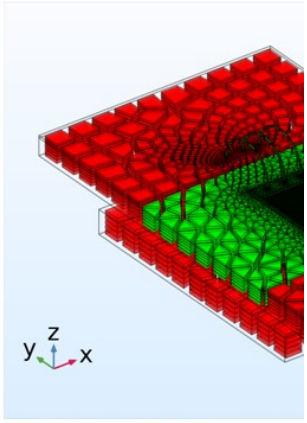
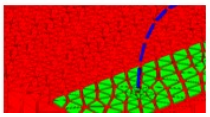
Mesh

- Custom mesh
- Prism and hexahedrons
- Created with mesh sweep feature

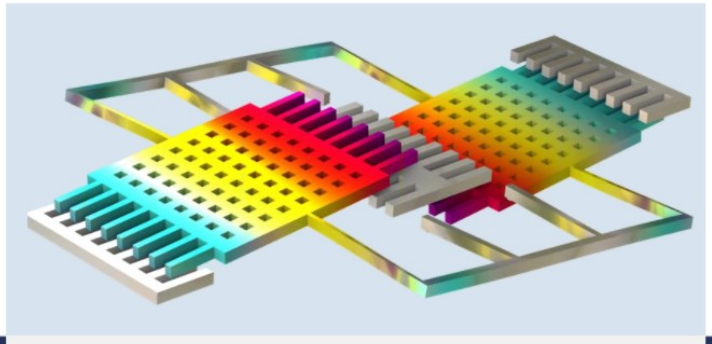


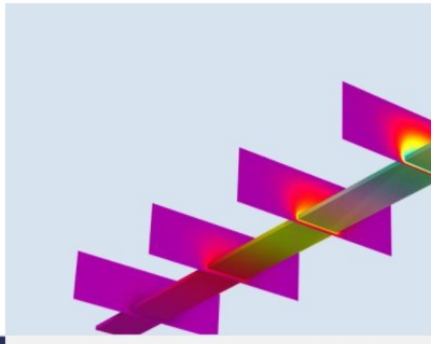
Equations

- Time transient 3D Cartesian heat transfer
- Phase change
- Electrical current
- Laminar flow in porous media



Structural Mechanics and Electromagnetics





Structural Mechanics

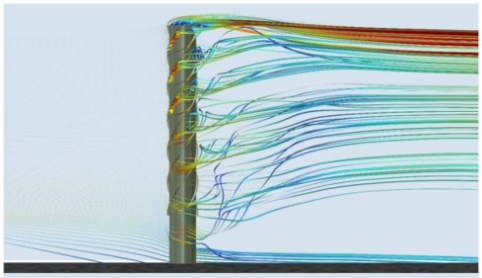
- Geometric nonlinearity
- Loss, damping, and body forces

Electromagnetics

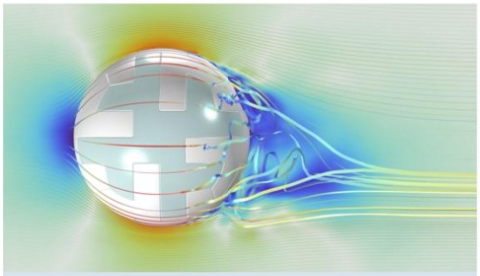
- Electrostatics and electric currents incl
- Infinite elements for infinite domains

MODELING CAPABILITIES

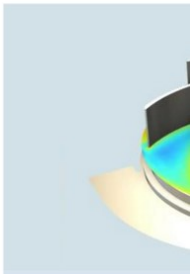
Single-Phase Laminar and Turbulent Flow



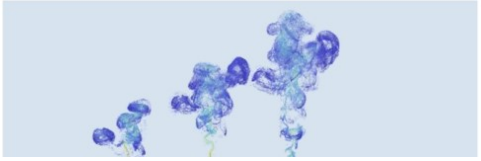
Incompressible and compressible flow.

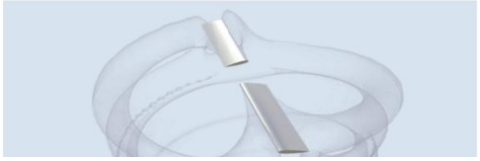


RANS turbulence models and LES.

