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Jan 12, 2022
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ANALYSIS OF THE HARDENING PROCESS AGAINST THE MECHANICAL STRENGTH OF BRASS METAL

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Abstract

Carburization is done by heating at a high enough temperature at austenite temperatures in an environment that contains active zinc atoms, so that the active zinc atom will diffuse into the surface of the brass and reach a certain depth. After the fuscous is diffused, followed by a rapid cooling treatment (quenching), so that a harder surface is obtained, but clay and tough the middle. The method is done by heating the metal material until the temperature of 600^0C,700^0C, 800^0C with a length of 3 hours, austenization and holding it at that temperature takes a period of about 10 minutes and then cooled by the method of cooling minerals containing the elements Natriun, Potassium, Calcium, Magnudaraium, Bisengat, Chloride, Nitrate and Sulfate. Carburizing procedures applied to metals aim to obtain a chemical composition with high levels of hardness. Use of different heating temperatures in carburizing procedures to obtain high hardness with different levels of shock. This research is experimental research. The Rockwell Method's hardness test conforms to JIS Z 2245:2011 standards with the Affri 206 RT test and the composition test according to ASTM E 415 – 15 using spectro TXC03.

Keywords : Quenching, Carburizing, chemical composition

1. Introduction

Brass is one type of metal that is widely used with copper as the main element about 60% and zinc as one of the bases of the mixture about 40%. In addition, brass also contains other elements such as sulfur (S), phosphorus (P), silicon (Si), manganese (Mn), and so on whose numbers are limited. The properties of brass in general are strongly influenced by zinc prudaraentase and microstructure. The microstructure of brass is affected by heat treatment and brass composition. In the manufacturing industry the production of a spare part must have strength and withstand wear with high value, for that many anticipate it by using soft brass this aims to facilitate and save costs, which later the results of the workmanship continued to the stage of carburizing and quenching so that the results of the workmanship of spare parts are desired in terms of the durability and strength of the parts themselves[1].

Zinc with other mixed elements in brass forms a carbbid that can add hardness, gorudara resistance and temperature resistance. The difference in the percentage of zinc in a mixture of brass metal becomes one way of classifying brass. Brass is usually clarified as a copper alloy. The color of brass varies from dark reddish brown to silvery yellow light depending on the amount of zinc levels. Zinc affects the color of brass more. Brass is also stronger and harder, but not as strong or hard as steel. Brass is very easy to form in many forms, a good conductor of heat, and is generally resistant to corrosion from salt water and air. Because of these properties brass is mostly used to make tube pipes, screws, radiators, musical instruments, ship applications, and catridge casings for firearms[2].

Pack carburizing is the process by which carbon monoxide derived from solid compounds decomposes on the surface of metals into newborn carbon and carbon dioxide. Newborn carbon is absorbed into the metal, and carbon dioxide immediately reacts with the carbon material present in the solid carburization complex to produce fresh carbon monoxide. The formation of carbon monoxide is enhanced by energizers or catalysts, such as barium carbonate ($BaCO_3$), calcium carbonate ($CaCO_3$), potassium carbonate ($K2CO_3$), and sodium carbonate ($Na2CO_3$), which are present in carbursation complexes. Energizer facilitates the reduction of carbon dioxide with carbon to form carbon monoxide. Thus, in a closed system, the amount of energy cannot change. Carbursement continues as long as enough carbon is present to react with excess carbon dioxide[3].

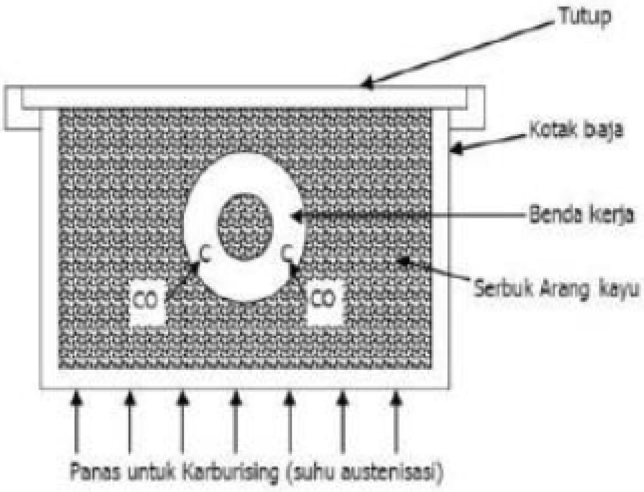

Figure 1. Carburizing Pack Process

CO2 and CO. Co gas will react with the steel surface forming carbon atoms which then diffuse into the steel[4].

2. Methods

This research is conducted in accordance with the research framework to fit the stages of the research.

