

Utilization of infrared heating innovation in a 25 Kg Capacity Satay Grilling Machine for MSMEs in Benowo District West Surabaya

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Abstrak.

Sate merupakan makanan favorit di Indonesia. Berbagai jenis bahan sate yang digunakan oleh para pedagang mulai dengan daging ayam, kambing dan sapi. Proses pembakaran sate memerlukan treatment khusus untuk mendapatkan cita rasa yang nikmat. Kami melakukan penyuluhan serta membuat pembakar sate kapasitas 25 kg untuk meningkatkan kapasitas. Ide ini kami keluarkan karena kami mengidentifikasi bahwa sebagian besar operator sate menghadapi kesulitan dalam pembakaran selama proses berlangsung. Penyuluhan ini dilakukan pada pelaku UMKM Sate di Sentra Wisata Kuliner Sememi Surabaya barat. Mesin ini dilengkapi dengan fitur teknologi baru yang sudah tidak menggunakan arang untuk proses pembakaran sate. Tetapi, menggunakan pemanas infrared HD-262 yang berbahan bakar gas elpiji. Pemanas infrared ini dapat dikontrol suhunya melalui kontrol digital yang dihubungkan dengan beberapa komponen infrared lainnya. Suhu yang dihasilkan pemanas infrared ini lebih maksimal untuk makanan yang proses pensajiannya melalui pemanggangan.

Kata kunci: pembakaran sate, pemanas infrared dan kapasitas 25kg.

Abstract.

Sate is a favorite food in Indonesia. Various types of satay ingredients are used by traders, starting with chicken, goat, and beef. The process of grilling satay requires special treatment to get a delicious taste. We conducted outreach and made satay burners with a capacity of 25 kg to increase capacity. We came up with this idea because we identified that most satay operators face difficulties in burning during the process. This counseling was carried out for Sate MSMEs at the Sememi Culinary Tourism Center, West Surabaya. This machine is equipped with new technology features that no longer use charcoal for the satay burning process. However, it uses an HD-262 infrared heater, which is fueled by LPG gas. This infrared heater can have its temperature controlled via digital control, which is connected to several other infrared components. The temperature produced by this infrared heater is optimal for food that is served through grilling.

Keywords: satay grilling, infrared heating and 25kg capacity.

Introduction.

Emerging technologies in the field of infrared heating highlight the application of space heating in buildings and energy savings compared to fossil fuel-based furnaces or boilers. Space heating applications in western and Scandinavian countries have used heating units fired using fossil fuels such as natural gas or oil or electric heaters with air blowers to transfer heat to the room. A lot of heat is wasted because hot air tends to remain at ceiling level and is not utilized by the people occupying the room or building [1]. Although infrared radiation cannot penetrate deeply and heats only a few millimetres below the surface of the sample, the main effect of infrared is due to heating

a thin layer of food material on the surface. The infrared heating process increases the shelf life of food ingredients and is a promising method for efficient microbial inactivation. During infrared heating operations such as drying, blanching, roasting, frying and cooking food products, pasteurization has developed at the same time [2].

Infrared gas stoves are a type of low-pressure gas stove and have higher heat efficiency than other domestic cooking stoves. This research considers computing to determine the temperature distribution of water and air, the distribution of water and air velocities and the thermal efficiency of an infrared gas stove. Time-dependent heat transfer equations involving diffusion and convection combined with time-dependent fluid dynamics equations are implemented and solved using the finite element method (FEM). The results obtained can provide a basis for improving the energy efficiency of infrared gas stoves and other equipment, including helping to reduce energy consumption [3]. Increasing the efficiency of stoves, both kerosene and gas stoves, is generally directed at construction engineering efforts and optimizing the use of fire. The addition of a finned heat radiation reflector to the LPG stove affects the resulting efficiency. The positive effect is in the form of complete combustion and fuel energy savings; increased efficiency occurs in all finned reflectors tested when compared with those without using a reflector and using a reflector without fins [4].