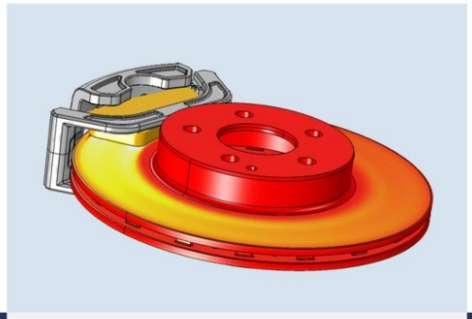


Flow in rotating ma



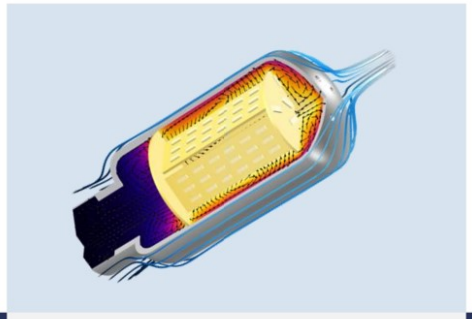


Heat Transfer Overview



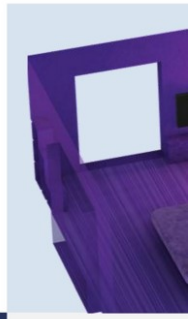
Conduction

- Isotropic, anisotropic, linear, and



Convection

- Free and forced convection



Radiation

- Surface-to-

USER STORY: SWISS FEDERAL INSTITUTE OF TECHNOLOGY LAUSANNE

Optimizing a Hyperloop Pod

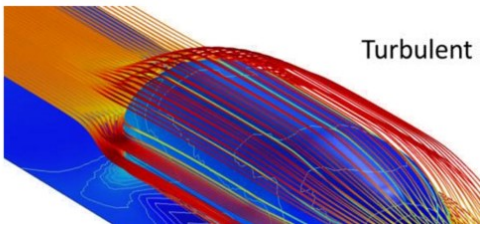
PROBLEM

Hyperloop Pod Competition goal is to find transportation mode that is high speed, intercontinental, and self-propelled.

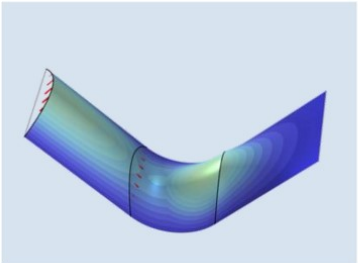
SIMULATION SOLUTIONS

Using COMSOL Multiphysics, engineers modeled:

