Investigation of Scuffing Resistance of Heat Treated 8625 Alloy Steel under Lubricated Conditions

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Scuffing is a common source of failure for many mechanical components in automobiles. 8625 alloy steel, for example, is commonly used in camshafts, gears, piston pins, shafts, and splines. The purpose of this research was to study the scuffing resistance of non-treated, carburized, nitrocarburized, and carbonitrided 8625 alloy steels. The scuffing resistance of the 8625 alloy steels was determined through pin-on-disk tests. The hardness and microstructure of the disks were analyzed along with investigations using electron microscopy to determine the wear mechanics for each surface treatment. The wear mechanisms were then related to the scuff resistance of the various treatments.

About AERIM

The AERIM program was set up in the department of mechanical engineering at OU to provide meaningful, hands-on, paid 10-week summer research experiences to talented and motivated undergraduate engineering students from across the United States. This program is sponsored by the National Science Foundation and by the Department of Defense ASSURE program and has been funded for the 2006-2008 and 2010-2012 summer periods. The goal of this program is to engage participants in rewarding research experiences that excite and motivate them to pursue careers in scientific and engineering research. Student participants work in teams on automotive and energy-related research projects in mechanical engineering and also take part in other activities such as industrial research lab and facilities tours, meetings with working engineers, conferences and seminars. A total of 37 students from 30 different universities have taken part in the program since its inception in 2006. For more information about the program, please visit http://me-reu.secs.oakland.edu.

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An Investigation of In-Vehicle Rear Seat Computing System Monitor Placement

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The automotive industry is embracing the advancement of personal computers by offering more computing and entertainment options in vehicles. However, the ergonomics associated with such technology have not been thoroughly investigated. Consequently, there are few studies in literature pertaining to ergonomic recommendations for in-vehicle rear seat computing and entertainment systems. This study involves preliminary analyses of monitor placement ergonomics for in-vehicle rear seat computing and entertainment systems. A determination of the applicability of established office-environment computing ergonomic standards to a rear seat vehicle environment is made. Through the use of a computer-aided design program, geometric modeling, and experimentally observed data on human subjects, it was found that office environment ergonomic recommendations can be applied to the rear seat vehicle environment considered in this study. Recommendations are cautiously extended to a broad range of vehicle seating configurations.

Evaluation of Thermal Conductivity and Viscosity of Water-Based Al_2O_3 Nanofluids

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Nanofluids have been proposed to enhance heat transfer and fluid flow across many applications. For this experiment, nanofluids were evaluated for improved thermal conductivity and viscosity. Nanoparticles of aluminum oxide (Al2O3) with 40-50nm diameter were placed in solution with base fluids of deionized water and ethylene glycol. These nanofluids were modified from traditional nanofluids by the introduction of surfactants and the modification of pH levels. A new apparatus that utilizes the transient hot-wire method was designed to measure the thermal conductivities of the nanofluids. The new apparatus includes a 50 μm platinum wire coated with a 50 μm thick layer of Teflon and incorporates a lever arm and a spring to compensate for the strain gauge effect found in other thermal conductivity apparatuses. Additionally, an attempt has been made to utilize the molecular simulation capabilities of the LAMMPS software to verify the results of thermal conductivity and viscosity testing.

Study of Anisotropy and Post-Necking Local Fracture Strain of Advanced High Strength Steel with the Utilization of Digital Image Correlation (DIC)

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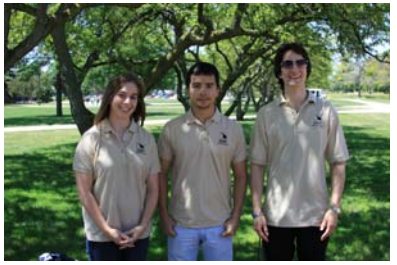

In the automotive industry, the need for lightweight materials capable of withstanding large mechanical loads is crucial to the optimization of component manufacturability. The increased durability of advanced high strength steels (AHSS) allows for dramatic increases in safety, while reductions in weight increase fuel efficiency. The goal of this study was to investigate the effect of anisotropy on the yield and ultimate strengths of four types of advanced high strength steels using a wide-grip MTS tensile test machine and a Digital Image Correlation (DIC) setup. DIC is an optical method that uses gray scale intensities of light reflected from the surface area of interest as recorded by image detector(s) to determine local strain on a loaded sample. The method is a nondestructive, noninvasive way to measure full field displacement/strain with very high accuracy. A nonstandard wide dogbone sample was loaded in tension such as to achieve plane strain in the plane perpendicular to the dogbone, parallel to the tensile force. Loads were applied in the rolling direction, as well as transverse to it to investigate the effect of rolling direction on necking strain values in HSLA 50ksi, Dual-Phase (DP) 600, DP780 and DP980 AHSS steels.