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The Effect of Fluid Variations in The Reservoir on Air Pressure in Knife Tool Heating Furnaces

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ABSTRACT

The stainless steel material reservoir tube can produce combustion steam from the heating furnace. The research objective was to determine the effect of variations in the type of liquid and air pressure efficiently used in the reservoir tube. The type of research used is pure experimental research. The medium used is mineral water, 10%, 20%, and 30% brine, and the Manufacturer's coolant is heated using a heating furnace at 110° C for 42 minutes and measured by a pressure gauge. The results of the tests carried out have the effect of differences in mineral water 1.50 bar or 1.48 atmosphere, 10% brine 1.50 bar or 1.48 atmosphere, 20% brine 2.40 bar or 2.36 atmosphere, 30% brine 3, 50bar or 3.45 atmospheres, factory coolant 1.75bar or 1.72 atmospheres. 30% salt water is more efficient and suitable for the stainless steel material reservoir heating process in producing steam under pressure, which is used in knife tools.

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INTRODUCTION

Using heating furnaces with current design models has disadvantages because combustion products are not used thoroughly and are only wasted, so they are inefficient. They will affect the quality of the product. An efficient heating furnace design using a blower can protect the temperature level as a result of heating or heat treatment; holding time can be tried; heat treatment using this heating furnace can also increase the level of hardness of agricultural and plantation equipment products obtained by blacksmiths with a general escalation of 16 HRC, the temperature of this furnace design is also able to reach temperatures of 9000C with LPG fuel (Rusadi et al., 2018).

The research results related to the quality of knife tools and agriculture show that local factory production equipment cannot yet compete with imported products. This is because the quality of the products is still poor compared to imported products. Viewed from the aspect of the price of foreign imported products (Malaysia), it is more expensive when compared to local production prices, but entrepreneurs are sorting out imported (Malaysian) production products because the quality of local products is small. As a result, entrepreneurs switch to using tool equipment for foreign imported products. The problem has caused a decrease in the number of manufacturers in several local iron pande businesses (Suherman et al., 2012). Making iron pande furnaces in an efficient and area-friendly way or making the right technology for solving for residents (Sodikin and Triyono, 2014),

The heating furnace is waiting for ordinary heaters, challenging the community of business actors such as blacksmith craftsmen. The challenge in question is that following the development of knowledge and technology, the efforts of blacksmiths like this become constrained because heating is less than optimal, wasted, and product quality. Therefore, the development of heating furnaces is carried out by blacksmiths to make knife tools to minimize the possibility of work accidents that can occur at any time due to heating furnace sparks, streamline the work process, and maintain good product quality.

As for how to streamline the work, the flame will continue to burn constantly, so air pressure must be pumped into the reservoir design furnace. A model of a reservoir furnace will be developed that will utilize the residual heat from the furnace to drive the airflow. The plan developed is to utilize the residual heat of combustion that will warm up. The reservoir is designed to utilize the escaping steam directed into the condenser, which becomes warm air. This design is expected to reduce the energy expenditure of both human and electric power. The result of the program from the creation view is to make an iron pande heating furnace that is efficient and area-friendly to meet the demands of the market regarding tools and agricultural equipment (Degarmo, 2000).

To obtain air pressure vapor, liquid media is needed, which is used to influence the rate of formation of air pressure in the reservoir from the form of martensite converted into austenite. This will determine how far the mechanical properties of the treatment increase the solution. In the research of Rabiatul Adawiyah et al. (2014), the alteration of cooling devices to microforms in salt water devices has a ferrite price of 29.8%, martensite 70.2%, and ordinary water media has a ferrite price of 38.3% and martensite 61.7%. While the oil cooling media has a ferrite price of 37% and martensite 63%, cooling media also affects the material's corrosion because the material is in direct contact with the liquid. To determine the effect of these types of liquid variations on other liquids, researchers will conduct research using liquid water, salt water, and coolant manufacturer media to determine the influence of air pressure vapor on reservoirs.

METHOD

This type of research is pure experimentation. Experimental research is a type of research that can be interpreted as a way to look at the effect of specific treatments on others under controlled conditions by researchers. This experimental research is usually conducted in the laboratory, and certain variables are treated or compared (Sugiono, 2018:107).

The variables in this study consist of dependent variables, namely air pressure in the reservoir tube that has been formed according to the design. At the same time, the free variable is the variation of liquids that have been determined, among others, namely, mineral water liquid, salt water 10%, 20%, 30%, and manufacturer coolant. The object of this study is the design of a stainless steel material reservoir furnace measuring 30 cm in diameter and 20 cm in height.

This research procedure includes the initial, implementation, and final stages. The preparation stage starts with conducting observation and literature studies, collecting data from various iron pande artisans, making preparations and selecting concepts, and making heating furnaces. The implementation stage is carried out by testing reservoir tubes and fluid variations. At the same time, the final stage is carried out by analyzing the results on the thermometer and the amount of pressure. The data collection technique in this study used structured observation. At the same time, the data content is carried out using comparative descriptive techniques.

