Design of a Self-Recharging Untethered Mobile Inspection Tool inside a Pipeline

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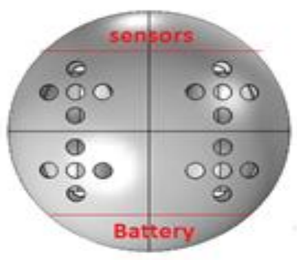
Scope:

- Design a fully autonomous inspection tool
- Self-recharging mobile ball
- Optimize the design of the ball for maximal energy gain

Model Design:



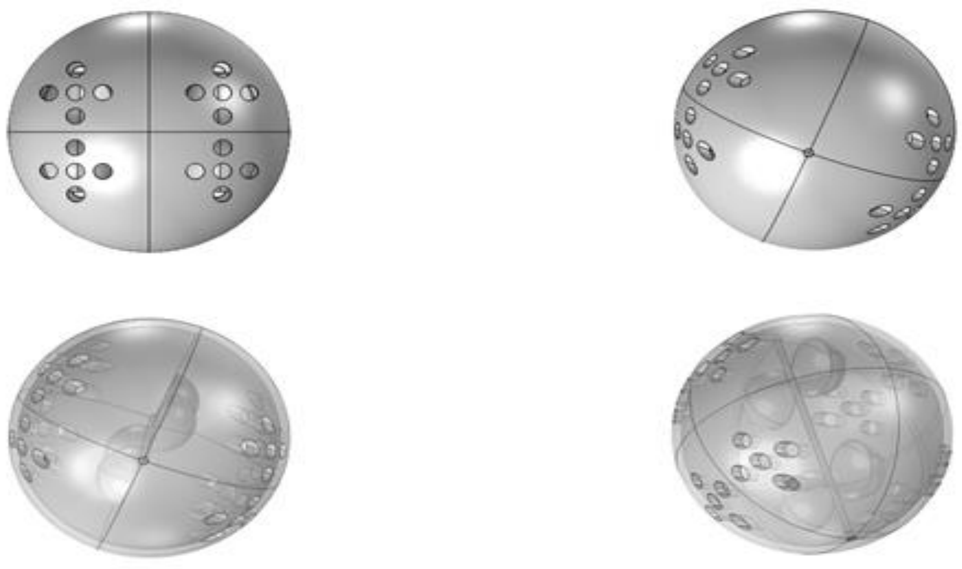
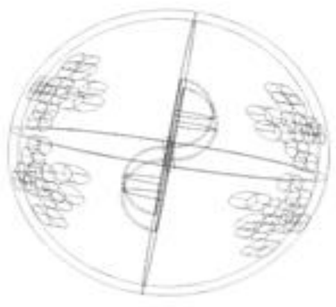


Figure 1. Design of the Ball Outer Shell



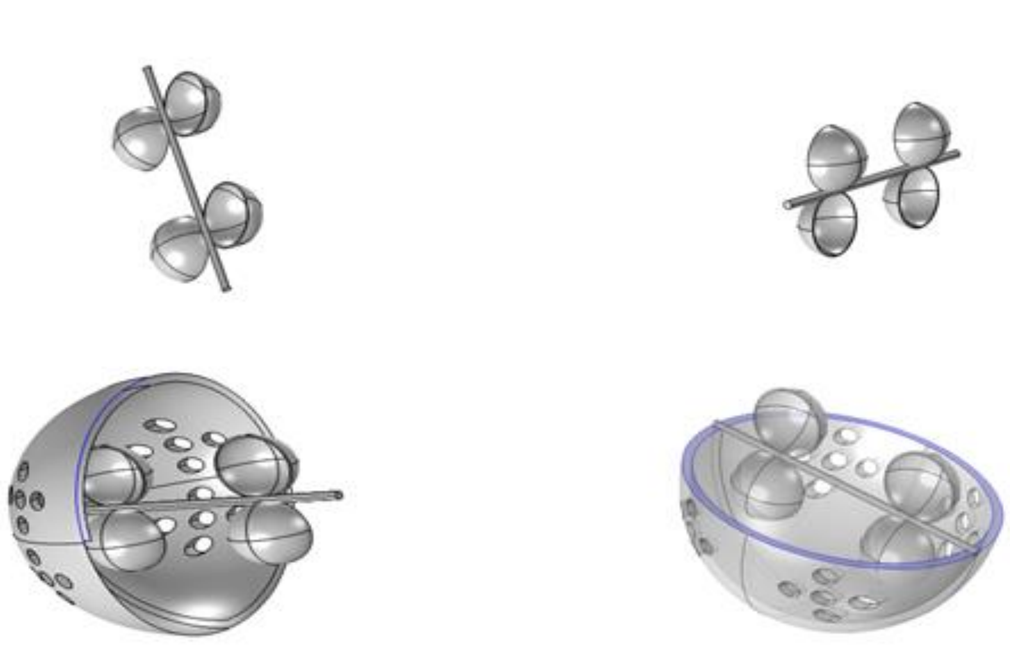


Figure 2. Design of the Rotating Blades

Sensitivity Analysis:

