The Journal of System Engineering and Technological Innovation
ISSN: 2828-4003, Vol. 03, No. 02, pp. 258-262
Faculty of Engineering-Wijaya Putra University

DESIGN AND CONSTRUCTION OF A DODOL DOUGH MIXING MACHINE WITH AN ELECTRIC MOTOR DRIVE WITH A CAPACITY OF 10 KG

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Abstrak.

Dalam proses pemasakan adonan dodol dibutuhkan tenaga beberapa orang untuk mengaduk secara terus menerus hingga adonan mengeluarkan gelembung-gelembung udara. Proses pembuatan dodol secara umum membutuhkan waktu tergantung dari seberapa banyak adonan yang ingin dimasak. Jika ingin memasak adonan dodol sebanyak 10 kg, maka waktu yang dibutuhkan untuk memasaknya kurang lebih 10-12 jam dengan api sedang atau normal. Saat ini industri dodol skala rumah tangga masih menggunakan cara manual untuk proses pencampuran dodol, yang mana akan membutuhkan tenaga lebih dari satu orang untuk mengaduk dalam waktu yang lama sehingga akan memakan waktu untuk satu kali pekerjaan yang berulang-ulang dan biaya produksi akan menjadi lebih tinggi. Tujuan dari kegiatan ini adalah membuat teknologi tepat guna berupa mesin pengaduk dodol. Dengan mesin pengaduk dodol ini diharapkan mampu menghasilkan adonan dodol yangoptimal serta dapat meningkatkan kapasitas produksi. Metode yang digunakan pada kegiatan ini yaitu pemilihan dan perhitungan komponen alat yang dirancang, pembuatan rancang bangun mesin pengaduk dodol, dan dilanjutkan dengan peragaan uji coba terhadap kinerja mesin pengaduk dodol. Hasil dari kegiatan ini adalah rancang bangun mesin pengaduk dodol. Dengan daya motor penggerak 1/2 Hp mesin pengaduk dodol ini mampu menghasilkan produksi sebesar 10 kg/jam dengan multifungsi.

Kata kunci: rancang bangun, dodol, kapasitas 10kg.

Abstract.

The process of cooking dodol dough requires the energy of several people to stir continuously until the dough produces air bubbles. Making dodol generally takes time depending on how much dough you want to cook. If we cook 10 kg of dodol dough, the time needed to cook it is approximately 10-12 hours with medium or normal heat. Currently, the household-scale dodol industry still uses manual methods for the dodol mixing process, which will require more than one person to stir for a long time, so it will take time for one repetitive job and production costs will be higher. This activity aims to create appropriate technology in the form of a dodol mixer machine. With this dodol mixer machine, it is expected to be able to produce optimal dodol dough and can increase production capacity. The method used in this activity is the selection and calculation of the components of the designed tool, the creation of a dodol mixer machine design, and continued with a demonstration of the performance of the dodol mixer machine. The result of this activity is the design of a dodol

mixer machine. With a 1/2 Hp motor power, this dodol mixer machine can produce 10 kg/hour with multifunction.

Keywords: *design, dodol, capacity 10kg.*

Introduction.

Indonesia is one of the countries with a variety of regional specialties. One of them is dodol, which comes from Central Java. Dodol has long been in demand by the community, even being one of the types of snack commodities increasing in demand in the market, especially on big days. Dodol is one of the special foods that is no longer foreign to the community [1]. However, the large consumer demand and the difficulty of the dodol-making process lie in the mixing process, where cooking dodol takes a long time, and human power carries the dough-mixing process constantly and continuously. It makes home industry entrepreneurs overwhelmed to meet the increasing consumer demand [2].

The dodol mixer machine that exists now is only manual, not automatic. With an automatic mixer machine, it will be easier to make a dodol dough. This design also has a flexible shape that can be made anywhere. The automatic mixer machine, such as bread dough, can make dodol as desired. In addition, many people still use manual mixers because they can create a distinctive taste, so the initiative to make this automatic mixer machine is to make it easier for people to stir it [3]. Nowadays, all matters are required to be fast, precise, and efficient, one of which is the human need to create various tools that make human work easier. Humans began to make modifications and innovations to their tools for ease in carrying out work. The steps that have been taken include making a dodol stirring machine so that the heavy work in the stirring process that used to use human power is now done with motor power as the driving force in the stirring in this discussion. We will analyze the results of stirring on a dodol machine using an electric motor as an alternative driver [4].