- Aeroshell: CFD, shape optimization, and mechanical stress analyses

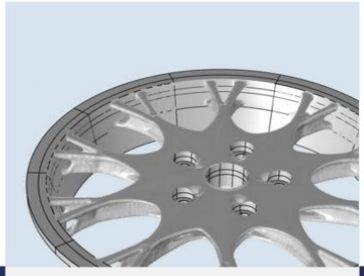


Optimization in COMSOL Multiphysics®



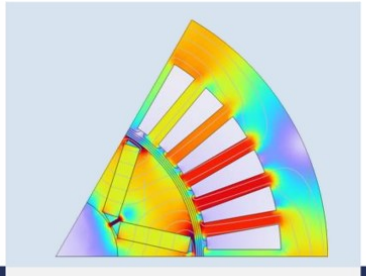
Shape Optimization

Find the optimal shape so that it minimizes an



Topology Optimization

Optimize the material distribution to minimize an



Parameter Optimization

Find the optimal dimensions and position so that they

Pa

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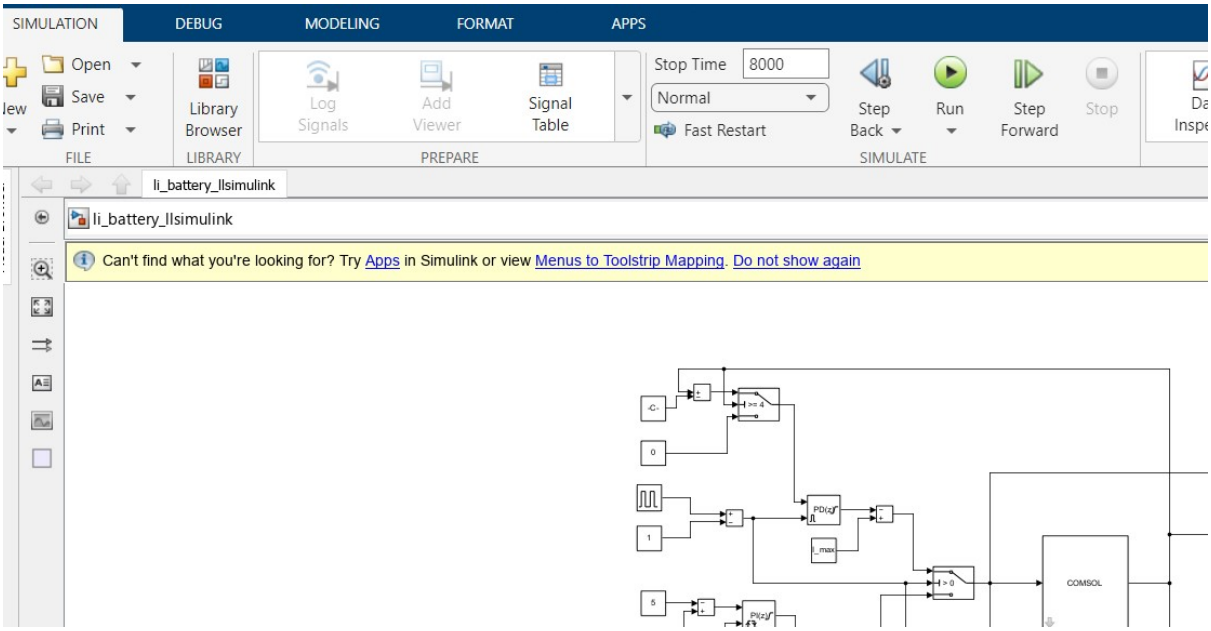
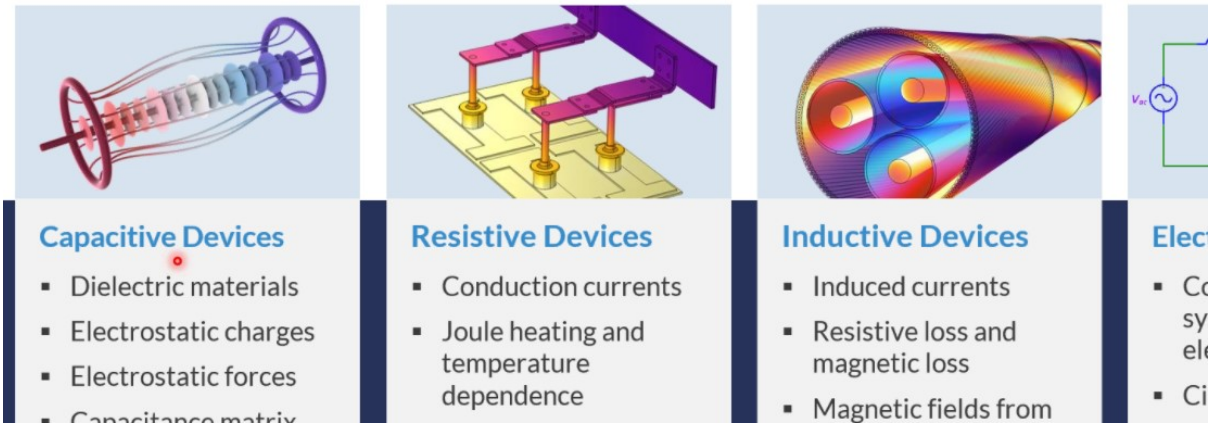
va



Modeling Electronic Components



Capacitive Devices

- Dielectric materials
- Electrostatic charges
- Electrostatic forces
- Capacitance matrix

Resistive Devices

- Conduction currents
- Joule heating and temperature dependence

Inductive Devices

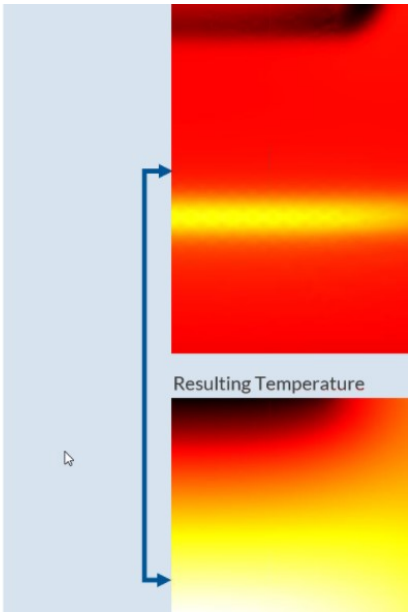
- Induced currents
- Resistive loss and magnetic loss
- Magnetic fields from

