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## **PHILOSOPHY OF TECHNOLOGY AND ITS APPLICATION TO MECHANICS AND MATERIALS IN DESIGN**

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### **ABSTRACT**

The Philosophy of Technology constitutes a vision of the roles of Technology in the world from the point of view of the professionals of the same, that are the engineers already graduated from an engineering school, graduated from other university careers reconverted to engineers through their professional experience or self-taught. For engineers worried about the development of their profession, of which Dessauer (1958) was a characteristic example, the Philosophy of Technology implies the approach of the essence and the meaning of Technology in its different aspects. The 7 rules of the Philosophy of Technology and its application on mechanics and materials in design are presented.

**Keywords:** philosophy of technology, engineers, mechanics, materials, design.

### **INTRODUCTION**

An in-depth analysis of the Philosophy of Technology in all its aspects would undoubtedly fall outside the limits of this article. For this reason, is recommended the following literature Dessauer (1958), Mitcham (1989), Berg (2009) and Meijers (2009). However, among the various aspects of the Philosophy of Technology there is one that may have been little analysed and that with the elevation of the complexity of the technological system has become increasingly important. It is the philosophy of the technician's behaviour to ensure success in creating or improving products or processes. There are behavioural guidelines that all technicians must adopt independently of the technology to which they engage but some of them are especially important to apply on mechanics and materials selection in design.

### **THE SEVEN RULES OF THE PHILOSOPHY OF TECHNOLOGY**

The seven rules of the Philosophy of Technology are as follows.

*Rule 1: Good is so much enemy of the bad as of the best.*

This is, in the opinion of the authors, the golden rule of Technology. Its correct application guarantees the professional success of the individual coach and the collective success of a company or a country. This standard defines the pragmatism that the technician must have. Its application represents the search for a dynamic equilibrium because technological progress makes, what today is better, tomorrow becomes good, and what constitutes a good solution today is bad tomorrow.

*Rule 2: The application of complex design methods that lead to the calculation with the greatest possible accuracy of a product, should only be performed when the search for the minimum cost of the final product is justified.*

Bunge (1980) reflects well this standard when he says in his Epistemology: "The technologist (engineer) cannot prefer deep but complicated theories when he suffices for simpler but superficial theories. However, unless he is a pseudo-engineer, he will not avoid deep and complex theories when they promise success".

*Rule 3: The design of any technological development of any product should be done taking into account the worst case design.*

The engineer must take into account Murphy's popular law: "If something can work wrong it will surely". The one who is not a pseudo engineer always has very in mind that: Everything works on paper; a prototype in real conditions is more difficult to work correctly. This standard is also very useful in the materials selection that are used in the construction of numerous machines.

*Rule 4: The appearance of the technological system means that the solution to a technological problem is almost never unique and that the most appropriate one depends on the characteristics of the concrete application.*

For example in some applications the modularity (scalability) is important although it increases the cost, while in others it is not necessary and its use is not the optimal solution.

*Rule 5: Nowadays in the world, the conception of reliable processes and products involves an enormous amount of knowledge to be carried out by teams of experts from different areas of knowledge.*

That is why the engineer must be open to teamwork not only with other engineers but also with scientists, economists and business graduates, among others.

*Rule 6: Experience is the mother of engineering.*

The G8 countries demonstrate the importance for a nation to have companies that for decades have engineers who acquire practical knowledge through other fellow engineers. Examples include, among many other companies, Siemens, Philips and General Electric. To help the formation of interdisciplinary teams that work in the medium and long term and not only in the short term, is not only the task of the companies but in it play, the politicians a special role.

*Rule 7: Divide and win.*

This rule is mandatory when a complex system has to be developed. The Association of German Engineers elaborate the VDI 2221 standard that establishes a systematic procedure that starts from the analysis of the global problem, goes through its decomposition into sub problems, the search for partial solutions and finally their combination to obtain a global solution.

## REFERENCES

- [1]-Berg JK, Selinger E, & Riis S. New Waves in Philosophy of Technology. Palgrave MacMillan editors 2009.
- [2]-Bunge M. Epistemología. Capítulo 13. Tecnología y filosofía. Editorial Ariel 1980.
- [3]-Dessauer F. Streir um die Technik. Verlag Josef Knecht. 1958. Versión española: Discusión sobre la Técnica. Ediciones Rialp. 1964.
- [4]-Meijers A. Philosophy of Technology and engineering sciences. Elsevier. 2009.
- [5]-Mitcham C. Qué es la filosofía de la Tecnología? Editorial Anthropos. 1989.