The mixing process in animal feed is generally still done manually, and using a hand shovel in mixing feed results in uneven mixing. The purpose of making this feed mixer machine is to lighten the work of farmers. The manufacturer of this machine produces a design for a feed mixer machine with a capacity of 50kg/2 minutes. With this design, production is expected to increase compared to the manual mixing process using a manual shovel. This mixer machine is made with dimensions of 800mm long x 600mm wide x 900mm high, and this tool uses a 1HP motor, 70mm motor pulley, 150mm gearbox pulley and a 480mm long v-belt and a gearbox with a ratio of 1: 30 and produces a speed of 22 rpm [5]. Jenang ketan is a traditional Indonesian food made from rice flour or sticky rice, then cooked with coconut milk and brown sugar or coconut sugar. This design aims to determine the power requirements of the electric motor that will be used in the jenang ketan mixer. In the design process of this tool, it has been known that the power required to rotate the mixer is 0.41 Hp. By using an electric motor with a capacity of 0.5 Hp and an engine speed of 1430 Rpm, it can drive the jenang mixer from a gearbox ratio of 1:50 and using a 75mm diameter pulley which gets an output rotation results from the gearbox of 28 Rpm [6].

This automatic mixer machine can be used not only to make dodol but can be used as desired. In addition, many people still use conventional mixers because they can create a distinctive taste, so the initiative to make this automatic mixer machine is to make it easier for users to stir it. The study aims to design and develop an innovative product for this dodol dough mixer machine, equipped with a motor to make it easier to stir according to the producer's needs. Therefore, the author tries to design a machine to facilitate dodol mixing by creating a dodol dough mixer machine with an electric motor drive with a capacity of 10 kg.

Research Methods

The method used in this study is to design and build Appropriate Technology (TTG) for a dodol dough mixer machine to replace the function of manual tools used in UMKM. Consecutively, the design of this TTG begins with a concept design using sketch drawings, preparation of tools and materials, measuring materials, cutting materials, inspection, welding, assembly, and finishing [7]–[10]. The process sequence can be shown in Figure 1. After all components are designed, the next step is to make the TTG according to the design results, test and analyze, and improve the desired TTG performance.

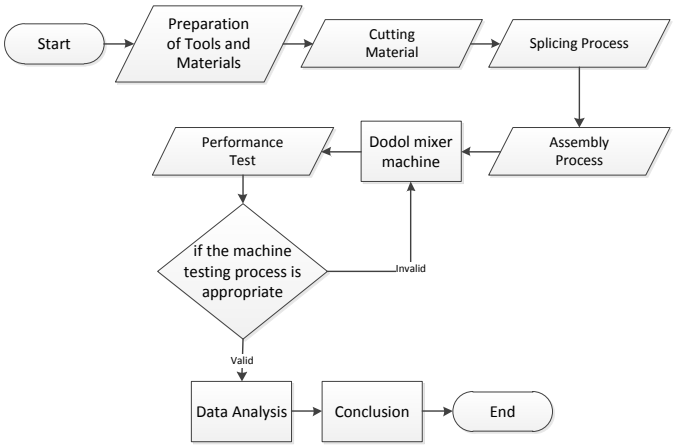

Figure 1. Dodol mixer machine design diagram.

Results and Discussion.

a. Data collection

Data collection is a process to obtain information about making Dodol Mixer Machine. Data collection is done in two ways: literature study and observation.

b. Planning

At this stage, several product concepts will be made that can meet the demands that have been previously determined. In planning, the final result is a list of demands. Table 1 shows some of the demands applied to the dodol mixer machine.

Tabel 1. List of Claims.

Types of Claims	Information
Main Demands	• The power used is a ½ Hp electric motor with a speed of 1400 rpm. • Capacity 10 kg. • Cost required 2-3 million • Hygienic • Fuel used gas stove • Stirs automatically.
Secondary Claims	The mixing shaft can be flexible up-down
Demands of Desire	Easy to operate machine maintenance

c. Design

At this stage, the author provides an alternative assessment of the part function by creating a design drawing and optimizing the machine design.

Tabel 2. Skeletal function assessment

Assessment Criteria	Total Ideal Value			Capacity	Total Alternative Value		
					A1	A2	A3
Spare Parts Availability	3	2	1	25%	0,75	0,25	0,5
Easy of Operation	2	3	1	25%	0,5	0,75	0,25
Easy of Maintenance	3	2	1	25%	0,75	0,5	0,25
Aesthetics	3	1	2	25%	0,75	0,25	0,5
Total Value					**2,75**	**1,75**	**1,5**

Tabel 3. Mixer function assessment

Assessment Criteria	Total Ideal Value			Capacity	Total Alternative Value		
					B1	B2	B3
Spare Parts Availability	3	2	1	25%	0,25	0,75	0,5
Ease of Operation	2	3	1	25%	0,25	0,5	0,75
Ease of Maintenance	3	2	1	25%	0,25	0,75	0,5
Aesthetics	3	1	2	25%	0,75	0,25	0,25
Total Value					**1,5**	**2,25**	**2**

d. Machine Design

From Table 3, it can be seen from the assessment that the concept variant with the highest value is the concept variant that will be selected to be used as the design for the machine to be made.

Figure 2. Dodol mixer machine design.

Conclusion.

