

A Review on: Design and Analysis of Diverter Mechanism Based Noise Suppressor Using MQL Method

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Abstract: Minimum quantity lubrication is a new concept in lubrication methods wherein a metered quantity of lubricant is delivered by the MQL system to the machine under consideration. Noise generated from this pump is the main problem in industries. Pump noise can be categorized into two basic classes namely the audible noise that can be heard and needs to be controlled to maintain comfort level in the industry / workshop where this device is used and secondly the pump noise in form of pulsations of flow which is more significant because it is one of the major cause of inaccuracies in the metered quantity of fluid. The proposed design is developed for R-11 pumping element to be used in one such MQL pumping unit. The paper also discusses the effect of change in discharge from the pump on the audible noise from the system.

Index Terms: MQL, Machining, Diverter Mechanism, Noise

I. INTRODUCTION

Minimum quantity lubrication is a new concept in lubrication methods wherein a metered quantity of lubricant is delivered by the MQL system to the machine under consideration. These systems which are normally employed piston pumps for application due to the accuracy of the piston pump in delivering the exact quantity of fluid. Pump noise can be categorized into two basic classes namely the audible noise that can be heard and needs to be controlled to maintain comfort level in the industry / workshop where this device is used and secondly the pump noise in form of pulsations of flow which is more significant because it is one of the major cause of inaccuracies in the metered quantity of fluid.

II. LITERATURE REVIEW

The Authors Pooja S. Patel [1]: Minimum quantity lubrication is a new concept in lubrication methods wherein a metered quantity of lubricant is delivered by the MQL system to the machine under consideration. These systems normally employ piston pumps for application due to the accuracy of the piston pump in delivering the exact quantity of fluid. But the noise generated from this pump is the main problem in industries. The proposed design is developed for R-11 pumping element to be used in one such MQL pumping unit. The purpose of the paper is to discuss the design and analysis of two critical components namely the neo-polymer membrane (Earlon-66) and the diverter that play a significant role in noise reduction. The paper also discusses the effect of change in discharge from the pump on the audible noise from the system.

Sumit A. Nehere [2]: Hydraulic pump is the main source of pulsations and vibrations. While pump manufacturers have reduced noise to design goal, every pump still produces some ripple - the pump manufacturers' term for pulsations. Ripple causes noise generation in pumps. To get a reduction of noise in pumps hydraulic conductors should be reviewed. Somewhat surprisingly, one factor that can contribute much to the noise level is the improper use of a hydraulic hose. Recent research shows that they could take an average of 5 dB (A) out of a standard power unit merely by changing the configuration of the hydraulic hose. Introduction of compressible medium with an incompressible medium of hydraulic fluid will show a reduction in hydraulic pulsations.

Nourredine Boubekri [3]: The aim of this article is to Review the relevant literature in machining using MQL mainly as it related to environmental, and health issues, and outline future potential research in this technology. The results show that the process of mist particles generation and their physical characteristics are to be considered for a whole class of machining processes and machining conditions. The resulting impact of the findings as related to machine and work place design is yet to be determined.

Kedare S. B. [4]: In this paper, the effects of three parameters, namely, cutting speed, feed and depth of cut were studied upon Surface Finish during the milling operation. The end milling performed under the Minimum Quantity Lubrication condition (900ml/hr.) by using end mill cutter and compared with conventional flooded lubrication (2liter/min). The comparative effectiveness was investigated in terms of surface finish. The surface finish was seen to be improved by 27%. The findings of this study show that MQL may be considered to be an economical and environmentally compatible lubrication technique.

III. LUBRICANT FOR MINIMUM QUANTITY LUBRICATION

Fatty alcohols which used for machining processes in which the separation effect rather than the lubricating effect is of prime importance (avoidance of built-up edges). An example of this is the machining of non-ferrous metals. Fatty alcohols have excellent biodegradability which is toxicologically harmless and likewise, are rated as non-hazardous to water.

Smell -The smell of the lubricant is not inconsequential. Spraying the lubricant can the smell to be intensified.

Spray ability- The lubricant should spray easily and, especially with 1-channel systems, be able to produce a stable aerosol (oil-air mixture).

Additives-The additives can be adjusted to the processing requirements, mainly when processing non-ferrous metals and difficult-to-cut steels.

Viscosity range -Practical experience shows the best results with lubricants (ester or fatty alcohol) are gain at a viscosity range of 15 to 50 mm²/s and in some cases up to 100 mm²/s at 40 °C. Higher viscosity limits can be discussed with the MQL system manufacturer (check device suitability for spray ability). In general, the MQL system and lubricant can be compatible with each other.

Corrosion protection-A check can be made as to whether the thin MQL residual film on the workpiece after machining offers corrosion protection that emits the requirements or whether additional corrosion protection is needed.

IV. CONCLUSION

Minimum quantity lubrication is a new concept in lubrication methods wherein a metered quantity of lubricant is delivered by the MQL system to the machine under consideration. These systems normally employ piston pumps for application due to the accuracy of the piston pump in delivering an exact quantity of fluid. But the noise generated from this pump is the main problem in industries. Minimum Quantity of Lubrication machining refers to the use of a small amount of cutting fluid, typically in the order of 500 ml/hr. or lower to which are about three to four orders of magnitudes lower than that used in flooded lubricating conditions, MQL technique consists in atomizing a very small quantity of lubricant in an airflow towards the cutting zone.

REFERENCES

- [1] Pooja S. Patel, S. P. Mogal "Design Analysis and Testing of Diverter mechanism based noise suppressor for single piston pump system for minimum quantity lubrication application" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 03 Issue: 12 | Dec -2016.
- [2] Sumit A. Nehere, Milind S. Ramgir "Design, Development & Analysis of Hydraulic Noise Suppressor" International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Index Copernicus Value (2015).
- [3] Nourredine Boubekri, Vasim Shaikh "Minimum Quantity Lubrication (MQL) in Machining: Benefits and Drawbacks" Journal of Industrial and Intelligent Information Vol. 3, No. 3, September 2015.
- [4] Kedare S. B. Borse D.R. and Shahane P. T. "Minimum Quantity Lubrication (MQL) on Surface Roughness of Mild Steel of 15HRC on Universal Milling Machine" 3rd International Conference on Materials Processing and Characterization (ICMPC 2014).

