Opinion
Volume 13:3, 2023

Journal of Civil & Environmental Engineering

ISSN: 2165-784X **Open Access**

Integrating Surface Engineering with Life Cycle Engineering

Hadi Salehi*

Department of Chemical Engineering, University of Louisiana Tech, Ruston, LA, USA

Introduction

Surface engineering and life cycle engineering are two key disciplines that contribute to improving product performance and sustainability. Surface engineering focuses on modifying the surface properties of materials to enhance their functionality and durability, while life cycle engineering encompasses the holistic assessment of a product's environmental impact throughout its entire life cycle. In this article, we explore the benefits and challenges of integrating surface engineering with life cycle engineering and discuss how this integration can lead to more sustainable and high-performing products. The majority of metal surface finishing procedures involve the use of chemicals and a lot of energy, both of which have the potential to be toxic to humans and the environment. Be that as it may, surface completing cycles can prompt natural and monetary advantages in other life cycle stages by decreasing rubbing, wear and consumption. Understanding these effects is made possible by incorporating life cycle engineering into surface engineering. This study provides a framework for evaluating the economic and environmental effects of surface treatments on other phases of the life cycle. A contextual investigation outlines the commitment of a surface completing interaction for slicing supplements to the existence cycle execution [1].

Description

Surface engineering techniques, such as coatings, treatments, and modifications, can significantly improve product performance. By tailoring surface properties, manufacturers can enhance corrosion resistance, wear resistance, friction reduction, and other desirable characteristics. This leads to longer product lifetimes, reduced maintenance requirements, and improved overall performance. Integrating surface engineering into the design phase allows for the optimization of surface properties based on specific product requirements, resulting in more reliable and efficient products. Life cycle engineering aims to minimize the environmental impact of a product throughout its entire life cycle, including raw material extraction, manufacturing, use, and end-of-life disposal. By incorporating surface engineering strategies, products can be designed to have extended lifespans, reducing the need for frequent replacements and minimizing waste generation. For example, protective coatings can prevent corrosion, extending the life of metal components, while surface treatments can improve wear resistance, increasing the longevity of mechanical parts [2].

Integrating surface engineering with life cycle engineering encourages the use of sustainable materials. Surface modifications can allow the utilization of alternative materials or lower-grade materials by enhancing their performance. For example, surface coatings can protect lightweight materials, reducing the need for high-strength, energy-intensive materials. Additionally, surface treatments can enable the use of recycled materials, promoting circular economy principles and reducing the environmental impact associated with resource extraction. Surface engineering techniques can contribute to improved energy efficiency and reduced environmental impact. For instance, low-friction coatings can reduce energy losses due to friction, leading to energy savings in various applications. By optimizing surface properties, products can also be designed for easier cleaning, reducing the consumption of water and cleaning agents. Furthermore, surface modifications can enhance the recyclability of products by improving the bondability and compatibility of materials, facilitating their disassembly and recycling at the end of the product's life cycle [3].

Integrating surface engineering with life cycle engineering poses some challenges that need to be addressed. These includes technological Complexity: Surface engineering techniques require specialized knowledge and expertise. Integrating them into the life cycle engineering process may require collaboration between different disciplines, such as materials science, engineering, and environmental science. Cost and Economic Viability: Surface engineering processes can add costs to the manufacturing process. However, a life cycle perspective considers the long-term economic benefits, including improved product performance, extended lifespan, and reduced maintenance costs. Environmental Trade-offs: While surface engineering can enhance certain properties, it is essential to consider potential trade-offs. For example, the use of certain coatings or treatments may introduce environmental concerns due to the presence of hazardous substances. Evaluating the overall environmental impact is crucial to ensure sustainability [4,5].

Conclusion

Integrating surface engineering with life cycle engineering offers substantial benefits in terms of product performance and sustainability. By optimizing surface properties, products can exhibit improved functionality, extended lifespans, and reduced environmental impact. Collaboration between surface engineers, product designers, and environmental experts is vital to successfully implement this integration. Embracing this approach will contribute to the development of more sustainable and high-performing products, supporting a transition towards a circular and resource-efficient economy.

References

1. Kirby, Russell S., Eric Delmelle and Jan M. Eberth. "Advances in spatial epidemiology and geographic information systems." *Ann Epidemiol* 27 (2017): 1-9.
2. Ekanayake, I. U., D. P. P. Meddage and Upaka Rathnayake. "A novel approach to explain the black-box nature of machine learning in compressive strength predictions of concrete using Shapley additive explanations (SHAP)." *Case Stud Constr Mater* 16 (2022): e01059.
3. Oh, Sejong. "Predictive case-based feature importance and interaction." *Inf Sci* 593 (2022): 155-176.
4. Filion, Yves R., Heather L. MacLean and Bryan W. Karney. "Life-cycle energy analysis of a water distribution system." *J Infrastruct Syst* 10 (2004): 120-130.
5. Kleiner, Y., B. J. Adams and J. S. Rogers. "Water distribution network renewal planning." *J Comput Civ Eng* 15 (2001): 15-26.
6. Cunha, Maria da Conceição and Joaquim Sousa. "Water distribution network design optimization: simulated annealing approach." *J Comput Civ Eng* 125 (1999): 215-221.

***Address for Correspondence:** Hadi Salehi, Department of Chemical Engineering, University of Louisiana Tech, Ruston, LA, USA, E-mail: salehi@gmail.com*

Received: 02 May, 2023, Manuscript No. Jcde-23-105906; **Editor assigned:** 04 May, 2023, PreQC No. P-105906; **Reviewed:** 16 May, 2023, QC No. Q-105906; **Revised:** 22 May, 2023, Manuscript No. R-105906; **Published**: 29 May, 2023, DOI: 10.37421/2165-784X.2023.13.503

How to cite this article: Salehi, Hadi. "Integrating Surface Engineering with Life Cycle Engineering." *J Civil Environ Eng* 13 (2023): 503.