

PAPER • OPEN ACCESS

Community Service Report: Designing The Ergonomic Roasting Machine For Coffee Seed With Additional Electrical Motor At Seduh Kopi Coffee Shop

To cite this article: Frans Jusuf Daywin *et al* 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* **852** 012091

View the [article online](#) for updates and enhancements.



The banner features a dark blue background with a satellite-style image of Earth. On the left, there are three circular logos: the top one is 'ECS' in a white circle, the middle one is 'The Electrochemical Society' with a stylized 'ECS' logo, and the bottom one is 'THE KOREAN ELECTROCHEMICAL SOCIETY'. The main text in the center reads 'Joint International Meeting PRiME 2020 October 4-9, 2020' in white and blue. Below this, a light blue bar contains the text 'Attendees register at NO COST!' in dark blue. On the right side, there is a large white logo for 'PRIME' with a stylized 'P' and 'M' shape above it, followed by 'PACIFIC RIM MEETING ON ELECTROCHEMICAL AND SOLID STATE SCIENCE' and '2020' in white. At the bottom right, a dark blue bar contains the text 'REGISTER NOW' in white with a right-pointing arrow.

COMMUNITY SERVICE REPORT: DESIGNING THE ERGONOMIC ROASTING MACHINE FOR COFFEE SEED WITH ADDITIONAL ELECTRICAL MOTOR AT SEDUH KOPI COFFEE SHOP

Frans Jusuf Daywin¹, Lina Gozali¹, Lamto widodo¹, Carla Olyvia Doaly¹, M.Wildan Hendri Ross¹

¹Industrial Engineering Department, Universitas Tarumanagara, Jakarta, Indonesia

*fransjusuf42@gmail.com

Abstract. Seduh Kopi Coffee Shop is a coffee shop which has its own roasting machine with 2-kilogram capacity for roasting process. The reason of designing this roasting machine because of the expensive price of new machine in the market with small capacity (400 gram) for roasting process. Benchmarking activities needed for comparing the previous machines in the market before designing this roasting machine utilize the VDI 2221 method. This roasting machine consist of important component such as overall frame which is made from 50 x 35 Unp Iron and has function as an engine mount, roasting machine tube which is made from 2 mm stainless steel plates, The axis for spinning process is made from hss or solid round Iron, Tube Cover, input and output machine for coffee roasting are also made of Stainless Steel plates. The prime mover of this coffee roasting machine utilizes AC 220 V motor which function as prime mover connecting with Sprocket-Chain and Vbelt-Pulley.

Keywords : Roasting Coffee, Benchmark, VDI 2221 method, Designing Roasting Machine

1. Introduction

Kopi Seduh Coffee Shop is a coffee shop that roasts its own coffee. The coffee roaster machine used to be a manual Coffee Roaster Machine which has a handle that was rotated by the operator's hand. Kopi Seduh Coffee Shop has been used this roasted coffee machine which has a maximum capacity of 400 grams coffee beans.

The purpose of this design to increase the capacity of the container in the coffee roasting machine and get a driving force and also has a driving link to the Coffee Roaster Machine. Roasting is a process of moving heat either without media or using sand with the aim of getting a certain taste [1]. There are two types of processing, the first type of roasting process uses traditional methods and the second type uses a Coffee Roaster Machine. Roasted Coffee Machine used to process raw coffee beans (Green Bean) into ripe coffee (Roasted Bean) and ready for brewing. The roasting process is usually carried out enclosed by using a tube that is given a rotating force by the motor and usually has a heat source from the gas stove, or heating wire element. There are many coffee roaster machines available in the market that have many advanced features, but have very expensive prices, and coffee brewing still uses a coffee roaster machine.

The problem raised, how long the roasting process time of coffee bean with a manual machine; how to design a coffee roaster by adding a driving force machine to keep it comfortable and safe to use; how to increase the ease of roasting coffee; How to increase the capacity of the roasting process



more efficiently. The purpose of the research is to identify the needs are needed by the coffee roaster machine, especially the manual coffee roaster machine; a coffee roaster design as needed; designing a propulsion engine that is suitable for the Coffee roasted machine; increasing the processing time and capacity of coffee in production machines and the roasting process more efficiently. The benefits of this research are increasing the time in the roasting process and increasing the production capacity of the roasting machine.

