

Flywheel Energy Storage Lab

Classroom worksheet · Interactive simulation: <https://lkforge.com/tools/physics/flywheel/>

Name: _____ Date: _____

Learning objectives

- Explain rotational kinetic energy storage.
- Relate stored energy to moment of inertia and spin rate.
- Identify advantages and losses.

Variables to change

- Rotation speed
- Flywheel mass/inertia
- Friction

Procedure

1. Spin the flywheel up and note the energy stored.
2. Increase the rotation speed and observe how stored energy grows.
3. Let it coast and observe energy lost to friction over time.

Observations

Record stored energy versus rotation speed and how quickly it decays.

Questions

1. What form of energy does a flywheel store?
2. Write the stored energy.
3. Which matters more for stored energy, speed or inertia?

4. What causes a flywheel to lose stored energy?
5. What are flywheels good for?

Answer key (instructors)

- **1.** Rotational kinetic energy.
- **2.** $E = \frac{1}{2} \cdot I \cdot \omega^2$, where I is the moment of inertia and ω the angular speed.
- **3.** Speed — energy grows with the square of ω , but only linearly with I .
- **4.** Friction in bearings and air drag; advanced units use vacuum and magnetic bearings.
- **5.** Fast charge/discharge and high power for short durations (e.g. grid frequency regulation).

A flywheel stores rotational kinetic energy $E = \frac{1}{2}I\omega^2$. Because energy scales with the square of spin rate, speeding it up stores far more than adding mass. Friction and drag cause losses, so it suits short-duration, high-power applications.