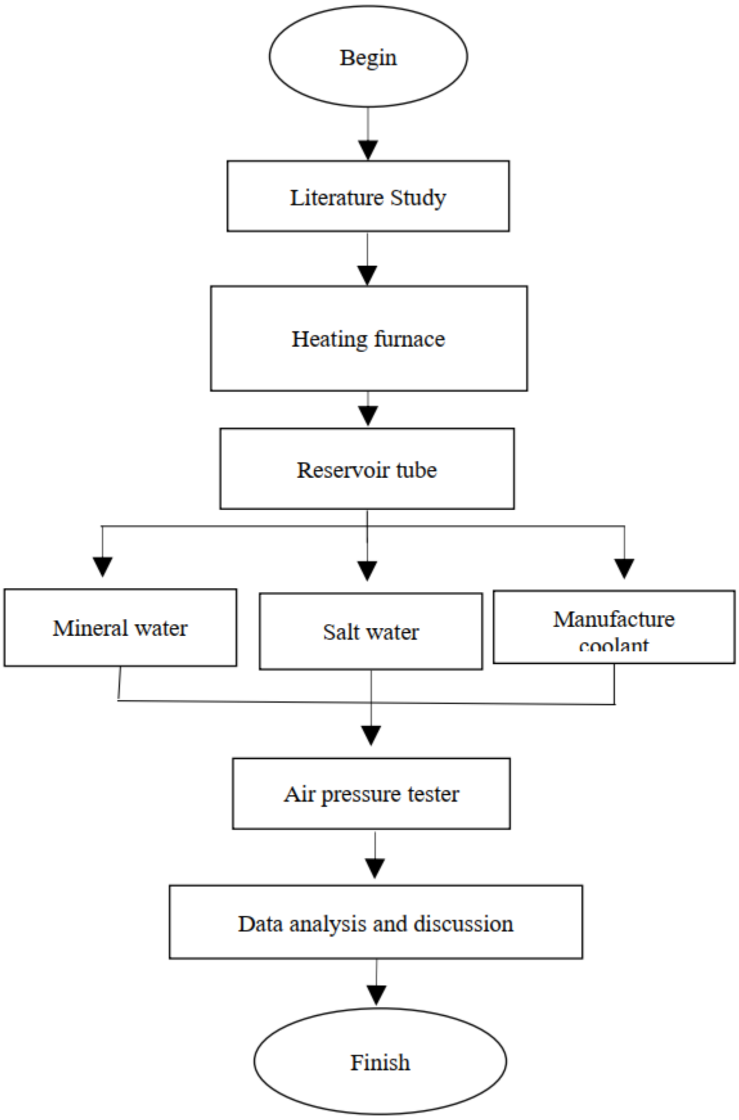

Figure 1. Research Flowchart

RESULTS AND DISCUSSION

From the results of the data obtained by the researcher, on testing the specification of fluid variations and air pressure in the reservoir of stainless steel material alternately with the volume of water in the reservoir as much as 12 liters of mineral water, salt water 10%, 20%, 30%, and coolant manufacturer in the reservoir furnace, by requiring a reservoir heating process lasts for 42 minutes with a benchmark comparison until the temperature in the reservoir furnace reaches 110°C (above the boiling point of water). Getting different values or results produced by the influence of variations in mineral water liquid, salt water 10%, 20%, 30% and manufacturer coolant and air pressure can be data as follows:

Table 1. Research Results Data

Variations Liquid	Time		Pressure	
	Measuring Instruments	Result	Measuring Instruments	Result
Mineral Water	Stopwatch	42	Pressure Gauge	1.50 bar or 1.48 atm
Brine 10%	Stopwatch	42	Pressure Gauge	1.50 bar or 1.48 atm
Brine 20%	Stopwatch	42	Pressure Gauge	2.40 bar or 2.36 atm
Brine 30%	Stopwatch	42	Pressure Gauge	3.50 bar or 3.45 atm
Coolant Manufacturer	Stopwatch	42	Pressure Gauge	1.75 bar or 1.72 atm

