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Meat Mixing Process Analysis of Chicken Nugget

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Abstract.

Chicken nuggets are food produced from chicken meat processing technology. Making chicken nuggets is divided into several processes, starting from the preparation of raw materials, the process of grinding meat, making dough, freezing the dough with liquid nitrogen at a temperature of -3 to -5◦ C, molding, coating butter, and bread flour, frying at a temperature of 177◦ C, steaming at 160◦ C, and freezing the finished chicken nuggets at -35◦ C. In this study, a thorough analysis of the process of making nuggets was carried out.

INTRODUCTION

To form Chicken nuggets are a food that is very much in demand in Indonesia. This makes technological developments in the manufacture of chicken nuggets grow. Seeing the increasing number of chicken nugget enthusiasts and the growing quality of chicken nuggets, this research was conducted to understand and analyze the latest technology for making chicken nuggets. This research will focus on the nugget production process, including the process from boneless chicken to nuggets in packaged form. This study aims to understand the process of making chicken nuggets and conduct an in-depth analysis of the chicken nuggets production process, especially in the meat mixing process in which liquid nitrogen is mixed with liquid nitrogen until it reaches a temperature of -3 to
-5◦ C so that the nugget dough can be molded. The meat mixing process is carried out on a twin mixer machine. The twin screw on the twin mixer machine will mix the liquid nitrogen with the nugget mixture. So that the nugget dough can reach a temperature of -3 ◦ C to -5◦ C

RESEARCH METHODOLOGY

In this study, data were collected in accordance with the provisions of the research method. Where the research method used is an experimental research method.

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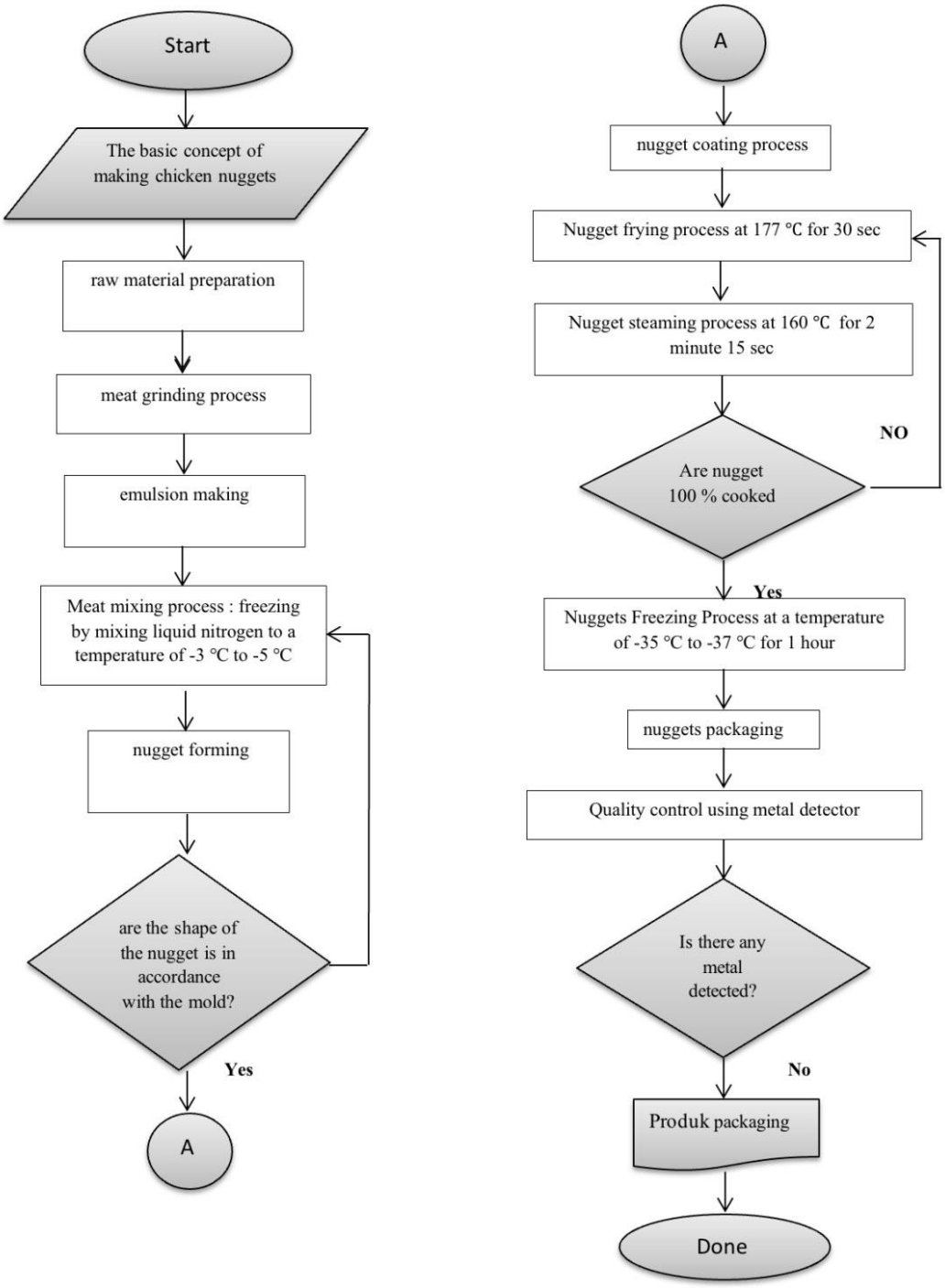

