Design Optimization of a Dual-Rotor Turbine for River Current Energy Conversion

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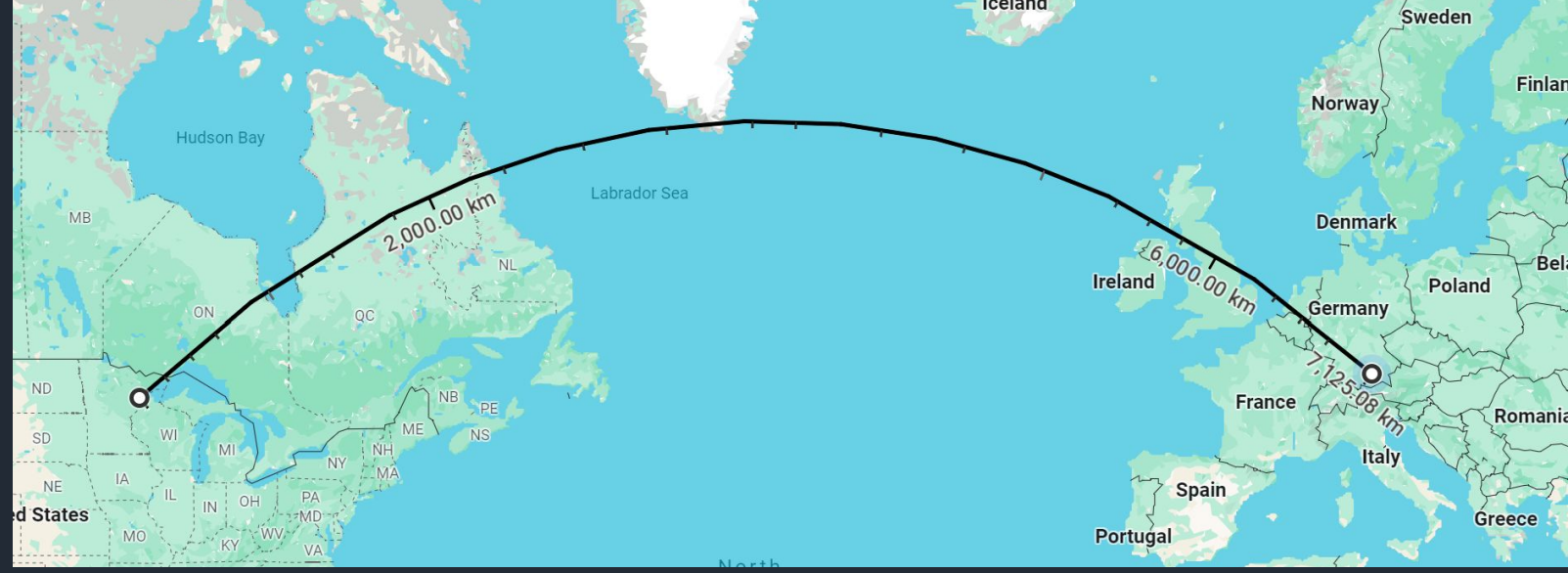
UMN-Duluth & Energyminer Collaboration



- University of Minnesota continues to build connections and collaborations with German companies and universities.
- Energyminer GmbH (Gröbenzell, DE) aims to deploy large scale hydrokinetic turbines across Germany, then expand.
- Shared interests in harnessing energy from renewable methods.