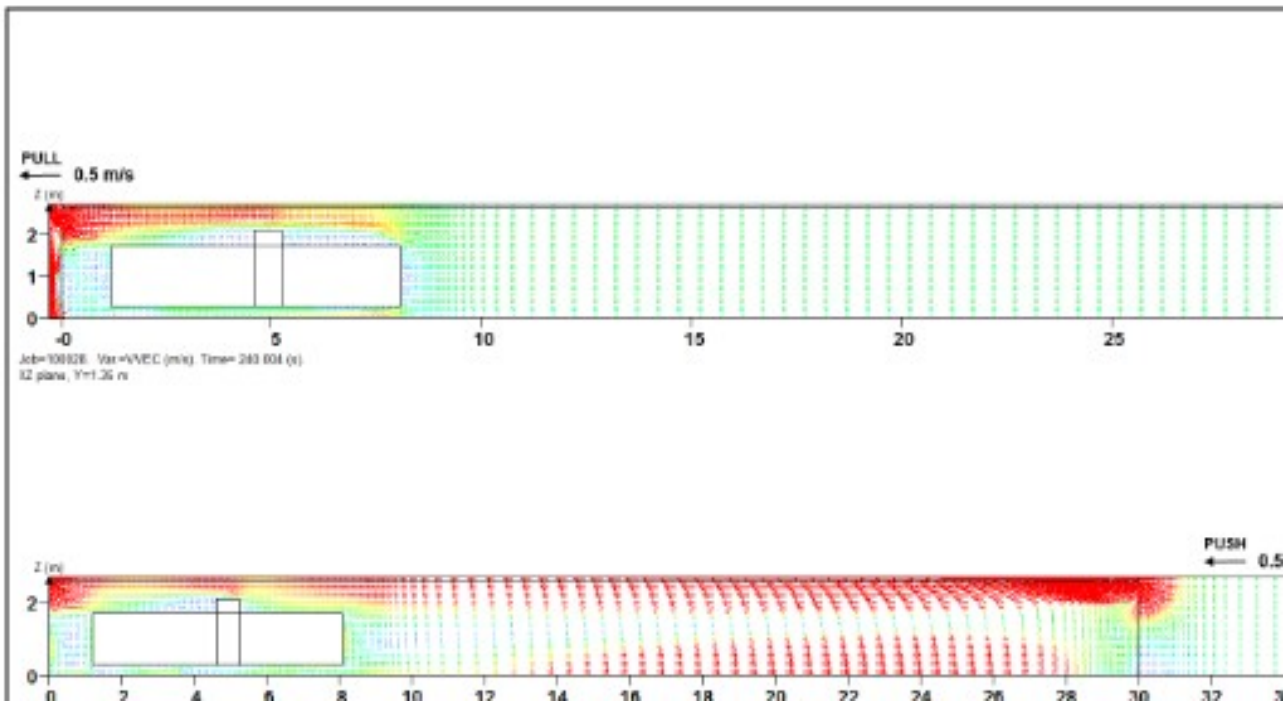
Elec

- Co sy el
- Ci

Thermal Effects

- The *Heat Transfer in Solids* and *Semiconductor* interfaces can be coupled to model nonisothermal devices
- The material properties of the semiconductor are functions of temperature
- Joule heating and recombination heating are included
  - Heterojunction heat source available on boundaries





