

Fig. 6. The Correlation between Holding Time and Hardness

In Figure 6 showed the longer the holding time, the higher the hardness value. The highest hardness value was obtained at 60 minutes of holding time and 850°C of temperature. The increase of hardness in the length of 20 minutes of holding time is about 13.55-14.32 HVN.

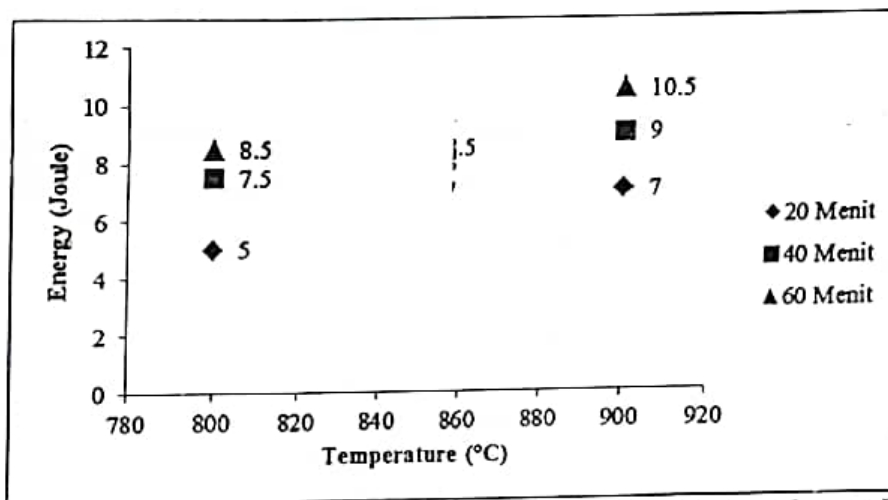


Fig. 7. The Correlation between Temperature and Holding Time on Impact Energy

Figure 7 showed the correlation between temperature and energy. Energy in this context refers to the energy that required to break the specimen test. At 800°C, 850°C, and 900°C of temperature and 20 minutes of holding time, the amount of energy required are respectively 5 Joules, 7 Joules, and 7 Joules. At this holding time, the higher the temperature, the greater the energy required to break the specimen test. Due to the greater energy required, the samples are more resilient because the great value of impact energy [Widya Mukti S 2007].

Conclusion

From the research of the influence of austenisation temperature and holding time on Ni-Cr-Mo alloy steel before and after heat treatment at 800°C, 850°C, 900°C of temperature and 20, 40, 60 minutes of holding time, it can be concluded that:

1. The micro structures before the heat treatment are ferrite and pearlite, while after the treatment is the formation of martensite phase.
2. After the heating process, there were compounds scale that consist of FeO (wustite), Fe₃O₄ (magnetite), and Fe₂O₃ (hematite). The lowest scale thickness is 47.81 μm at 800°C of temperature and 20 minutes of holding time, while the highest scale thickness is 108.86 μm at 900°C of temperature and 60 minutes of holding time.