- Vary the openings number and location
- Compare the energy gain, denoted G, generated by different ball designs

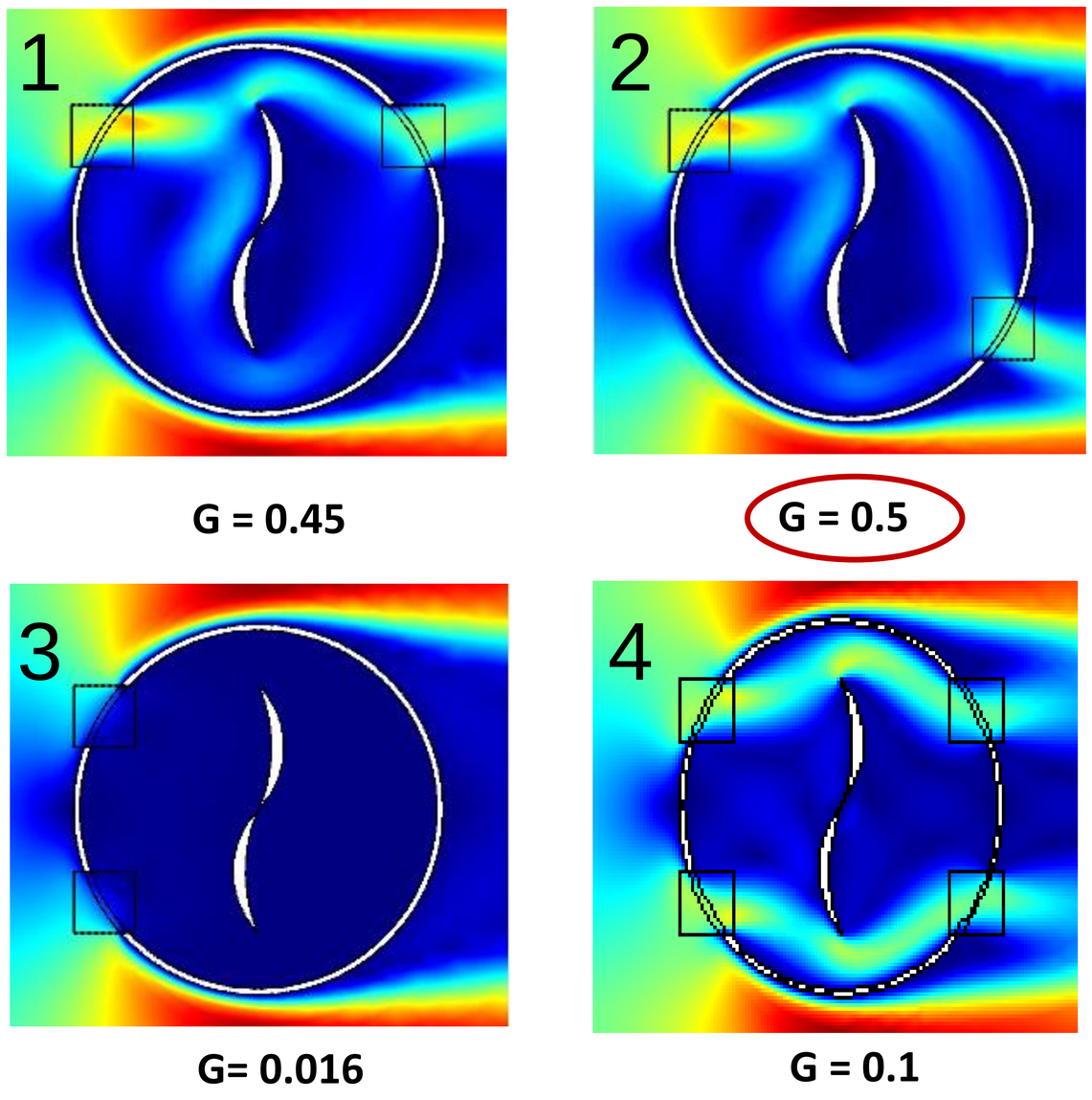


Figure 3. Fluid Velocity Profile inside the Ball with different designs and their respective gain

Conclusions:

- The maximal velocity for the blades rotation is achieved by Design 2 (G = 0.5)
- The kinetic energy generated from the rotation of the blades by the fluid flow inside the ball will recharge the battery

References:

1. Wadie R. Chalgham, Abdennour C. Seibi and Fathi Boukadi, Simulation of Leak Noise Propagation and Detection Using COMSOL Multiphysics, *ASME Proceedings of the International Mechanical Engineering Congress & Exposition, Phoenix, Arizona, USA* (2016)
2. Wadie R. Chalgham, Abdennour C. Seibi and Matthew Lomas, Leak Detection and Self-Healing Pipelines Using Twin Balls Technology, *SPE Annual Technical Conference and Exhibition, Dubai, UAE* (2016)