# 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.

The process parameters for milling API 5ST TS-90 Alloy with an end mill has been analyzed and optimized with RSM. AI-driven models (ANN, ANFIS) and algorithms are applied to predict the machining results and compared. It has some meanings and suitable for acceptance BUT the manuscript needs to be enhanced. Comments are as follows:

1. The topic is ambiguous: "***Optimized Material Removal and Tool Wear Rates in Milling API 5ST TS-90 Alloy:AI-Driven Optimization and Modelling with ANN, ANFIS, and RSM***".

It should be revised. It could mean that ANN, ANFIS and RSM are AI-models used for optimization. Whereas RSM was used for optimization of process or cutting parameters while ANN and ANFIS were used as predictive models. I will advice a paraphrased of the topic for clarity and scientific correctness.

2. The authors need to revise the literature review. The introduction is quite good and the relevance of the material ***API 5ST TS-90 Alloy*** to the oil and gas sector. However, the review of related literatures should focus on this specific specimen/workpiece, the specific cutting tool (end-mill) and applications of the AI models in question: ANN and ANFIS

3. I would suggest that the authors remove or revise this sentence "*However, the predictive modelling of MRR and TWR in milling using combined intelligent models such as ANFIS, ANN, and RSM has not been reported*". This could be relative, possibly due to geographical location of authors. It is a question? Because there are tons of research articles out there in which machine learning models have been applied to conventional or micro milling operations. In same way RSM has been used to explain process parameters effects/influence on responses. It is not a novelty.

Also, this sentence needs to be revised, *"Furthermore, a comparative analysis of the three models, which have not been reported elsewhere, was investigated, and reported in this work."* It is not proper to do comparative analysis with ML predictive models (ANN, ANFIS) and optimization model (RSM). If the authors are comparing predictive accuracy of all three fine, they should stick to it. But ANN and ANFIS are not optimization. The authors should be able to distinguish each models' applications.

4. In the ANN training, the R correlation is equal to 1 for the training and validation, and relatively closed to 1 for the testing (Fig 16). However, this **does not** imply that the proposed model is good enough. **This is evident in the Fig 17, where the test error is extremely higher than the training error, implying overfitting of the model**. It does not

reconcile with the computed errors (performance indicators, as reported). Therefore, the Authors still need to improve on the ANN model and state why they select this model type.

5. Data partitioning: In deploying AI-Driven models, data partitioning and architecture are very important.

i. The authors divided datasets in 70%, 15%, 15% (14, 3, 3) for training, testing and validation respectively for ANN model. While in ANFIS they used the whole 100% (20 datasets) for the training (Fig 20, Fig 21). Why was this so?
ii. More so, authors used a single model for ANN of 3-N-2 which is three (3) input parameters at input layer and two (2) output parameters (responses: MRR and TWR) at output layer. However, in the ANFIS model, the authors used 3-N-1 architecture for the 2 different responses: MRR and TWR. (Figs. 20 and 21).

With these developments (i) and (ii), there is no justification of comparing of the two models, as the results are bias. I suggest that the author make a uniformity in data partitioning and model architectures. Since the model responses (MRR, TWR) in ANFIS are done independently, similar method should be used for the ANN. Most cases the response parameters will not be affected equally by the input parameters.

**NOTE:** providing the ANN model architecture would be appropriate for clarity.

6. And to evaluate the performance /accuracy of AI-driven models (machine learning), the authors should calculate the test error (residual) if the dataset is only using training and testing data. If it includes training, testing and validation data, then the authors should focus on validation error. To avoid biasness in comparison, it should be employed to both the ANFIS and ANN model. There should be uniformity for the bases of comparison.
7. An experimental cum modelling flowchart should be provided in such a research article. And the picture in Fig 1 is not sufficient, additional clear pictures should be provided for the specimen/workpiece and the end-mill cutter, or zoomed in to machining environment to compliments the description of experimental methods.
8. The authors need to state clearly the objectives of this research and main scientific contributions in the conclusion.