

## MECHANICAL ENGINEERING STUDENT SEMINAR

Wednesday, May 25 2022 at 13:00, Betty and Dan Khan Building, Auditorium 1.

### Coandă-based Reciprocating Wind Energy Generator for Water Desalination

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Wind-Driven reverse osmosis (RO) desalination of sea- or brackish-water is a potential low-carbon solution to water scarcity, but generator and motor losses negatively affect efficiency. This research introduces a high-torque Coandă-based Reciprocating (CoRe) system that converts wind energy directly to high-pressure mechanical pumping energy thereby eliminating generator and motor inefficiencies. Large lateral loads produced by pulsed periodic blowing slots on a spring-stabilized circular cylinder and mechanical advantage combine to produce the required high-torque/high-pressure conditions. A small-scale proof-of-concept (2-meter high) system was constructed and evaluated in an open-jet wind tunnel. It delivered 2 to 6 bars of water pressure with a net efficiency of up to 4% depending on wind speed and control parameters. A mathematical model of the system produced excellent correspondence with the experimental data. Subsequent performance improvements were made using a double-slotted arrangement, combined with low-amplitude excitation of the vortex shedding instability. This combination resulted in efficiencies greater than 20%, rendering the system competitive with conventional wind-energy based solutions.