

Abstract

This study is concerned with the effect of polymer quenching on some properties of selected alloys of steel which are low alloy steel (St37), tool steel (X155) and austenitic stainless steel (316L). Three different operations of heat treatment have been done including quenching, quenching with tempering and quenching with freezing. A comparison has been done between the effect of polymeric quenchant i.e. water solution of poly vinyl alcohol (PVA) and the conventional quenchants represented by distilled water, engine oil and food oil in having better properties. Tests have been done to the original and heat treated specimens which were Brinell hardness test, wear rate test as a percentage of weight loss and thermal conductivity test. Results had revealed that the heat treatments generally enhance the properties especially the treatment of quenching with freezing, because this treatment gave the best hardness for the low alloy steel (St37) by using the polymeric quenchant which contain (0.6 gm/l) PVA and for the austenitic stainless steel (316L) by using both distilled water and the polymeric quenchant which contain (1 gm/l) PVA. Also this treatment gave the lowest percentage of weight loss for the tool steel (X155) by using the polymeric quenchant which contain (0.6 gm/l) PVA and for the austenitic stainless steel (316L) by using engine oil as quenchant, and in most cases the polymeric quenchants gave better results than the conventional quenchants. Also a simulation to the results of the experimental work has been done by using the Visual Basic language, and the results had proved the compatibility between the experimental and the theoretical sides and also gave us an indication to the specimens' behaviour at different concentrations of polymeric quenchants over the range used in the experimental work, beside the great possibilities of the program in display the experiments which help in training engineers in heat treatment and testing fields.