

METHODS FOR REDUCING VIBRATION IN POWER TRANSMISSION DEVICES

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Abstract: *paper investigates methods for reducing vibration in power transmission devices, with a focus on worm gear systems. Through laboratory experiments, an improved design of the worm gear reducer was proposed, and its effectiveness in reducing vibration was tested in practice. The results contribute to enhancing the operational efficiency of mechanical systems and ensuring long-term reliable performance.*

Keywords: *Vibration reduction, power transmission devices, electric motor, worm gear reducer, coupling.*

Introduction

Power transmission devices, such as gear reducers, wheel-driven mechanisms, and electric motors, are extensively used in industrial applications. Vibrations in these systems can lower efficiency, cause rapid wear of components, and compromise operational stability. This study aims to explore effective techniques for minimizing vibration in power transmission devices and to verify their effectiveness through laboratory experiments.[1]

Theoretical Background

- 1) Causes of vibration: Imbalance in the mechanical shaft, engagement of gear teeth in the reducer, and misalignment in couplings and connecting components.
- 2) Methods for vibration reduction:
 - 2.a) Precise installation of gear transmission elements
 - 2.b) Secure and stable mounting of the reducer and electric motor
 - 2.c) Balancing of weight and mass
 - 2.d) Developing an improved design incorporating elastic elements

Materials and Methods

The experiment was conducted at the Machine Components Laboratory of Navoi State University of Mining and Technologies. An electric motor and a 1Ч-63A worm gear reducer were used as the test objects.

Results and Discussion

During power transmission, adding an elastic element to the reducer led to a noticeable reduction in vibration. Vibration levels were measured using a VIP Expert device, while mechanical measurements were performed with a caliper (250 mm, accuracy 0.01 mm). Throughout the experiments, vibration levels were recorded under different configurations, and the system's operational performance was evaluated.

The results indicate that incorporating elastic elements significantly reduces vibration in power transmission systems. Additionally, secure mounting on the test stand and proper mass balancing of the electric motor and worm gear reducer substantially improved operational stability.[3] Observations also revealed that alignment of mechanical components, precise engagement of transmission elements, and the use of rubber elements play a crucial role in vibration reduction.[2] These findings have practical significance for the design and optimization of power transmission devices.

Conclusion

This study focused on methods to reduce vibration in power transmission devices, particularly in worm gear systems. Laboratory experiments demonstrated that the use of elastic elements, stable system mounting, and mass balancing significantly reduce vibration levels. Furthermore, precise installation of gear elements and proper alignment of mechanical components enhance the system's operational efficiency. These findings are practically important for the design and optimization of power transmission devices and for ensuring their long-term reliable performance.

References

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