Real Time Car Engine Condition Monitoring By Using Instantaneous Angular Speed Analysis (IAS)

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Abstract

The main objective of this work was to utilize instantaneous angular motion analysis for monitoring the condition of car engine, and to develop a reliable technique for real-time fault detection. In addition, this project explains a technique that is reliable for condition monitoring of a car engine by applying instantaneous angular speed (IAS) analysis. The rotating of the crankshaft is affected by piston velocity that was derived in this report using the equation. The experimental work and the analysis discussed in this project provide a fine understanding of the damage effects on the instantaneous angular speed. Moreover, it is showing the details in crankshaft motion using angular motion technique. Fault detection principle was recognized using the amplitude of the optical encoder sign wave during the fault The optical encoder is used to acquire the angular motion data. The signals were obtained and analyzed in the phase domain using the signal averaging to determine fault and its position.

National Instruments hardware is used and NI LabVIEW software code is developed for real time. The new approach using LabVIEW real-time data analysis of the optical encoder output digital signal represented a reliable method to monitor and detect faults in car engine. The sensitivity of optical encoders to pistons fault detection techniques is experimentally investigated by applying IAS analysis under different operating conditions.

Keywords

IAS - Instantaneous Angular Speed, condition monitoring and fault detection.

Biographies

Dr. Abdulrahman Sait is assistant professor at Mechanical Engineering Technology Department, Yanbu Industrial College (YIC). He started his profession by joining as Faculty member at YIC in 2000. He continued higher studies in Mechanical Engineering and earned his Bachelor of Science at South Dakota School of Mines and Technology, USA and thereafter Master and PhD in Mechanical Engineering from Florida Institute of Technology (FIT), USA. He presented his research work in dissertation titled as "Real-Time Condition Monitoring and Fault Diagnosis of Gear Train Systems Using Instantaneous Angular Speed (IAS) Analysis". He joined back at YIC as Lecturer and then progressed to Associate Professor. During this period, he was involved in delivering lectures and trainings to BS and AS students in different subject areas like Metrology, Applied Mechanics, Structural Analysis and Industrial Safety. He served as Course Coordinator, Program Coordinator. He also participated as member of Department Council, YIC College Council and YTI Institute Council. He has also served as Head of Academic Quality Committee and Curriculum Committee at YTI.

Jamal Alfifi was born in Taif, Kingdom of Saudi Arabia, in 1994. He graduated from King Faisal High School in Tabuk, Kingdom of Saudi Arabia in June 2015, He is a final year student of Mechanical Engineering Program at Yanbu Industrial College, Yanbu Al-Saniyah, Kingdom of Saudi Arabia. He has certificates of scientific excellence from Yanbu Industrial College (YIC). He worked as a trained at a military equipment maintenance plant in King Abdulaziz Military City for Operation & Maintenance, Tabuk, Kingdom Of Saudi Arabia.