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Project: Geometric Effect of Nozzles on Direct Contact Condensation in a Laminar Flow Field
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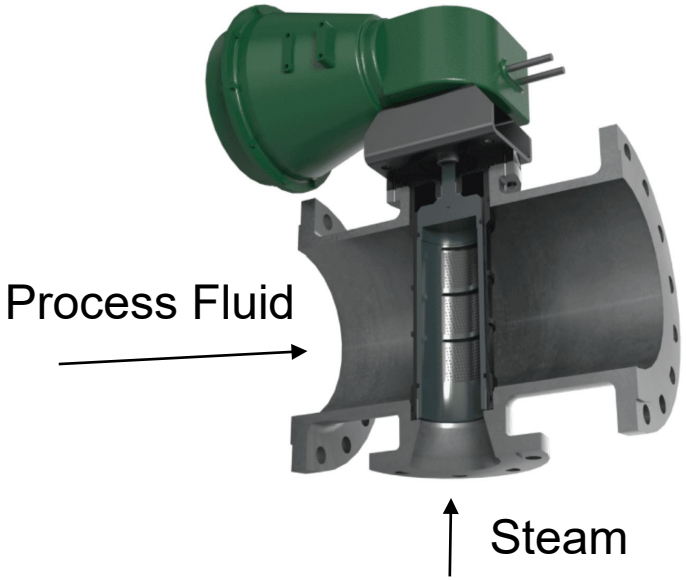
Sponsor: Hydro-Thermal Corporation

SCL

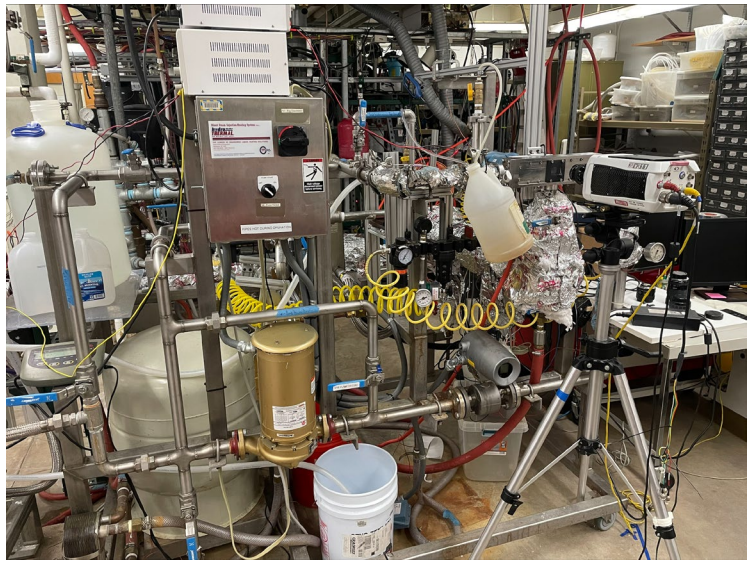
MFVAL

# Background

- Direct Contact Condensation is the process of heating a liquid phase by condensing superheated vapor (commonly steam) injected via a nozzle or series of nozzles
- It is used in several industries for process heating such as food production, pasteurization, brewing beer, paper mills, and nuclear energy
- The benefits of utilizing DCC instead of other methods are reduced complexity, smaller scale, and high heat transfer rates
- However, the waves of condensing steam are accompanied by significant pressure oscillations at high and low frequencies putting equipment and workers at risk.




Single-port Nozzle

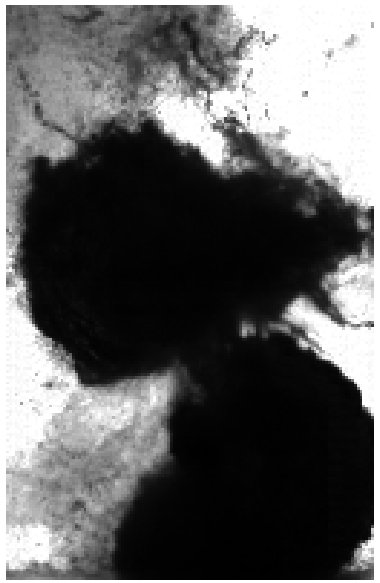


Test Stand

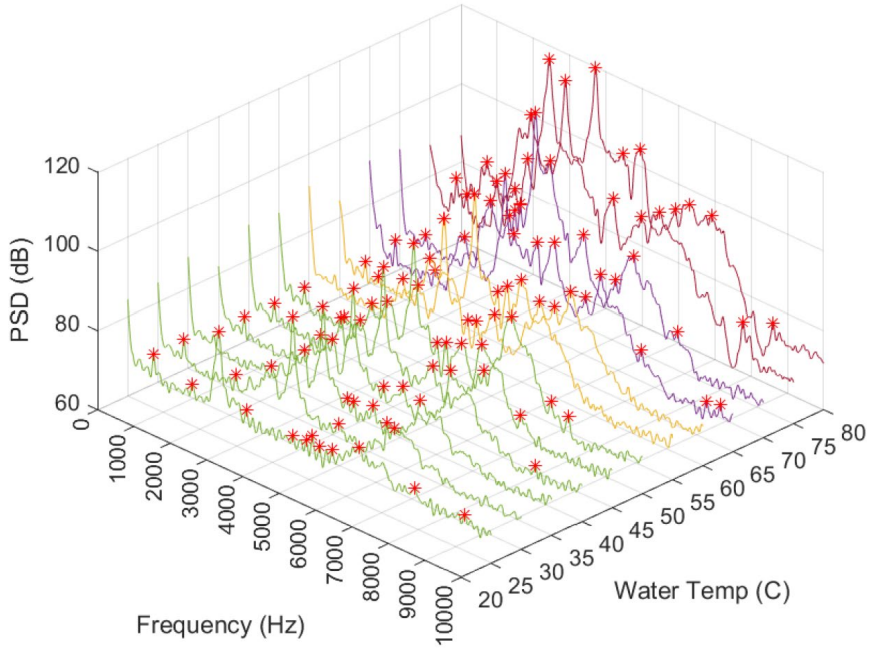
# Project Goals

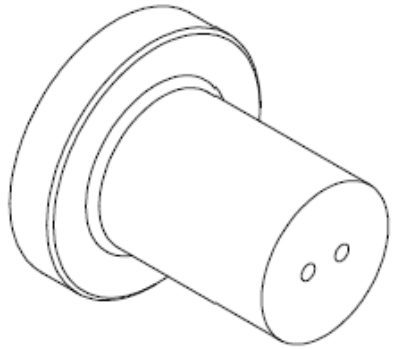
- Understand the mechanisms in which certain nozzles result in unstable flows
- Optimize the design of a two-port steam injection nozzle for high heat transfer and low noise
- Directly compare the effects of a two-port nozzle to an equivalent area single port nozzle

Stable



Unstable



2-port Nozzle to Test