MagFlow: A Revolutionary Magnetic Coupling System for More Than Just Generating Flow

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MagFlow is a revolutionary magnetic coupling system that eliminates the need for mechanical or electrical connections to flow pumps within an aquarium or enclosed space. Traditional fully submerged powerheads, used to generate flow, can lead to dangerous stray voltage and maintenance challenges. The current alternative design to these is patented, unreliable, and expensive. MagFlow uses an exterior dry side and an interior wet side that are magnetically coupled to spin a propeller through the tank wall. An array of electromagnets on the dry side rapidly pulse to induce rotation of the propeller that is attached to permanent magnets on the wet side. The two sides are held together with strong central magnets. In order to measure performance, the maximum RPM of each design was tested over a range of gap thicknesses, and the temperature of the dry side was logged over 10-minute run times. Iterative improvements were made over the three main designs constructed. Notably, the second iteration saw a 356% RPM performance increase while only using 54% of the power at a 5mm gap compared to the first main design. Even with the major advances, there are still many areas for future improvement in the design. Multiple alternative applications for the MagFlow coupling system are also being investigated and designed, including a magnetically joined robotic arm with the potential for self-assembly.

Awards Won:

Third Award of $1,000

Missouri University of Science and Technology: $1,250 tuition scholarship (renewable for up to 4 years)

NC State College of Engineering: Scholarship to attend NC State Engineering Summer Camp