DESIGN OF RAKA DRYER WITH ETC TECHNOLOGY (ELECTRICAL TEMPERATURE CONTROL)

Irfan Malik Hartanto[1)], Agam Seftian Effendi[2)], Choirul Hamzah[3)], Aldiansyah Rusminanda[4)], Irenta Teguh Wahyu Widodo[5)], Agung Prijo Budijono*[)]

[1)]S1 Mechanical Engineering, Faculty of Engineering, State University of Surabaya
e-mail: irfanhartanto@mhs.unesa.ac.id
[2)]S1 Mechanical Engineering, Faculty of Engineering, State University of Surabaya
e-mail: agameffendi.16050754032@mhs.unesa.ac.id
[3)]S1 Mechanical Engineering, Faculty of Engineering, State University of Surabaya
e-mail: choirul.17050754042@mhs.unesa.ac.id
[4)]S1 Mechanical Engineering, Faculty of Engineering, State University of Surabaya
e-mail: aldiansyah.17050754032@mhs.unesa.ac.id
[5)]S1 Mechanical Engineering, Faculty of Engineering, State University of Surabaya
e-mail: irenta.17050524040@mhs.unesa.ac.id
[*)]Author Corespondance, Faculty of Engineering, State University of Surabaya
e-mail: agung_pbudiono@yahoo.co.id

ABSTRACT

The purpose of this study is to provide solutions for problems in SMEs katul leaven, especially the problem of drying process that the process is still using the traditional way and the tool is still relatively simple so less hygienic. The method used is to utilize sunlight, exhaust fan, and Heat Exchanger technology that supply electric energy from solar panels and operate semi-automatically. The expected result is the increased productivity and efficiency of the production process so that the productivity of SMEs leaven can increase twice from 40 kg / day to 80 kg / day.

Keywords : leaven katul, SMEs , Automatic, dryer, solar cell

I. INTRODUCTION

Leaven tempe is a seed that is used for making tempe. Therefore it is often referred to as a starter tempe. Leaven tempeh contains mushroom *Rhizopus sp*. which is also known as mushroom tempe. Traditionally, mushrooms for starter making tempeh are usually taken from banana leaves former wrap tempe at the time of manufacture, or leaves aru or teak known as "usar". However, the use of banana leaves or usar is very limited and only for small production. For larger production, tempe starter is made by multiplying tempeh mushrooms (*Rhizopus sp*.) on a particular medium. Furthermore, the growing spores are preserved in a dry state along the medium where the mushroom grows tempe. With this technique the quality of tempe produced will be guaranteed, because the dose of starter usage can be arranged. (Rochintaniawati, 2010)

II. BACKGROUND

Based on research and observation with Mr. Cipto (partner SMEs), during this process of drying leaven katul so far still use traditional and less hygienic way as food product. The problem faced by partner SMEs is on the drying process. In this process becomes a significant problem because it can affect the productivity and effectiveness of lean leaven production, the drying process is still using the traditional method of drying the leaven in a stretch of land with a plastic sheeting tar under the sun. In this drying process, business actors complain about some of the problems (a) drying is relatively long due to the intensity of the fluctuated heat of the sun based on the weather, (b) tempeh

leaven products have poor quality because the leaven of tempe is contaminated with dust and other substances in the vicinity of drying, (c) drying is relatively heavy because it needs to reverse the leaven of tempe leaven to be perfectly dry, (d) require ample land as a drying site. From the problem we have an innovation that is (raka dryer) leaven katul dryer with hybrid system and equipped with ETC (electrical temperature)**. It has removable iron frame construction, the walls are made of transparent acrylic, there are two sources of heat power: the heat and the stove is equipped with heat exchanger and set semi-automatic using ETC (electrical temperature control) with power source of sollar cell**.

III. METHODS

The method used in the manufacture of raka dryer with a hybrid system and equipped with ethanol (etc) in the implementation of the Student Creativity Program Technology is shown in the following flowchart.

