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Tribology and Environment impact

Think Tank for a WTC 2021 Eco-Friendly Event
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Human activities undeniably have a great impact on the environment. This can be seen in everyday life. To reduce or change it, individual awareness with daily actions is necessary, but so is a significant development of research to find solutions to existing and future problems. Tribology is exactly the science that aims to reduce wear and energy losses. This presentation shows the impact of human activities and how some important results in tribology can have a positive response to the impact on the environment. Finally, it is mentioned how the organization of current and future WTCs can reduce their impact.

Keywords: tribology, environment impact, conference

1. Introduction

Human activities undeniably have a great impact on the environment. Today, if the issue of Global Warming due is disputed by some, this impact is observable in everyday life. For examples, an acceleration in recent years of the melting of glaciers is noted; the so-called sixth continent made of plastic in the Pacific ocean is well identified and analyzed; the almost daily disappearance of species has become critical.

To modify this impact, 3 main options are available and must be conducted in parallel: i/ an individual awareness with daily actions having an immediate effect; ii/ an important development of research in order to find solutions to existing problems and to improve products and services taking into account the Jevons paradox (increasing the rate of consumtion when increasing the efficiency); iii/ the development of new products and services in order to improve the life quality of people.

Tribology, since the creation of this word in 1966 by Sir Peter Jost [1], is a science which aims precisely at optimizing contacts and thus reducing wear and energy losses. Current research is being carried out to reduce energy consumption in various mechanical systems, for example in the field of transport. They also make it possible to reduce the size of components such as bearings, to use less raw material or even to reduce on-board masses, as for example in the air transport sector.

The first part of this presentation will show the impact of human activities by focusing on emissions but also on the reduction of available raw materials and ressources. A second part is devoted to some important results in tribology showing how this science can have a positive response to the impact on the environment. Finally, an emphasis will be placed on the organization of the current and future WTCs to reduce their impact.

2. Tribology and human activity footprint reduction

In every mechanism, only a very small volume of material is actually in moving contacting bodies. Nevertheless, this material plays a defining role in the overall efficiency of the system though friction power losses. From the earliest times, it has been searched for to reduce the friction of mating parts. Tribology in the past century contributed significantly to this effort by developing high-performance lubricants and adding anti-friction coatings to base materials.

Tribological methods were employed successfully in car industry. Figure 1 shows a very clear reduction of friction coefficient in 10-year period for different friction mechanisms in a standard car. It is yet to be seen if the prediction for 2020 was correct. This shows also a very wide difference between what is achievable in laboratory conditions and a real application.

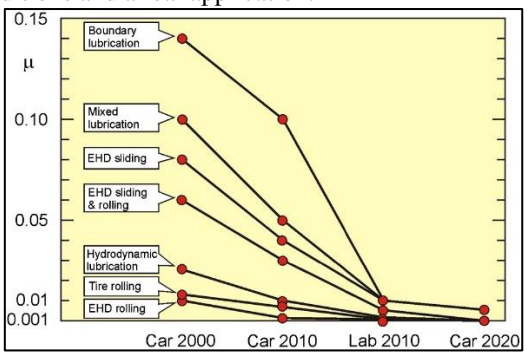

Figure 1: Trends of friction coefficients encountered in typical passenger cars [2]

3. WTC organization scenarios

On the one hand, face-to-face conferences are of major interest for having scientific discussions and meeting people. On the other hand, even if virtual conferences seem interesting from an environmental point of view reducing transport, the use of gigantic computer systems is not without impact, environmental but also human with limited opportunities for networking and relationship building...

Reducing the environmental impact of the WTC 2021 in Lyon was one of our challenges. The Lyon Convention Centre, the organizers and all their partners worked together on this topic, to make WTC 2021 an eco-friendly event. The impact of this edition was studied and practical solutions were proposed such as: zero food waste, no plastic bottles, tools for participants to optimise their travel not only in terms of money but also in terms of emissions (one example, Figure 2).

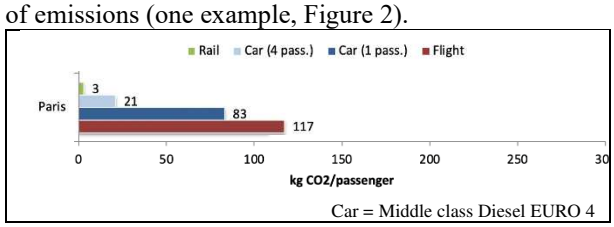

Figure 2: CO2 emission for a Paris-Lyon travel
http://www.ecopassenger.org/

4. References

[1] Jost, H. P., “Tribology - Origin and Future” Wear, 136, 1990, 1-17.

[2] Holmberg, K. et al. “Global energy consumption due to friction in passenger cars”, Tribology international, no. 47, 2012, 221-234