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FORM AND LONG PIPE SPIRAL EFFECT FOR THE TEMPERATURE AND EFFICIENCY IN MINI BOILER

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ABSTRACT

The researchers conducted a study on the modification of the pipe in the boiler mini spiral pipe shape with a length of 196.8 cm pipe. By purpose to increase efficiency and temperature that would be generated by a mini boiler and also to determine the shape and length of pipe that is better for use in mini boiler. Results of the testing showed that the temperature rise had passed through the pipe superheater, on the model of spiral pipe an increase in temperature of 10,92 ° C with a steam temperature of 277,62 ° C, while the temperature of incoming steam coming out of the pipe superheater at 288.54 ° C. Researchers previously known to occur at temperatures of 16,6 ° C rise in temperature of incoming steam superheater piping temperature of 267,4 ° C and 284 ° C steam out. Testing for heating water in the boiler mini was conducted for 90 minutes. Spiral pipe temperature value is better than the previous penilitian pipe and the efficiency in the can on mini boiler which uses the spiral pipe is equal to 14,957%, while in the previous study only 5,63%.

Keywords: temperature, efficiency, boiler

1. INTRODUCTION

One result of the high rate of population growth in the region is the rising needs of electric power in the area. That is because every individual has a need for the use of electrical energy by a certain quantity, so that the increase in demand and the need for electrical energy becomes a major problem. electrical energy supply crisis go hand in hand with the crisis of fossil fuels such as petroleum, natural gas, and coal. Electrical energy crisis with fossil fuel crisis occurred because many power plants using fossil fuels as its primary fuel.

To reduce the number of power plants and fossil fuel energy, we can use other alternatives such as the use of the potential of renewable energy and also easily around us and daily life - today. One of the potential of renewable energy is biomass energy waste wood sawdust. One reason why the author created a tool to reduce the use of fossil fuels by making use of alternative energy, especially biomass energy. So it can use alternative energy is becoming a solution to the growing crisis of supply of electric energy in Indonesia.

Wood sawdust can be used as fuel to heat the mini-boiler where steam will be generated from the combustion can be used again to drive a turbine simple and can further generate electrical energy.

The system used in this tool is similar to the workings of the boiler where the combustion heat transferred to water until it becomes heated water / steam but steam generator system at the factory are pumps for pumping water into the boiler while the tool is not contained pump. The steam generated will go to the pipe to be heated back which serves to convert the saturated vapor into steam further.

In testing tools (Ismail Thamrin, 2010), there has been a drain pipes for steam, but the installation of the pipe when tested vapor state is still in wet conditions with a temperature of 197.1 ° C with a testing time of 70 minutes and fuel sawdust still stuck in the pipeline for the steam produced is

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still wet. So the authors would like to modify the tool by replacing pipes that already exist by using pipes with a size of 0.5 inches which is made in a spiral shape model and using a pipe with a length of 196.8 cm for comparison with pipes that previously had been used which is more efficient and implemented in order to generate steam to dry better. In this study, researchers aimed to determine the length and shape of the pipe which is better, helped make the technology useful tool for rural residents who need electricity as well as to increase the efficiency and mini boiler temperature.

2. METHODOLOGY/ EXPERIMENTAL

Mini boiler tool created as a system of steam power plants to generate electricity that turns the turbine to drive the generator. This tool has a combustion chamber where the combustion chamber is in the middle of the boiler. There is also room to refill the water to be heated and in addition to these tools made economizer heat the water that is the use of heating is done on the boiler. From the above it also created a tool box powered fuel pipe toward the combustion chamber to put fuel in order to continuously is not difficult in the delivery of fuel at the device. The existence of a safety valve to keep - keep if the steam produced in excess of limits cause damage to the tool. In a box plus fuel pipelines also throwers fuel vapor. Amid the combustion chamber created a pipeline that would like to go through the steam that is heated with steam passes intended that it can be reheated so that the output temperature is higher or referred to the reheater.

