TensilasticEnergy

Syracuse University
College of Engineering
& Computer Science

Elastic Pumped Storage Hydro

Project Description

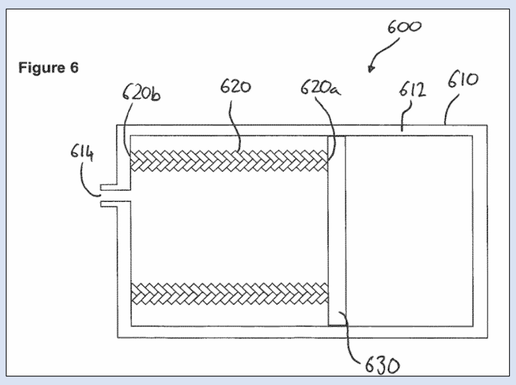
Our team is tasked with revolutionizing pumped storage hydro (PSH) by replacing gravitational potential energy with elastic. PSH is a form of large-scale energy storage that operates as a "two-way dam." By using elastic potential energy, our storage system will be more readily scalable and portable. Tensilastic Energy's patented process hopes to store this elastic energy by tensioning braided fibers.

Background and Existing Solutions

Currently, PSH is a gravity-based and stationary method of storing energy. Because it relies on gravity, meaning larger systems store more energy, it presents obstacles in scalability and mobility. In terms of portable energy storage, lithium-ion batteries dominate the market. These, however, come with significant issues regarding safety and environmental sustainability.

Design Options

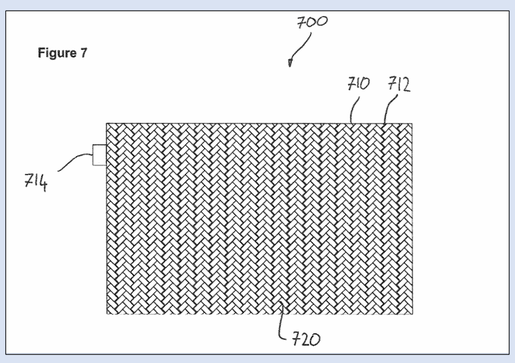
Option 1



This piston model uses separate intake and discharge holes. The fibers are attached to the cylinder's interior at one end and to the moving piston on the other end. The vessel is then filled with fluid on the fiber side so that the piston moves and the fibers stretch. This will build tensile energy which can be later released via the discharge hole.

- **Pros:**
  1. Linear fiber stretching simplifies calculations and estimations
  2. Rigid structure streamlines transport and allows for easy setup
- **Cons:**
  1. Fibers are submerged in liquid and may corrode
  2. Fiber replacement requires accessing the piston cylinder interior
  3. Attaching fibers to piston system may be complex

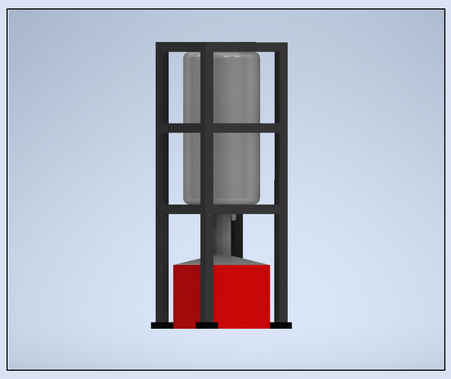
Option 2



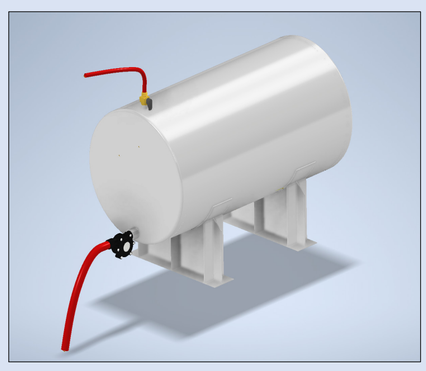
With elastic fibers tightly wrapped around the outer-surface of an inflatable bladder, water intake will stretch the fibers, thus storing elastic potential energy. When the valve is opened for energy generation, the elastic fibers compress the bladder, pushing water out quickly.

- **Pros:**
  1. Fibers are not subject to corrosion by liquid
  2. Fibers are easily accessible for replacement
  3. The system takes up less space when not filled
- **Cons:**
  1. Attaching the fibers to a nonrigid body is complex
  2. The variability in shape may make the setup difficult

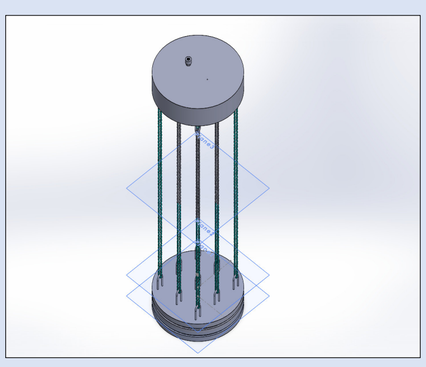
Exterior Design #1



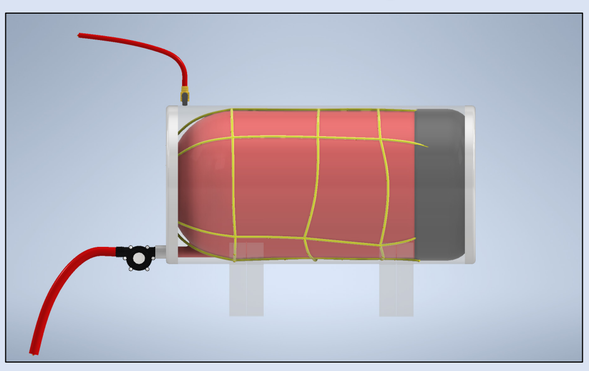
Exterior Design #2



Piston Design



Bladder Design



Semester Deliverables:

1. Patent-adhering method of storing and using elastic pumped storage hydro energy
2. Design clearly demonstrates market viability
3. Measured 82% system efficiency, if not possible with constraints, then shown with variables upscaled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