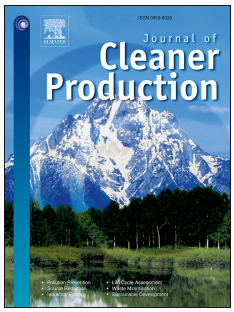
Accepted Manuscript



Dry machining of nickel-based super alloy as a sustainable alternative using TiN/TiAlN coated tool

A. Thakur, S. Gangopadhyay

PII: S0959-6526(16)30342-0

DOI: 10.1016/j.jclepro.2016.04.074

Reference: JCLP 7098

To appear in: *Journal of Cleaner Production*

Received Date: 22 June 2015

Revised Date: 2 February 2016

Accepted Date: 17 April 2016

Please cite this article as: Thakur A, Gangopadhyay S, Dry machining of nickel-based super alloy as a sustainable alternative using TiN/TiAlN coated tool, *Journal of Cleaner Production* (2016), doi: 10.1016/j.jclepro.2016.04.074.

Dry machining of nickel-based super alloy as a sustainable alternative using TiN/TiAlN coated tool

A.Thakur, S. Gangopadhyay*

Mechanical Engineering Department, National Institute of Technology

Rourkela, Rourkela-769008, Odisha, India

*Corresponding author, E-mail: soumya.mech@gmail.com

Phone no: +91 9439096336

Abstract

Surface coating has been used to improve sustainability in machining process. Therefore, the role of advanced tool coatings in curtailing the usage of environmentally hazardous cutting fluid (CF) particularly during machining of difficult-to-cut materials needs immediate research attention. In the present work, Incoloy 825, a nickel-based super alloy, has been machined under completely dry environment using a commercially available multilayer (TiN/TiAlN) coated tool obtained using physical vapour deposition (PVD). Various machinability characteristics with primarily emphasis on cutting force (responsible for consumed cutting energy), tool wear (for tool life) and surface quality (surface roughness) have been compared with those obtained with uncoated tool under conventional flood cooling and minimum quantity lubrication (MQL). The results achieved under both rough and finish modes of machining clearly established the use of PVD coated tool under dry environment as a sustainable strategy for achieving green machining.

Keywords: Cutting force; Temperature; Multilayer coating; Incoloy 825; Minimum quantity lubrication; Tool wear; Surface integrity.