The effect of depth of cut, table speed and cooling method on temperature, surface roughness and chip forming mode in grinding AISI 1045 steel

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ABSTRACT

Basically, surface grinding is mechanical process that result high temperature and chemical reaction on surface work piece. On this process, the heat energy has been released along of the surface. A part of the energy would be transferred to chip and the other would be continued to the environment by grinder and work piece. Use of coolant on the surface of the object will be function as lubricant, which can reduce friction between grinder and the object. Moreover, in grinding process, cooling can effect on temperature and surface roughness, with chip forming mode.

This research used factorial design 3x3x3 to evaluate the effect some variables process such as table speed, depth of cut also cooling method on temperature, surface roughness and chip forming. High pressure wet coolant, high pressure air and air in room temperature are kinds of cooling method in the process, the result of experiment would be analysis by ANAVA. Than, the chips are kinds of cooling method in the grinding process would be investigated by Scanning Electron Microscope (SEM).

The experiment shows that temperature in wet cooling method would be same as in high pressure air method, but it is lower than by air of room temperature cooling method. The surface roughness of the work piece in wet cooling method is the lowest. The faster table speed of grinding machine caused that the lower of the grinding temperature and the work piece surface roughness. Moreover, the higher depth of cut would cause the higher grinding temperature and surface roughness. The chips that resulted in air room temperature and high pressure air cooling method were lamellar and spherical, they were caused by shearing, rubbing and exothermic oxidation. However, the chip form in high pressure wet cooling was blocky particle, it was caused by shearing and fracturing.

Keywords : surface grinding, table speed, depth of cut, cooling method, grinding temperature, surface roughness, chip forming.