Technion-Israel Institute of Technology
Faculty of Mechanical Engineering

הטכניון-מכון טכנולוגי לישראל
הפקולטה להנדסת מכונות

סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות שתתקיים ביום ה' 4.04.2019
(כ"ח באדר ב', תשע"ט), בניין דן קאהן, אודיטוריום 1, 13:45.

מרצה: מוטי רייזנר
מנחה: פרופ"מ רנה ואן האוט
מנחה שותף: פרופ' גרשון גרוסמן

על הנושא:

Heat transfer and flow field measurements of a pulsating round jet impinging on a flat heated surface

The seminar will be given in Hebrew

תקציר ההרצאה :

Heat transfer by means of impinging jets has been thoroughly investigated due to its strong ability to achieve high heat fluxes from surfaces. Applications include cooling/heating of electronic components, laser diodes, and turbine blades, amongst others. In order to achieve higher heat transfer coefficients, jet pulsation can be applied. However, pulsation may also lead to decreased heat transfer, and for a chosen jet configuration the optimal pulsation frequency and setup needs to be determined.

Applying flow pulsation to an impinging round jet while keeping the average mass flow rate constant, may increase heat transfer compared to a steady impinging jet. Here, heat transfer and flow field characteristics of a pulsating, round jet impinging on a flat heated plate were measured and compared to those of a steady jet. The surface to jet nozzle stand-off distance equaled two nozzle diameters (*D*) and Reynolds numbers based on the average steady jet exit velocity were Re = 4,606, 8,024 and 13,513. Strouhal numbers ranged between $2 \text{x}10^{-3} < \text{Sr} < 15.6\text{x}10^{-3}$. Jet exit velocities varied nearly sinusoidal, having a radially uniform exit velocity at each phase. Self-similarity of the mean radial velocity in the wall jet was not attained for the pulsating jet, and the quasi-steady assumption cannot be applied.

Radial distributions of the Nusselt number, Nu, showed the well-known secondary peak at $r/D \approx 2$ (r denotes radial distance away from the jet centerline) due to the generation of secondary vortices, while as a result of partial confinement, another peak was detected at $r/D \approx 4$.

Overall heat transfer enhancement, Λ, of maximum 15.7% and 4% at Re = 4,606 and 8,024, respectively, was obtained within the studied Sr range. At Re = 13,513, Λ was slightly negative. Additionally, at Re = 8,024 a local maximum on Λ was obtained at Sr = 4.1. The trends of the overall heat transfer enhancement as a function of Sr could be well correlated to the primary vortex generation Strouhal number, Sr_v. Our results indicate that heat transfer enhancement is associated with increased Sr_v and attenuation with decreased Sr_v, compared to the steady jet.

בברכה,

פרופ"מ מתי סאס

מרכז הסמינרים