Planning the world's largest water tunnel research facility

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The University of Miami College of Engineering has received funding from the Corporacion Andina de Fomento to undertake a feasibility study for a new experimental facility located in Panama. The proposed Water Tunnel of the Americas at the Panama Canal (WTAPC) would be the largest water tunnel facility in the world.

The experimental facility would greatly benefit the construction, naval, aerospace, and automobile industries on a global scale, by providing unique capabilities to conduct ground-breaking research. The project is aimed at advancing the fundamental understanding of aerodynamics and fluid-structure interaction and translating the findings in improved designs, analysis methodologies and tools.

"The facility would enable researchers to test models of structures they want to build, including vehicles, buildings and turbines," says Antonio Nanni, professor and chair of the UM Civil, Architectural and Environmental Engineering Department and PI of this project. "The tunnel would also enable scientists to determine forces of extreme weather on buildings and structures, by replicating real life conditions on a larger scale than it's currently possible."

The tunnel would have a test section of 4 x 4 m width by 20 m in length, and would allow a water velocity of up to 20 m/s to be maintained for 60 seconds. These characteristics would make WTAPC the largest and most advanced water tunnel facility in the world based on the size of the test section, mass flow rate and flow speed.

"A water tunnel is the natural progression from a research wind tunnel," says Nanni. "Water and wind have similar effects on structures and materials, but with water, one can maximize the dynamic effect because it's denser than air."

Existing water tunnels are closed loops that use electricity and demand energy to operate, but the new tunnel would be a "green" project, because it would use a blow-down water tunnel design that generates power by periodically allowing the water stored in the Panama Canal Maddem Dam, to flow down through the tunnel, and use the force of the water to test a broad range of man-made structures.

"We are using the force of nature to operate a research facility without impacting the energy demand," says Nanni. "The proposed design stands on sound ground from both a technical and sustainability standpoint, while the scientific and economic relevance of such a research facility for Panama and the region is unprecedented."

Once constructed and possibly coupled with existing and new UM complementary facilities such as, Miami Wind™ wind tunnel, and the UM Supercomputing Center and the wind-wave-storm surge simulator, at the Rosenstiel School of Marine and Atmospheric Science, it would help create a transformational regional hub for research that would enable scientist and engineers to address the challenges of extreme weather threatening the safety of our communities and the world.

Provided by University of Miami