Experimental Study on Counting of Eggs in Egg Breaking System and Level Maintenance in Collecting Tanks

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Abstract. The food industry is a global collective of diverse businesses that supply much of the food energy consumed by the world population. Eggs are one of the most nutritious foods available. The versatility of eggs means that they are an important ingredient in many food products including cakes, sauces, desserts and sandwiches. In egg processing industry the approximate amount of egg processed is 14,00,500 eggs per day including wastages. But there is no accurate method to measure the broke eggs excluding the wastages. Our Project enhances the correct measurement and provides the data that how much eggs can be break to improve the amount of egg powder produced. Our project also includes the level maintenance the collecting tank which collects yolk, albumen and whole egg separately after breaking the eggs and the suction motor can be operated automatically when the level reaches the required level, this helps in complete automation in the industry by using Programmable Logic Controller (PLC).

Keywords- Egg; breaking; counting; maintenance;

1. INTRODUCTION

This paper proposes a new measure to calculate the accurate number of eggs breaking per day in each machine. The parameter “egg products” refers to the process by which the eggs are separated from their shells for further processing. This figure 1 shows complete process stage involved in egg processing. The eggs are directly transported to the processing area from the laying area or flock area. The process is called in line operation of the eggs are transported directly from the laying area. The modern techniques do not follow this method and are designed to transport the eggs through conveyors. Then the eggs are washed properly to remove external contaminations in the shell. The washing liquid is water which is maintained at a temperature higher than the eggs. The washing process is superseded by the process of sanitization. The further processing of eggs is carried out in the storage silo. Figure 2 shows the flow diagram of egg’s liquid product in further processing.
Figure 1. Process Involved in Egg Processing

Figure 2. Flow Diagram of Liquid Egg Product for Further Processing.
Liquid egg products yolk and whole egg are pasteurized by plate pastures. These plates have compartments which can handle high temperatures. Liquid egg white is pasteurized and sold as a either a liquid or a frozen product. Dried egg products can be heat treated by a so called “hot room” treatment at 130°F (54°C) for 7 days. Here the products are in their final package already.

2. EXISTING METHODOLOGY

The general process of egg breaking and collecting tanks is shown in the Figure 3 this explains the fundamental process from storage area to collecting tanks [1,2,3]. In the egg breaking section the eggs from the storage area are moved to the breaking section through conveyor and the egg tray are kept in the moving conveyor manually [4,5,6,7]. Then the eggs are sucked up through suction tube and placed in the forward moving rotating continuous rods which make the eggs to move towards the breaking point. Here the eggs are arranged in a line up and with the help of pneumatic system and vertical pointed rod is operated downwards to break the egg at top [8]. Here the number of eggs broke is calculated by measuring the weight of eggs for a total of 100 trays at a time and then calculated with the number of trays passed after passing the breaking section [9,10].

![Figure 3. General Process of Egg Breaking and Collecting Tanks](image)

After the eggs broke the yolk, albumen and whole egg are filtered and each was collected separately in the collecting tank. These egg remains are have to be pumped to next stage called pre-pasteurization through diaphragm pump at a pressure of 5 bar. When the egg liquid level in the collecting tank increases to the required level then it is moved to the pump by opening the lower opening of the collecting tank and the motor is operated to pump the remaining egg liquids to the next level [11,12,13 and 14].

In the existing system the drawbacks are:

- The accurate number of eggs broke is not calculated.
The pumping of egg remains is not done automatically when it reaches the required level; this reduces time efficiency and also production. The above drawbacks can be overcome by the proposed method.

3. PROPOSED METHODOLOGY

3.1 Counting of Eggs and Level Maintenance

To overcome the above drawbacks we proposed a system to count the accurate number of eggs breaking in the breaking section itself by using proximity sensor at the point of breaking at the down side of each section of the pneumatic operated rod type instrument when it is placed for breaking. This provides the count of eggs which is broke. For the level maintenance in the collecting tank it is planned to implement three sensors in the tank at three different positions. The positions are Level Low (LL), Level High (LH), and Very High (VH). When the level reaches the position LL the motor automatically stops and so the suction from the tank also stops. When the level reaches LH then motor automatically starts and suction starts from the tank to the diaphragm pump. When the level reaches VH then the entire breaking section stops in order to avoid the over flow of the egg liquid in the collecting tank. The proposed method is going to be implemented using PLC. Figure 4 shows the block diagram for the level maintenance of the proposed system.

Figure 4. Block Diagram for Level Maintenance

4. CONCLUSION
In the existing system, eggs were broken per day and the egg liquid was collected in a tank. The count of the egg and tank level was calculated approximately by measuring its weight. To overcome the problem in existing system, proximity sensors are used in egg breaking machine to measure the broken eggs and in the tank to maintain the level of the egg liquid. In this project we have planned to automate the dryer section in which egg liquid from the storage tanks are pumped by the high pressure pump to the chamber section where the egg liquid is sprayed and converted into egg powder at high temperature. The moisture controller is designed to maintain the moisture level in the cyclone situated in the dryer section. This ensures the best efficiency in obtaining effective egg powder and increase egg powder production.

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