In the roasting process of this coffee bean can be adjusted to consumer demand, while the level of roasting coffee beans that often occurs in Indonesia consists of: light roast, medium roast, and dark roast. This level of roasting of the beans determines the taste and color of the roasted coffee beans. [2]

VDI 2221 method is a process of systematic thinking in solving a problem to get maximum results as expected in the initial activities of a series of activities in the production process. [3] Product Development Process is a sequence of steps to change a set of inputs into a set of outputs. The product development process is a sequence of steps or activities in which a company tries to arrange, design and commercialize a product. [4] Product Design is a plan in making an object, system, component or structure. Then, the word "design" can be used as a noun or verb. In a broader sense, design is an applied and engineering art that integrates with technology. [5]

The prototype is defined as a product assessment through one or more dimensions of concern. With this definition, any form that shows at least one aspect of the product that is of interest to the development team can be displayed as a prototype. [6] There are two types of electric motors, AC motors and DC motors, AC motors (alternating current) electric motors of this type use electric current that reverses its direction regularly at a certain time span. DC motor uses direct current in special applications where high torque ignition or constant acceleration is required for a wide speed range. [7] The prime mover consist of a variety of Sprocket and Chain drive belts, V-belt, Pulley, and Rotors. Benchmarking method is a process of identifying "Best Practices" of two products and the production process until the product is shipped. Benchmarking provides the insights needed to help management understand its processes and products by comparing them with similar or different industries. [8]

2. Research Methodology

The research methodology is an activity to analyze theoretical of research method and is also a systematic framework of thinking. With the research methodology, the research carried out becomes more directed and systematic. Several stages of the methodology in the study to do the design of a manual coffee roaster with the addition of movers in the Seduh Kopi Shop.

The research began with the observation data collection data that was carried out when workers roasted coffee with a manual coffee roaster. Data processing is done when you have obtained data on roasting time manually. After the data is collected and processed, analysis and design are carried out. The design of the roaster design with limited dimensions and also the design of adding the drive are made using AutoCad software. Conclusions and suggestions are the final stages in this study. The conclusion of this study was obtained from the results of the design that has been done to answer the research objectives.

3. Data Processing

3.1 Concept Design

A description of the work on the Manual Coffee Roaster Machine used in the Coffee Shop Sedings is shown in Table 1.

