

Proposition sujet de mémoire **2014 - 2015**

MASTER Recherche 2^{ème} année

Management, Innovation, Technologie

spécialité « Génie industriel »

Towards a Products Eco-Efficiency Assessment for the purpose of Eco-Design (Design for Environment)

Description of the subject

Context:

Product demand and manufacturing have increased dramatically in the last decades. At the same time, products are strongly related to environment sustainability during their life cycle. It is known that largely of the environmental damages from product life cycle are determined in design process. Hence the product design has crucial role for product sustainability. An effective improvement of the product sustainability during the design phase should be achieved if the designers have appropriate methods and tools for assessment of product sustainability. In practice it is very difficult to determine the environmental burden from production, using and disposal to a specific product. Different approaches for design sustainability are existing: Design For Disassembly (DFD), Design For Energy Savings (DFES), Design For Recycling (DFR), Design For Manufacturing (DFM), Design For Reusability (DFRU), Design For Maintainability/Serviceability (DFMS). Each of them represent only one side of product sustainability thus their integration is necessary. The main problems for this design result from: the complexity and the difficulties of life cycle analysis; lack of sufficient and reliable data; complicated calculation of trade-off with other design constraints; integration problem with current CAD packages, etc. Thus, business managers, designers and engineers have to know how to assess a product not only in terms of functionality but in terms of sustainability as well.

Aims of the study:

In this context the proposed subject aims to contribute to the application of *eco-efficiency concept* in the product design phase. This concept has to link environmental excellence to business excellence and to consider sustainable consumption as well as sustainable production. The main challenge in product eco-efficiency assessment being environmental damage, caused from product during its life cycle, the integration of various approaches have to be proposed like the quantification of damage by using external costs and approaches for obtaining score (or %) assessment of the product sustainability elements. The *eco-efficiency concept* has to integrate both *Economic added value* and *Environmental damage* in order to reduce; the material intensity; the energy intensity; the transport intensity; the toxic dispersion.

Some dimensions of this *eco-efficiency* may be: enhance material recyclability; sustainable use of renewable resources; extend product durability and increase the service intensity of product which has to be integrated in the concept. Criterion and algorithms for achievement of *eco-efficiency* must be proposed in order to assess environmental damages. The different steps of the algorithm have to include: i.) calculation of environmental damages external costs: of materials; of energy; due to goods transport; resource depletion; of emissions, ii.) Calculation of added value; iii.) Calculation of eco-efficiency of a product; iv.) Investigation; v.) Product redesign and finally vi.) Calculation of eco-efficiency of new-designed product. This integration will enable to assess the environmental

damage of more sustainability elements for a more reliable assessment of eco-efficiency and hence for more sustainable product design.

Co-operation with other researchers and research units

The proposed subject falls under a common set of themes of research: *Methods and tools for environmental lifecycle assessment of products, services, processes and technologies*, within a cooperation with the Bulgarian Academy of Sciences, Sofia Bulgaria.

- Quel parcours conseillez-vous : Product Development
liste des cours sur le site web du master
- Pour mener à bien le stage, il est souhaitable de suivre en cours optionnels le (s) enseignement(s) suivant(s) :

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