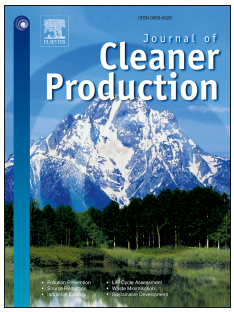
Accepted Manuscript



Environmental friendly cutting fluids and cooling techniques in machining: A Review

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PII: S0959-6526(14)00799-9

DOI: 10.1016/j.jclepro.2014.07.071

Reference: JCLP 4563

To appear in: *Journal of Cleaner Production*

Received Date: 12 September 2013

Revised Date: 22 July 2014

Accepted Date: 26 July 2014

Please cite this article as: Debnath S, Reddy MM, Yi QS, Environmental friendly cutting fluids and cooling techniques in machining: A Review, *Journal of Cleaner Production* (2014), doi: 10.1016/j.jclepro.2014.07.071.

Environmental friendly cutting fluids and cooling techniques in machining: A Review

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Abstract

Owing to environmental concerns and growing regulations over contamination and pollution, the demand for renewable and biodegradable cutting fluids is rising. In this review paper, an attempt is made regarding of green machining including the cutting fluid type as well as the methods to apply the cutting fluids in machining process. Knowledge of the cutting fluid types and its machining conditions are critically important in order to maximize the efficiency of cutting fluids in any machining process. Generally, heat generation at the cutting zone due to the friction at tool-chip interface, and friction between the clearance face of the tool and work-piece is always the decisive factor on the surface quality of the work-piece. A good understanding of the methods to apply cutting fluid at the cutting zone may significantly reduce the heat generation in machining and thus improve the surface roughness. Surface roughness and tool wear are always used as a quality indicator of a finished or semi-finished product. This paper reviews the developments in bio-based cutting fluids by using various vegetable oils and their performances in machining. Undoubtedly, these bio-based cutting fluids have significantly reduced the ecological problems caused by mineral-based cutting fluids. An overview of the cleaner application techniques of dry cutting, minimum quantity lubrication (MQL), and cryogenic cooling is also well presented. These techniques largely minimized the amount of cutting fluids used in machining while providing similar or even better cutting performances compared to wet cooling methods.

Keywords: *Vegetable-based cutting fluids; Dry cutting; MQL; Cryogenic cooling; Cutting fluids; Application methods*