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Penerapan Teknologi Pengemasan Menggunakan Mesin Continuous Band Sealer Pada Produk UMKM di Kecamatan Palipi

Application of Packaging Technology Using Continuous Band Sealer Machines for MSME Products in Palipi Subdistrict

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Abstrak

Program pengabdian kepada masyarakat ini bertujuan untuk meningkatkan produktivitas dari Mitra dengan menyediakan alat pengemas modern dan memperkenalkan teknik pengemasan yang tepat bagi produk keripik Mitra. Mitra merupakan salah satu UMKM di Desa Pardomuan Nauli, di Kecamatan Palipi, Provinsi Sumatera Utara, yang bergerak dalam penjualan keripik singkong. Metode pelaksanaan kegiatan pelayanan masyarakat ini dilakukan dengan mengunjungi dan mewawancarai mitra mengenai masalah yang dihadapi dan menjadi hambatan dalam proses produksi keripik singkong. Solusi yang diberikan oleh tim pelayanan masyarakat Universitas Sumatera Utara (USU) adalah (1) Penyuluhan untuk menambah skill Mitra dalam teknologi pengemasan yang diterapkan pada produk UMKM Mitra. Memperkenalkan Kemasan atmosfer termodifikasi melalui sistem nitrogen flushing yaitu sistem kemasan untuk memperpanjang umur simpan produk makanan dengan cara memasukkan gas ke dalam kemasan (2) Pemberian alat mesin continuous band sealer sehingga produksi keripik singkong yang dihasilkan dari usaha Mitra lebih terjaga mutunya dan juga membantu proses pengemasan menjadi lebih praktis. (3) Memperkenalkan teknologi tepat guna dari mesin continuous band sealer agar memicu motivasi Mitra dalam menerapkan cara produksi pangan yang baik dan yang sesuai. Hasil kegiatan menunjukkan peningkatan kapasitas produksi, penjualan dan laba bersih dari produk yang dihasilkan oleh Mitra.

Kata Kunci: mesin pengemas; continuous band sealer; UMKM; nitrogen flushing;

Abstract

This community service program aims to increase the productivity of partner by providing with modern packaging tools and introducing good packaging techniques for their cassava chips products. Partner is a micro, small and medium enterprise (MSME) in Pardomuan Nauli Village, in Palipi Subdistrict, North Sumatra Province, which is engaged in the sale of cassava chips. This community service activity was carried out by visiting and interviewing partners about the problems they faced and the obstacles in the cassava chip production process. The solutions provided by Universitas Sumatera Utara (USU) community service team were (1) Counseling to improve the partners' skills in packaging technology applied to MSME products. Introducing modified atmosphere packaging through a nitrogen flushing system, which is a packaging system to extend the shelf life of food products by injecting gas into the packaging. (2) Providing a continuous band sealer machine so that the quality of cassava chips produced by the partners is better maintained and also helps make the packaging process more practical. (3) Introducing the appropriate technology of the continuous band sealer machine to motivate partners to implement good and appropriate food production methods. The results of the activities showed an increase in production capacity, sales, and net profit from the products produced by the partners.

Keywords: packaging machine; continuous band sealer; MSME; nitrogen flushing;

1. Introduction

Packaging is the final process carried out to wrap a product so as to reduce the damage that can occur to the food. Packaging also plays an important role in placing products that will be distributed and stored, so that the packaging process is closely related to the storage process. There are 3 types of packaging, namely natural packaging such as fruit skins, traditional packaging such as bark, banana leaves, cloth, gunny sacks and so on, and modern packaging, namely paper, plastic, metal, fiber and other packaging materials [10]. Packaging is one of the processes of packaging or packing by using a material to wrap the product so that the

product can be well protected. Packaging includes the final process so that packaging can also increase consumer appeal and can add a high enough selling value. One way that can be done to simplify packaging is to use a packaging tool, one of which is a continuous band sealer. This is because the continuous band sealer tool can increase efficiency in the packaging process and the accuracy level is quite high [1].

Continuous band sealer is one of the packaging machines used for plastic-based packaging or plastic film sealer. Continuous band sealers can be divided into two based on their working position, namely vertical type continuous band sealers and horizontal type continuous band sealers. Vertical type continuous band sealer is a packaging tool that has a standing working position and is often used to package products in liquid form. Continuous band sealer horizontal type is a packaging tool with a horizontal position and is often used to package products that have a solid form [2].

Nitrogen is one of the nonaesthetic gases that is widely used to reduce oxygen content, namely by nitrogen flushing. Nitrogen flushing is the process of introducing nitrogen gas into a container to reduce oxygen content which can cause oxidation. The use of nitrogen flushing is widely practiced in snack food packaging so as to extend the shelf life of these food products. Nitrogen is a gas that will not react with food in the packaging so it is safe to use [3].

