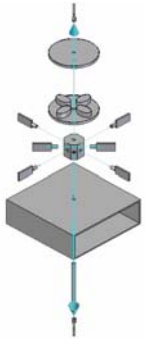


Engineering 110 presents



Alternative Energy Storage Systems

Demonstrations



Tuesday, May 3



(Demonstrations will be

on the College Avenue side of Esbenshade)

(Refreshments served at 3:00 pm inside)

2:15 pm – Demonstration of Projects (outside)

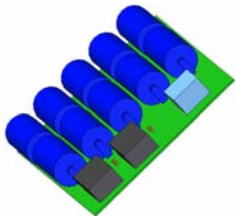
3:15 pm – Powerpoint Presentations (in Gibble Auditorium)

Alternative Energy Storage Systems (AESS) Design Project Objective:

Design an energy storage system, that doesn't use electrochemical batteries, to store energy generated during 15 minutes of sunlight on a 120 Watt solar panel, and, after a 0 - 5 minute pause, recover the stored energy in electrical form.

Materials:

1. Solar Panel, 120 Watt, 12 volt nominal (Size : approximately 59 by 26 inches)
2. The rest is up to you -- the student. Maximum budget = \$400.



Project Teams:

Ultracapacitors with smart switch –

Gabe Chong, Chris Yorgey, Pat Gianelli, Robert Erdesky, Paul Stegner

Induction Flywheel

Robert Blevins, Chris Weaver, Garry Brock, Suman Jonchhe, Derek Dietz, Matt Lauver

Micro-scale Pumped Hydroelectric

Zach Galbraith, Keenan Barbour-March, Ryan Cohick, Jeremy Crouse, Duane Breneman, Devin Oweremohle, David Coleman

Mechanical/Induction System -

James Painter, Adam Beard, Matt Quinlan, Drew Graybeal, Josh Brubaker, Alex Poletto

Micro-scale Compressed Air - DJ Lehr, John Yarrish, Josh Bittle, Adam Botterbusch,

Rob Fern, Dan Woodhead

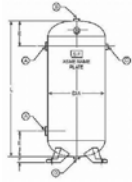


THE PROJECTS:

Ultracapacitors: Ultracapacitors advantages include very long lifetimes with virtually no decline in performance, high power density, and negligible leakage current . A typical Lead-Acid battery may have a lifetime of 1000 – 3000 cycles while ultracapacitors are routinely rated for 300,000 cycles. Ultracapacitors, however, are currently at least 10 times more expensive and 10 times larger than an equivalent battery setup. Ultracapacitors, today, are used in some uninterruptible power supplies (UPS).

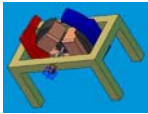


Pumped Hydroelectric: Pumped hydroelectric energy storage is the current standard for large-scale energy storage. Pumped hydroelectric systems have extremely long lifetimes (75 years) and very low maintenance. The major attractive feature is a much lower cost per unit energy over the lifetime of the system as compared with any other energy storage method. Efficiency currently falls off for micro-scale systems and overall energy density is extremely low.



Compressed Air: Compressed Air energy storage is an emerging competitor to pumped hydroelectric for very large systems. The one plant in operation in the USA is a combined natural gas generation system. Energy density is higher than pumped hydroelectric and lifecycles can be upward of 20 years, but challenges remain in efficient recovery of the stored energy for standalone (non-combined) systems.

Flywheel Energy Storage: Flywheel-based energy storage has the potential for longer lifetimes than a battery based system without declining performance. Flywheel systems have similar energy density to a battery-based system and higher power density. Research continues in composite materials that can be spun at very high RPM without failure, increasing the energy density. As well, research continues into “frictionless” magnetic bearing systems. Flywheel energy storage is currently used in some cases in uninterruptible power supplies (UPS).



Induction Pendulum Energy Storage: A creation of the students at Elizabethtown College, pendulum based energy storage has very low energy density, but may have applications for engineers whose kids have grown and wish to convert their swing sets into a home energy storage system.



More information: Energy storage synopsis –

Technologies such as solar photovoltaics and wind turbines generate power intermittently (i.e., only when the sun shines or when the wind blows). Such alternative energy generation methods will be limited to use as a “supplemental” source unless effective energy storage is implemented. Thus, one can consider energy storage as a fundamental part of any plan to implement a standalone alternative-energy powered facility.

In this project, we explore non-battery (electrochemical) based energy storage techniques. While batteries are widely used and somewhat effective, limited lifetimes, cost, and size, as well as environmental disposal concerns compel us to explore other technologies.