Fiabilité et optimisation des systèmes mécaniques : applications aux éoliennes

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Abstract

The dynamic behavior of mechanical systems is crucial in industry to avoid instability and vibrations, ensuring the reliability and durability of equipment. The inherent complexity and uncertainties make precise modeling challenging, but incorporating these uncertainties is essential to strengthen system robustness. Approaches such as Monte Carlo simulation are used to account for these uncertainties, particularly in specific areas like gear transmissions, where uncertain parameters can significantly impact dynamic behavior. In summary, understanding and managing uncertainties in the design of mechanical systems contributes to improving their performance and reliability in various operational environments. Furthermore, a thorough understanding of mechanical dynamics allows anticipating weak areas and minimizing failure risks, essential for ensuring the safety and performance of industrial equipment. Engineers must take a proactive approach to address challenges in designing reliable mechanical systems, considering uncertainties related to factors such as friction forces, gear stiffness, and changing environmental conditions. Stochastic modeling, such as Monte Carlo simulation, provides valuable tools to assess and mitigate risks associated with these uncertainties, thereby ensuring more robust design and better performance of mechanical systems in diverse operating conditions.