ANALYSIS OF NOZZLES IN ABRASIVE WATER JET MACHINING

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Abstract

An "Abrasive water suspension jet (AWSJ)" machining process utilization increasingly in industrial applications. It is a non-traditional machining process and involves multifarious mechanism. A nozzle is required to execute abrasive water suspension jet machining for matter removal with the help of very high velocity of water suspension jet. The main problem of AWSJ machining process is nozzle wear during the process. The wear depends on various parameters such as water jet characteristics, abrasive size and nozzle geometry, etc. The nozzle wear is not fully understood experimentally; also the uncontrolled nozzle wear can affect the effectiveness and surface finish obtained through the "AWSJ" machining process. This analysis is totally depends on nozzle geometry and nozzle material is taken same for all cases. This analysis can be highly helpful for understanding nozzle wear during the "AWSJ" machining process [1], [2].

Keywords: nozzle, abrasive, water, jet, machine, geometry

Introduction

An "Abrasive water suspension jet (AWSJ)" machining process is a non-conventional machining process, which has been used in industrial applications. AWSJ machining process operates at relatively high-pressure and focused stream of abrasive particles carried by high pressure water is made to impinge on the work material is removed by erosion by high velocity Abrasive particles [3]. In abrasive water suspension jet machining process pure water (tap water) is used. In AWSJ machining in which suspended abrasive particles in liquid medium called slurry is pressurized and expelled through the nozzle. Slurry is accelerated through a fine orifice to produce a high velocity stream, which is capable of machining a range of materials. Benefit of AWSJ over AWJ is the generation of stable jet with higher power density, which leads to efficient energy transfer to abrasive particles. Nozzle wear is a complex phenomenon, which is not only influenced by the material properties of the nozzle but also by the nozzle geometry and operating parameters. Hardness and toughness of nozzle material influence of nozzle wear. An empirical model was developed for the prediction the wear. A Beautiful attempt to decrease the nozzle wears in AWSJ cutting [4], [5].

Result and Conclusion

It is expected that higher wall shear stress will induce higher wear of the wall, and it is concluded from analysis nozzle geometry is highly effect the wear rate and efficiency of AWSJ machining process. The model provides a lot of results to the user and it can be useful in studying the overall water suspension jet process and for the optimization of the nozzle geometry. In future analysis of multistep nozzle in AWSJ machining can be done with the help of CFD software package.

References

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