Time & Location: November 2, 2018 at 9:00 AM in Engineering 2 202A
Title: The Study of an Impinging Unsteady Jet - Fluid Mechanics and Heat Transfer Analysis

The high heat transfer capabilities of impinging jets have led to their widespread use in industrial applications, such as gas turbine cooling. These impinging jets are usually manufactured on the walls of super alloy metals which are influenced by the confined setting. Studies have been shown to enhance the heat transfer of impinging jets by fluctuating the flow which is analyzed with two separate designs. The first design is a self-sustaining stationary fluidic oscillator that causes a sweeping motion jet to impinge on the surface. This is investigated using particle image velocimetry (PIV) to study the flow field as well as copper-block heated surface to study the heat transfer. The second design uses a rotating disk that opens and closes the jet hole to generate a pulsing jet that will too impinge on the surface. This is examined using hot-wire anemometry (HWA) for understanding the fluid mechanics and copper-block heated surface to study the heat transfer.

The results for the fluidic oscillator indicate: Reynolds stress profiles of the jet demonstrated elevated levels of mixing for the fluidic oscillator; heat transfer enhancement was seen in some cases; a confined jet does worse than an unconfined case; and the oscillator's heat removal performed best at lower jet-to-surface spacings. The results for the pulsing mechanism indicate: lower frequencies displayed high turbulence right at the exit of the jet; the duty cycle parameter strongly influences the heat transfer results; and heat transfer enhancement was seen for a variation of frequencies.

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Approved for distribution by Jayanta Kapat, Committee Chair, on October 2, 2018.

The public is welcome to attend.