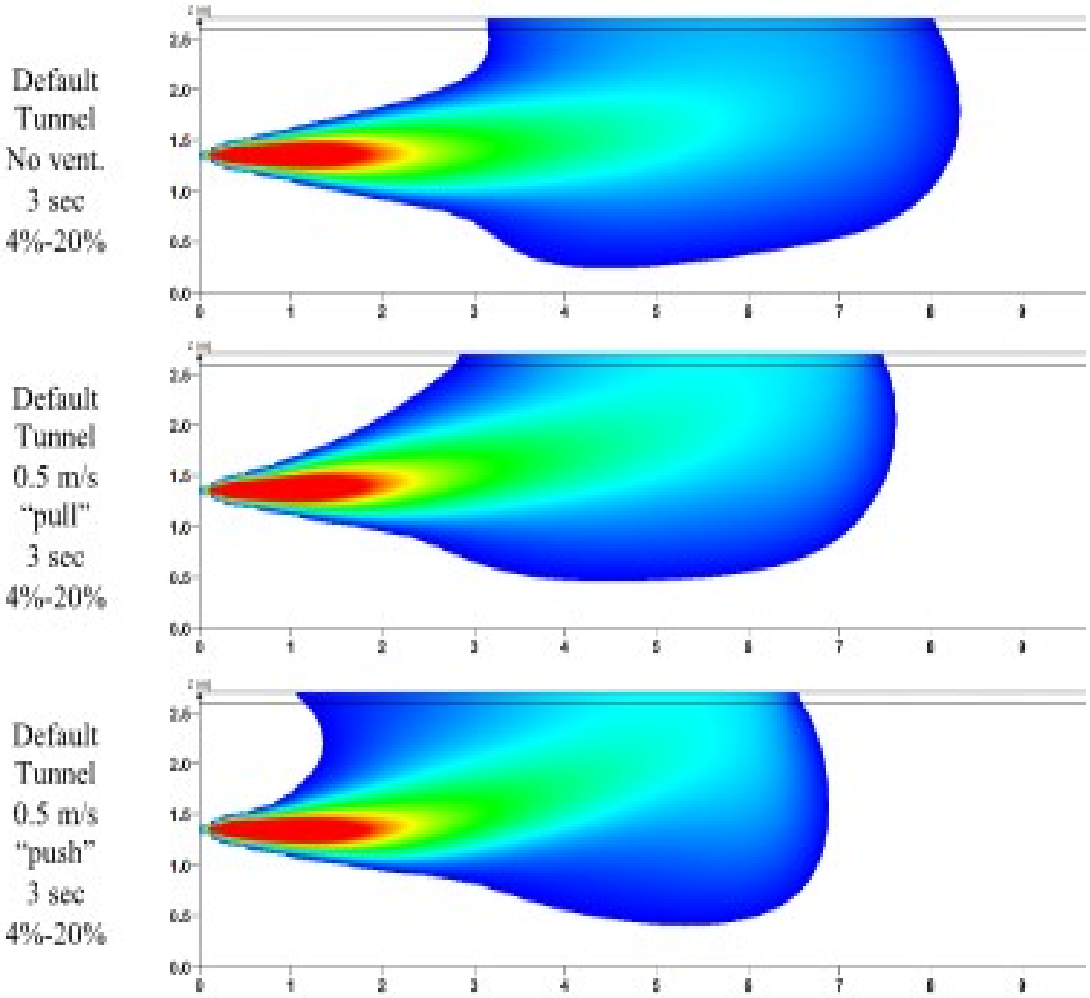
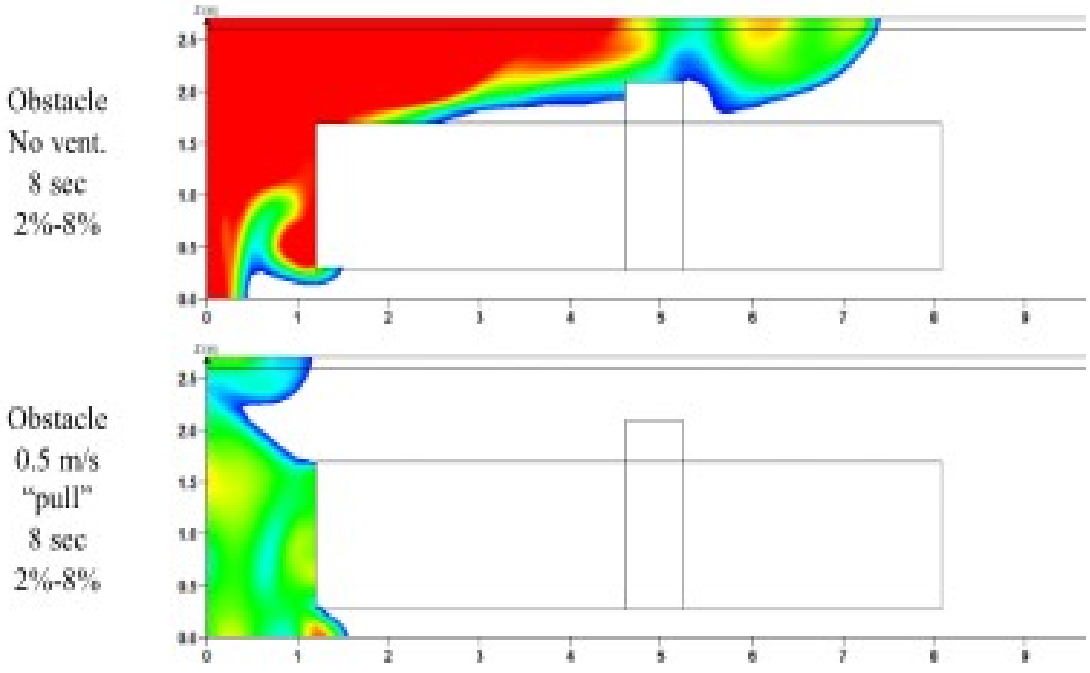
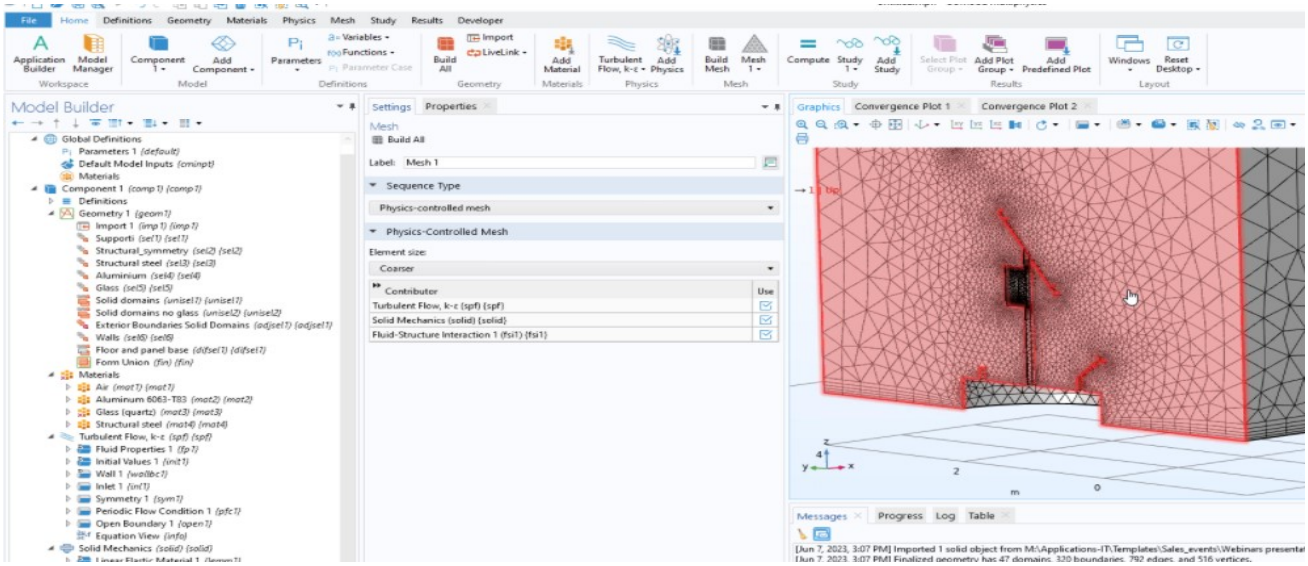


