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REVIEWER'S REPORT

Manuscript No.: IJAR-52559 Date: 01.07.2025

Title: EXPERIMENTAL CHARACTERIZATION OF MULTI-STAGE SPUR GEARBOX DYNAMICS UNDER VARIABLE TORQUE LOADS

Recommendation:
Accept after minor revision……

Rating	Excel.	Good	Fair	Poor
Originality	✓			
Techn. Quality		✓		
Clarity	✓			
Significance		✓		

Reviewer Name:Dr.K.Arumuganainar **Date:** 01.07.2025

Reviewer's Comment for Publication.

Overall Strengths

- Well-focused experimental study with real-world applicability.
- Appropriate methodology and instrumentation.
- Good use of data analysis to support conclusions.

Weaknesses / Areas for Improvement

- Limited number of test cases.
- Slightly shallow discussion of sources of inefficiency (e.g., lubrication or gear profile).
- Future scope and industrial relevance could be more elaborated.
- Minor formatting and language issues.

Detailed Reviewer's Report

1. Title and Abstract Evaluation

- **Title**: Accurate and descriptive. It clearly conveys the research scope.
- **Abstract**: Well-structured, concisely summarizes objectives, methodology, key findings (input/output parameters, regression results), and practical significance. However, it lacks mention of limitations or future work.

Score: 9/10

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2. Originality and Novelty

- The paper fills a known gap by **experimentally evaluating** the behavior of high-reduction multi-stage spur gearboxes under varying torque loads—an area mostly covered by simulations.
- Empirical results such as efficiency under load and regression analysis of RPM/torque data add novelty.

Score: 8.5/10

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3. Methodology Assessment

- **Gearbox Design**: Clearly explained with gear stage ratios and materials.
- **Experimental Setup**: Use of digital tachometers and strain gauges is standard and appropriate. The control of variables and repeatability of measurements (triplicate measurements with 30-second stabilization) is commendable.
- **Power and Efficiency Calculations**: Equations are correctly applied.

Strengths:

- Use of real, calibrated instruments.
- Regression analysis supports analytical validity.

Limitations:

- Only 4 test scenarios are fully reported; more data points would improve statistical significance.
- Dynamic loading (transients) not explored—only steady-state.

Score: 8/10

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4. Results and Discussion

- **Clarity**: Data in Table 1 is concise and well-labeled.
- **Graphs**: Figures 1 and 2 (though not fully visible in the text extract) are referenced appropriately for RPM and torque trends.
- **Interpretation**: Authors correctly relate gear system behavior to fundamental principles—e.g., trade-off between torque and speed, internal frictional losses.

Suggestions:

- Include error bars or ranges in figures for repeatability.
- Explore influence of misalignment or lubrication in more detail.

Score: 8/10

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5. Conclusion

- Effectively summarizes key findings: efficiency trends, load behavior, and correlation results.
- Suggests future optimization strategies (lubrication, gear alignment).

Missing:

- Explicit mention of future experimental work.
- Consider discussing scale-up potential or applicability to different industries (robotics, microgen, etc.).

Score: 7.5/10

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6. References

- Recent and relevant references (2022–2025).
- Proper use of journal and online technical sources.
- A few URLs are repeated—needs cleanup.
- One or two references (e.g., “TechMeStuff”) are non-scholarly and may not be peer-reviewed.

Score: 7/10

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7. Language and Structure

- Language is technical and appropriate for engineering audiences.
- Minor issues: “Figur” should be “Figure” and a few spacing/formatting inconsistencies (line breaks, margin alignment).
- Smooth flow from introduction to methodology to discussion.

Score: 8.5/10

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8. Overall Strengths

- Well-focused experimental study with real-world applicability.
- Appropriate methodology and instrumentation.
- Good use of data analysis to support conclusions.

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9. Weaknesses / Areas for Improvement

- Limited number of test cases.
- Slightly shallow discussion of sources of inefficiency (e.g., lubrication or gear profile).

- Future scope and industrial relevance could be more elaborated.
- Minor formatting and language issues.

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10. Recommendation

Recommendation	**Score Range**	**Justification**
Minor Revision	**8.0 – 9.0**	Solid work; needs additional data points, graphical clarity, and language fixes.

Overall Score: **8.3 / 10**