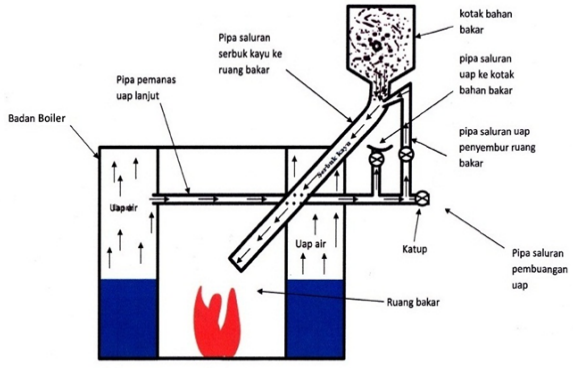

Figure 3.1. Scheme of Boiler Mini

Mini boiler is made of 2.5 mm thick steel plate with a size Length x Width x Height = (80 x 80 x 60) cm. Amid these tools is the combustion chamber while hand side - next to it there is space for the filling of water to generate steam. The steam generated by the combustion going through a pipe located in the middle combustion chamber so that steam through the tube can be reheated and produce dry steam (superheated). That comes out and drives a turbine to drive an electric generator.

3. RESULTS AND DISCUSSION

The testing process is done by using the model forms spiral pipe measuring 0.5 inches with a length of 196.8 cm. Tests carried out five times to obtain more accurate data. Here is the initial parameters before melaksanankan the research process:

1. The mass of water in the boiler: 83.7 kg Mini boiler 2. Size: 80 cm x 80 cm x 60 cm
2. The length of the spiral pipe: 196.8 cm
3. The diameter of the pipe: 0.622 in = 1.579 cm
4. The outer diameter of the pipe: .840 in = 2.133 cm

Table 3.1 Value Average Test Results

Pengujian	Massa air		Suhu air	
	Sebelum (kg)	Sesudah (kg)	Sebelum (°C)	Sesudah (°C)
Pipa Spiral	83,7	73,32	29,1	100
Pipa 2	83,7	73,65	28,12	100

Pengujian	Massa bahan bakar (kg)				Kecepatan aliran (m/s)	Temperatur uap pada rongga *boiler* (°C)	Temperatur uap yang keluar *boiler* (°C)	Kecepatan putaran turbin (RPM)
	Kayu		Serbuk gergaji					
	Sebelum	Sesudah	Sebelum	Sesudah				
Pipa Spiral	30	5,68	3,5	2,06	18,48	277,62	288,5	508
Pipa 2	30	5,12	3,5	2,2	17,34	267,4	284	486,8

Table 3.2. Table average yield on the cavity temperature steam boiler

Pengujian	Temperatur uap pada rongga *boiler* (°C)								
	Waktu (menit)								
	10	20	30	40	50	60	70	80	90
Pipa Spiral	78.76	114.18	135.66	160.9	178.8	242.62	277.62	231	189.9
Pipa Persegi	81.94	116.84	136.72	155.18	170.85	230.2	267.4	224.4	190

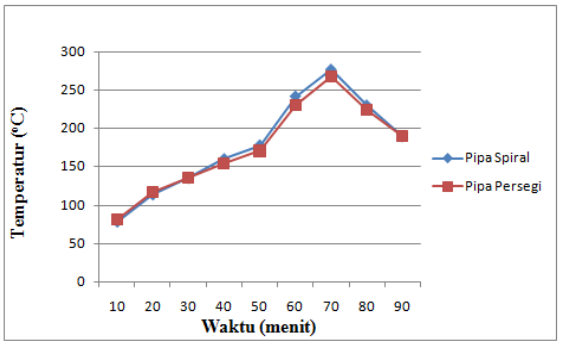

Figure 3.1 Graph incoming steam temperature comparison between spiral pipe and pipe square models

In the graph above shows that the ratio of incoming steam temperature on the boiler superheater pipes with pipe spiral shape and temperature steam superheater pipes enter the square models look termperatur vapors enter the spiral pipe is 277.62 ° C while the temperature of the steam enter the square pipe is 267,4oC

