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1. Eco-efficiency Measures for Sustainability

Sustainability is a widely used concept that is applied by companies, organizations and politicians in various contexts. This chapter deals with specific measures to minimize the environmental footprint. An overview of the most important aspects of sustainable development and eco-efficiency. The eco-efficiency measures for sustainability provide a foundation for understanding our environmental responsibility and resource efficiency.

1.1 Introduction

Throughout history, geo-resources have served as crucial elements in providing all kinds of raw materials. However, excessive consumption has inflicted significant damage on the ecosystems, resulting in pollution and resource depletion. Sustainable engineering presents itself as a solution to this pressing issue, aiming to reconcile the demands of environmental preservation with economic growth. Sustainable engineering plays a fundamental role in these processes as it is rooted in the three pillars of sustainable: environment, society, and the economy. In simple terms, sustainability means to satisfy existing needs, without eliminating the needs of future generations. This correlates also with the 17 sustainable development goals (SDGs) from the United Nations. By adapting to nature, rather than trying to control it, more sustainable practices and products can be created.

1.2 Environmental

The environmental influence of products is of high importance in many aspects such as by depleting natural resources or emitting greenhouse gases. Concerning the product, it is important to try to reduce negative influences on the environment. This is achieved by reducing, reusing and recycling raw materials; taking into consideration the energy consumption in all phases of the project, as well as by minimizing transport.

1.3 Economical

The economic aspect of sustainability relates to the efficient and cost-effective utilization of resources, aiming to minimize environmental impact while ensuring long-term economic viability. The goal is to strike a balance between environmental responsibility and financial success by devising products, processes, and business models that are both ecologically and economically advantageous. Thus, the sustainable economy focuses on the responsible management of economic, social, and environmental resources to support the well-being of current and future generations. The goal of economic sustainability is to achieve economic growth without making the negative environmental trade-offs that traditionally occur. It also means that the price of the product matches the time the product fulfils its purpose.

1.4 Social

Social sustainability is about identifying and managing business impacts, both positive and negative, on people. It refers to the ability of a project or initiative to foster positive and inclusive social

interactions while considering the long-term effects on society. The social aspect of sustainability deals with the community, education, equality, justice, social resources, health, well-being, quality education and quality of life. The product should meet those social aspects.

1.5 Life Cycle Analysis

One crucial task is to assess how each stage of the life cycle contributes to the overall environmental impact. This analysis is typically aimed at prioritizing enhancements in products or processes and comparing various products for internal purposes. Life Cycle Analysis (LCA) is a method for evaluating the environmental impact of a service or product throughout its life cycle, from design to end-of-life management. LCA or life cycle assessment is an essential tool to support sustainable development decision-making, as well as to assess the potential environmental impacts of a product, material, process or activity.

1.6 Summary

Provide here the conclusions of this chapter and introduce the next chapter.

Based on this sustainability analysis, the team chose <specify here the design, technique(s) material(s), component(s)> for the following <specify here the relevant sustainability-related reasons>. Consequently, the team decided to design a solution with the following <specify here the features added for sustainability reasons>.

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