



CASE STUDY

ECM Displays Advantages of PCB Stator Motors For Pump Applications

Overview

ECM was recently commissioned by the New England Aquarium, in Boston Massachusetts, to replace a conventional 2.2kW pump motor with a custom PCB stator motor solution. The specific circulation pump of discussion services a tank responsible for the rehabilitation of injured sea turtles.

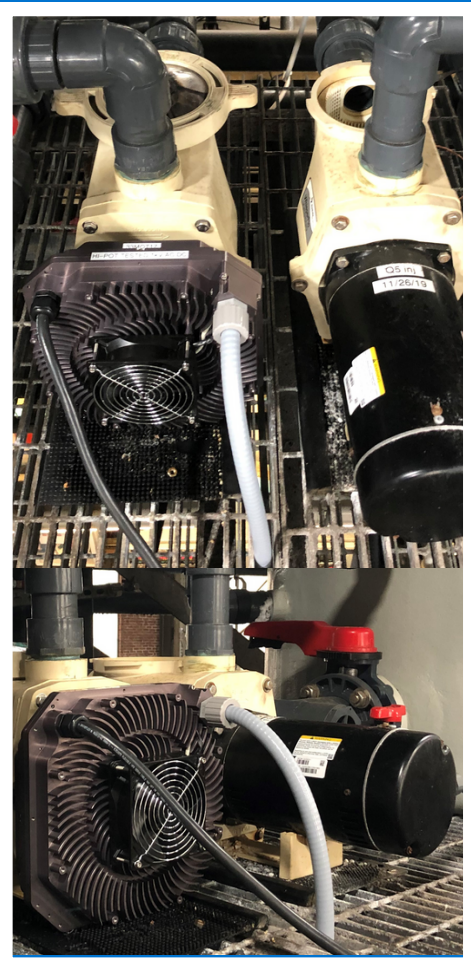
Benefits

Motors developed with ECM's PCB Stator technology have many benefits for motorized pump systems and other HVAC applications. Using the PrintStator design software, ECM can design motors which offer substantially high efficiencies, reduced weight, and ultra-thin form factors. Higher efficiency motors mean either less fuel consumption, or reduced energy costs, and a smaller carbon footprint. PCB stator motors require significantly less raw materials and having an axial flux form factor, allowing PCB stator motors to be up to 70% lighter than traditional machines while only being a fraction of their axial length.

Furthermore, ECM's stators are fully encapsulated in FR4, reducing reliability and maintenance issues that arise from vibration and insulation failures, leading to an extended motor lifespan and less required maintenance. These negligible levels of vibration in PCB stators means ECM's motors make less audible noise.



New England
Aquarium





Results

ECM replaced a 2.2kW pump motor at the New England Aquarium with a custom 2.2kW ECM PCB stator motor. The legacy motor that ECM replaced had a rated motor efficiency of 79%, weighed 17kg and was over 13 inches in axial length. ECM's solution has a rated motor efficiency of 93%, a mass of 12kg, and decreased axial length to just 3.9 inches.

Further, a Fluke 435 Series II Power Analyzer was used to measure the power consumption of both motors to directly compare performance. The aquarium's existing solution had an average power consumption of 3.36kw, indicating the motor was likely running at a load condition greater than the 3hp rated operating point. After the ECM machine was installed, an average power consumption of 3.02kw was observed for the entire motor system.

Motor durability was another factor of particular interest in this application. Living in a harsh, saline environment, the legacy motor had many issues with reliability, specifically with salt buildup as well as bearing failure from corrosion. Since ECM motors have fully encapsulated copper windings and are totally enclosed machines, IP ratings of IP68 or higher can be achieved to help increase life expectancy of the ECM motor in comparison with existing solutions. The ECM PCB stator motor has been running continuously at the New England Aquarium, without issue, since August 2021.



2.2kW Circulation Pump	Existing Solution	ECM PCB Stator Motor
Nominal Power (kW)	2.2	2.2
Nominal Speed (RPM)	3000	3000
Nominal Torque (Nm)	7	7
Voltage	480 VAC	480VAC
Efficiency	79%	93%
Axial Length (inch)	13.6	3.9
Mass (kg)	17	11.8

Next Steps

EECM is in the process of integrating PCB stator technology and the PrintStator software into a wide range of HVAC and pump motor systems, in both the industrial and residential sectors. High motor efficiencies, significant weight reduction and ultra-thin form factors are a few of the benefits that have been highlighted by HVAC industry leaders. Increased durability and low audible noise further add to the value of PCB stator motors for HVAC applications and beyond.

To discuss the benefits of ECM's PCB stator technology within your product line, please email info@pcbstator.com or visit pcbstator.com/design-your-own to learn more about our 5-step integration process.