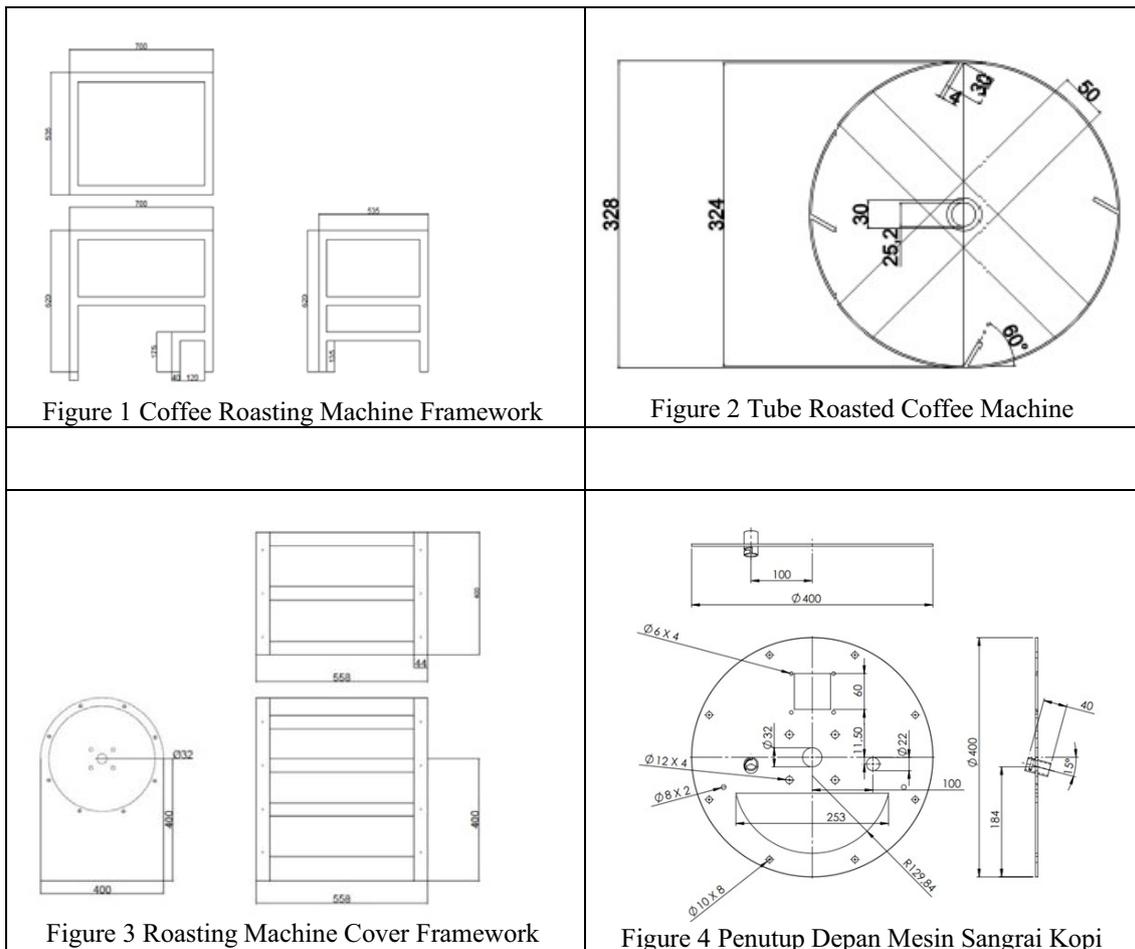
Table 1. The Job Description of Coffee Roasting Machine Manual

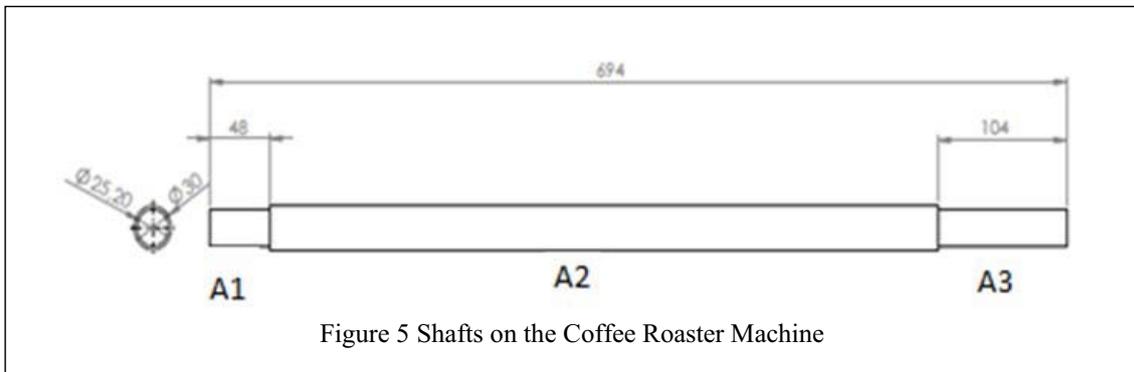
Picture	Machine Part Name	Remarks
	<p>Manual Roasted Machine</p>	<p>Manual roasted Machine at Seduh Kopi Coffee Shop</p>
	<p>Player Handle</p>	<p>A rotary handle on the manual sanggarai machine used in the coffee shop Brewed coffee, which still uses Hand rotation</p>
	<p><i>Hopper</i></p>	<p>While loading coffee beans process to be roasted</p>
	<p>Roasted Process 1</p>	<p>Currently doing the roasting process manually</p>

