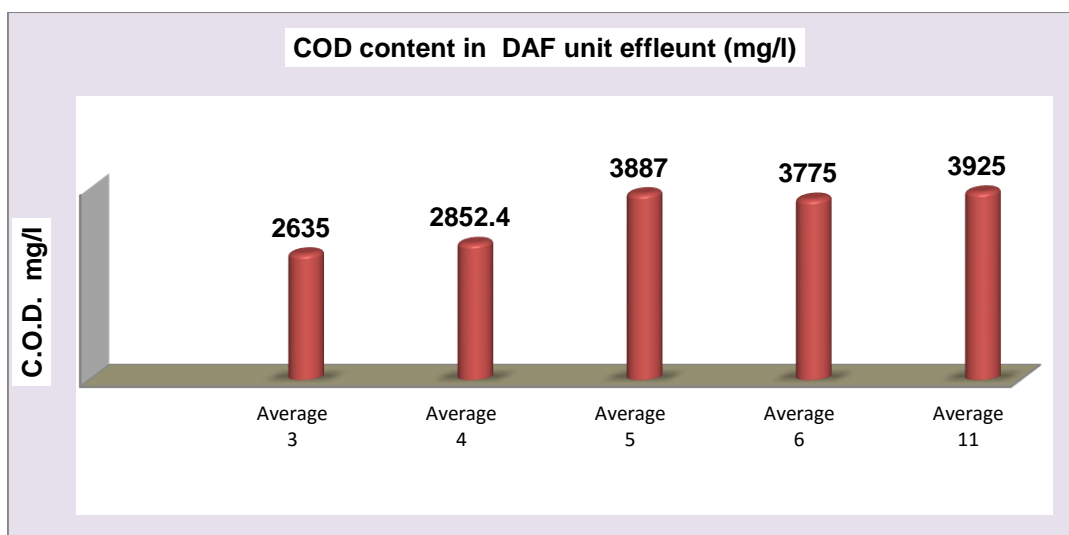


Fig. (4): Chemical oxygen demand (COD) in effluent wastewater DAF unit.

6-COD Removal percent after DAF units in wastewater treatment plant:

Chemical analysis of wastewater samples collected from influent and effluent wastewater El-Wataniya slaughterhouse revealed that; The highest positive efficient value percent was recorded in wastewater samples collected in March (20.27%). The lowest negative efficient value percent was recorded in wastewater samples collected in June (-18.70%).

7- (TSS) influent wastewater DAF unit:

TSS content in the influent wastewater of the DAF unit ranged between 1197.2 mg/l in April to 1885 in November with average of 1499 mg/l at the five samples that collected for selected months (Fig. 5).

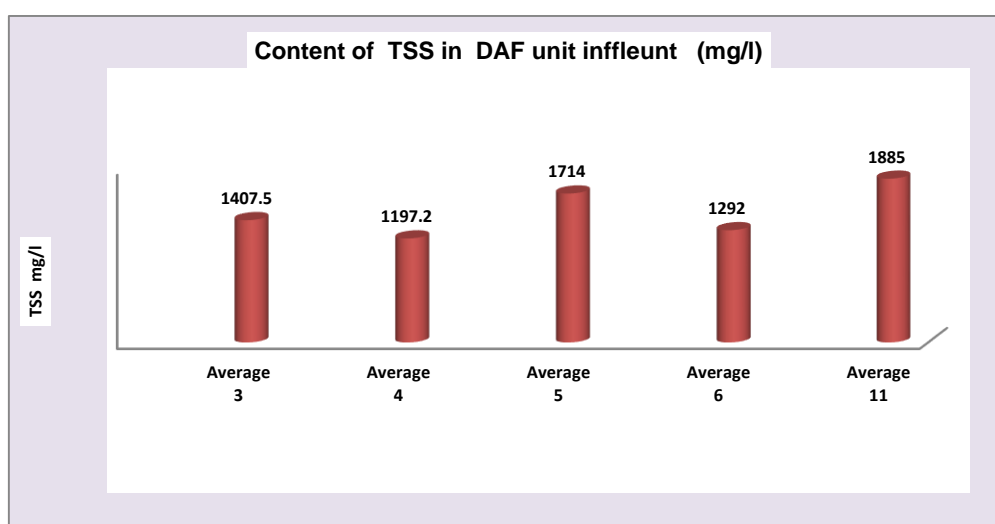


Fig. (5): TSS content in industrial wastewater in DAF unit influent.

8-(TSS) influent wastewater DAF unit:

TSS content in the effluent wastewater of the DAF unit ranged between 931.8 mg/l in April to 1564 in November with average of 1499 mg/l at the five samples that collected for selected months (Fig. 6).

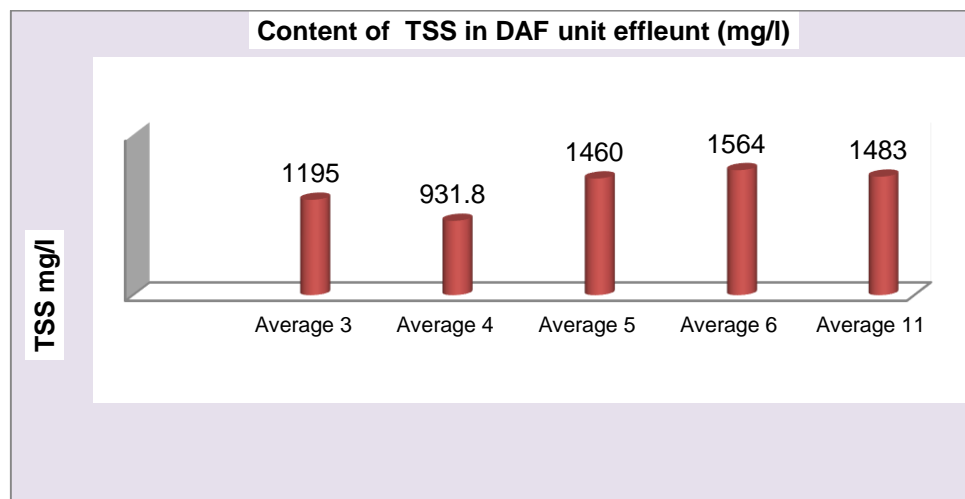


Fig. (6): TSS content in industrial wastewater in DAF unit effluent.

9-TSS Removal % in DAF unit effluent:

Chemical analysis of wastewater samples collected from influent and effluent wastewater El-Wataniya slaughterhouse revealed that; The highest value for TSS removal was recorded in November (26.63 %). Whereas the lowest value was recorded in May (14.80 %). When the removing % recorded minus value at June (-21.10 %). The mean average of TSS removal in the five months was recorded 12.8 %. The efficiency of DAF unit on TSS basis can be calculated with removal % values.

CONCLUSION

From the case study illustrated the importance of mechanical equipment in the acceleration of treatment works. The DAF efficiency depends on the removal percentage and this percentage can give an indicator for some mechanical equipment in wastewater treatment systems.

Recommendations

- 1- Need to focus on running the blood separation prior to indirect the wastewater into the primary treatment to reduce the organically load value on the following treatment stages.
- 2- The DAF unit indispensable in the process of separating fat, grease and oil in wastewater resulting from the poultry processing treatment plants.
- 3- The DAF efficiency depends on the removal percentage and this percentage can give an indicator for some mechanical equipment in wastewater treatment systems.
- 4- Using new sweeping water fully to reduce water consumption rates.
- 5- Need to pay attention to the necessary maintenance of the DAF units in wastewater poultry treatment.

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