Heat Transfer is a form of heat rate of energy or type of heat that can move due to temperature differences. Temperature transfer occurs from objects with high temperatures to objects with low temperatures. When two objects with different temperatures meet, heat transfer will flow and move from the object with the high temperature to the object with the low temperature. Energy in the form of heat can move through a medium or without a medium. Therefore, the medium through which it passes greatly determines the rate of heat transfer. Based on the medium through which it passes, there are three heat transfer mechanisms, namely conduction, convection and radiation heat transfer [5]. An object has a temperature gradient, so according to experience, there will be a transfer of energy from the high-temperature part to the low-temperature part. When two objects with different temperatures meet, heat transfer will flow and move from the object with the high temperature to the object with the low temperature. Energy is transferred by conduction, and the rate of heat transfer is proportional to the normal temperature gradient [6]. In complete combustion, the magnetic ignition reactant will conduct electricity and burn, producing a limited number of embers. Infrared catalytic is a porous ceramic honeycomb panel that attaches to the catalyst as a combustion furnace, utilizing cutting-edge technology, science and design. When hydrocarbon catalytic ceramics are burned with gas fuel, only carbon dioxide gas and flame will be produced from the magnetic igniter .

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Figure 1. Conventional Process of Burning Satay.

Implementation Method.

a. Field Survey

Determining the extension location is intended to find out a general description of the extension area that will be used as a case study. The location that will be used as the extension case study is the Sate MSME actors at the Sememi Culinary Tourism Center, West Surabaya. Factors that influence the selection of extension areas are:

1. The Sememi West Surabaya Culinary Tourism Center is an area close to residential areas and schools.
2. Counseling about Sate MSMEs at Culinary Tourism Centers is rarely carried out.

b. Discussion with Partners and Finding Problem Solving

Discussion with partners and finding solutions to problems. Based on the results of discussions with partners during the field survey, partner problems were found when burning satay. The problem is that the satay burning process is still conventional. Based on the problems faced by these partners, a tool for the burning process that is easy to use is needed so that it can shorten production time. As production time decreases, production capacity increases so that partner income increases.

c. Implementation of the machine

This counseling was carried out for Sate MSMEs at the Sememi Culinary Tourism Center, West Surabaya. This machine is equipped with new technology features that no longer use charcoal for the satay burning process. However, it uses an HD-262 infrared heater, which is fueled by LPG gas. This infrared heater can have its temperature controlled via digital control, which is connected to several other infrared components. The temperature produced by this infrared heater is optimal for food that is served through grilling.

This community service activity in the form of counselling for MSMEs in Benowo District, West Surabaya City, is a collaboration between the Faculty of Engineering, Wijaya Putra University and the local government to improve the quality of life with a strategy for developing state MSMEs for local communities which aims to implement the planned program. The program was determined based on the results of brainstorming between officials, community leaders and the Faculty of Engineering Team, so a program of community service activities was established, which included 1) the application of appropriate technological machines for the community and 2) increasing the quality and quantity of Sate small businesses.

Before implementing all activities, the mechanical engineering study program will conduct program outreach to the community to increase participation in program implementation. The activity continues with making materials, providing counseling or training, then mentoring in the field [16]–[20].

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Results and Discussion.

Heat transfer in the roasting process in the satay burning room furnace in this satay-making and Burning Machine is by conduction, convection, and radiation. The first heat produced is conduction; for more details, it can be seen in Figure 2 below. Shows the basic concept design of the HD 262 infrared heating furnace room. This furnace is connected by 2 door hinges so that it can be opened or closed during the satay burning process. The heat flow that occurs in the HD 262 infrared heating combustion chamber furnace is conduction, convection, and radiation. The walls of the combustion chamber are covered with gas wool, which has a thickness like a 40x40x3.5mm square tube frame. The surface of the jail wall is covered with a stainless plate with the front and back ends open 10 cm for air circulation. The walls of the combustion chamber are covered with gas wool. In the furnace and in and out of the satay, which is carried out using a chain conveyor,

this stainless plate has 2 layers of inner surface walls, a wool coating, and an outer surface. For stainless wall lining of heating room furnace surface.



