Specimens with pack carburizing treatment at temperature 925 ^{0}C and soaking time 6 hours have the most surface hardness number compared with this initial material are shawn in Figure 3. Due additional of bamboo carbon and supported by BCBP as an energizer so that carbon diffuses faster into the mterial. The composition 25% BCBP in carburizing agent resulted a surface hardness number is 650 Kg/mm^2. It's the most surface hardness number after the pack carburizing treatmen at temperature 925 ^{0}C and soaking time 6 hours. This indicates that the pack carburizing process is influenced by energizer which speeds up a process. Calcium content with the addition of 25% BCBP at carburizing agent most effective compared to other processes. It's shown in Figure 3.

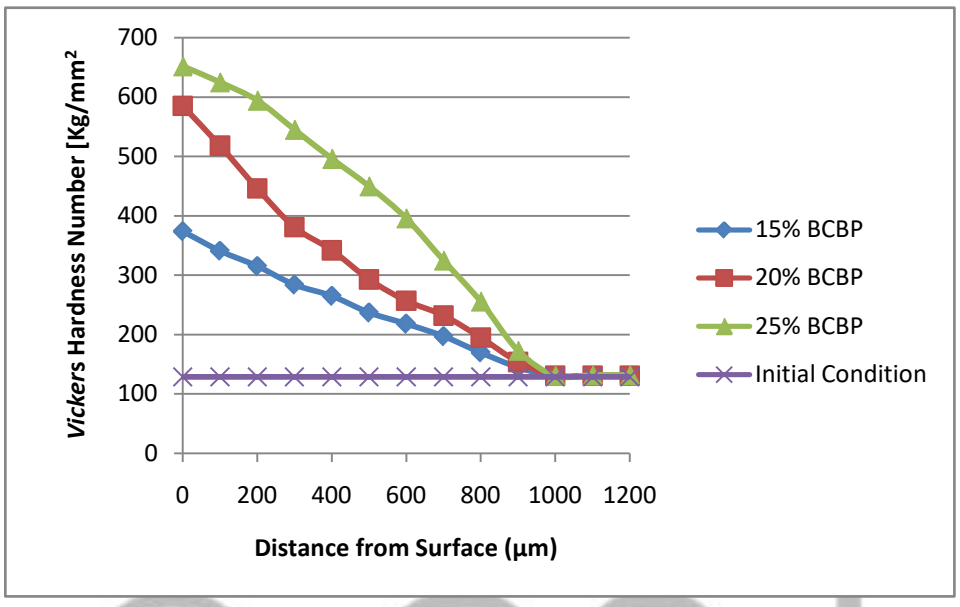


Figure 3. Influence BCBP on pack carburizing at time 925^{0}C and soaking 6 hours

Micro Structure Specimens on Pack Carburizing

The result of micro structure observation of the initial material before pack carburizing treatment can be seen in Figure 4.

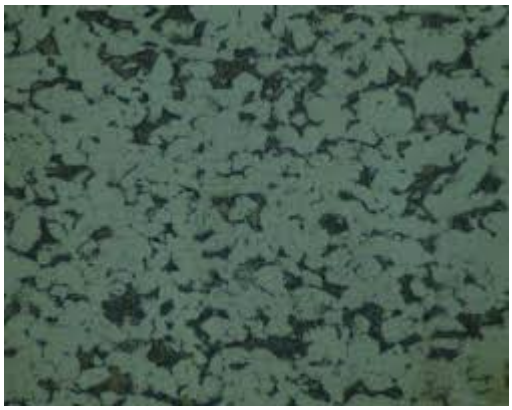
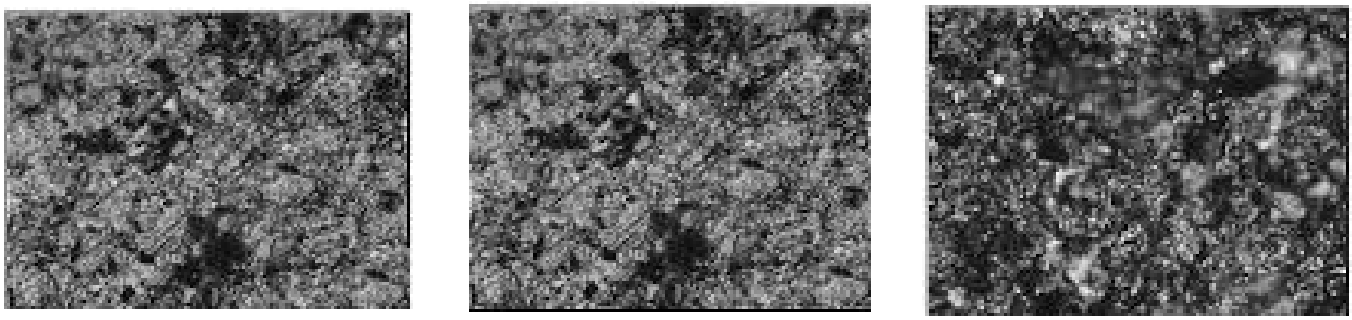


