And if engine oil can lubricate or cool metal for a long time, then its other properties inevitably decrease over time, so it needs to be replaced.

Various manufacturers set their official oil change intervals, unofficially recommend changing even more often. Much depends on the type of unit, its operating time and other factors.

For a more reasonable oil change interval, it is necessary to determine the change in its properties over time, based on the use of various sensors. In this work, a prototype of an oil condition monitoring system based on LED & LDR (photoresistors) sensors was used. These sensors are used in EOM systems to determine the condition of the engine oil in real time, including checking the visibility of the lubricant, measuring the depth of the lubricant in the vehicle tank and determining changes in the condition of the oil over time.

The designed EOM model was developed by measuring the oil condition to the distance traveled by gasoline engine vehicles.

To more accurately determine the change in the condition of the lubricating oil, it is also necessary to use sensors for determining wear particle monitoring and viscosity monitoring sensors thereby increasing the reliability of the entire mechanical system.

Zhang Nan, V. V. Komrakov
(*Sukhoi State Technical University of Gomel, Gomel*)

AN EXPERIMENTAL STUDY OF PARTS WEAR MONITORING AND ITS APPLICATION TO PREDICTIVE MAINTENANCE

Приводится краткое описание построения модели многоуровневого разреженного автоэнкодера с регрессией обратного распространения для прогнозирования износа образцов на основе необработанных температурных сигналов. Погрешность прогнозирования составила менее 10 %.

Manufacturing has become the backbone of the country's economic development. Digitalization, automation, and intelligent systems are of great significance to the development of the entire manufacturing industry.

Predicting wear can help enterprises and businesses reduce losses and safety risks caused by equipment wear. Wear is one of the most effective methods for mechanical equipment failure.

Temperature monitoring is one of the most important parameters affecting the wear of parts. Heat is generated during the friction process and occurs in the contact area. Monitoring temperature changes can indicate the progression of wear of parts or the occurrence of other negative consequences. Infrared sensors or thermocouples can measure temperature changes. In the study, special material samples were used in which a thin-film thermocouple was integrated to collect temperature signals over a long period of wear testing. A multi-level sparse autoencoder model with NN backpropagation regression was proposed to predict the wear of samples based on raw temperature signals. The predictive performance was compared with that of traditional machine learning methods, which resulted in better prediction accuracy and stability. Wang et al. [1] proposed a model for predicting tool wear during milling of Inconel 182 linings. The threshold temperature of adhesive wear, diffusion wear and oxidative wear were determined by sliding wear tests, which is the criterion for the occurrence of various tool wear mechanisms. Based on this, a mathematical model for the flank wear of milling tool was proposed by determining the cutting force data based on the real-time temperature with a prediction error of less than 10 %.

The presented direct temperature monitoring method can be applied as one of the most important parameters to improve the accuracy of predicting the wear of parts, thereby increasing the reliability of the entire mechanical system.

Literature

1 Wang, C. Milling tool's flank wear predic tion by temperature dependent wear mechanism determination when machining Inconel 182 overlays / C. Wang, W. Ming, M. Chen // Tribol Int 104, 2016. – PP. 140–156.