

SAUCE FILLER MACHINE AUTOMATIC SCREW SYSTEM EQUIPPED WITH ELECTRICAL CONTROL UNIT

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ABSTRACT

The purpose of this research to provide solutions existing problems in Sambal Goreng entrepreneur, especially on the process of sauce filling which is still using the traditional way. This research was comitted by designing an automatic filling machine, with a filler mechanism using a screw-driven piston technology, where the thread is rotated by an electric motor integrated with the timer. The result expected of prototype automatic filler machine is 1.2 kg/min flow rate, for the 150 g of sauce capacity storage takes 7.5 second . This machine is equipped with an easy charging method that is operated using only 1 button. the productivity of performance machine has been increased twice.

Keywords : Sambal Goreng, automatic, sauce filling, machine.

I. INTRODUCTION

The focus of this research is to find out the problems that exist in SME entrepreneurs Sambal and provide the right solution to

overcome it. As we know in general the problems that exist in entrepreneurs is the limitations of machine technology or tools to support the production of products and meet market needs.

Small and medium enterprises (SMEs) important factors supporting the development of the nation's economy. In order to encourage high economic growth, balanced, fair and sustainable, the Government prepares the Master Plan for the Acceleration and Expansion of Economic Development in Indonesia (MP3EI) 2011-2025. As an economic sector, SME productivity needs to be improved based on technology content of SMEs consisting of four components: technoware (physical equipment), humanware (human resources), infoware (fact, information system) orgaware (institutional or leadership). This research was conducted with the aim to know how the role of technology in increasing SME productivity. The results showed that technology utilization rate based on technology content in SME production process is still low. (Astuti et al., 2013)

Sambal which is a sauce made from chili is destroyed until the water content out

so that the spicy flavor. After added seasoning, the spicy flavor will be transformed into a delicious floral delicacy. There are a variety of sauce variations. Each variation requires different ingredients and ingredients as well. Although the process of making simple cannot be considered trivial. All the ingredients, ingredients and ways of making it must be properly considered. So that later produced a delicious spicy flavor (Munawaroh and Jasmine, 2006: 2)

This Paper is the result of research and application of technology from the students to provide the right solution for the problem of existing SME sambal goreng, ranging from research discussion and interview with related parties so as to provide the right solution in increasing the productivity of sambal production

II. BACKGROUND

A chill filling process by manual can be replaced by using a filling machine (filling). The filling stage of liquid product and the product in solid form into bottle container has the different technique. The technique of filling the liquid product into bottles is divided into four types: Measured dosing (Paine and Paine, 1993)

The several problems that exist in SMEs (Small Medium Enterprises) of sambal, that is during this process of making of sambal still using traditional and conventional way also used machine still relatively simple. Problems faced by partner SMEs is in the process of filling long enough sambal. During this time for the process of filling the sambal is Packaging done manually that is by using the help of bottle mizone and still using a spoon, so that the production process takes a long time and can be at risk to the producers themselves, such as exposed sambal that can give the effect of heat on the skin. Another consequence of the use of inadequate production equipment is to cause the production process becomes less effective and productive.

Therefore, we need alternative machines that can increase the productivity

and effectiveness of the entrepreneur. The right solution is with created automatic sambal filling machine.

The purpose of this research is to provide solutions by creating an easy-to-use machine that can improve the effectiveness and productivity of sambal goreng production with indicator: chili filling process using Quantity Control method and 2 combined Control Chiller syrup controlled quantity with time variable, with drive wiper motor, so the process of filling sambal get faster

III. METHODOLOGY

The research method used is research and development (R & D). Research and development method is a research method used to produce a specific product and test the effectiveness of the product (Sugiyono, 2013)

Based on the problems that arise we strive to create innovation that useful to the community, based on strong theoretical science we are trying to implement and implement in the form of a tool SAMKILLER "Sambal Goreng Filler" One-Way Fryer Automatic Chilli Filling Machine Which Screw System the application of this tool is based on the Law and Theory of Physics, in this case is the Bernoulli Law

