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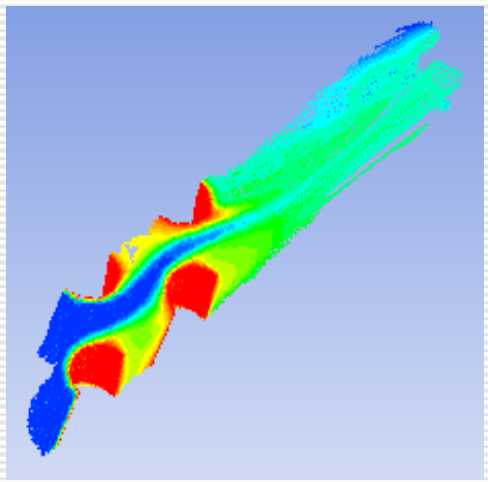


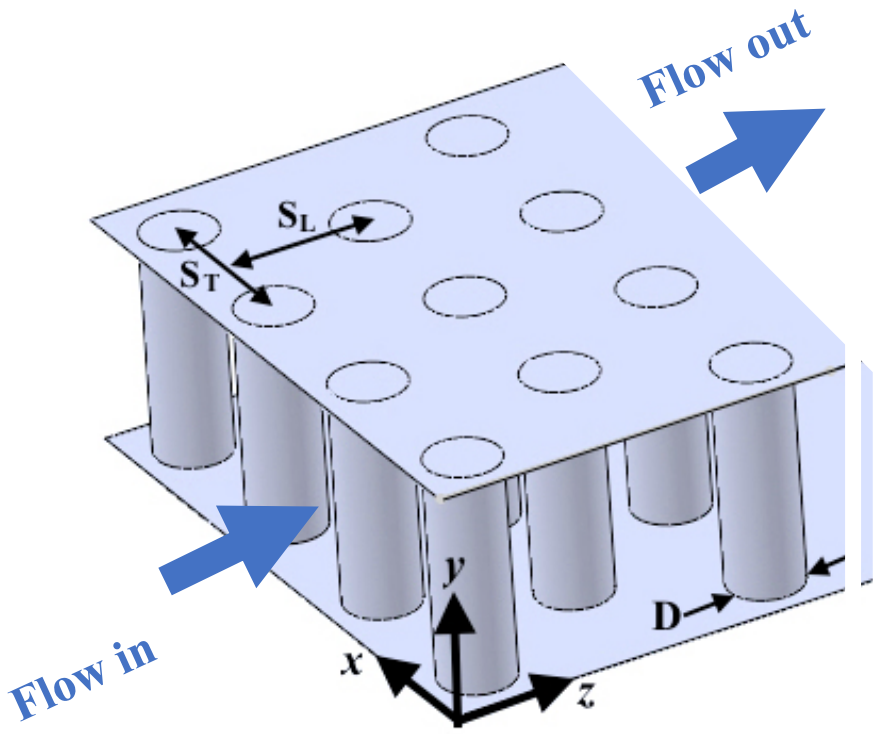
Background: tube-fin heat exchangers

A **tube-fin heat exchanger** contains a set of identical microstructures, each of which is a channel populated with an array of pins (i.e., tubes). The pins and base plates are heated or cooled and heat is transferred to or from fluid passing through.

The overall performance is improved by optimizing each microstructure to:

- maximize heat transfer
- minimize pressure drop

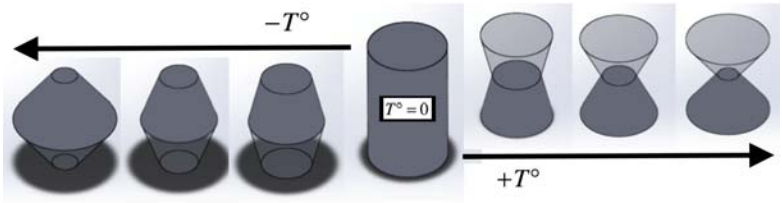
Correlations and simulations can be used to predict the performance of these microstructures.



Investigating

banks with tapered pins

Advancements in manufacturing allow a wider variety of microstructure designs to implemented within a tube-fin heat exchanger, including the use of more interesting pin shapes. One idea is to use tapered pins, which have more surface area exposed to fluid than straight-cylinder pins with the same volume.

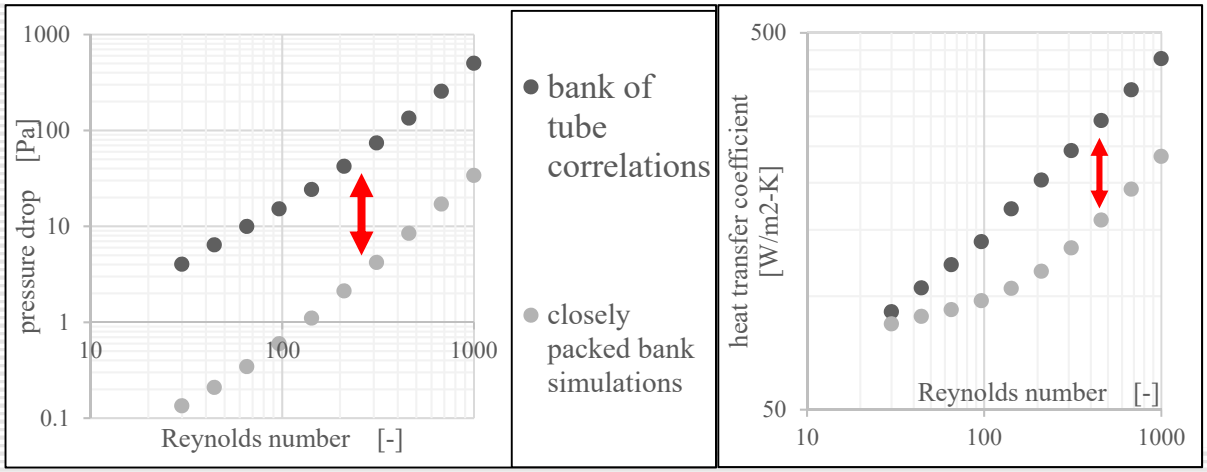


<u>Research Goal #1:</u>
develop correlations for banks with tapered pins

&

closely packed banks

Correlations for banks of tubes (straight-cylinder pins) **aren't accurate** for most mm-scale (i.e., closely packed) banks, which is problematic because many practical applications use pin-fin heat exchangers on this scale.

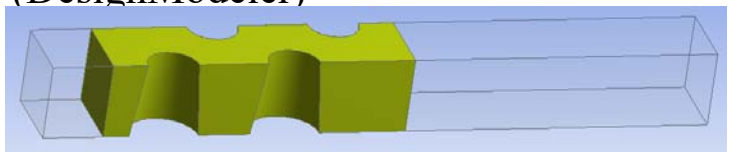


<u>Research Goal #2:</u>
adapt bank of tube correlations for closely packed banks

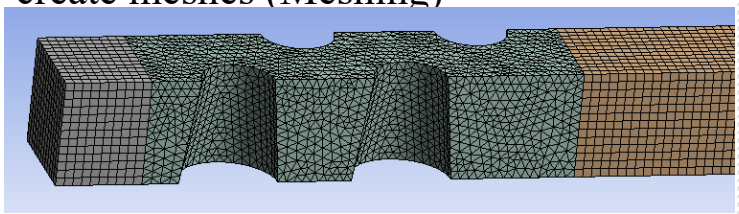
Running simulations & developing correlations

ANSYS Workbench was used to:

1. parametrically vary the geometry (DesignModeler)



2. create meshes (Meshing)



3. run simulations (Fluent)