EXPERIMENTAL INVESTIGATION ON MODELLING OF SURFACE GRINDING PROCESS: A GREEN MANUFACTURING APPROACH

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ABSTRACT

In today's scenario, the major focus is on the wellbeing of mankind and environment. For this, in the field of manufacturing, every possible attempt has been made to make the manufacturing processes environment friendly and safer for the health. This gave birth to a unique approach of Green manufacturing. Green manufacturing involves the use of energy efficient, non-polluting techniques for making the products. The concept of Green manufacturing has been emerged as a result of the efforts of technologists for providing ecological conditions on the shop floor. The main source of health hazards in machining operations is cutting fluids. These fluids are composed of minerals and synthetic compounds. A number of methods like Minimum Quantity Lubrication (MQL), dry machining, cryogenic machining have been suggested to eradicate the pollution problems. In the present work, the concept of green manufacturing has been applied on surface grinding process, which is one of the main processes leading to aerosol or particulate pollution. There are some research gaps to achieve the objectives of Green Machining processes

In this study, some parameters like cutting force, specific energy, aerosol generation and surface roughness are experimentally monitored, and compared with the existing theoretical model. In the present work, a model is referred from Stephen Malkin's Grinding Technology (1989). From the plots of experimental data and theoretical model data, it was observed that the model is significant up to much extent with today's manufacturing scenario. It shows that dry machining, which is considered to be most ecofriendly, leads to high aerosol generation, high surface roughness and consumes more force and energy. On the other hand, the flood and MQL methods are somewhat comparable to each other but overall the MQL method leads the other two techniques in all the three spheres of mechanical, quality and health considerations.