Colorado Science and Engineering Fair

2024 Individual Project Abstract Form

Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.

Title of Project: Reduction of Vortex-Induced Vibrations with Helical Grooves

Finalist's Name: Alexander Polazkowyj

School and City: Evergreen Senior High School , Evergreen, CO

Sponsor's Name: Stephanie Seevers

Category: Engineering (ENGR) Division: Senior (9th - 12th grades)

Abstract (250 words or less):

Vortex-Induced Vibrations is a phenomenon whereupon fluid flow over flexible structures result in violent shaking and clashing, which results in fatigue and potential failure. Subsea cables hold great importance in the global community, providing connectivity and power across nations, making it imperative to protect cables from VIV. My project, The Effect of Helical Curves to reduce Vortex-Induced Vibrations (VIV) on Subsea Cables, intends to test the effectiveness of helical grooves as a method to reduce VIV. This idea is founded from fins often found on oil risers as VIV protection, but inset to prevent damage from contact with ocean floors or other points of danger, as well as reduce the environmental burden of waste in the ocean. To simulate the environment that the cables would be enduring, I made use of a Computational Fluid Dynamics Simulation, called openFOAM, to test the different models created to determine the effectiveness of each. From here, each cable's frequency, amplitude, damping, and the speed of the water after interaction with the cable. My results indicate only a slight reduction, not even statistically significant differences in VIV effect for cables with strategically designed reductions compared to conventional cables. Based on this, inset helical grooves should not be considered effective VIV reduction methods.

I hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I also attest that the above properly reflects my own work.

Finalist's Signature: Date:

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES o all of these forms to your Regional Fair Director with you Finalist Verification/Permission Form. A signed copy of this form must be included in your notebook.