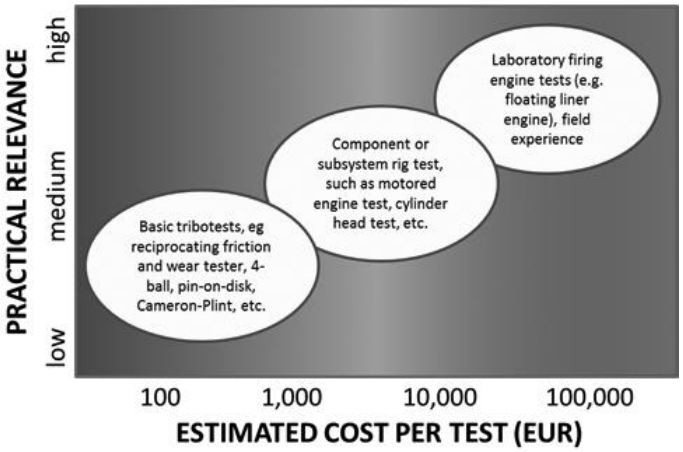
Engine Tribology – A Thorny Way from Lab to Field

B. Zhmud[1,2]

[1]Applied Nano Surfaces Sweden AB
[2]BIZOL Germany GmbH

Tribology has always been an integral part of mechanical engineering, spreading to automotive, industrial and energy generation sectors. However, due to a growing focus on energy efficiency and component longevity, tribological research has been rapidly intensifying over the past decades. Unfortunately, a narrow-sighted one-component-at-a-time optimization that prevails in academic research is nothing less than misleading and only complete system tests can be viewed as relevant.

The diagram on the right shows a relationship between practical relevance and cost of different tribological tests.



Hence, basic tests may be inexpensive, but often also useless. However, such tests are broadly used for marketing purposes, where the impression factor outruns the truth. In general, it is fairly easy to find materials or additives excelling in a given tribological test. It is much more challenging to identify materials and additives that can be used by industry.

Cost, health safety, supply situation and compatibility with a myriad of other materials already in use play a huge role here.

This presentation covers current advances and challenges in low friction powertrain development, highlighting the importance of choosing appropriate tools for tribological optimization.

References:

Zhmud, B. Engine tribology: A thorny way from lab to field. Lube 2019 (154) 20.

P. Lee, B. Zhmud, Low Friction Powertrains: Current Advances in Lubricants and Coatings, Lubricants 2021 (9) 74.

B. Zhmud, E. Tomanik, A. Jimenez-Reyes, et al. Powertrain friction reduction by synergistic optimization of cylinder bore surface and lubricant, SAE Tech. Paper 2021-01-1217.

B. Zhmud, A. Coen, K. Zitouni, Fuel Economy Engine Oils: Scientific Rationale and Controversies, SAE Tech. Paper 2021-24-0067.

*Corresponding author: zhmud@bizol.de