Terbit *online* pada laman web jurnal : http://metal.ft.unand.ac.id

METAL: Jurnal Sistem Mekanik dan Termal

| ISSN (Print) 2598-1137 | ISSN (Online) 2597-4483 |

Research Article

Innovation for Making Portable Induction Furniture as a Solution for System Waste Handling Post-vaccination COVID-19 Vaccine

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ARTICLE INFORMATION

Article History:
Received: 01 September 2022
Revised: 28 October 2022
Published Online: 31 October 2022

KEYWORDS

Evaluation

Incinerator

Garbage

Induction

CORRESPONDENCE

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A B S T R A C T

The world was shocked by the outbreak of a new Coronavirus Disease 2019 (COVID-19) in 2020. Using personal protective equipment in the community during a pandemic increases the amount of medical waste. The syringe is one of the medical waste from the COVID-19 pandemic, which is classified as metal waste. One of the solutions offered is a medical waste incinerator. The researchers designed a simple incinerator based on the medical waste incinerator model in hospitals. The incinerator to be used is a portable induction type. It is hoped that the use of this incinerator will be able to overcome the existing medical waste problem.

1. INTRODUCTION

Since the COVID-19 outbreak in Indonesia in 2020 until now, the use of medical equipment such as syringes has increased. Used syringes are included in medical waste with the category of infectious waste or B3 (Hazardous and Toxic Materials). Handling this waste requires the right way to avoid spreading dangerous diseases and environmental pollution. According to the former Indonesian Minister of Research and Technology/Head of the National Innovation Research Agency, Bambang Brodjonegoro, there will be great potential for accumulating medical waste in the form of syringes after the corona vaccination has been carried out [1]. The syringe can only be used once and will be disposed of afterward, and then, it will become medical waste.

According to Ismawati [3], there are several ways to manage waste from healthcare facilities at health centers and hospitals, including burning or incineration. The Ministry of Environment and Forestry also recommends burning medical waste with temperatures above 800 degrees Celsius to ensure that the virus does not pollute the

https://doi.org/ 10.25077/metal.6.2.138-142.2022

environment [3]. Medical waste treatment by incineration still creates new problems, namely the formation of ash, residual crust from combustion, and emissions from the furnace. The development of waste combustion continues to be carried out by applying various combustion furnaces. This research is a continuation and expansion of Abdurrahman's research [2]. Therefore, in this study, a Heat Treatment induction furnace will be designed to heat treatment of B3 hospital syringe waste specimens.

2. METHODOLOGY

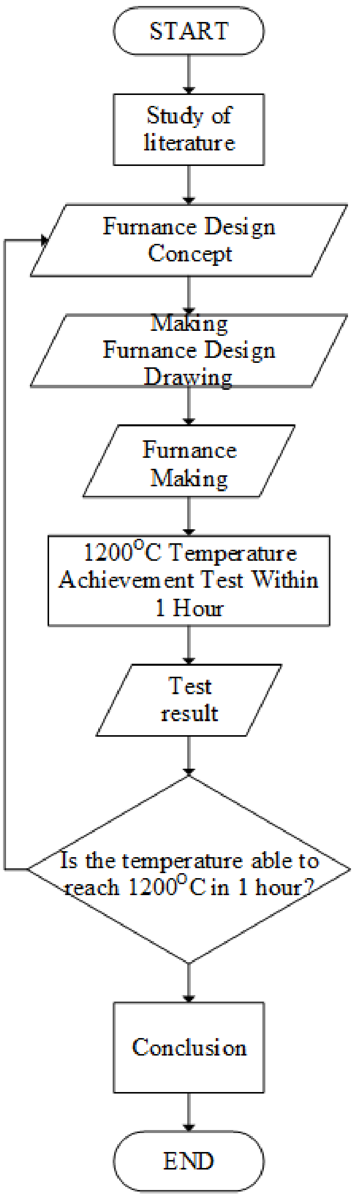

Figure 1. flowchart

The initial stage begins with looking for a literature study for data collection and also looking for an initial picture for the furnace, followed by the concept of what kind of furnace design is, after that the drawing of the furnace is made, after that the furnace is made and the temperature is tested and the results are obtained. If the furnace can function properly, it can be concluded that the furnace.

3. RESULTS AND DISCUSSION

The data below is the result of testing the furnace temperature of 750 and 1000 with an interval of 5 minutes and a temperature difference of 250

a. Testing temperature up to 750°C with a time difference of 5 Minutes

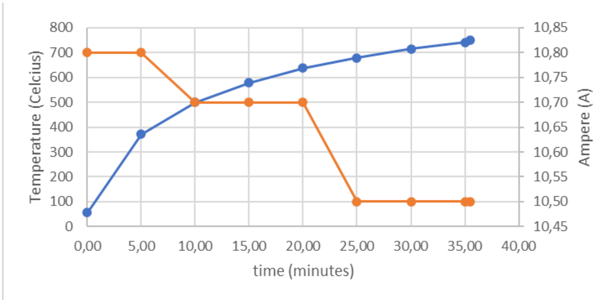

Figure 2. temperature & ampere vs time on testing until 750°C with a time difference

The results obtained from the graph above are tests at temperatures that reach 750 °C with a time difference of 5 minutes.