Packaging is important and related to food safety such as preservation and distribution. The function of packaging in addition to protecting the product also serves to prevent the product from being contaminated by bacteria, toxins, oxygen, air humidity and prevent leakage which can affect the odor of the packaging. Manual technology that is still often used as a packaging tool is heat sealing. Packaging technology using heat sealing has several common problems, namely insufficient operating temperature and packaging materials that become damaged when heated to excessive temperatures [4].

Packaging material is the type of material used to package food products. Packaging materials can be made of plastic, aluminum foil, glass, cardboard, wood and many more. On the packaging material, there is a label that functions to provide food information in the form of writing, images, or a combination of both. The choice of packaging type needs to be done to pay attention to its effect on product quality and related to consumer acceptance. What needs to be considered in choosing the type of packaging is the type of product being packaged, the production process, the machine used and the target market [5].

The shelf life of food stored in packaging can be more durable by reducing the concentration of oxygen contained in the packaging. Oxygen contained in the packaging plays a role in the occurrence of lipid oxidation, the presence of water entering the packaging will accelerate the oxidation. Lipid oxidation has an influence on food quality, especially fried foods such as chips. The result of the lipid oxidation reaction is the appearance of unwanted flavors and aromas or food experiencing rancidity [6].

during storage. This is difficult to do because seasoning formulations vary and have different storage stability. Flavor stability is influenced by several factors, namely the manufacturing process, storage process and packaging materials. Packaging materials can cause a reduction in the intensity of flavor compounds contained in seasonings so it needs to be evaluated and controlled by paying attention to lipid oxidation [7].

The purpose of this service activity is to provide partners with packaging tools and introduce good packaging technology to their cassava chips product to increase the productivity of Mitra.

2. Method

The method of implementing this community service activity was carried out by conducting visits and interviews with Partners regarding the problems faced and obstacles in carrying out the cassava chip production process. The problem faced is that Partners still use manual packaging tools in the form of heat sealers so that the production process is less efficient. The solution provided by the USU community service team is to provide innovative packaging equipment in the form of a continuous band sealer. The flow of the activity method is as follows.

1. Observation

The USU Community Service Team conducted direct observations and interviews partner to find out the problems being faced.

2. Plan to provide continuous band sealer

The problem faced by partners is that Partners still use manual packaging tools in the form of heat sealers so that the production process is less efficient. The solution provided by the USU community service team is to provide innovative packaging tools in the form of continuous band sealers.

3. Testing the continuous band sealer tool

Testing of the tool is done to find out if the function of the tool is working properly and correctly that met the Partner's needs.

4. Training

Training is carried out by the USU community service team to improve Partners' skills in packaging technology applied to their products. (a) Introducing modified atmosphere packaging through a nitrogen flushing system, which is a packaging system that extends the shelf life of food products by injecting gas into the packaging. (b) Training to guide Partners to operate the continuous band sealer tool.

5. Handover of continuous band sealer equipment.
6. Further Observation

The USU Community Service Team conducted further observations to find out the impact on partners resulting from these community service activities.

3. Result and Discussion

The Community Service Program activities started with field visit by the team. Based on this visit, the team selected the design of a packaging tool in the form of a continuous band sealer machine combined with food-grade nitrogen gas to optimize the function of packaging as a food product packaging. After acquiring the machine, the team tested on the machine operation and try to identify the suitable plastic packaging that met the Partner's needs. The machine experiment process was carried out in the laboratory of the Faculty of Mechanical Engineering USU (Figure 1).



Figure1. The team is discussing the temperature settings, pressure and type of packaging to be used with the machine tool that will be provided to Partners.

Previously, partners packaged their cassava chips products using a heat sealer. This tool has several weaknesses, particularly the shelf life of the product is less than optimal due to the risk of the packaging has imperfect seals and results in packaging leakage and product spoilage.

Heat sealer itself is a manual packaging process. According to [8], the way this heat sealer tool works is that the open end of a filled packaging is placed right on the sealer and the tool is pressed shut so that the open end of the packaging will close. A light indicator on the tool indicator signals for the sealing time limit. Packaging material that is pressed too long will cause the packaging to tear and if not pressed long will cause the seal may be not completely closed, allowing air or water to enter and damage the product.

This program aims to solve packaging technology problems experience by the partner. The alternative packaging technology provided by the USU community service team is a continuous band sealer tool equipped with a nitrogen gas cylinder. According to [9], continuous band sealer is a machine that can seals packaging made from plastic or laminated foil. This tool operates continuously and can increase efficiency because the adjustable speed (Figure 2).



Figure2. Continuous band sealer machine provided to Partners.