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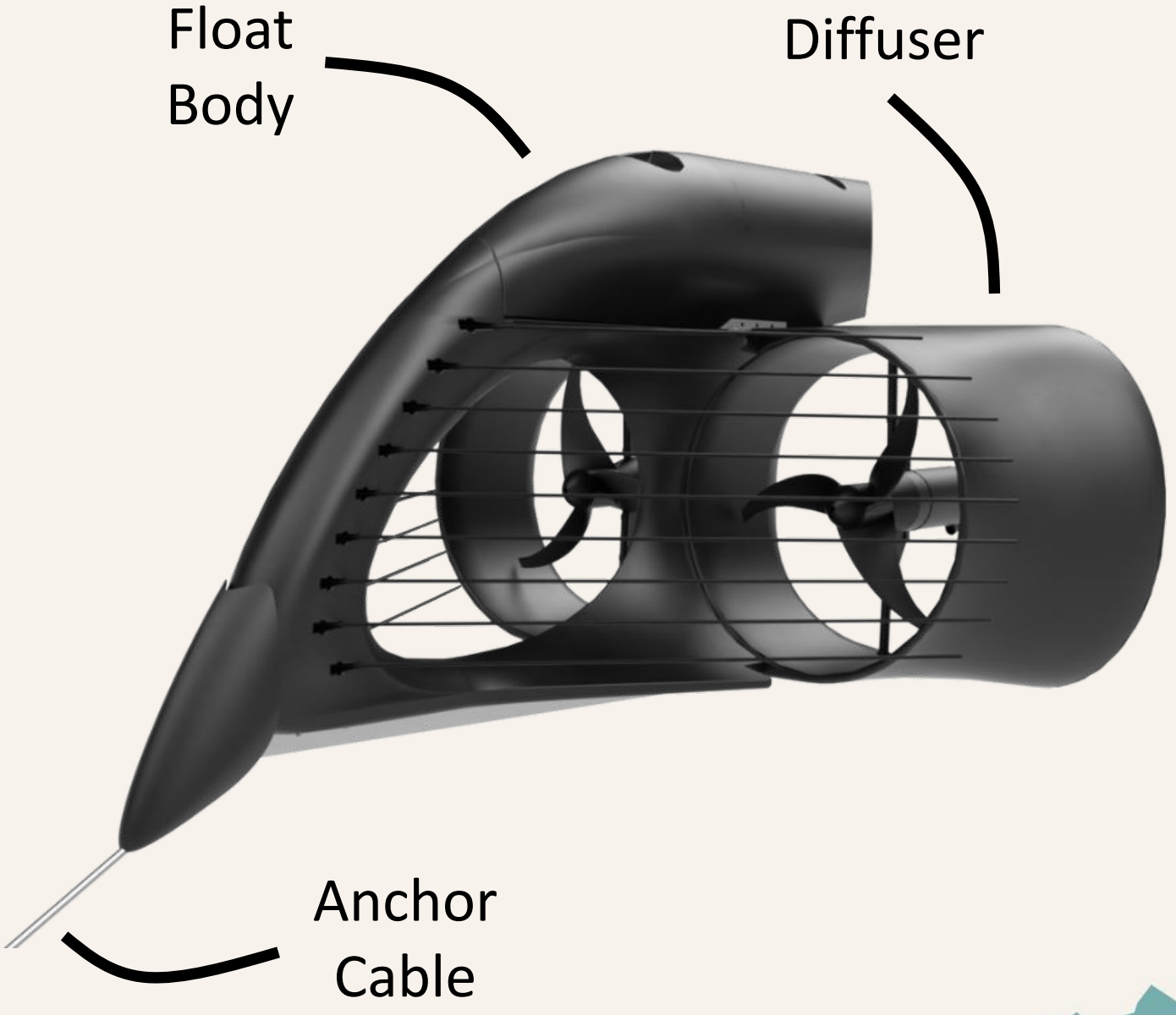
The Energyfish

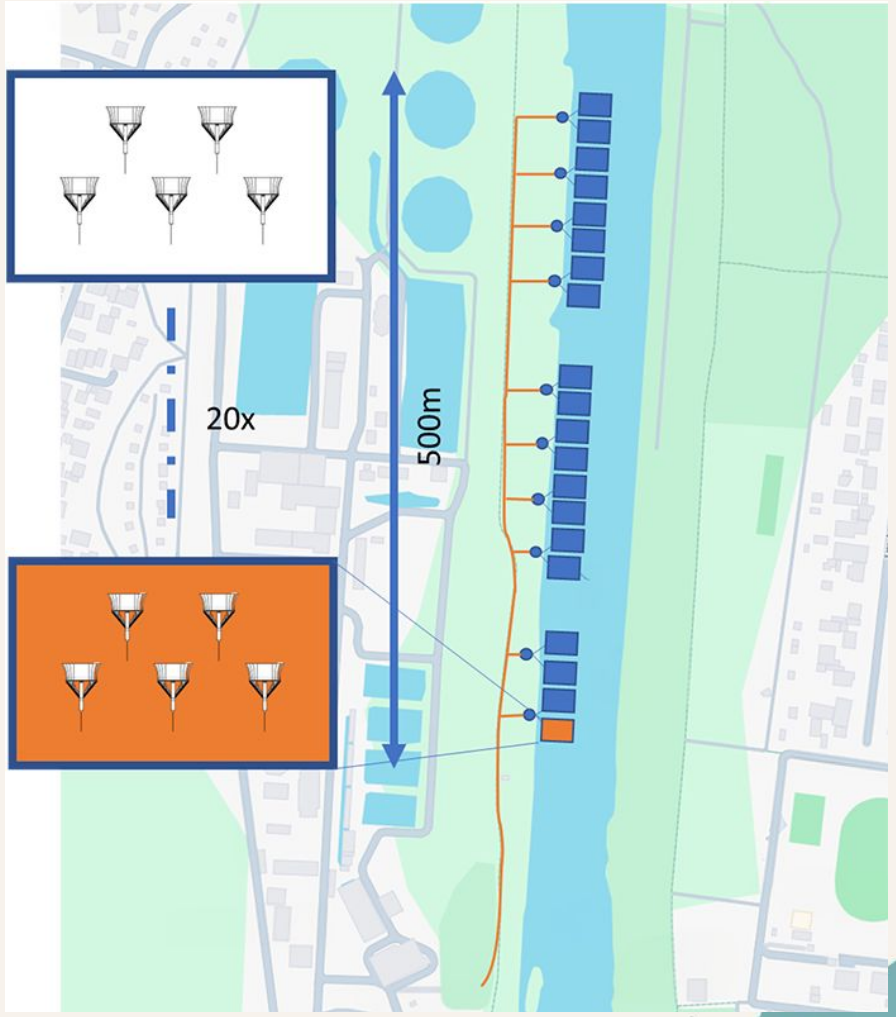
Technical Specifications

Weight	Approx. 80 kg
Dimensions	3 x 2.4 x 1 m
Installed Capacity	6 kW
Avg. Power Output	1.8 kW
Avg. Annual Production	15,600 kWh
Avg. Annual Carbon Offset	-23 tons



