

Manufacturing of Tools and User Assistance for Spice Grinding Machine for Setia SMEs

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Abstract

Purpose: This research project aims to address operational challenges faced by Setia SME, which specializes in spice sales. Specifically, we aim to design a spice-grinding machine to enhance processing efficiency.

Method: We conducted a comprehensive analysis of Setia SME's challenges and formulated a research design that included machine development. Data collection involved surveys, interviews, and on-site observations, analyzed for feasibility.

Practical Applications: The successful implementation of the spice grinding machine will boost Setia SME's operational efficiency by eliminating off-site grinding, reducing costs, and increasing production capacity. The technology may benefit other SMEs in the spice industry.

Conclusion: This research offers practical solutions to Setia SME's spice processing challenges, demonstrating the value of innovation and technology for SMEs in improving efficiency and sustainability.







Introduction

Spices and herbs have long been essential resources in human life (Irshad et al., 2023). Spices are plant parts used as seasonings, flavour enhancers, fragrances, and food preservatives (Martínez & Más, 2020), albeit in limited quantities (Maji et al., 2023). Spices are aromatic plants or plant parts primarily used to add flavour (Otunola, 2022). The culinary use of spices is widely known (Jiang, 2019). Besides their culinary role, spices have been used for herbal remedies (Łuczaj et al., 2023), cosmetics, and antimicrobial purposes (Khanal et al., 2021) for centuries (Bainsla, 2021). With the growing awareness of plant-based health benefits, spice-based food and beverages have become popular in culinary tourism (Suliantini et al., 2023), including drinks like bandrek hanjuang, bajigur hanjuang, sekoteng, and more (Daniela & Maria, 2022).

Indonesia is renowned as the world's largest producer of spices. Historically, European nations sought to dominate the Indonesian archipelago solely for its valuable spice trade (Saputro & Anggrasari, 2021)., which commanded high prices in global markets (Kumoratih et al., 2021) Today, Indonesia remains one of the most essential spice producers and exporters globally (Anggrasari & Saputro, 2022). Spices can be readily found in traditional markets, where spice trading thrives. Traditional markets play a significant role in advancing Indonesia's economic growth and possess a natural competitive advantage (Almaidah, 2019). These markets are vital not only for local and central governments but also for the livelihoods of traders, buyers, labourers, and more, all of whom contribute to preserving the existence of traditional markets in Indonesia (Taufik, 2020).

Typically, spices sold in traditional markets are sourced from various Small and Medium-sized Enterprises (SMEs) engaged in the processing of spices into traditional cooking seasonings. One such SME in the spice trade is SETIA SME, located at Jl. Adinegoro No. 3A Gang Menara, Birugo Village, Aur Birugo Tigo Baleh Subdistrict, Bukittinggi City, West Sumatra. SETIA SME processes spices into finely ground traditional cooking seasonings. Various types of spices are processed by SETIA SME, as shown in Table 1.

Table 1. Some Spices Processed by SETIA SME

No	Types of Spices	Photo	Form
1.	Pepper		Coarse/Fine
2.	Nutmeg		Coarse/Fine
3.	Cinnamon		Coarse/Fine
4.	Mace		Coarse/Fine

5.	Cumin		Coarse/Fine
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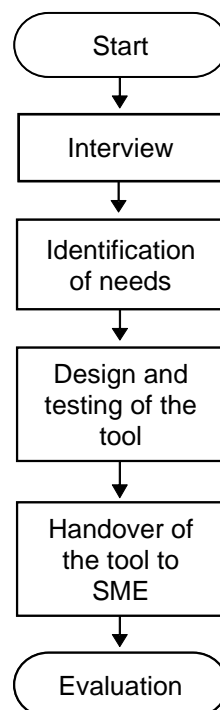
Other spices processed by SETIA SME, in addition to those shown in Table 1, include black pepper, cardamom, sweet fennel, coriander, cloves, and star anise. The sale of spices as cooking seasonings by SETIA SME is relatively smooth, but they face challenges in the grinding process. This challenge is due to SETIA SME's lack of a grinding machine, which necessitates transporting the spices to an external grinding facility. This disrupts the distribution of spices to the market as they have to wait in line at the grinding facility.

Based on interviews conducted with SETIA SME, the current issue revolves around the absence of a spice grinding machine. Consequently, the production of seasonings for the market needs to be improved, leading to delays in meeting customer demand. On average, customer demand for 150 kg per week can only be fulfilled to the extent of approximately 130 kg per week. In other words, the demand for 150 kg cannot be met within a week. Furthermore, the lack of a spice grinding machine results in additional production costs for grinding, which SETIA SME must bear. According to the SME owner, the minimum cost for grinding raw spice materials is Rp 4,000 per kg of coarse spices.

