



BUHLE POWER

Optimization design of energy storage flywheel rotor





Overview

How to optimize a flywheel rotor in multidimensional space?

We first build the shape optimization model of flywheel by parametric geometry modeling method with the objective to maximize the energy density of a flywheel rotor. Then the downhill simplex method is adopted to solve the nonlinear optimization problem in multidimensional space.

Does allowable stress affect the optimal shape of a flywheel rotor?

In the meantime, we consider the allowable stress effect on the optimal shape of the flywheel rotor. It is found that the optimized shape of the flywheel rotor is changed with the allowable stress. In general, the flywheel should first satisfy the requirement of energy storage capacity. The rotor of flywheel provides most of the kinetic energy.

How does a flywheel energy storage system work?

The flywheel energy storage system mainly stores energy through the inertia of the high-speed rotation of the rotor. In order to fully utilize material strength to achieve higher energy storage density, rotors are increasingly operating at extremely high flange speeds.

How to improve the stability of the flywheel energy storage single machine?

In the future, the focus should be on how to improve the stability of the flywheel energy storage single machine operation and optimize the control strategy of the flywheel array. The design of composite rotors mainly optimizes the operating speed, the number of composite material wheels, and the selection of rotor materials.



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Apr 27, 2025 · Flywheel energy storage systems (FESS) are widely favored in fields such as power systems, new energy, rail transit, UPS power supplies, etc. due to their high energy ...

[A review of flywheel energy storage rotor materials and ...](#)

Oct 19, 2023 · Therefore, the selection of appropriate rotor materials and the design of rotor structure are the key to reducing the cost of flywheel energy storage, which is crucial for the ...



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Aug 23, 2023 · Then, the optimization objective function is constructed by comprehensively considering critical speed constraint, influence factors of mode unbalance, proportion of strain ...

[Shape optimization of energy storage flywheel rotor](#)

Jun 17, 2016 · Then the downhill simplex method is adopted to solve the nonlinear optimization problem in multidimensional space. Finally, we obtain the optimized shapes of flywheel rotor ...



[Shape Optimization of Rotor for Flywheel Energy](#)

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Nov 2, 2023 · The suitable combinations of rotor thickness and radius of the selected shape were determined for maximum energy storage value (180-190 MJ) within commercially available ...



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May 1, 2023 · While the optimization objectives used for these rotors are different from the energy storage flywheels, some of these studies used a global stress constraint in the optimization ...



[DESIGN OPTIMIZATION OF A ROTOR FOR FLYWHEEL ...](#)

Sep 13, 2025 · having a higher correlation with increased utilization of green energy allowed the advancement of efficient flywheel energy storage systems (FESS) as an attractive battery

...



[Kainat Riaz1, Syeda Fatima Imam1, Nida Ilyas1, Zia ul](#)

Oct 19, 2022 · ABSTRACT Flywheel Energy Storage System (FESS) is an emerging technology with notable applications. To conduct analysis of flywheel's rotors, cylindrical shape ...



[Rotor Design for High-Speed Flywheel Energy Storage ...](#)

Sep 25, 2018 · More recently, flywheel systems were developed as true energy storage devices, which are also known as mechanical or electromechanical batteries. A remarkable example of ...



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The second contribution of this thesis was to offer holistic metal rotor FESS design guidelines by establishing the correlation between rotor shape, speed and radius and their combined effect ...

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