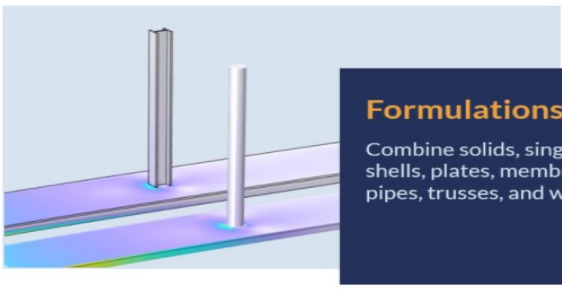
Figure 5. Hydrogen concentration envelope profiles (up to 30% (vol), in red) from flammability limit contour (4% (vol), in blue) along the jet direction (Y = 1.3 m) for scenarios in an empty tunnel.





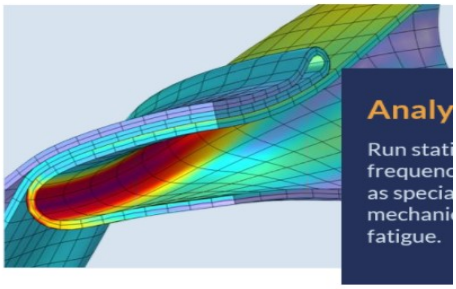
OVERVIEW

Structural Mechanics Functionality



Formulations

Combine solids, single and layered shells, plates, membranes, beams, pipes, trusses, and wires.



Analy

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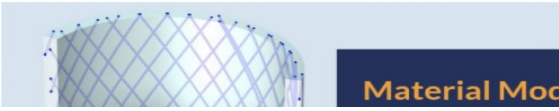
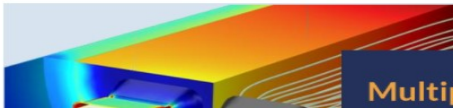
frequenc
as specia
mechani
fatigue.