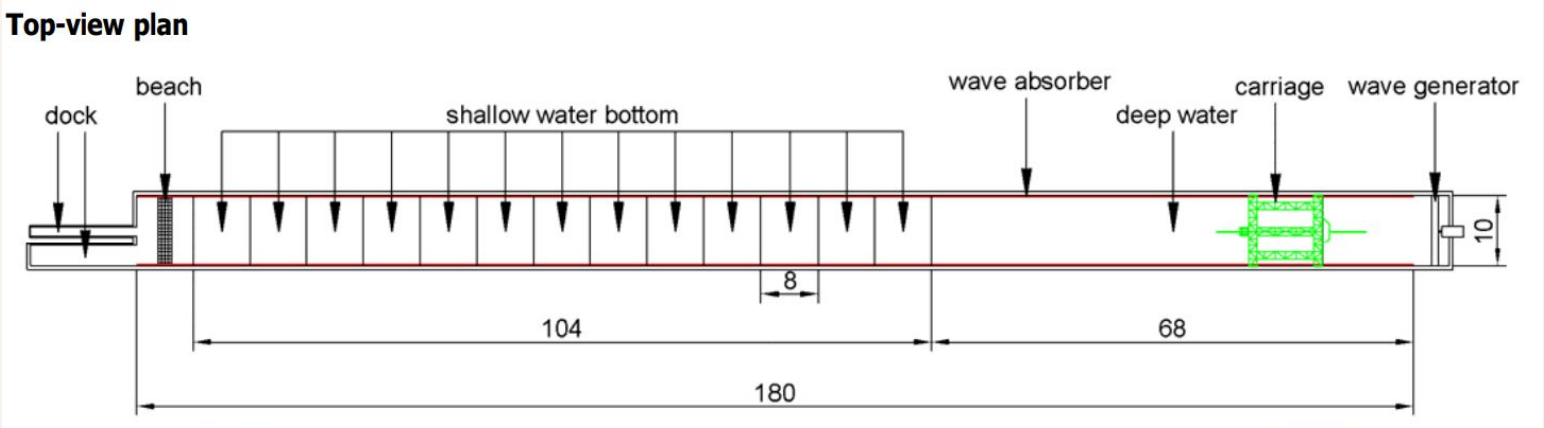
School of Energyfish – Case Study

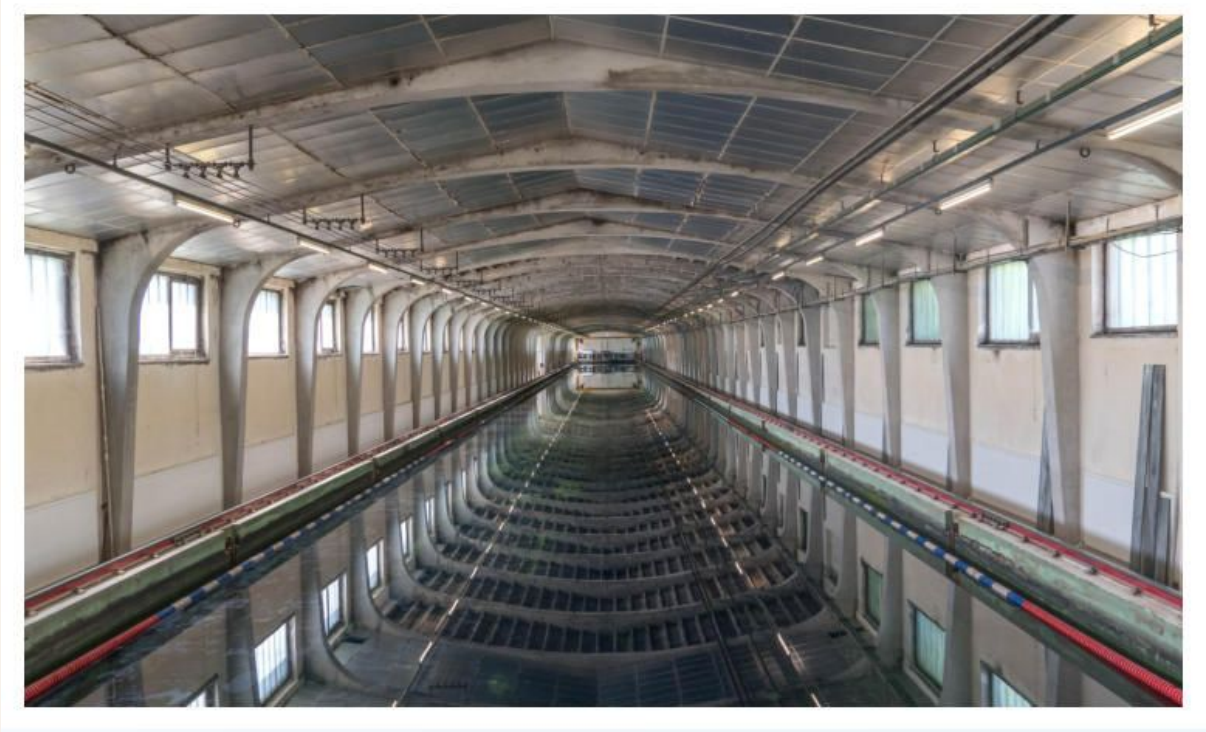
Key Figures	
Average Annual Yield	613.727 kWh (ca. 200 Households)
Installed Capacity	300 kW Low Voltage
Plant Size	100 Energyfish
Number of Rows	20
Total Length of School	500 m
Width of School	15 m
River Coverage	9 % of River cross section