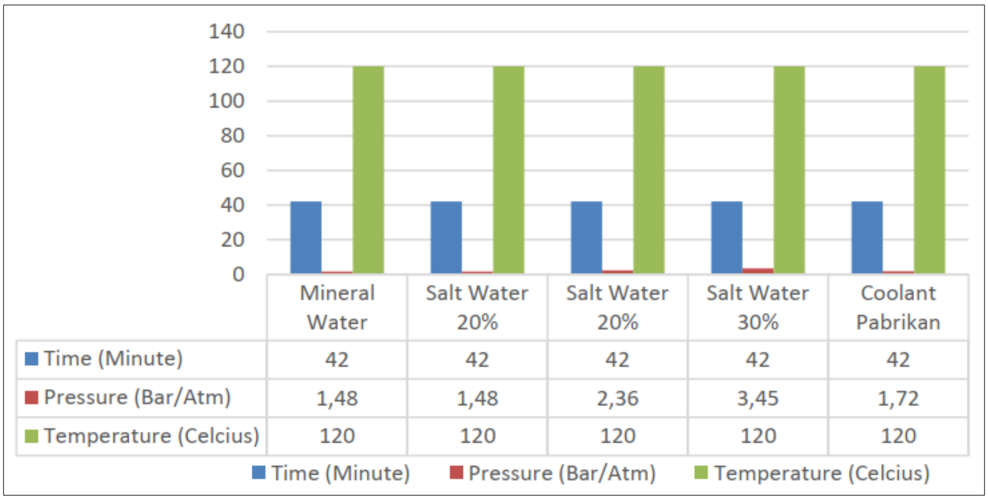

Figure 2. Graphs of Fluid Variation and Air Pressure

From the graph above, it can be seen that the resulting value with the influence of variations in mineral water liquid, salt water 10%, 20%, 30%, and the Manufacturer's coolant and air pressure obtained the difference in the reservoir tube.

In this study, the author conducted a comparative analysis of reservoir data on fluid variations and air pressure in order to know the influence of each fluid variation; in this study, there were five types of specimen fluids and different air pressures, including mineral liquids, 10% salt water, 20%, 30%, and manufacturer coolant. The material used in this study is a stainless steel reservoir.

This study was conducted for four days to take data on each specimen of fluid variation and air pressure in the reservoir tube because of the study, namely mineral water 1.50bar or 1.48 atmosphere, salt water 10% 1.50bar or 1.48 atmosphere, salt water 20% 2.40bar or 2.36 atmosphere, salt water 30% 3.50 bar or 3.45 atmosphere, Manufacturer's coolant 1.75bar or 1.72 atmospheres.

The highest air pressure is a variation of 30% brine specimens with a yield of 3.50 bar or 3.45 atmospheres because salt water with 30% spice has a transformation method that is intertwined faster. As a result, the heat is quickly free and causes salt crystallization to be created immediately. Therefore, cooling in salt water can be maximum in the reservoir material. Temperature in the Focus of salt water is characterized thoroughly. As a result, the intertwined heating can be thorough in all parts of the reservoir tube.

The lowest air pressure is the liquid variation of mineral water, 1.50 bar or 1.48 atmospheres; salt water, 10% 1.50 bar or 1.48 atmospheres in mineral water, has a pH of 7.0. Ph is the scale of acidity content in a solution. Water has similarities when tested. The higher the water's pH content, it continues to be good water. While it is the same as the saltwater variation of 10%, the air pressure produced is 10%, 1.50 bar, or 1.48 atmospheres. The air when the saltwater variation is only 10%, not too much water is mixed, the air pressure does not increase, and the dose of variation above it is needed so that it can experience changes in air pressure in the reservoir.

Therefore, researchers determined that salt water is 30% more efficient and suitable for heating reservoir furnaces on stainless steel material in producing air pressure steam used in knife tools. However, 30% brine media will cause the material to be more complex, but the disadvantage of this tool is that it produces corroded material from rusty finished goods.

CONCLUSION

Reservoir tubes with variations of mineral water liquid, salt water 10%, 20%, 30%, and coolant manufacturers obtain varying air pressure values or results. Based on the data from the researchers, it was concluded that fluid and air pressure influence the reservoir tube. Of the 5 liquid media, the highest result is in salt water, a variation of 30% with a result or value of 3.50bar or 3.45 atmospheres; from that result, the higher the salt content, the faster the heat will heat up and resulting in salt crystallization quickly formed temperature in brine concentration is comprehensive, as a result, the heating that occurs can be thorough in all parts in the reservoir tube. Therefore, the variation of 30% saltwater liquid can be maximized in the reservoir material so that it is better and more efficient to evaporate air pressure in the stainless steel reservoir material.

REFERENCES

Degarmo, E, P., (2000), "Material and Processes in Manufacturing", Dicetak di Amerika Serikat.

Emzir. (2018). Metodologi Penelitian Pendidikan Kuantitatif dan Kualitatif. Depok: Rajagrafindo Persada.

Rusadi, R., Hadimi, H., &; Karyadi, E. (2018). Desain dan pembuatan tungku dapur / pemanas untuk kerajinan pandai besi untuk meningkatkan kualitas produk. Elkha, 10(2), 68.

Rabiatul Adawiyah. "Penurunan nilai viskositas karena pengaruh kenaikan suhu pada beberapa merek minyak pelumas." Jurnal INTEKNA: Informasi Teknis dan Komersial 14.1 (2014).

Sodikin, I., Triyono, J., (2014), "Desain Penguat Pertumbuhan Tanaman untuk Meningkatkan Produktivitas Hasil Pertanian di Industri Herbal Kecil", Prosiding Simposium Nasional RAPI XIII, Universitas Muhammadiyah Surakarta, Desember 2014.

Sugiyono. 2014. Metode Penelitian Kuantitatif, Kualitatif, dan Kombinasi (Metode Campuran). Bandung: Alfabeta.