By Daniel Bernoulli's Law (1700-1782) proves that the greater the speed of fluid, the less the pressure and vice versa, the smaller the fluid velocity, the greater the pressure. Then this statement is known as BERNOULLI LAW. It is through this principle that the application of SAMKILLER "Sambal Goreng Filler" can be realized, through the basic equation of Dynamic Fluid that is = Flow discharge (Q) = Total volume of fluid flowing unity of time,

$$Q = \frac{V}{t}$$

based on the Usage of Equation above can be obtained a new equation of the equations used in the application of SAMKILLER machine "Sambal Goreng Filler"

$$V = Q \cdot t$$

Where :

V = Fluid Volume in Bottle (gram)

Q = Flow Rate (cm³/detik)

t = Time (s)

So that the Fluid Volume on Filler Sambal depends on the flow of the sauce flow at times with the filling time interval

This research was conducted in 5 months from 2017 to 2018 located in basecamp of Surabaya State University and SMEs kebonsari Surabaya

Tools and Materials used are binders, notebooks, recording laptops, exhibitions and refractory books and research guides

The data collection method used is taking a sampling from the production process analyzed and also participate directly in the process of filling sambal within doing observation analysis supported by the use of a theoretic method of Research and Development (R & D).

The technology used to increase the productivity and effectivity of sauce filling is by using one way valve , this invention method in principle is the control of the flow of discharge out through the concept of charging sambal with 2 phases of suction phase and press phase using one way valve (Valve one-way) inputs and outputs as well as the use of transmissions that drive the piston using a screw system, where the frying machine uses the prime mover of the electric motor and has been integrated with the screw transmission piston as a driver and equipped with ECU (Electrical Control Unit) as the controller the main quantity of timer-based

chili sauce, which is the application of the law using Daniel Bernoulli or "BERNOULLI LAW" that is controlled variable is Volume Fluid out which is the discharge that comes out of the valve per unit time so that it can be the volume data in a certain time unit sian sambal there are 2 phases that is suction dase and press phase, the process of suction phase of sauce entering through hooper will be suction by piston and one way valve of input will open so that sauce enter into piston tube, then in press phase, motor-driven piston will move forward so as to push the sauce to the one-way valve of the output outlet so that the sauce out to the bottle has been prepared. In this part of the invention the long piston movement is determined by the timer at the ECU (Electrical Control Unit) where the length of time the piston will affect the outflow volume on the output valve

In addition to using the method (R & D) of this study also through direct observation in the field. By considering the emerging problems and providing the right solutions in the appropriate technology. Here is a flowchart of a series of research activities,

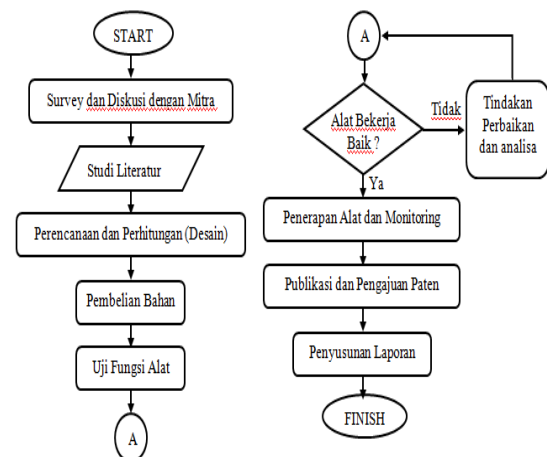


Figure 1. Flowchart Research Method

Observation and Discussion

This activity is the first step in finding the necessary data, Observation and FGD (Focus Group Discussion) conducted by the team with the entrepreneurs, where the discussion discusses the working conditions of the entrepreneurs and the constraints