Figure 1. Chicken nugget production process

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RESULT AND DISSCUSION

Meat mixing is a process carried out by a twin mixer machine. In this meat mixing process, the nugget dough that has been made from a bowl cutter machine is mixed with liquid nitrogen. This is done so that the dough can reach a temperature of -3 to -5 . This temperature aims to make the dough denser so that it can be molded into nuggets using a drum former (forming) machine. Twin mixer machine is a machine used in the meat mixing process. Where this machine uses an electric motor as the main driver and a gearbox along with a v-belt as a power transmission. The twin mixer machine uses twin screws that move in opposite directions to knead the dough and 6 nozzles which are controlled by an accuator valve to inject liquid nitrogen into the dough. In the meat mixing process, the liquid nitrogen used is already food grade. Where the liquid nitrogen is used to raise the temperature of the dough until it reaches -3 to -5.

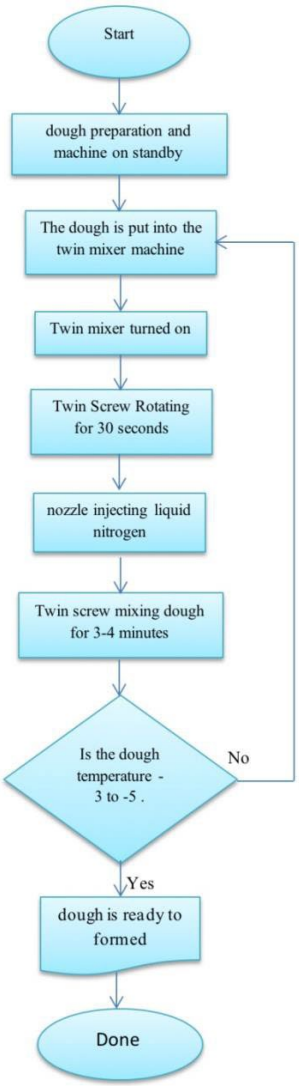

Figure 2. Meat mixing flow chart

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The meat mixing process is a process that is carried out to increase the temperature of the dough until it reaches – 3 to -5 . At first the nugget dough that has been processed in the bowl cutter is put into the twin mixer machine, after the machine is turned on, the twin screws will move in the opposite direction to stir the dough. After 30 seconds the nozzle set by the accuator valve will inject liquid nitrogen into the dough while the twin screw continues to rotate in the opposite direction to stir the dough. This process takes between 3-4 minutes until the nugget dough can reach a temperature of -3 to -5 . However, in the nugget production process, metal flake contamination was found in the product which was known during the quality control process, where during quality control there were nuggets that were detected to be contaminated with metal flakes. To find out the cause of this contamination, the steps taken were to analyze the nugget production machines. Where after checking it was found that contamination occurred during the meat mixing process in the twin mixer machine, this was due to damage to the twin screw which functions to knead the dough as shown in **Figure 3**, therefore it is necessary to do a special analysis of the damage

Figure 3. Twin Screw

Based on the results of the analysis, it was found that the causes of the damage were as follows. Huge workload, Twin Screw serves to stir the dough and liquid nitrogen so that the dough can reach a temperature of 3 to -5 . Where for each use, the twin screw usually has to knead approximately 250 kg of dough. The number of stirring blades on each screw is 8 pieces. Assuming the load from the dough is evenly distributed on the twin screw, each mixing knife will receive a load of 15.625 kg. so that it can be calculated

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p = 35 cm

l = 1 cm

W = 15,625 kg

A = p x l
= 0,35 m x 0,01 m

= 3,5 x 10^{-3} m^2

P = $\frac{F}{A}$

P = $\frac{15,625}{3,5 \text{ x } 10^{-3}}$

P = 4464,286 Pa

The pressure of 4464,286 Pa, which continuously occurs on the stirring blade causes the twin screw to be susceptible to damage. Therefore, it is better to reduce the speed or decrease the amount of load.

Wrong screw setting. The wrong and less precise setting of the twin screw causes friction on the twin screw. This causes the twin screw to be damaged. Defective locking bolt. The peg is a component that functions as a lock between the screw and the gearbox. With a broken peg, the rotation of the twin screw becomes a forced rotation. This forced rotation causes friction between the twin screws and other components, the friction then causes damage to the twin screws The age of the machine, the twin mixer machine is an old machine with a very long period of use. Based on the period of use, over time, the twin mixer machine and its twin-screw components experienced a decrease in quality. Where the quality has decreased from year to year causing the twin mixer and its components to be very susceptible to damage.

Based on the concept of Ductile-Brittle Temperature Transition, it is known that at low temperatures, some metals that are ductile at room temperature can become brittle. The temperature of the ductile-brittle transition depends on the metal composition. For some steels, the transition temperature can be around 0°C.

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CONCLUSION

The manufacture of nuggets has 3 very important sectors, namely utilities, production, and waste treatment. The nuggets produced are already using automation, where the entire nugget production process uses machines that move automatically. The machines used in the nugget production process are all regularly maintained. Based on the calculation results in the case study, it is known that each stirring knife on the twin screw will receive a pressure of 4464,286 Pa. Based on the case study, it is known that there are still components that are not food grade in the manufacture of nuggets, for example, the shaft on the twin screw. Where the shaft is experiencing corrosion. It would be better if all the components used in the nugget production process were all food grade

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