

## 1. Introduction

Poultry production activities are among the giant water consumers and wastewater generators in the world. The phenomenon is expected to be continuously growing due to the fact that, the demand for poultry products has also been rapidly increasing as a result of the high population growth worldwide [1]. It is estimated that the poultry production processes generate approximately 20 to 40 L of wastewater per processed bird, with 25 L being a typical value [2]. It is also worth noting that, poultry slaughterhouse serves as the crucial unit in the poultry production processes [3]. The main sections in the poultry slaughterhouse are; defeathering, evisceration, and cooling. The most challenging part is that the activities in the slaughterhouse generate one of the highly polluted types of wastewaters [4]. More specifically, the generated wastewater is characterized by a high level of biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), and a complex mixture of fats, proteins, and fibers requiring systematic treatment before discharge or recycling [5,6].

Although there are already many technologies used in the field of wastewater treatment in general [7–11], however, the performance of these systems is highly dependent on the type of technology used and characteristics of the wastewater to be treated. Generally, poultry slaughterhouse wastewater can be purified using physical [12], chemical [13], and biological-based [14] treatment approaches. But it has to be noted that, each treatment technology has its strengths (advantages) and weaknesses (disadvantages). For instance, although the biological treatment systems, both anaerobic and aerobic are relatively strong in terms of the microorganism's adaptability to a wide variety of wastewater composition; however, these systems are relatively slow treatment processes requiring large physical areas while generating huge volumes of sludge [15,16]. This is because biological wastewater treatment relies on microorganisms to assimilate organic matter and nutrients present in the wastewater [17]. However, these microorganisms need time to properly digest the pollutants in the wastewater [18]. In general, the biological treatment processes are the most widely applicable technologies for poultry slaughterhouse wastewater. In the literature, several investigations based on up-flow anaerobic sludge blanket reactors achieved more than 90% COD removal efficiency from poultry slaughterhouse wastewater [19,20]. According to Aziz et al., that investigated the performance of submerged fibers in an attached growth sequential batch reactor for poultry slaughterhouse wastewater treatment, more than 93% for BOD and COD was achieved,

The physical treatment processes such as membrane filtration (MF) systems including reverse osmosis are among the most highly efficient treatment approaches in terms of pollutant removal, but they are giant power consumers as to operate the system high pressure is needed [21]. Also, they are well-known in terms of sludge generation and the generated sludge has to be handled separately. The whole process makes the treatment process relatively expensive and less feasible for large-scale treatments and low-income communities [22]. On the other hand, there are also chemical-based treatment technologies such as electrochemical (EC) systems that act as a potential alternative to the poultry slaughterhouse wastewater treatment [23–25]. The EC treatment systems offer a number of advantages such as being robust, requiring a relatively small working area, as well as being relatively strong and flexible under fluctuating wastewater flows and composition. In general, the EC treatment technologies have been of recent highly gaining researchers' interest in the field of wastewater treatment, for example; Sharma Swati and Simsek Halis [26] investigated the applicability of EC methods for the treatment of sugar beet industry process wastewater, Davarnejad Reza and Nikseresht Mehrazin [27] for dairy wastewater, Hoang Tran Le and Luu Tran Le [28] for textile wastewater as well as Tien Tran Tan and Le Luu Tran [29] for tannery wastewater.

The general working mechanism of an EC treatment system depends on at least two electrodes (an anode and a cathode), and also there should be an intermediate space filled with electrolytes [30]. It is also important to understand that, the terms anode and cathode are not fixed and are highly dependent on the direction of current passing through the