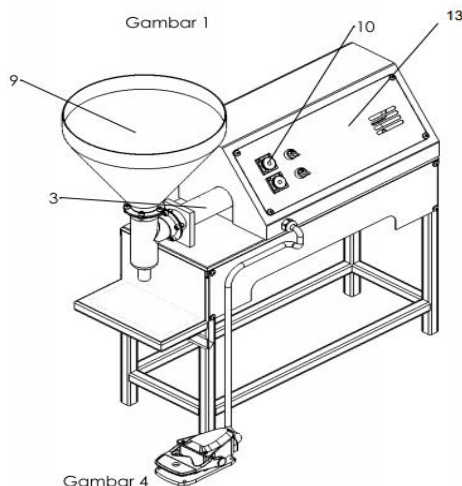
experienced as well as the short-term and long-term impact which is obtained by the entrepreneurs from both the technological and economic aspects. Such as production capacity in 1 process, how much demand, and constraints of sambal production process) and also social aspect (lack of customer trust to sambal goreng product) to health and hygienic product during a process of making

Literature

The Literature Study contains a series of search and assessment activities of relevant and reliable sources in the collection of material and become a reference in writing this CREATIVITY PROGRAM OF STUDENT. The literature we use includes mechanical engine elements (Robert L. Mott), Mechanisms and Machine Dynamics (Dr. Ramses Y. Hutahaeon, MT), and Book of Element Engine Volume I (G. Niemann, Anton Budiman, Bambang Priambodo). In this phase we get reference design, work, and security system in making Samkiller machine

Creation Design

The next step is planning and designing machine "SAMKILLER". Based on the results of the discussions of the executing team, lecturers and partners, the design of the "SAMKILLER" machine is chosen, which the design team has discussed with the entrepreneur. The design of this



machine using software inventor 2016 as shown in the picture below:

Figure 2. Samkiller Machine Design

After the design is made more that is the Design analysis From the initial design that has been made, analyzed together to find out the various things needed in the process, what can be done, what is in accordance with the wishes of partners, what are the constraints, how to overcome them, then what alternative.

Procurement of Tools and Materials

Before work begins, it is necessary to purchase materials in and machines used in machining.

Manufacture Machine

Once everything is available, including the tools and support tools that will be used, then the next step is the manufacture or assembly of the machine. Usually this process takes a long time but our target is 1 month for machining work. If encounter obstacles and problems usually use the services of a public workshop or hire a handyman to finish making the machine, but here we try to make the machine itself.

Trial and test

The SAMKILLER Engine Testing is intended to ensure that the performance of each component of the machine-making output can function as expected. The test will be conducted at our partner's place, in the fried sambal of Mrs.Yudy's fried sambal in Kebonsari Surabaya

Implementation and Monitoring

After the machine has been tested and get good results and maximum, then the machine submitted to the partner, and testimony in order to get a partner opinion how the performance in the machine. Monitoring is done to monitor the condition of the machine used by the partner, then documented and

taken also analyzed data.

Publication and Patents

The result of our program will be published both scientifically and mass media with the aim that people know about the benefits generated by the machines we make. Given the many benefits generated by CREATIVITY PROGRAM OF STUDENT that we created and in the search results GOOGLE PATENT no one has filed a patent regarding our machine.

Evaluation

The evaluation and improvement phase of the machine is done after the machine testing is done. At this stage will be assessed working system of the machine, both from the move, stability mesindan form of perfection of processing results. If the machine does not meet expectations, failure analysis and corrective action will be performed.

Report Letter

Reporting is done after all stages are completed so that the results obtained from making the machine can be explained in detail according to the data obtained.