Method

The problem-solving framework used in the implementation of this community service project is as follows:

Figure 1. Problem-Solving Framework



In this context, our target is a Small and Medium-sized Enterprise (SME) specializing in the production of traditional cooking seasonings. The method employed in the execution of this community service project first involves conducting interviews with SETIA SMEs regarding the challenges they face in their business. After identifying the issues, the next step is to offer

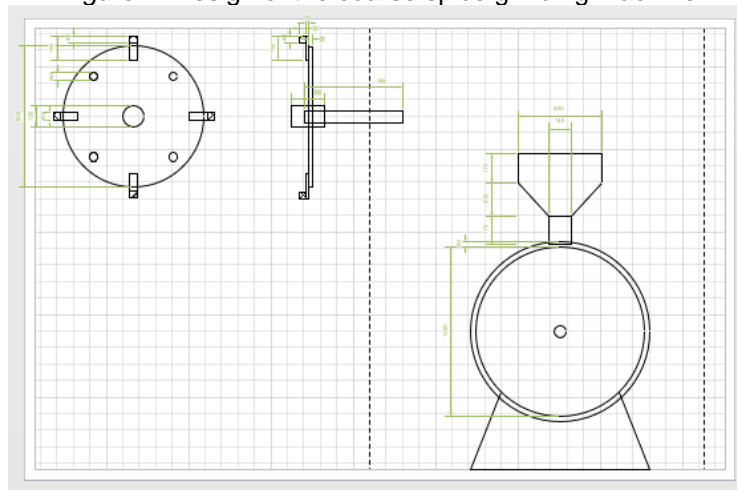
a solution in the form of designing and creating a coarse spice grinding machine that meets traditional market specifications and can be purchased by consumers. Subsequently, the machine's design is developed through consultation with professionals who have expertise in machine design. Once the grinding machine is completed, a feasibility test is conducted to ensure that the machine functions properly. The final step is the handover of the grinding machine to the SME.

After completing the entire process, an evaluation is conducted to assess the grinding machine's ability to produce finely ground seasonings from coarse spices in accordance with traditional market specifications for consumer purchase. Additionally, an evaluation is carried out to gauge the impact perceived by SETIA SME regarding the provided solution.

Result

Based on the analysis of the issues faced by our partner, a spice grinding machine has been designed and created to meet the needs of SETIA SMEs, thus helping to address the problems they encounter. Below is the design of the spice grinding machine that will be offered.

Figure 2. Design of the coarse spice grinding machine



The equipment to be created is a stainless-steel spice grinder with a capacity of 5 kg, featuring an iron frame and a top feed inlet. This machine will include more than one sieve to select the desired level of fineness for the spices.

Table 2. Equipment Specifications

No.	Tool Name & Material	Specifications	Quantity
1	Grinder	Stainless steel	1
2	Drive motor	2 HP, 3-phase power	1
3	Frame	Iron	1

Based on the design work carried out, the resulting equipment can be seen in the images below.

Figure 3. Spice Grinding Machine



Figure 4. Spice Grinding Machine (side view and internal components)



Based on the equipment design, we have created a spice grinding tool that can be utilized for grinding spices in two types: fine grinding and coarse grinding. In the next phase, we will conduct spice grinding tests at the SETIA SME location and hand over this equipment to them.

This community service project is expected to solve the long-standing issues faced by SETIA SMEs. To ensure that the use of the equipment contributes to the smooth operation of SETIA SME, monitoring of the spice grinding equipment's usage will be conducted twice after its delivery.

Discussion

The community service activity that has been carried out has resulted in a spice-grinding tool whose purpose is to address the issues faced by SETIA SMEs. The produced tool is expected to significantly assist in the activities and smooth operation of SETIA SME. The process of this community service activity began with the challenges encountered by SETIA SME. Until now, SETIA SME had to take their finely ground spices to an external grinding facility, incurring additional costs and waiting in line to obtain the desired results. This process also carried the risk of cross-contamination with other processed items due to shared equipment.

After understanding the challenges faced by SETIA SME, the design and creation of the spice grinding tool were undertaken to meet their specific needs. The design and fabrication of this tool involved the expertise of professionals in machine engineering, which greatly facilitated the community service project. The spice grinding machine created for SETIA SME has a capacity of 5 kg per grinding cycle and is equipped with two sieves to determine the desired fineness of the spices produced. With this spice-grinding tool, SETIA SME has adopted the concept of Good Manufacturing Practices (GMP). This ensures a focus on food safety (Herdhiansyah et al., 2021) and the quality of the products produced (Gema et al., 2023). Another significant benefit of this grinding tool is the minimization of production costs and an increase in profits.

Conclusion

Spices and herbs have played a vital role in human life, serving as seasonings, flavour enhancers, fragrances, and food preservatives for centuries. Indonesia stands as the world's largest producer of spices, with its rich history intertwined with the spice trade's allure and high market value. Traditional markets have been instrumental in Indonesia's economic growth, serving as hubs for the spice trade. Small and Medium-sized Enterprises (SMEs) like SETIA SME have been crucial in processing these spices into traditional cooking seasonings. However, SETIA SME faced challenges, particularly in the grinding process, due to the need for a spice grinding machine.

To address this issue, a community service project was undertaken, resulting in the design and creation of a spice grinding machine tailored to SETIA SME's needs. This machine not only aids in efficient spice processing but also promotes Good Manufacturing Practices (GMP), emphasizing food safety and product quality. Moreover, it minimizes production costs and enhances profitability. This project illustrates the power of collaboration between academia and local businesses to overcome challenges, foster economic development, and promote sustainable practices. By providing practical solutions, such as the spice grinding machine, we contribute to the growth and success of SMEs like SETIA and help preserve Indonesia's rich spice heritage.

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495) Manufacturing of Tools and User Assistance for Spice Grinding Machine for Setia SMEs, Ramadian, D., Akbar, A., Sardani, R., Mufti, W. F., Viarani, S. O.

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