Review of: "Optimized Material Removal and Tool Wear Rates in Milling API 5ST TS-90 Alloy: AI-Driven Optimization and Modelling with ANN, ANFIS, and RSM"

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Potential competing interests: No potential competing interests to declare.

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Manuscript Summary:

The manuscript titled "Optimized Material Removal and Tool Wear Rates in Milling API 5ST TS-90 Alloy" explores the critical aspects of manufacturing, specifically focusing on optimizing Material Removal Rate (MRR) and Tool Wear Rate (TWR) during the milling process of API 5ST TS-90 alloy. The study employs Response Surface Methodology (RSM) and artificial intelligence models such as Artificial Neural Networks (ANNs) and Adaptive Neuro-Fuzzy Inference Systems (ANFIS) to model and optimize MRR and TWR.

Key Findings:

1. Experimental Setup and Data Collection:

The manuscript details a well-planned experiment involving a ZX6350C milling machine and a 10 mm High-Speed Steel (HSS) end-mill cutter, with a design based on Central Composite Design (CCD) in Design Expert 14 software. This provides a sound foundation for the research.

2. AI-Driven Modeling:

The application of ANFIS, ANN, and RSM for predictive modeling of the milling process yielded promising results, with a coefficient of determination exceeding 0.85. It is commendable to see the integration of advanced AI techniques into manufacturing processes.

3. Predictive Capability:

The manuscript suggests that ANFIS outperformed both RSM and ANN in predicting both MRR and TWR, although RSM also demonstrated better predictive ability than ANN. This comparison of different models adds valuable insights to the study.

4. Optimal Parameters:

The study identified optimal milling parameters (720-rpm spindle speed, 24 mm/min feed rate, and 0.979 mm depth of cut) to achieve a highly efficient MRR of 1272.163 mm3/min and a reduced TWR of 0.781 mm/min. This practical guidance for optimal machining parameters is a significant contribution to the field of manufacturing.

5. Validation:
The manuscript validates its findings by conducting milling experiments under the recommended conditions. The close correlation between predicted and validated values strengthens the credibility of the research.

Conclusion:
This study demonstrates the effectiveness of RSM, ANN, and ANFIS models in predicting and modeling the milling process, offering a valuable contribution to the field of manufacturing. The emphasis on practical application, with optimal parameters leading to enhanced production and reduced tooling costs due to decreased tool wear, is noteworthy.

Constructive Feedback:
The manuscript is well-structured, with clear explanations and logical flow. However, to further enhance its quality, consider addressing the following points:

1. Expand on the practical implications of the findings: How can the optimized parameters be practically implemented in a manufacturing setting? Provide some insights into potential industry applications.

2. Discuss limitations: Every research study has limitations. Address any limitations in the research and potential areas for further investigation.

3. Provide more context: While the manuscript is well-written, adding some background information on the significance of optimizing MRR and TWR in manufacturing, and how it impacts industries, could enhance its introduction.

Overall, this manuscript offers valuable insights into the optimization of milling processes, and with the suggested improvements, it can become an even more valuable contribution to the field of manufacturing research.