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### THE ACTIVITY AS A CRITERION FOR DESIGNING INDUSTRIAL EQUIPMENTS – CONTRIBUTIONS FOR ERGONOMIC DESIGN

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Activity, Industrial Equipments, Ergonomic Design

#### ABSTRACT

Ergonomics has been growing as an important science interested in human activities and other elements of a system. The definition of ergonomics adopted by the IEA (International Ergonomics Association) Council in 2000 asserts that:

“Ergonomics is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.”

Ergonomics has the design as a main objective. Therefore, it is fundamental to highlight the importance of its contribution to the design of work instruments and/or or workplaces. Considering the fact that ergonomics can bring differentiated criteria to a specific design problem, when compared to the traditional design methods, its approach can contribute to the development of more comfortable, safer and healthier work environments.

Enframed by the so called “francophone tradition of ergonomics”, the Ergonomic Analysis of Work Activity (EAWA) is an approach, that is much more focused on worker’s activity in real context, rather than on an experimentally controlled approach. The concept of Activity differs from the concept of task as soon it considers the work in this contextualized approach. Task can be understood as prescribed work, while activity is the work made by a specific operator, in a specific time and place, and with all the variability that emerges in this context (Béguin 2007). Through a Work Analysis it is possible to understand worker’s activity (including

postures, efforts, information search, decision making, communications), as a personal response to a set of determinants, some of which are company-related (design of the workstation, formal work organization, time constraints, etc.) and others are operator-related (age, anthropometrical characteristics, experience, etc.) (Garrigou et al. 1995). From this global perspective, the EAWA can shed light on unknown constraints and determinants of work.

Hence, the worker’s activity is an important and powerful variable that can be used to develop specific criteria to specific design problems in industrial contexts. Ergonomics aims to solve real problems in a real timing, in particular contexts, in which the specific character should be considered (Daniellou and Béguin 2007).

Using the Activity as a criterion to design means that specific options need to be identified and distinguished with precaution in each. The use of the Activity as a criterion to the design can unveil constraints that could remain masked when using a traditional design process. The gap between real activity and the dominant representations of work that guide designers and managers in the design process appears to be one major cause of the inefficient or hazardous design of production means (Daniellou 1987).

However, to be influent ergonomics approach should be integrated into the engineering design process. Nowadays, the majority of researches related with safety, ergonomics and design shows clearly the existence of a consensus between people in industry and researchers on the fact that a good industrial performance cannot be obtained without really taking human factors into account (Fadier and De la Garza 2006). However, the integration between ergonomics and engineering design has not always been an easygoing process. Ergonomic criteria are commonly viewed by engineers and designers as “too general” or “too hard to understand”. In a constraint-full



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environment, these criteria can easily lose their strength in the decision making process, as they will compete with other criteria that are technically or legally imposed. Therefore, ergonomics is still frequently viewed by designers as an extra-cost or time loss. Therefore, there is a need to develop new models, new approaches and new tools to integrate ergonomics into the design process.

This study aims to demonstrate the importance of considering ergonomic criteria into the design of work instruments and the role that ergonomists can play in a design team of an engineering design process. In order to reach this goal, a case study was conducted in a big tire manufacturing company, where a processing machine was being installed.

The case study consisted in two main phases, according to a methodology suggested to the design of a future activity (Daniellou 1985). The first moment was focused on the understanding of a reference situation. The EAWA was applied in a similar machine to the one that was going to be installed. From the results obtained on this first phase, recommendations to the design were developed. This moment was also based on a participatory perspective. The second phase included the integration of an ergonomist into the design team, and the discussion and appliance of the suggestions prepared in the preliminary phase.

After combining the results obtained from the case study with a literature review, a conceptual model of ergonomic design for industrial equipments will be developed. The main purpose of this model is to contribute to the development of ergonomic design methods and tools in the future. Finally, ergonomics design can contribute to develop healthier and safer work environments by considering the needs, skills and limitations of workers for the design of industrial equipments.

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