Picture	Machine Part Name	Remarks
	<p>Roasted process 2</p>	<p>Currently doing the roasting process manually</p>

The capacity of a manual coffee roaster is very low, it can only accommodate 400 grams of coffee beans and the roasting process using a manual coffee roaster machine is still less efficient with time. Factors that cause the ineffectiveness of the roasting process of coffee using a manual coffee roaster machine such as: the heat channeled to the drum is not well focused because the tube affected by the stove is not protected from room temperature outside the coffee roaster; small capacity in the tube; the drive for the tube still uses the handle of the player which is still moved by the operator's hand.

4. Machine Making





The roasting equipment that will be designed has several main components, namely:

1. Tool frame. This tool frame serves as a supporter of the components of other tools, which are made from iron unp dimension 50 x 35. This tool has a length of 700 mm, width 545 mm and height of 620 mm.
 2. Electric motor. The electric motor functions as a source of mechanical power (drive). This tool uses 0.5 HP electric motor with a number of revolutions per minute (rpm) of 1420 rpm.
 3. Speed reducer. Speed reducer is used to reduce rotation speed. This speed reducer has a ratio of 1:40.
 4. Thermo control. Thermometers are used to measure the temperature level in the roasting cylinder.
 5. Input channel (Hooper). The input channel is made of stainless steel which functions to put the dried coffee beans to be roasted into the tube.
 6. Output channels. This output channel is made of stainless steel which functions to distribute roasted coffee beans to the provided shelter.
 7. Heater. The heater is used as a producer of heat energy to get the desired temperature. Which comes from a gas stove?
 8. Tube. The tube functions as a container for roasting dry coffee beans that are installed horizontally, and functions as input and output of coffee beans. This cylinder has a diameter of 328 mm, a length of 325 mm and a thickness of 2 mm. Made of stainless steel.
- Mover In this tool uses 2 Sprockets, which have 38 and 19 teeth, to find the size of the Sprocket. This tool uses vbelt and pulli, which have a belt length of 50 cm and a diameter of 20 cm pulli. After determining all the diameter sizes for this coffee roasting machine, the coffee roaster machine is assembled. The picture of the coffee roast machine that has been assembled can be seen in figure 6



Figure 6 Coffee Roasting Machine



In producing coffee roast machine to Seduh Kopi Coffee Shop is part of the community service activities of the 4 faculties of Industrial Engineering Department, Engineering Faculty of Tarumanagara University. In figure 7 shows the visiting activities dated 8 October 2019 to Kopi Seduh Coffee Shop.

5. Conclusion

After the design was done with a 2 kg Capacity Roaster Machine, and after implementation was carried out then it was found that a coffee roaster machine produced using a propeller which has the main driving source of the AC Electric Motor, and has a drive connector in the form of Pulley and V-Belt can increase the roast machine capacity from 400 grams to 2 Kilograms capacity.

6. References

- [1] Mawaddah, A. 2012. Teknologi Pengolahan Pangan. Yogyakarta.
- [2] Ciptadi, W. & Nasution, M.Z. 1985. Pengolahan Kopi. Fakultas Teknologi Institut Pertanian Bogor.
- [3] Schulte, M., Weber, C., & Stark, R. (1993). Functional features for design in mechanical engineering. *Computers in Industry*, 23(1-2), 15-24.
- [4] Dharmawan, Harsokusoemo. 2000. Pengantar Perancangan Teknik. Jakarta : Direktorat Jendral Pendidikan Tinggi
- [5] Weichen, W., Zhencai, Z., Liang, F., Yuqin, G., & Fansheng, W. (2009). An Algorithm for Compensating Volumetric Difference between Layers in Rapid Prototyping. *Mechanical Science and Technology for Aerospace Engineering*, (11), 6.
- [6] Sunarlik, W. (2011). Prinsip Kerja Generator Sinkron. *Jurnal November*.
- [7] Bradner, S. (1991). Benchmarking terminology for network interconnection devices. *Benchmarking*.