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Experimental investigation of wear characteristics on TiCN-coated AISI 410 steel

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Abstract In this work, the dry sliding wear test of uncoated and multilayer TiCN-coated AISI 410 steel against high carbon steel disc recognized at 2.30267 ms^{-1} sliding speeds and under a three series load of 5, 10 and 20 N at room temperature. On account of the more coherent interface between TiCN and C probably found, there are high hardness and superior wear resistance. Compared to AISI 410 uncoated steel, the presence of C in the multilayer TiCN coatings leads to reduced coefficient of friction and wear loss. The multilayer TiCN coating is characterized by X-ray diffraction analysis, scanning electron microscopy, micro-hardness and pin-on-disc tribometer tests. The more grooving region, pits and ploughing ridge were examined on the worn surface of the AISI 410 uncoated steel. The result shows hard multilayer TiCN-coated particles viewing on the worn surface of the high carbon steel disc.

Nomenclature

V	Voltage
T	Time in min
L	Load in N
TiCN	Titanium carbonitride
COF	Coefficient of friction

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1 Introduction

In modern internal combustion engines, the friction and wear increases in the piston ring contact sliding surface. During high load and high parameters has been made the operating condition of diesel engine more adhesive wear in abnormal for a cylinder liner. Because of this, no reliable lubrication is available in the contact surface forming dry friction. It leads to direct metal contact between the sliding surfaces. Furthermore, the piston ring and cylinder liner contact surface metals are fused and softened. The fusion leads to damage. It was reported that mechanical losses increase due to friction 4–25 % of the total energy consumed [1]. 40–55 % of those total mechanical losses occurred in the power cylinder [2] and generated half of the power cylinder friction losses [1, 3, 4]. Recent studies show that reduction of friction loss is the deposition of coatings and 80 % of the total cost for the protection of metals is related to coating application [5]. Different kinds of coatings have been studied and developed using several types of deposition processes. The capacity of some coatings to be used in severe working conditions can be attributed to the high hardness and wear resistance, as well as a good oxidation and corrosion resistance [6–11]. Coatings provide a way of extending the limits of the use of the materials at the upper end of performance capabilities, by allowing the mechanical properties of the substrate materials to be maintained while protecting against wear, oxidation and corrosion. To evade pollution and to diminish processing cost, new manufacturing dry machining technologies are being performed and consequently the physical vapour deposition (PVD) process is used. PVD is one of the technologies that improve the tool's life and productivity. A coated tool can cut faster, reducing the time of

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