IV. Result



Figure 3. 3D Design of Samkiller Machine

The machine invention is capable of controlling the chill fill using two phases that is suction and press phase, one-way valve (One-way valve) and also transmission usage that drives piston using screw system. By using a Food Grade material which is safe for sambal, This machine is equipped with ECU (Electrical Control Unit) which serves to control the quantity of outgoing chili with the prime motors of timer-based electric motors. The invention in principle is controlling the flow of discharge out through the concept of filling sauce with 2 phases of the suction phase and press phase using one way Valve (One-way valve) input and output and also the use of transmission that drives the piston using a screw system where the filling machine uses the main fryer of electric motors where the motor has been integrated with piston and screw transmission as a driving force and equipped with ECU (Electrical Control Unit) as the main controller of timer-based choke quantity, which its application using Daniel Bernoulli or "ASAS BERNOULLI"

| Component | Keterangan |
|---------------|--------------------------|
| Motor | 0,37 HP / 12 V |
| Transmisi | Screw |
| Frame | Stainless-Steel 90x30x90 |
| 2 Valve | One Way Valve |
| ECU | 50 Watt |
| Push Button | - |
| Saklar on off | - |

The bernoulli formula: the above technical calculations. The calculation formula to determine the size of the piston tube and the speed of the piston motion.

Mass of flow sambal = 20 gr/s

Density = 0.764 gr/cm³

$$\begin{aligned}\text{Debit Flow sambal} &= \frac{\text{Massa aliran sambal}}{\text{Massa Jenis Sambal}} \\ &= \frac{20 \text{ gr/s}}{0.764 \text{ gr/cm}^3} \\ &= 26,17 \text{ cm}^3/\text{s}\end{aligned}$$

| |
|--|
| $\begin{aligned}\text{Debit Flow sambal} &= \text{Suction Debit} / \text{Press} \\ \text{debit (piston tube)} &= \text{Debit Input} = \text{Debit} \\ &\text{Output}\end{aligned}$ |
|--|

The diameter is specified in a 7.5 cm piston tube, thus the area of the tube base is

$$\begin{aligned}A &= \pi \cdot r^2 \\ &= 3.14 \cdot 3,75^2 \\ &= 14.6 \text{ cm}^2\end{aligned}$$

Calculation the speed of the Piston based on the discharge of the chili and the piston cross-sectional area

$$\begin{aligned}Q &= v \cdot A \\ 26,17 \text{ cm}^3/\text{s} &= v \cdot 14.6 \text{ cm}^2 \\ v &= \frac{26,17 \text{ cm}^3/\text{s}}{14.6 \text{ cm}^2} \\ v &= 1.792 \text{ cm/s}\end{aligned}$$

calculate the filling time of fried sambal using the principle of "Bernoulli"

$$\begin{aligned}Q &= V : t && \text{therefore} \\ t &= V : Q \\ t &= 150\text{gram} : 26,17 \text{ cm}^3/\text{s} \\ t &= 5,8 \text{ detik}\end{aligned}$$

so that in 1 process filling spent **5,8 second**

The result :

This research resulted in a prototype of automatic filler machine, which after simulation of machine performance calculation resulted in 480 bottles/hour with 4cm bottle/hour detailing bottle with the details of the 150 gr bottle need 5.8second time which the flow mass of 20 gram / second and the flow rate is 26,17cm³ / s. this machine is equipped with an easy filling method that is operation using only 1 button. thus Productivity of performance machine increased up to twice.

The benefits of this research are :

1. Engine Can improve productivity and effectiveness of employers
2. The hygiene and security in the production process more secured
3. Improve the economy of entrepreneurs

V. Conclusion

Conclusion

Based on the above explanation, a sambal filling machine with 480 bottle/hour capacity with 150 g of bottle size required 5.8 second time which the flow mass of 20 grams/sec and stream flow is 26,17cm³ / s. This machine also uses food-grade standard materials so that the use of this machine becomes more hygienic. By using this machine then the entrepreneur can increase production capacity up to 2-times so as to improve the economy of entrepreneurs.

Suggestion

For better development better use filling system with conveyor method and packing system so that process of filling and packing become easier, accurate and fast

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