The Energyfish - Pre-Series (Munich, DE)

Tank Testing (Vienna Model Basin Ltd)





Facility

180 m x 10 m x 5 m (L x W x H)

Motor Driven Carriage

Max Carriage Speed: 7 m/s

Wave Generator Capability

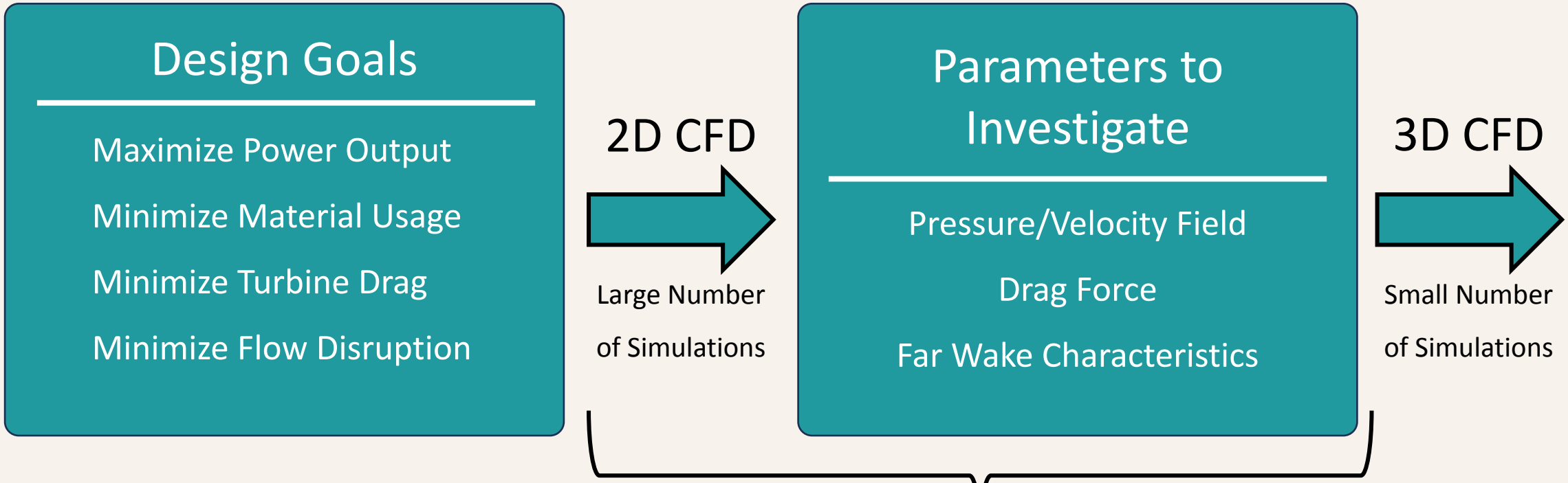
Max Wave Height: 0.6 m

Wave length: 0.35 – 20 m

Six-component Load Cells

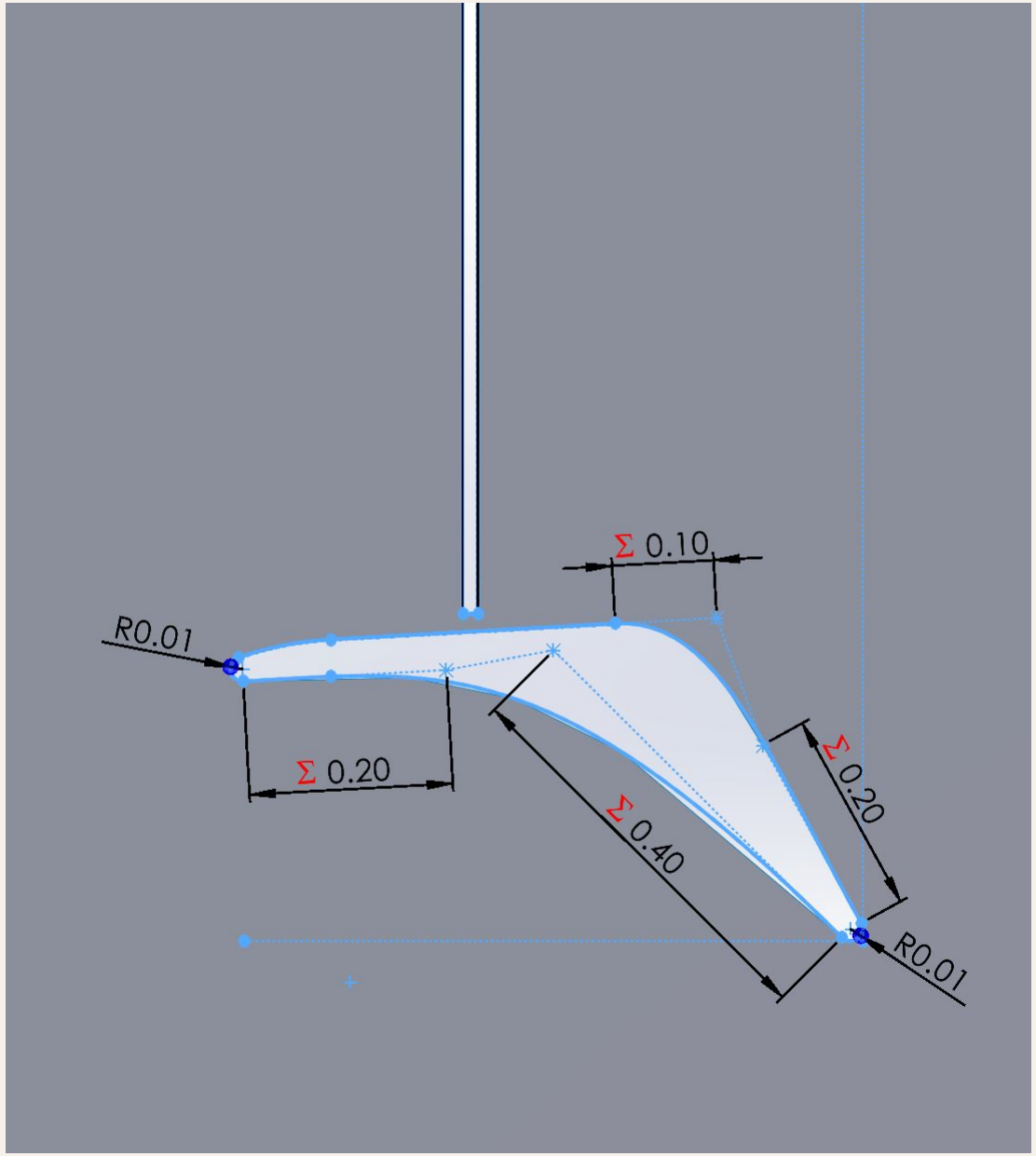
Tank Testing (Vienna Model Basin Ltd)