Figure 2. Satay Grilling Machine

The planning stage is the core of the planning process by sketching design drawings and using the design-build method. Design of the intended building or before development is carried out. Detailed dimensions in the design of a satay-making and burning machine with a capacity of 25 Kg, which is in accordance with the planning results with the model according to the planned plan. The next process is connecting the electric current to the panel box, testing the infrared heater, and running the chain conveyor. Successful implementation and testing of the processing system using a chain conveyor whose movement is assisted by an oriental motor. The meat skewers used are barbeque sunduk; the distance between the meat skewers is 50 mm. For the walls of the furnace, the combustion chamber uses a stainless plate covered with gas wool so that it does not conduct heat during the combustion process.

Considering the increasingly high prices of basic needs today, many people are running small and medium businesses to meet these basic needs. One of them is the satay business. Currently, there are many small and medium businesses selling satay, one of which is in Benowo District, Surabaya City. The first step in this community service activity is to survey partner locations to find out the problems faced by partners in burning satay. From the results of surveys to partner locations, satay burning is fast. For this reason, a satay burning machine is needed that is easy to use so that partners' production capacity increases in a short time so that partners' income increases. The output of the implementation of community service program activities is in the form of a satay burning machine.

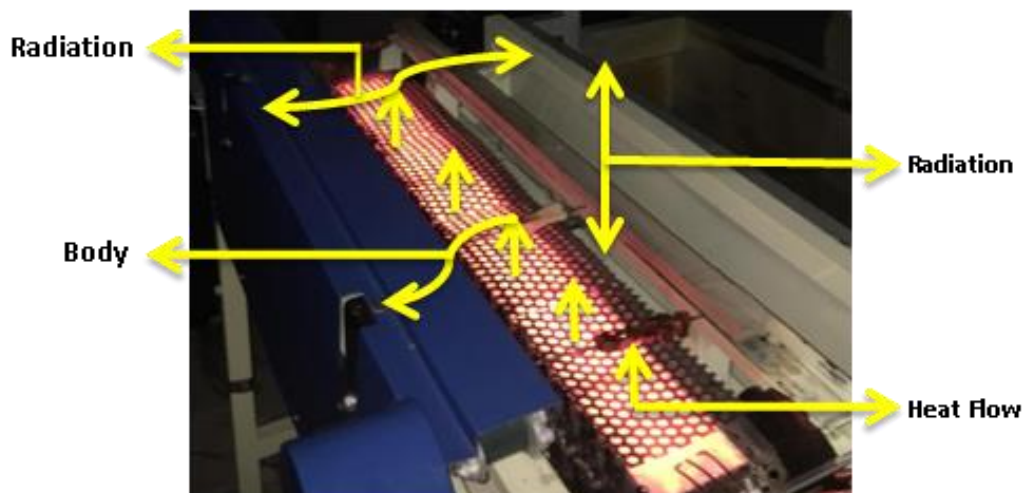


Figure 3. Heat Flow in Grilling Satay.



Figure 4. Counseling for MSME actors at the Sememi Culinary Tourism Center (SWT)

Conclusion.

Iron frame construction and several stainless steel plates and aluminum plates. This Satay Burning Machine has dimensions. This satay-making and burning machine has an HD-262 infrared heater that works using LPG gas as fuel and uses a regulator that has a pressure control so that the heater ignition can be regulated and does not waste fuel. Working Principles of the Electrical System, the composition of the Electrical System which is carried out by the input power electronic control system. This machine is quite sterile and safe. All the cover walls are protected with stainless plates and iron frames that have been coated with gas wool to reduce heat. Use hygienic materials even in direct contact with food.

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