

## FACULTY RESEARCH FUND

**Award Date:** Fall 2021

**Proposal Title:** Development of a Novel Streamlined Vortex Generator for Dry Cooling Heat Exchangers

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### ABSTRACT

In an era when energy and water resources challenges have come to the forefront, multi-scale vortical flow structures could lead to significant savings of energy and water usage in thermal management systems. The objective of this project is to design a novel streamlined vortex generator and explore the effects of induced vortical structure on convective heat transfer, especially in dry cooling heat exchangers. Many different geometries of VGs have been studied and most of the studies focused on simple geometries such as triangular, rectangular, or trapezoidal shapes with some variations such as punched holes. Therefore, the PI will 1) develop a novel streamlined VG based on potential flow theorem and 2) show that vortical structures induced by the proposed VG can transfer and transport thermal energy more effectively in surface cooling applications. In addition, the PI will develop the experimental setups to investigate the flow behaviors and thermal performance using flow visualization and liquid crystal thermography. The research data will be used as preliminary data to support extended research, which is to develop an industrial-scale high-efficient vortex dry cooling heat exchanger. If the FRAC supports this research project, the funds will be used to purchase a seeding particle generator, which plays a critical role in fluid dynamic study. The funds will also be used to recruit engineering students.