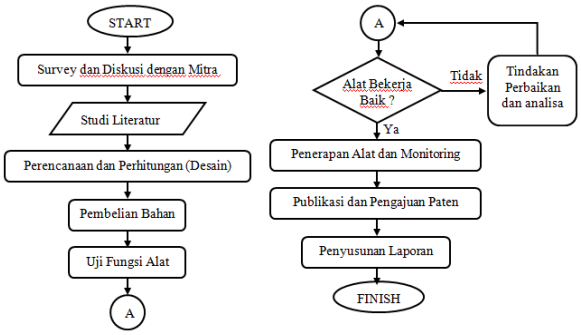

Figure 1. Flow diagram

Studi Literatur

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. The literature we use is the book Elements of Machine in Mechanical Design (*Robert L. Mott*), book Mechanism and Machine Dynamics (Dr. Ramses Y. Hutahaean, MT), fundamental book fluid mechanics (munson young) and fundamental heat transfer (frank..incopera). In this stage, there are reference design, work, material and simulation of drying process

Observation and Discussion with Partners

This activity is the initial stage in finding the data of partner problems, such as the capacity of partner products that only produce 40 kg per day while market demand is twice the production capacity of SMEs, drying leaven leaven still using traditional method and other problems related to economic aspect (can not reach maximum target so that income is not maximal), social (lack of customer trust to product quality leaven katul).

Designing

The next step is to make "raka dryer" machine design. Based on the results of the discussion of the executing team, lecturers and partners then obtained the design "raka dryer" using software inventor 2016 as shown in the picture below:

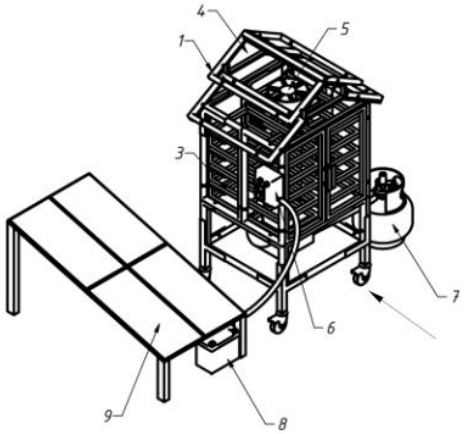

Figure 2. Dryer Design

Creating Work Order

Sequence of workmanship needs to be made to simplify the process of making the machine, so that the process sequence in the process can be done systematically and orderly.

Procurement of Tools and Materials

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

Machine Making

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 1.5 months for the engine work. If you 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.

Machine Test

Testing This raka dryer machine is intended to ensure that the performance of each component of the machine making results can function in accordance with what is expected. Testing will be done at our partner's place, in SMES katul leaven cipto pack

Evaluation

The evaluation and improvement phase of the machine is done after the machine testing is done. At this stage will be assessed system work of the engine, air circulation, room temperature equalization, electricity consumption and humidity in the room

Implementation of Machines 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. So that can be developed in the future

Publication and Filing of 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 the CREATIVITY PROGRAM OF STUDENT that we created and still much of the development of our tool.

Report Creation

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. And able to be an evaluation on our activities.

IV. RESULT

Based on the manufacturing process and assembly, the machine obtained dryers leaven katul with hybrid system and equipped with etc (electrical temperature) as shown in the following figure.

Figure 3. Initial Condition of RAKA Dryer before assemblying

Tabel 1. specifications Machine

No.	Description	Informations
1	Dimension	(2 x 2 x 2) m
2	Capasity	80 kg /proses
3	Frame	Besi holow
4	Heating Source	Sun and Gas Stove
5	Power source	The Solar Panel 100 wp
6	Air Sirculations	Exhaust fan 35 watt
7	Control	Ecu timer and temperatur
8	Wall	Acrylic 5 mm

Based on the specifics of the tools we have made, the results can be predicted to increase twice from production before using our tools.

Discussion

Based on the results of this program, the results obtained that the use of our tool can help the drying process becomes easier and faster, the use of acrylic wall can accelerate the drying process of the original 8 hours to 4 hours, and, the product is also more hygienic because the drying is in in the closed room and optimal circulation, the partner SMEs feel happy with this CREATIVITY PROGRAM OF STUDENT and hope that drying process become twice effective and efficient so that it can increase the productivity of the business.