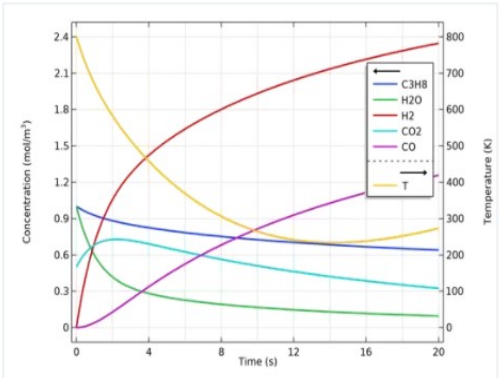


Material Models



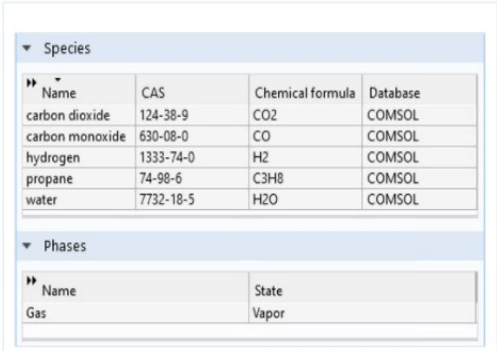
Multi

Modeling Strategy for Chemical Engineering



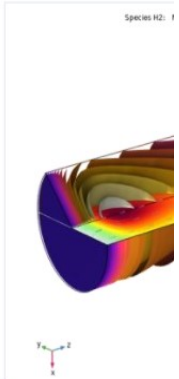
Perfectly Mixed System

- Type in the chemical equations

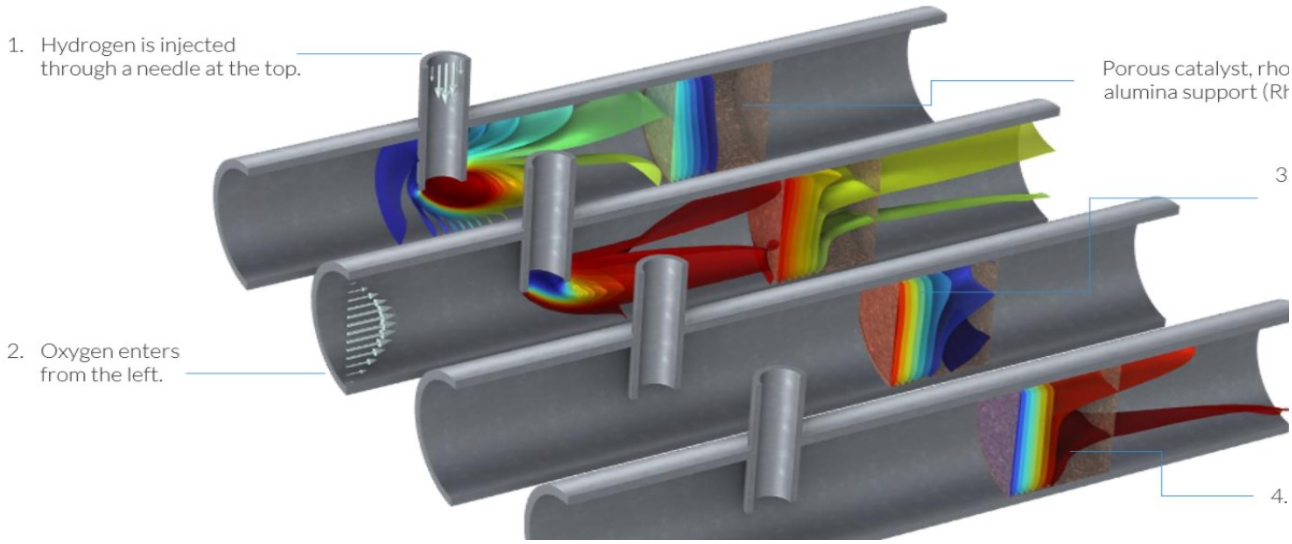


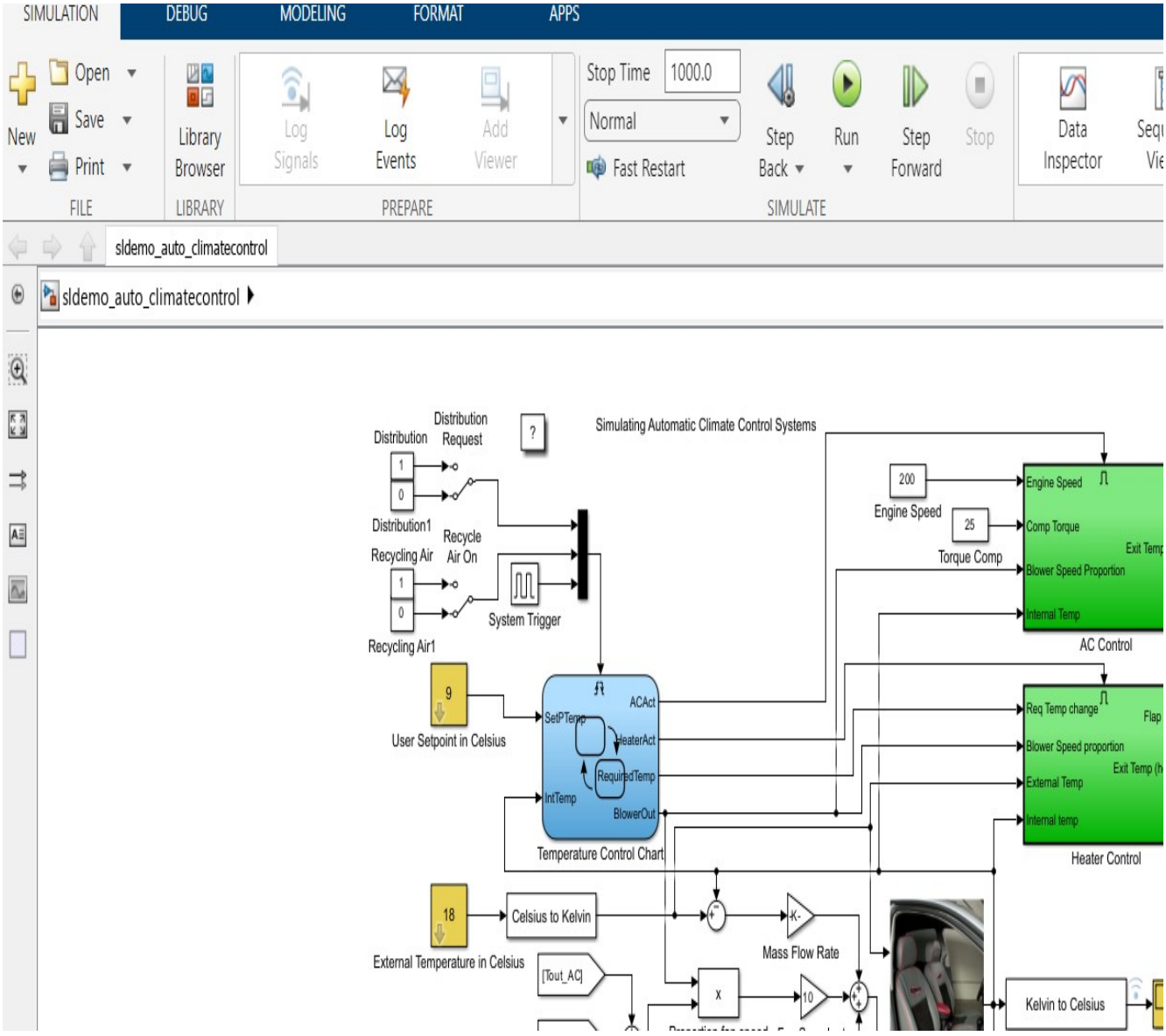
Thermodynamic Properties

- Add a thermodynamic system



Generate
Depende


1. Hydrogen is injected through a needle at the top.
2. Oxygen enters from the left.
Porous catalyst, rho
alumina support (Rh
3
4.


SIMULATION
DEBUG
MODELING
FORMAT
APPS
New
Open
Save
Print
FILE
Library Browser
LIBRARY
Log Signals
Log Events
Add Viewer
PREPARE
Stop Time
1000.0
Normal
Fast Restart
Step Back
Run
Step Forward
Stop
SIMULATE
Data Inspector
sldemo_auto_climatecontrol
Simulating Automatic Climate Control Systems
Distribution
Distribution Request
Distribution1
Recycling Air
Recycle Air On
Recycling Air1
System Trigger
User Setpoint in Celsius
SetPTemp
ACAct
HeaterAct
ReqHtdTemp
IntTemp
BlowerOut
Temperature Control Chart
Engine Speed
Torque Comp
Comp Torque
Blower Speed Proportion
Internal Temp
AC Control
Req Temp change
Blower Speed proportion
External Temp
Internal temp
Heater Control
External Temperature in Celsius
Celsius to Kelvin
Mass Flow Rate
[Tout_AC]
Kelvin to Celsius