Issues and challenges in industrial tribology

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1. Introduction

Tribological phenomena are closely related to the overall performance of mechanical systems. Particularly, the efficiency and life of the system depend directly on the friction and wear of moving components that comprise the mechanical system. In this regard, it is vital to consider tribological remedies in the design of such systems to achieve high efficiency and reliability. In almost all situations, it is desirable to eliminate wear, whereas the level of friction may need to be high or low depending on the application. Despite the extensive research on various topics of tribology, it is still difficult to control friction and wear of mechanical systems to the desired level in general engineering situations. For tribology to be more useful in engineering applications at the industrial level, a better understanding of the fundamental issues involved in tribological phenomena needs to be established.

2. Interfacial mechanisms and remedies

Since centuries ago, great effort has been made to understand the phenomena that occur at the interface of two contacting components in relative motion. According to the studies of numerous researchers, it is well conceived that friction is largely caused by competing mechanisms based on mechanical and chemical interactions [1]. To maintain friction to a desirable level, the main mechanism of friction should be properly identified and tackled. Also, wear can be caused by different mechanisms depending on the sliding or rolling situation [2]. It too, needs to be tackled based on the major mechanism of wear. As remedies to tackle friction and wear, researchers have proposed an extensive array of techniques and methods at the laboratory scale [3-5]. Nevertheless, despite the impressive tribological properties that can be achieved in the laboratory, the extent to which these techniques are applied in industrial applications still remains at a relatively elementary level.

3. Concluding remarks

The demand for low friction and wear will continue to increase at a rapid pace considering the urgency to converse energy and protect the environment. To this end, tribology can and will play a critical role and tribologists are faced with the challenge of satisfying the objectives by providing technological solutions that can be effectively utilized at the industrial scale. This is expected to be achieved through widespread education about tribology to design engineers and the development of cost-effective manufacturing processes to fabricate functional surfaces that are optimized based on tribological remedies.

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