b. Testing temperature up to 1000°C with a time difference of 5 minutes

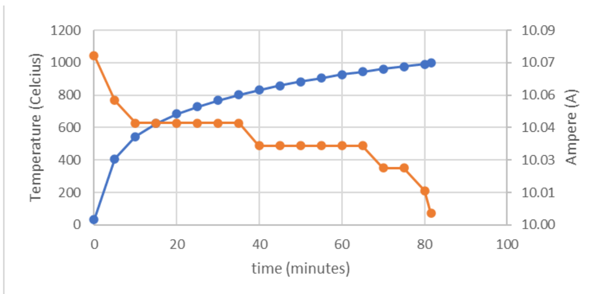

Figure 3. temperature & ampere vs time on testing until 1000°C with a time difference

The results obtained from the graph above are tests at temperatures that reach 1000 ºC with a time difference of 5 minutes.

c. Testing temperature up to 750ºC with temperature difference of 250ºC

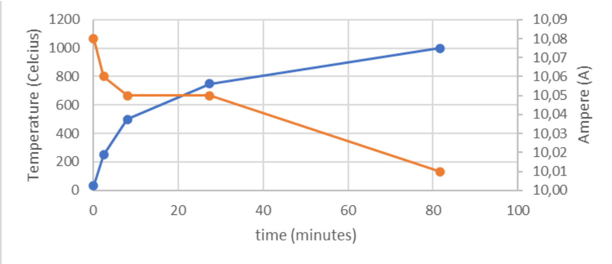

Figure 4. temperature & ampere vs time on testing until 750°C with a temperature difference

The results obtained from the graph above are tests at temperatures up to 750 ºC with a temperature difference of 250 ºC.

d. Testing temperature up to 1000ºC with a temperature difference of 250ºC

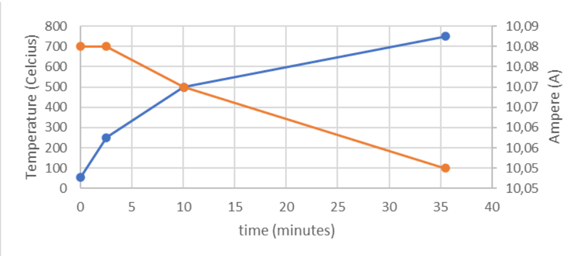

Figure 5. temperature & ampere vs time on testing until 1000°C with a temperature difference

The results obtained from the graph above are tests at temperatures up to 1000 ºC with a temperature difference of 250 ºC.

Below is documentation of photos of the manufacture and testing of the furnace attached as follows:

a. The unification of refractory bricks
uses refractory cement and is pressed using a press.

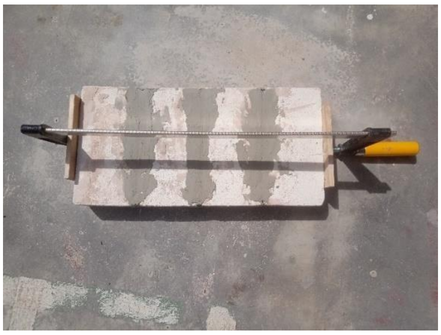

Figure 6. The unification of refractory bricks

This process is the union of refractory bricks with refractory cement and pressed using a press.

b. Refractory brick cutting process.

Figure 7. Refractory brick cutting process

After that, the refractory brick is cut according to the size that has been determined.

c. The line manufacturing process for heating coils

Figure 8. The line manufacturing process for heating coils

In this process, the coil line is made on the refractory bricks that have been marked and crushed using a drilling machine.

d. Heating coil winding process
The next process is to roll the coil with a predetermined pipe and roll it manually.

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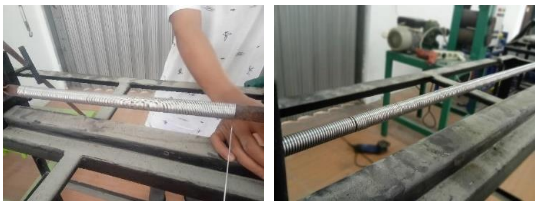

Figure 9. Heating coil winding process

e. The process of laying the heating coil on the wall of the furnace

Figure 10. The process of laying the heating coil on the wall of the furnace

After the coil winding is complete, it is continued by placing the coil on a fire-resistant brick wall as shown in Figure 10.

f. The process of uniting all refractory bricks

Figure 11. The process of uniting all refractory bricks

After everything is done, all the refractory bricks made are put together using refractory cement.

g. Welding process and manufacture of furnace frames

After all the walls are put together, a frame is made to strengthen the entire side of the wall which is welded using an angle iron. The welding process depicted in Figure 12

Figure 12. Welding process and manufacture of furnace frames

h. Process controller circuit

This process is to assembly of all controller components that will be attached to the heating coil as shown in Figure 13.

Figure 13. Process controller circuit

i. Furnace testing process

Figure 14. Furnace testing process

In this step, the controller and furnace tests are carried out after which temperature tests are carried out as shown in Figure 14.

j. The process of measuring amperes using an ammeter

Figure 15. The process of measuring amperes using an ammeter

Figure 15 shows the measuring process of amperes using an ammeter.

4. CONCLUSION

After carrying out the process of designing and testing this furnace, we can provide suggestions for the improvement of this second-generation production.

1. To get good fireclay brick workmanship, it should be done with a special cutting machine that has a cutting depth regulator.
2. The bending of the casing should use a special bending machine to get better results.
3. Furnace made to be equipped with temperature control.

ACKNOWLEDGMENT

We would like to thank the Batch V Research Grant Program of the PP Muhammadiyah Diktilitbang Council & LAZISMU Muhammadiyah. Thank you also to the Muhammadiyah University of Riau and all those who have supported the implementation of this research.

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