OPTIMIZATION OF INDUSTRIAL DESIGN PROCESSES AND MATERIAL COMPOSITION FOR SUSTAINABLE DESIGN

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ABSTRACT

Sustainable product development has become one of the central challenges of modern society, requiring the integration of environmental and functional aspects throughout the entire design process. The development of distinctive and competitive sustainable industrial designs plays a significant role in high-value-added production. This paper analyzes how industrial design can contribute to product sustainability with special attention to the role of materials and composite systems in achieving a balance between mechanical performance, aesthetics, and environmental requirements. The study combines theoretical analysis with a selected case study from practice in order to identify key strategies for optimizing sustainable product development. For this purpose, the design and development of concrete washbasins were selected. Specially formulated concrete mixtures were developed to achieve an optimal balance between aesthetics, functionality and sustainability. The cast concrete provided high strength, low porosity, and a refined tactile aesthetic. The material composition was enhanced with high-quality pigments and additives, enabling control of color, texture, and surface finish. The results indicate that interdisciplinary collaboration between industrial design, materials engineering, and manufacturing processes is essential for the successful implementation of sustainable design approaches. The presented findings contribute to a broader understanding of how the integration of innovation, advanced materials, and creative design strategies can support environmentally responsible industrial design and promote sustainable innovation in product development.

Keywords: sustainability, industrial design, materials, product development, eco design.