Table 4.3. The results table average temperature of steam coming out of boilers

pengujian	Temperatur uap yang keluar dari *boiler* (°C)								
	Waktu (menit)								
	10	20	30	40	50	60	70	80	90
Pipa Spiral	105.24	127.82	158.1	242.6	267.9	279.6	288.5	246.4	231.8
Pipa Persegi	108.5	130.06	159.56	237.8	256.4	269.8	284	238.6	223

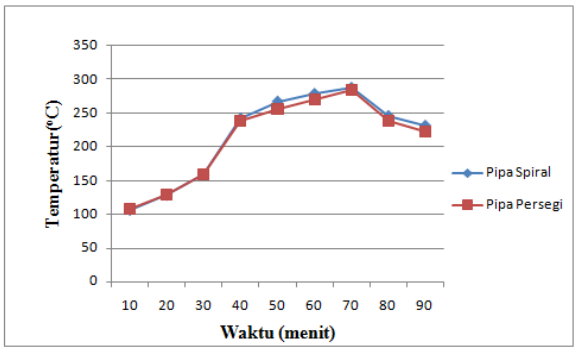

Figure 4.2 Graph exit steam temperature comparison between spiral pipe and pipe square models

In the graph above shows that the ratio of the temperature out on the boiler using a pipe with a spiral shape and temperature of the steam out on the pipe 2 there is an increase in temperature because the maximum temperature, the vapor out on the spiral pipe is 288.54 ° C while the temperature of the steam out on the pipe 2 is 284oC. This is because the superheater pipes with a spiral shape has a length of 196.8 cm undergo a heating process is longer than the superheater pipes square models with a length of 182 cm.

Table 3.4. The results table of data on the efficiency of the boiler

Percobaan	Efisiensi pada *boiler* (%)
Pipa Spiral	14,957
Pipa Persegi	5,63

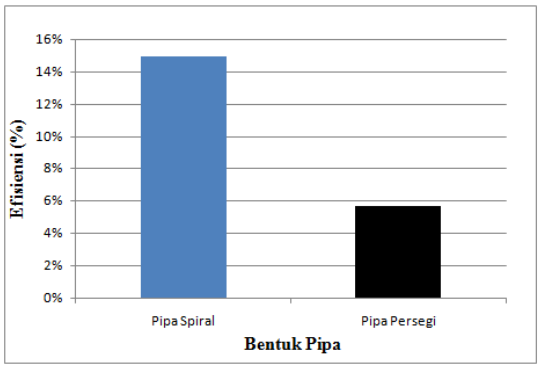

Figure 4.3 Graph efficiency of spiral pipe and pipe Square

In the graph above shows a comparison between the boiler efficiency boiler superheater pipe with a spiral shape and boiler superheater piping models that use the square. The efficiencies generated by the boiler superheater pipe with a spiral of 14.957%, while the efficiency generated by the boiler superheater pipes square models amounted to 5.63%.

4. CONCLUSION

Based on research that has been conducted on a mini boiler superheater pipes modified to form the spiral pipe and the length of pipe that have been studied previously different conclusions can be drawn as follows:

a. The length of pipe superheater affect the temperature of steam generated by the mini boiler, the longer the pipe, the resulting temperature is also higher, because the longer the process of heating the steam coming into the superheater pipes.

b. Superheater pipe length is more optimal to raise the temperature obtained in this study is the

length of pipe with a spiral shape that has a length of 196.8 cm resulting vapor temperature reached 288.4 ° C and boiler efficiency gained by 14.957% greater than the length of pipe square models obtained amounted to 5.63%.

Suggestions for this research is done by modifying the pipe in the boiler mini by adding length and change the shape of spiral pipes made of steel and thus do not have the elbow, to study further recommended fuels such as wood merawan and wood Racok in multiply or replaced by other fuels in order to heat the incoming larger and so the steam can mengasilkan better and added pressure gauge in order to find out pressures.

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