The conclusion obtained from the design and manufacture of dodol mixer machines can help MSMEs in the Samba Kerep area of West Surabaya in the process of making dodol from a conventional process to a mechanical process. Based on the calculation results in the manufacture of a dodol mixer machine can mix 10 kg of dough. In making a dodol mixer machine, several aspects are considered so that it is easier for the community to operate the machine.

References.

[1] Basran, L. Harun, A. J. Rosnita, Juliana, and Herlina, "Seaweed Dodol (Eucheuma Cottoni) Processing in UKM. Cahaya Madina Nunukan and Characteristics Products Produced in Nunukan Area," *Borneo Eng. Adv. Multidiscip. Int. J.*, vol. 2, no. Special Issue (TECHON 2023), pp. 128–133, Sep. 2023, Accessed: Oct. 02, 2024. [Online]. Available: https://beam.pmu.edu.my/index.php/beam/article/view/131.

[2] S. Prabowo, M. Syalfha, Sugianto, and Idiar, "Rancang Bangun Mesin Pen Gaduk Dodol Kapasitas 5 Kg," *Pros. Semin. Nas. Inov. Teknol. Terap.*, vol. 4, no. 01, pp. 124–128, Jun.

2024, Accessed: Oct. 02, 2024. [Online]. Available: http://snitt.polman-babel.ac.id/index.php/snitt/article/view/557.

[3] O. Fretno Wigiyanto Subali Wagiman, N. Chandrika Nanda, G. Agung Satria, P. Studi Manajemen, and S. Tinggi Ilmu Ekonomi Satya Dharma, "Peningkatan Kapasitas Pendapatan Umkm Dodol Penglatan Toko Bu Mawar Di Penglatan Kabupaten Buleleng-Bali," *J-ABDI J. Pengabdi. Kpd. Masy.*, vol. 2, no. 8, pp. 5705–5718, Jan. 2023, doi: 10.53625/JABDI.V2I8.4483.

[4] P. Alat Pengaduk Jenang Ketan Berkapasitas, M. Muslimin Ilham, and F. Rhohman, "Perancangan Alat Pengaduk Jenang Ketan Berkapasitas 20 Kg," *Pros. SEMNAS INOTEK (Seminar Nas. Inov. Teknol.*, vol. 7, no. 2, pp. 750–758, Jul. 2023, doi: 10.29407/INOTEK.V7I2.3493.

[5] D. A. Syaifurrizal and H. Mahmudi, "Rancang Bangun Transmisi Mesin Pengaduk Pakan Kapasitas 50KG/ 2 Menit," *Pros. SEMNAS INOTEK (Seminar Nas. Inov. Teknol.*, vol. 8, no. 2, pp. 1127–1133, Jul. 2024, doi: 10.29407/INOTEK.V8I2.5047.

[6] A. Kebutuhan Daya Pada Alat Pengaduk Jenang Ketan Berkapasitas, "Analisa Kebutuhan Daya Pada Alat Pengaduk Jenang Ketan Berkapasitas 20 Kg," *Pros. SEMNAS INOTEK (Seminar Nas. Inov. Teknol.*, vol. 7, no. 3, pp. 1225–1232, Jul. 2023, doi: 10.29407/INOTEK.V7I3.3562.

[7] G. Setyono, S. Riyadi, Muharom, O. A. W. Riyanto, and S. Pratama, "Effect of Cutting Parameter Toward The Surface Roughness Applied In Turning Tool Steel Material," *Infotekmesin*, vol. 13, no. 2, pp. 233–238, Jul. 2022, doi: 10.35970/INFOTEKMESIN.V13I2.1533.

[8] H. Siswanto, S. Riyadi, S. Siswadi, G. Setyono, D. Khusna, and W. Nugroho, "Design And Build The Appropriate Technology Machinery For Shredded Fish Processing," *J. Syst. Eng. Technol. Innov.*, vol. 2, no. 01, pp. 106–110, Apr. 2023, doi: 10.38156/JISTI.V2I01.38.

[9] A. R. Dewananta, R. A. Rahmadhani, D. M. Fantoja, M. Muharom, and G. Setyono, "Rancang Bangun Rombong Listrik Dengan Menggunakan Pembangkit Listrik Tenaga Surya (PLTS) Kapasitas 200 Watt," *J. Syst. Eng. Technol. Innov.*, vol. 1, no. 01, pp. 1–6, Apr. 2022, doi: 10.38156/JISTI.V1I01.9.

[10] D. Khusna, G. Setyono, S. Siswadi, S. Riyadi, N. Kholili, and A. Nugroho, "Investigasi Efek Debit Fluida Dan Karakteristik Pembebanan Disk Valve Terhadap Performa Water Hammer," *J. Syst. Eng. Technol. Innov.*, vol. 1, no. 02, pp. 38–43, Oct. 2022, doi: 10.38156/JISTI.V1I02.25.