Figure 4. Initial material micro structure of SS 400 steel

Based on Figure 4 show that ferrite (light-colored and white) and pearlite (dark and black) are larger in size than carbides. The carbide will enlarge in case of heat treatment of the workpiece (low carbon steel). Then the ferrite structure is more dominant than the pearlite structure are fewer in number, so that the surface hardness number of the initial material are lower. This occurs because there is no addition of carbon element given to the initial material and relating to to the carbon content contained in the structural steel SS 400 of 0.168% C. The observation of the microstructure of specimen with pack carburizing treatmen at temperature 925^0 C,soaking time 6 hours, with vriations of addition 15%, 20%, 25% BCBP in carburizing agen were showed in Figure 5 .



a b c

Figure 5. Micro structure of the specimens with pack carburizing treatmen at temperature 925^0 soaking time 6 hours
a. 15%BCBP b. 20%BCBP c. 25%BCBP

At the Figure 5 it is shown that the number pearlite structures are increasing and the grain size is evenly distributed along the penetration, although there is still a lot of ferrite. The greater the percentage of BCBP in carburizing agent, the more pearlite micro structures are formed, the finer and smaller the grain size. Refered in Figure 5a, 5b, and 5c. The increased amount of pearlite more than the microstructure of the initial conditions may occur due to the effect of adding a carbon element to the specimen during the diffusion process of carbon interaction with of pack carburizng the material at temperature 925 ^{0}C and soaking time 6 hours. The addition of BCBP with a concentration of 25% as an energizer accelerates the process of carbon diffusion into the steel so as to form more pearlit structures. So the surface specimen becomes harder than before and also influenced by temperture and soaking time so that it can change the physical properties of structural steel SS 400. The result of observation of microstructure from material that has been pack caburizing with ratio of 75% BC and 25% BCBP at temperature 925 ^{0} C and soaking 6 hours can be seen in Figure 5c.

Chemical Composition Test Result

Table 3. results of chemical composition test before treatment (Raw Materials SS400 steel) and after pack carburizing treatment (on optimum parameter) at a temperature of 925 ^{0}C, soaking time 6 hours and addition 25% BCBP in carburizing agent. From the data in Table 1 above, the composition test results on specimens before and after treatment, there was an increase in carbon content in which the raw materials contained 0.168% C while the carburizing on the surface according to the composition test contained 0.78% C. This proves that carbon has entered the surface of low carbon steel

Table 3. Results of chemical composition

No	Name of Element	Raw Material % average	After Pack Carburizing % average
1	Fe	98.342	97.480
2	C	0.168	0.74
3	Mn	1.400	1.400
4	P	0.045	0.065
5	S	0.045	0.065
6	Si	0	0,025

CONCLUSION

The surface hardness number of low carbon steel SS400 with pack carburizing treatment were influenced by the temperature of carburizing, soaking time and the ratio percentage between BC and BCBP in the carburizing agent. powder and media quenching. The sample pack carburizing with the addition of 25% BCBP at 925 °C temperature and soaking time 6 hours are considered the most effective pack carburizing treatmen of structural steel SS400. Because it resulted the largest asurface hardness number, that

is 650 Kg/mm^2. Based on observation of micro structure, there is a more of pearlite after treatment than the initial condition. Conclusion BCBP can replace the function of $BaCO_3$ and Na_2CO_3 as energizer on pack carburizing surface treament

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