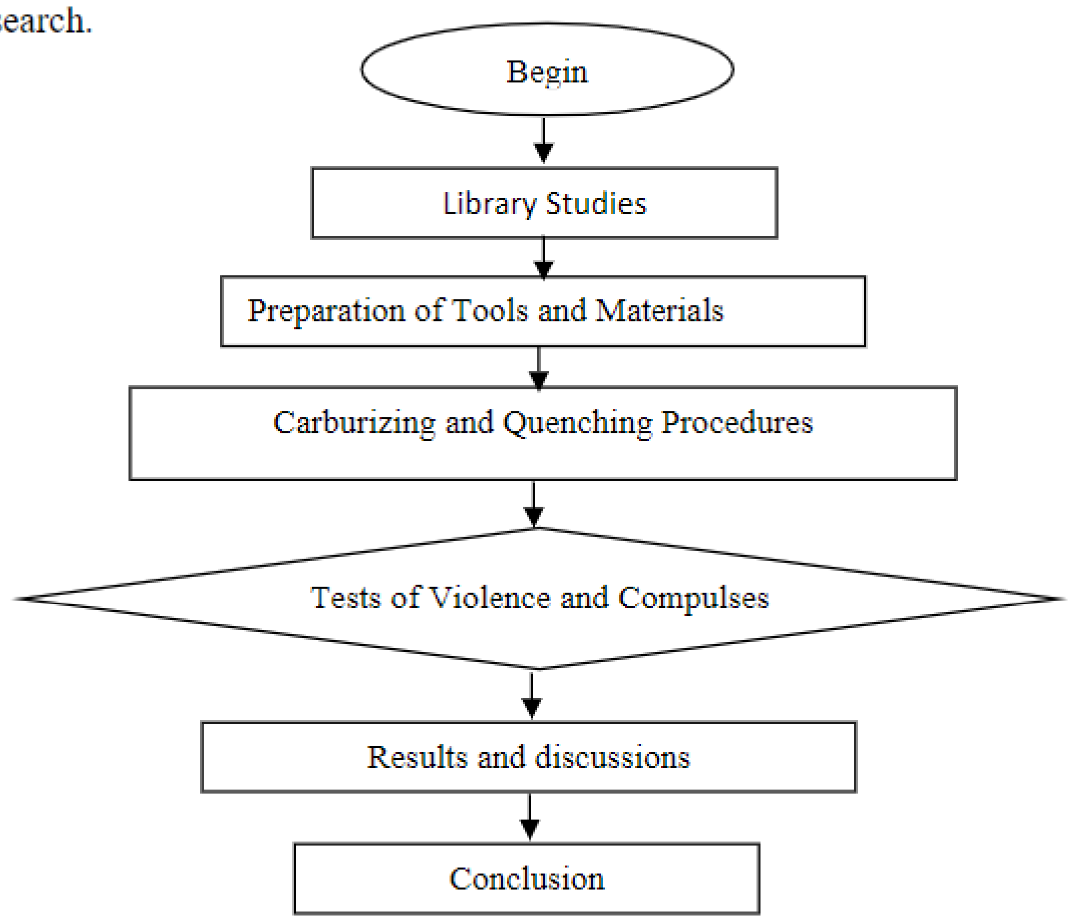

Figure 2. Research Flowchart.

3. Results

Material hardness testing results. The results of the test use the Rockwell test to determine the hardness value of a material by testing the material or species before and after the carburizing and quenching process.

NO	Point Cooler	Hardenes Value Material (HRC)			
		Point 1	Point 2	Point 3	Average
1	Oil	54	52	53	53.00
2	Air	56	57	54	55.67
3	Water	57	58	56	57.00

The following is a summary data based on the processing of data from heat treatment, chemical composition testing and testing of mechanical properties of materials in the study can be seen in table 4 below:

Table 2. Percentage of changes in mechanical properties and chemical compounds

No	Decryption	Proentase perubahan (%)		
		Oil	**Air**	**Water**
1	The Value of Violence	55,882%	63,735%	67,647%
2	Element C	8,163%	7,872%	25,364%
3	Element Si	73,913%	8,696%	2,174%
4	Element Mn	33,641%	4,455%	5,991%
5	Element P	7,143%	64,286%	42,857%
6	Element S	83,333%	94,444%	88,889%
7	Element Cr	99,936%	99,948%	99,951%
8	Element Ni	99,853%	99,872%	99,872%
9	Element Mo	3,814%	31,356%	13,136%
10	Element Al	10,000%	10,000%	15,000%
11	Element Cu	88,571%	88,571%	88,571%

4. Conclusion

The conclusion of the results of heat treatment hardness testing with hardening resulted in an increase in violence, namely in the absence of heat treatment 34 HRC to 57 HRC up 67.647% with water-cooled hardening, 55.67 HRC up 63.735% with air-cooled hardening, 53 HRC up 55.882% with oil-cooled hardening.

5. Acknowledgments

Thank you to Harapan Bersama Polytechnic for supporting this research.

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