MECHANICAL ENGINEERING STUDENT SEMINAR

Wednesday, June 1 at 13:30, Betty and Dan Kahn Building, Auditorium 1

Novel External Heat Engine Using Two-Phase Nozzle

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To combat anthropogenic climate change, policymakers need to promote new forms of reliable, dispatchable, and cost-competitive renewable electricity production. Concentrated solar power (CSP) systems are one such option, but they lack financeability due to their large size. Modular CSP systems could be the solution, but this would require a small, cheap, and efficient heat engine. Conventional heat engines struggle to reach high efficiency at a small scale due to the low heat capacity of working gases (which limits their size) and their tendency to behave as ideal gas (which limits their efficiency). This research explores both the theory and experiments of a novel heat engine which overcomes both challenges. Our small and efficient heat engine is based on the isothermal expansion of air bubbles within an HTL (heat transfer liquid) medium in a two phase de Laval nozzle. The air is externally isothermally compressed and heated isobarically to the HTL's pressure and temperature. The two-phase flow enters a converging section where the pressure decreases, causing the air bubbles to expand isothermally due to excellent thermal contact with the HTL. The expanding bubbles perform work on their surroundings, accelerating the HTL. This kinetic energy can be harvested using a hydroelectric-like turbine. My experimental results show high levels of isothermal expansion in the nozzle which may support an external heat engine at record efficiency. This novel, small, and efficient isothermal heat engine can be used as a pillar in our fight against climate change.

Note: the seminar will be given in English

Seminars Coordinator: Assoc. Prof. Matthew Suss.