Research Scope



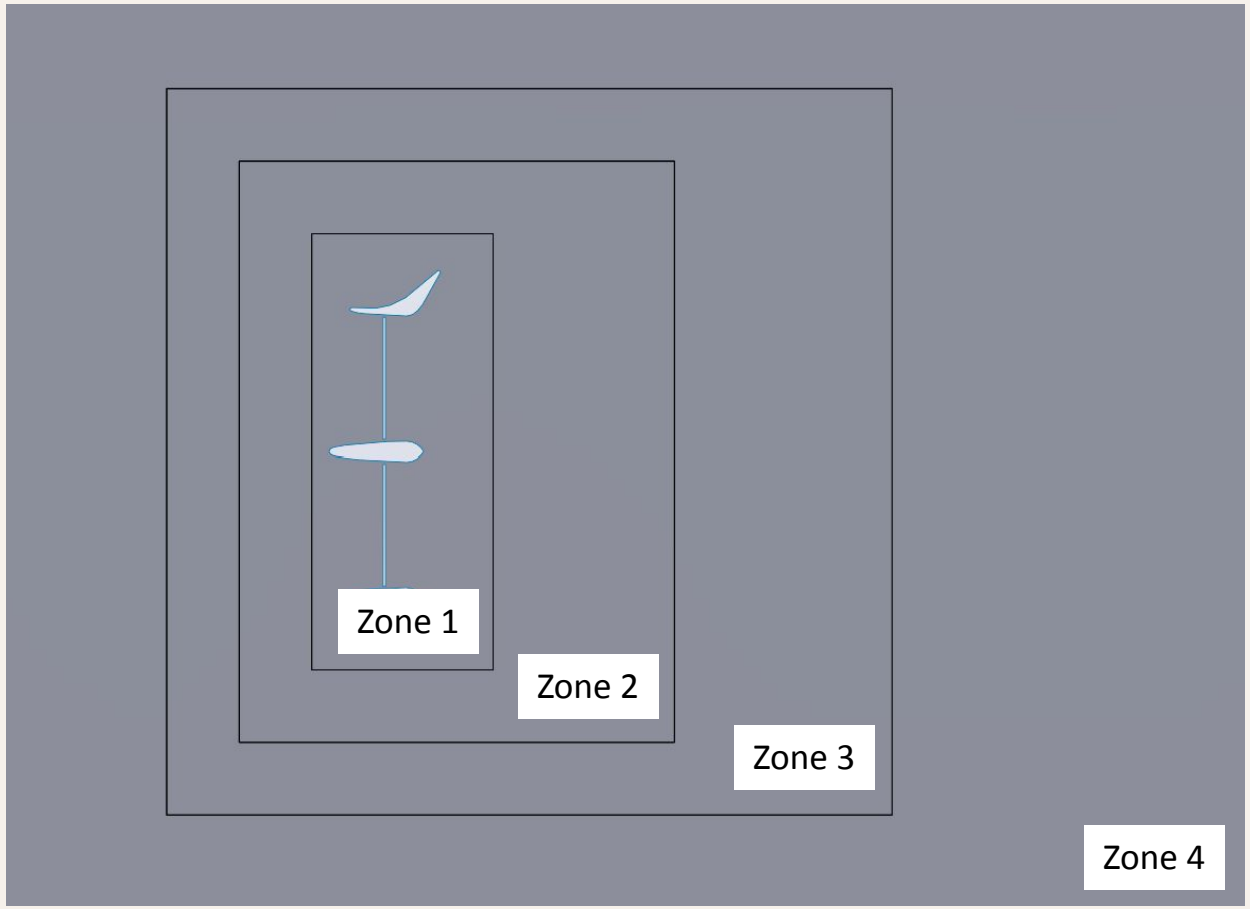
Design Parameterization

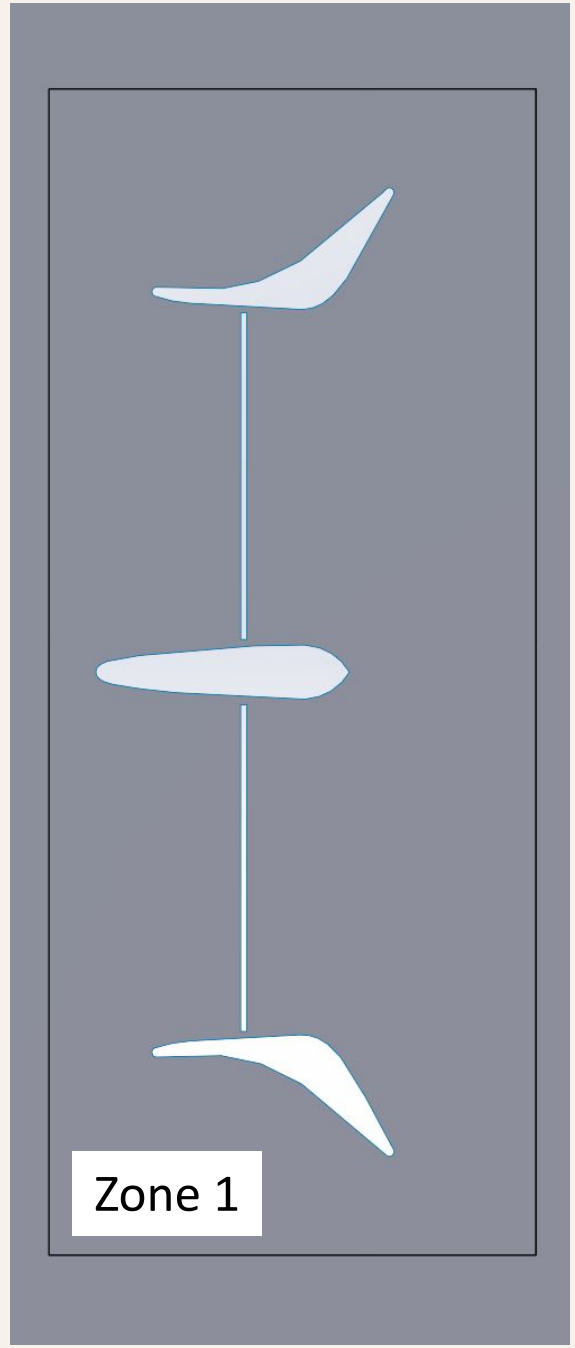
Name	Value / Equation	Evaluates to
Global Variables		
"DS_OUT1"	= 0.2	0.200000
"DS_OUT2"	= 0.4	0.400000
"DS_INN1"	= 0.1	0.100000
"DS_INN2"	= 0.2	0.200000
Add global variable		

