2022

Magnetically Geared Hydroelectric Turbine

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Magnetically Geared Hydroelectric Turbine

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BACKGROUND:

Current hydroelectric turbine technologies require mechanical seals and gearboxes to transfer rotation. These components are expensive and a common point of failure. This novel turbine design eliminates both components using magnetism.

HOW DOES IT WORK?

A concentric magnetic gearbox can transfer rotation across an air, water, or material gap. This allows for a fully sealed electronics chamber. Within the electronics chamber a smaller magnetic rotor is coupled to a motor shaft and a bearing. As the larger impeller blades rotate, a series of six N52 magnets rotate, this rotation force the rotation of the inner rotor.

The ratio of magnetic poles between the inner and outer rotors can be configured similarly to how a mechanical gear ratio utilizes different numbers of teeth. This magnetic pole ratio can be altered to increase the amount of torque, or the speed of rotation transferred.

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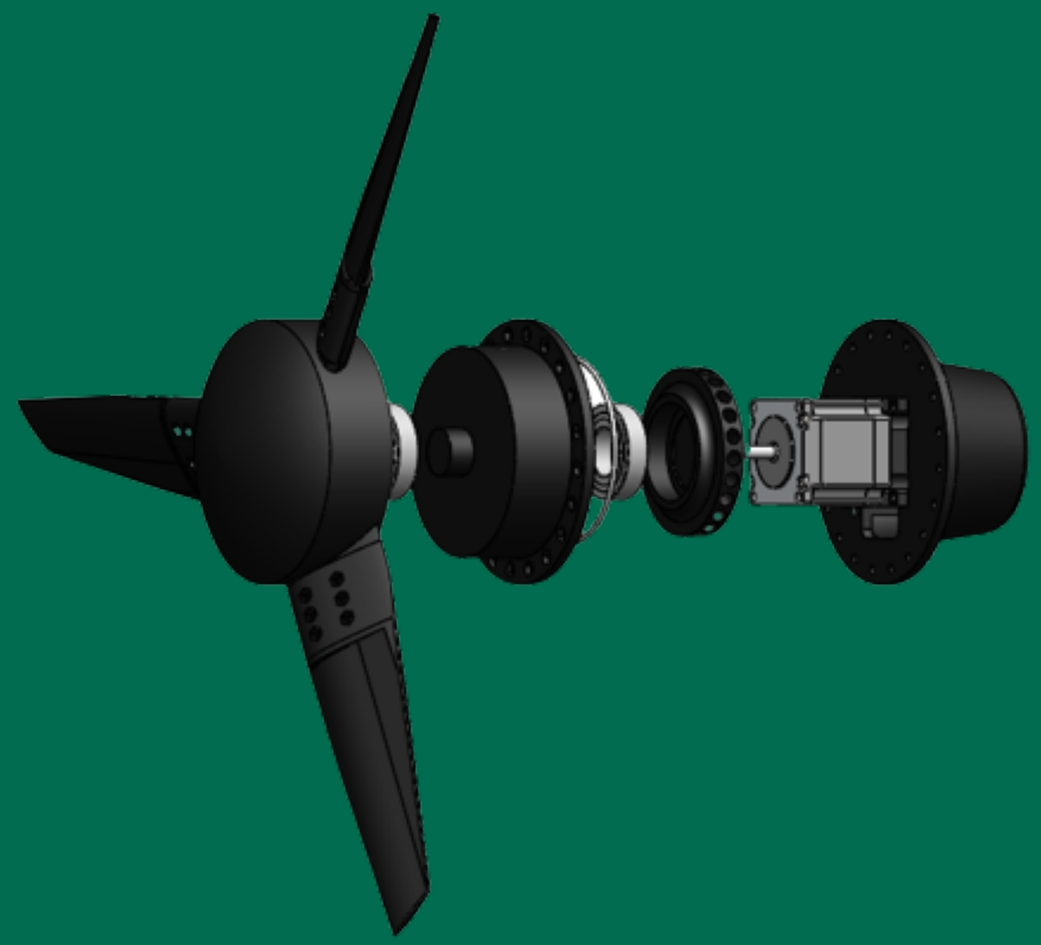
Magnetically geared turbine eliminates the need for a mechanical seal and a traditional gearbox.



Exploded assembly view displaying the internal components of the turbine

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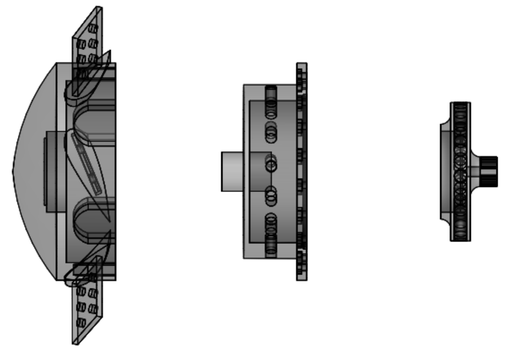
MAGNETIC GEARBOX:



A series of six N52 magnets around the perimeter of the outer rotor and a series of twenty-four smaller magnets on the inner rotor results in 4:1 torque increase. This allows for power to be generated via a high torque stepper motor. A set of fifteen ferrite beads sit radially spaced between the two rotors, allowing for a transfer of magnetic flux. The number of ferrite beads required for flux transfer is equivalent to the sum of the magnetic pole pairs on each rotor. For example, the outer rotors six magnets constitutes three pole pairs, and the inner rotors twenty-four magnets constitute twelve pole pairs. This sums to fifteen pole pairs, corresponding to the number of ferrite beads in the assembly.