SEMS: RESEARCH PROJECT DESCRIPTION

1. Project Background and Description

Harvesting energy from wind-induced vibrations using piezoelectric materials

Wind turbines are an increasing effective source of power generation, but the technology is not economical at small scales (less than tens of kilowatts), and there is a growing need to develop systems that are cheap, robust and can perform well at these scales. One potential approach is to use piezoelectric materials to harness the kinetic energy of vibrating structures in wind. Wind can cause structures to vibrate through a number of mechanisms, including the periodic shedding of vortices and the interaction between the structural elasticity and fluid motion. Traditionally, these vibrations have been seen as a problem because they can damage the structure, but there is a growing interest in promoting such vibrations so that they can be harnessed as a source of renewable energy.

This project will explore this approach by developing and testing a device that experiences structural vibration when placed in wind and uses piezoelectric material to generate electrical power. Through measurements of the fluid forces and the electric output, the mechanical and electrical efficiency of the system will be optimised. The project will involve design, performing wind tunnel tests and growing piezoelectric materials using lab facilities at Queen Mary.

2. Project Scope

Design experimental system that can vibrate in a wind tunnel, and allows the fluid forces to be measured

Grow piezoelectric materials that can extract power from the vibrations

Analyse electrical and mechanical efficiency and optimise design

3. Desired Skills from the Student

Understanding of fluid mechanics and/or vibrations

Experimental experience

Willingness to work in interdisciplinary team

4. Supervisory Team

Add supervisory team details

Primary: Dr Neil Cagney

Secondary: Dr Joe Briscoe