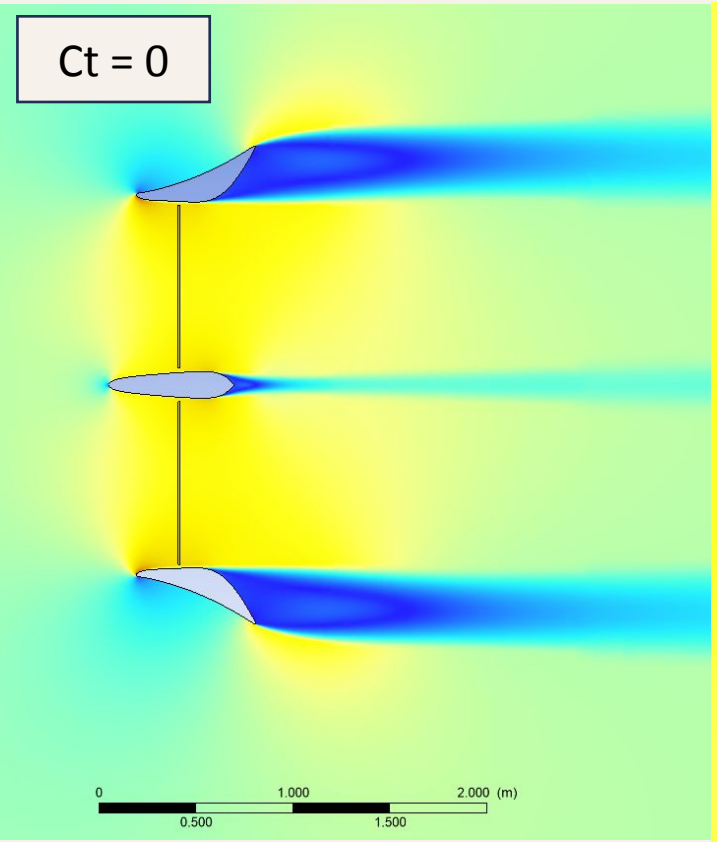


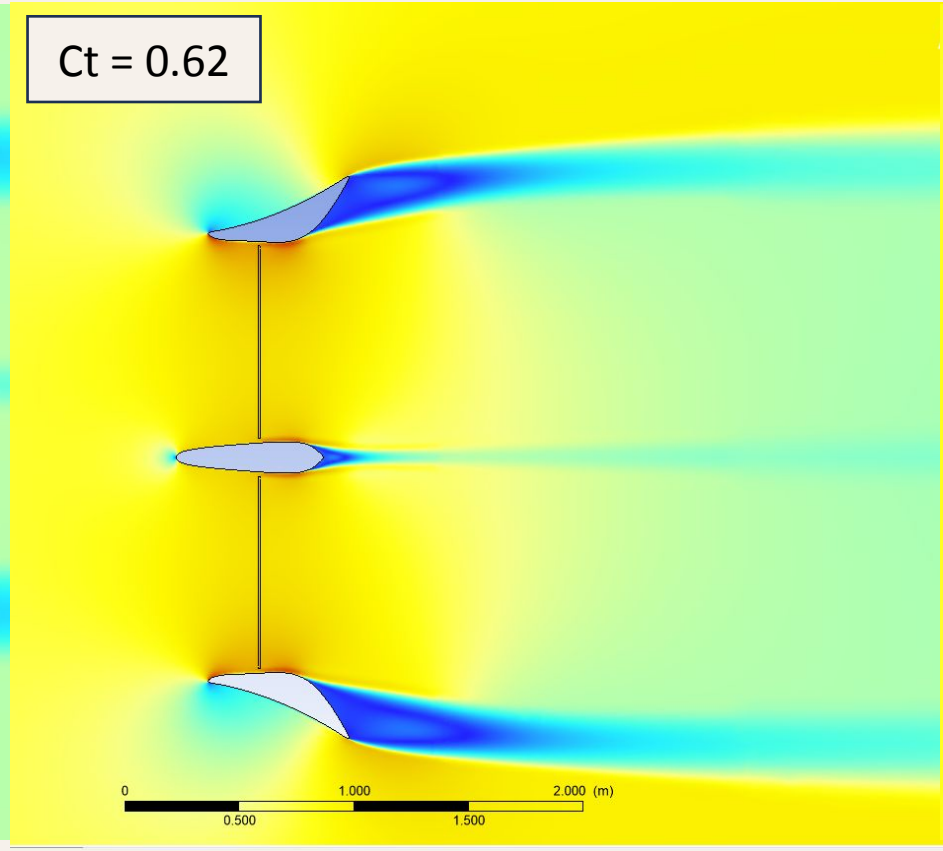
Domain Geometry

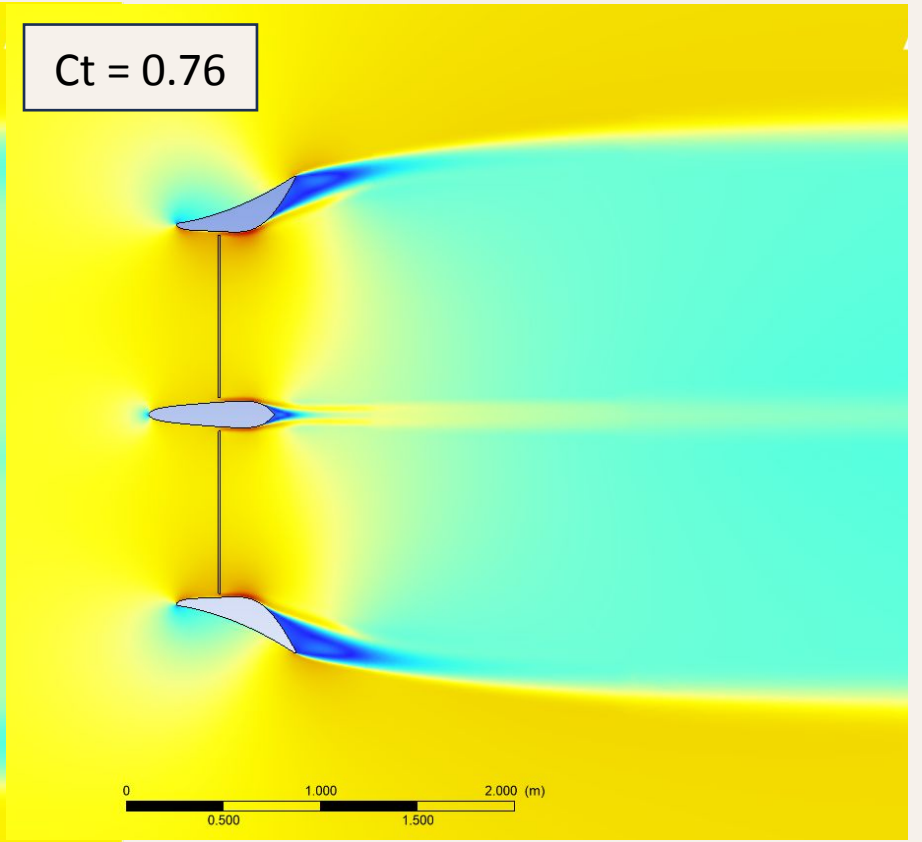
Label	Zone Dimensions (Streamwise x Cross-Stream)	Zone Mesh Element Size
Zone 1	1.5 D x 3.5 D	0.012 D
Zone 2	3.5 D x 4.75 D	0.024 D
Zone 3	4.75 D x 6 D	0.059 D
Zone 4	60 D x 12 D	0.119 D