During the hand over of the machine and equipment, the team gave an instruction on how to use and maintain the machine.

Then followed by a training session on the operating the machine and an introduction to nitrogen flushing, which is a modified atmosphere packaging (MAP) technology that can extend the shelf life of the partner's chip products.

The working principle of the continuous band sealer tool is the process of heating the plate by an ac motor engine that drives a conveyor equipped with an adjustable speed controller. After the plate has reaches the desired temperature, the packaging will then be directed towards the plate which seals the packaging ends. To ensure a strong seal of the product packaging, the packaging will pass through a cooling plate. To accommodate packages of different sizes, the conveyor height is adjustable. There is a height setting on the conveyor's height, which improves efficiency. The specifications of the provided machine are described in Table 1.

Table 1. The specification of the sealer machine.

Power/Voltage	110/220V 50 - 60 Hz 600W
Speed	0 - 12 m/min
Sealer width	6 - 12 mm
Temperature	0 - 300 °C
Support Weight	3 kg
Mold type	steel wheel printing
Machine size	925 x 400 x 305 mm
Machine Weight	28 kg

Nitrogen flushing is the process of removing oxygen in the package and replacing it with nitrogen so that the product inside the package is not easily damaged. The nitrogen gas introduced into the package will protect the product so that the product is not easily broken and destroyed. The use of nitrogen flushing in chip packaging is because nitrogen does not react with the product inside. This can maintain the color, aroma and taste of cassava chips.

According to [10], the main substance that causes lipid oxidation in chips that causes rancidity is hexanal substances derived from aldehydes. The hexanal substance in the package will be lower if nitrogen is added to it. The volatile substances in the lipid oxidation, namely hexanal, will achieve good stability in the packaging of chips that are added with nitrogen in it for up to 9 weeks. The picture of the nitrogen cylinder used for nitrogen flushing can be seen in Figure 3.



Figure3. Items provided to partners during counseling and training.

According to the statement of [11], the main reaction that affects the quality reduction in food products processed by frying such as cassava chips is lipid oxidation. This oxidation will cause a rancid reaction in cassava chip products. Initially, the formation of unstable hydrogen peroxide compounds will decompose these compounds into aldehydes, alcohols and hydrocarbons. The intermediate product of oxidation, namely hydrogen peroxide compounds and peroxide compounds, does not produce rancidity in the product. These compounds will break down into compounds that produce off-flavors or flavors that are different from the previous taste of the product.

Lipid oxidation is influenced by the presence of oxygen and water levels that enter the packaging of cassava chip products. This can occur due to leaks and the formation of micropores in the packaging seal due to the lack of adhesion of the packaging. These leaks will increase oxygen and water vapor levels in the package. For this reason, it is necessary to reduce oxygen levels in the packaging so as to reduce the rate of lipid oxidation.

Oxygen and water/vapor that enter the packaging can also cause physical and chemical reactions in food additives (BTP) added to cassava chips. According to [12], flavor stability in chips is important because it has a relationship with the shelf life of the product. The stability of BTP is influenced by the storage process, packaging material and product packaging method. Therefore, an alternative to prevent lipid oxidation reactions in packaging that affect the flavor and shelf life of cassava chips is to add nitrogen to the packaging or nitrogen flushing.

This nitrogen flushing packaging has many benefits in packaging a product, it can prevent rancidity with the presence of nitrogen gas can prevent the oxidation process of fatty acids which can activate aldehyde compounds so that they can trigger rancidity contained in a food product and can maintain the freshness of the color of food products, with the presence of nitrogen gas introduced into the packaging will increase the space on the inside of the package so that the product will be lighter and not easily destroyed. From the results of observations in the field, this service activity is very beneficial for Partners in the application of packaging technology that can help maintain the shelf life and indirectly increase the production capacity that gave effect Partner income. The assumption of increased income to partners for increasing production capacity by 75% at production capacity presented in Table 2.

Table 2. Partners Business Income Monthly

No	Aspects measured	Before	After
1	Production Capacity (pcs)	1920	3360
2	Sales (Rupiah)	1.440.000	2.520.000
3	Net Profit (Rupiah)	588.000	1.029.000

Providing tools, materials and hands-on practice (Figure 5), increases partners's knowledge and skills in managing their product packaging. This is expected to have a positive impact on the local economy by the development of new sales location and diversity their food products.



Figure 5. Group photo of the USU team with Partners.

4. Conclussions

The USU community service team introduced an alternative packaging system consisting of a continuous band sealer and a nitrogen gas. The advantages of continuous band sealers are efficiency and strong adhesion that reduces leakage in the packaging. The effect of using nitrogen flushing on packaging can prevent off-flavor or different flavors in the product in the package. As the results of these activities showed an increase in the partners' production capacity, sales, and net profit.

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