V. Conclusion

The application of "raka dryer" leaven dryers with hybrid system and etc (electrical temperature) is very useful for SMEs leaven katul so that the production process becomes 2 times more effective and efficient which initially 8 hours to 4 hours. As for the production capacity increased which initially only 40kg / day now to 80kg / day. For the drying process becomes more practical because there is no need to flip through leaven katul

REFERENSI

Rochintaniawati, D. (2010). Pembuatan Ragi Tempe. *Pembuatan Ragi Tempe*.

Biegel.J.E. 1998. Pengendalian Produksi, Suatu Pendekatan Kuantitatif.

Collins, J.A. 1993. ,Mechanical Design Of Machine Elements And Machines: analysis ,prediction , prevention, 2nd ed., wiley , new York.

Erdman, J.W. and Erdman, E.A. (1982). Effect of home preparation practices of nutritive value of foods in handbook of nutritive value of foods. Miloslaw

Recheign, Florida 1: 237 -263.diakses 3 Oktober 2015.

Fuad, Ahmadi. 2001. Karakteristik Teknologi Tepat Guna balam Industri Skala Usaha Kecil dan Menengah di Jawa Timur. Makalah yang disampaikan dalam rangka pelatihan produktivitas usaha kecil di Unesa.Tanggal 26 Juli tahun 2001.

Kasmidjo, R.B. 1990 Tempe : Mikrobiologi dan Biokimia Pengolahan serta Pemanfaatannya. PAU Panagan dan Gizi. UGM, Yogyakarta.

Pitt, J.I. and A.D Hocking. 1985. Fungi and Food Spoilage. Academic Press, Australia.

Rahayu, K. 1988. Bahan Pengajaran Mikrobiologi Pangan PAU pangan dan Gizi. UGM, Yogyakarta

Smith, A. K and J. Circle, S. 1978. Soybeans Chemsitry and Technology. The AVI pub Company Inc. Westport Connecticut.

Shurtleff, W. and A. Aoyagi 1979, The Book of Tempeh. Harper and Row Publisher. New York.

Wirakartakusumah, dkk. 1992. Peralatan dan Unit Proses Industri Pangan. PAU Pangan dan Gizi, IPB Bogor.

Ketaren, S. 1986. Pengantar Teknologi Minyak dan Lemak Pangan . UI Pres. Jakarta.

Novi Dewi Sartika. 2007. Studi Pendahuluan Daya Antioksidan Ekstrak Metanol Tempe Segar dan Tempe Busuk kota Malang TerhadapRadikal Bebas DPPH (1,1 –difenil-2pikrilhidrazil). Skripsi. Universitas Negeri Malang.

Samsudin, U. S. dan D. S. Djakamiohardja. 1985. Budidaya Kedelai. C.V. Pustaka Buana. Bandung. Hal 13-15

Sarwono, B. 1982. Membuat Tempe dan Oncom. Jakarta : PT Penebar Swadaya. Hal 10-15.

Snyder, H.E. and W. Know, T. 1987. Soybean Untiluzatin. An AVI Book. Published by Van Nostrad Rein hold company, New York.

Budijono, A. P., Habib, B. N., & Setiyawan, N. (2016, October). The effect of angle slope variation and dark light chimney for humidity and temperature full transparent walled dryer chamber. In *AIP Conference Proceedings* (Vol. 1778, No. 1, p. 030005). AIP Publishing.

Imam, M., & Budijono, A. P. (2016). PENGEMBANGAN DESAIN

MESIN PENGERING BREM TIPE HYBRID DENGAN METODE QFD (Quality Fungtion Deployment). *Jurnal Teknik Mesin*, *4*(03).

Setiyawan, N., & Budijono, A. P. (2016). PENGARUH VARIASI CHIMNEY PADA UNJUK KERJA RUANG PENGERING SERBAGUNA. *Jurnal Teknik Mesin*, *4*(02).

Sofyan, J., & Budijono, A. P. (2016). RANCANG BANGUN PERANGKAT PEMBELAJARAN PRAKTIKUM INSTRUMENTASI DAN KENDALI STANDAR KOMPETENSI MEMAHAMI SISTEM MEKATRONIKA DALAM PERALATAN KONTOL OTOMATIS BAGI MAHASISWA TEKNIK MESIN UNESA. Jurnal Pendidikan Teknik Mesin, 5(01).