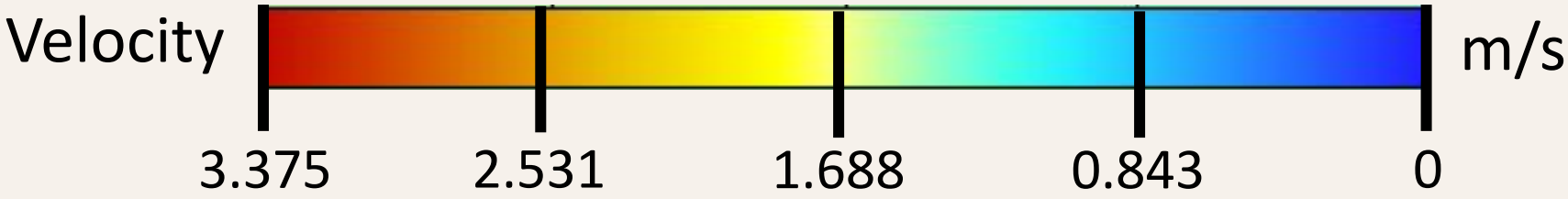










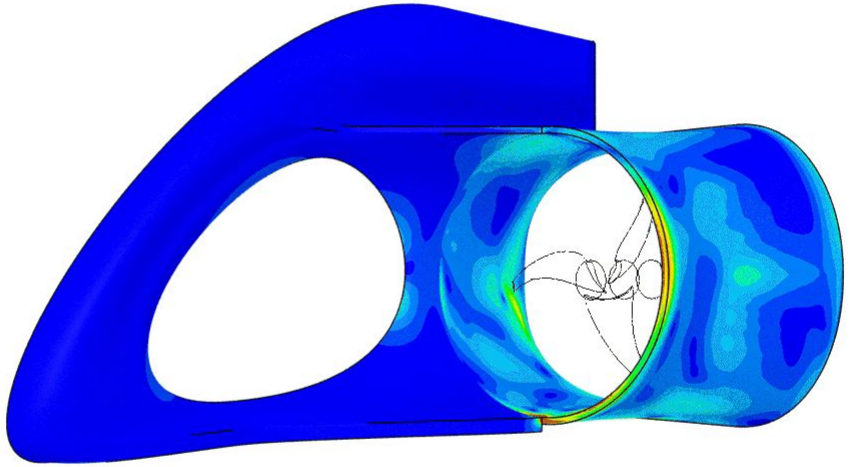


Testing Outcomes

Further Testing

- Move towards full scale 3D simulations informed by findings of this research

- Test the feasibility of a variable diffuser for different flow conditions



Questions?

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