Heat transfer analysis using SolidWorks-Guideline

MAE 107 Week #2
Lumped Capacitance Heat Transfer

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1. Design preparation

Design a solid sphere by using Solidworks2011 (Radius = 1.0 inch)
2. Material properties setting

Select the material of solid from the database (edit material → Aluminum Alloys)
3. Simulation control

Simulation → Study → Thermal → OK
4. Simulation control for heating

Study 1 (right click) → Properties → Transient → Set Total time and Time increment

![Simulation control window with settings]
5. Boundary condition setting for heating process

Thermal load → Temperature → Initial temperature → 25 Celsius → OK
6. **Boundary condition setting for heating process**
Thermal load → Convection → Convection coefficient (1850 W/m²K) → Ambient temperature (373 Kelvin) → OK
7. Simulation for heating

Run (will create mesh automatically and solve the transient problem)
8. Plot transient response of temperature during heating process

Results → Thermal1 (right click) → Probe → Select points → Response
9. Simulation control for cooling (forced)

Repeat step 3 & 4 → Check ‘Initial temperatures from thermal study’. Select heating process study and set the last time step.
10. **Boundary condition setting for cooling (forced)**
Thermal load → Convection → Convection coefficient (110 W/m²K) → Ambient temperature (298 Kelvin) → OK
11. Simulation for cooling (forced)

Run (will create mesh automatically and solve the transient problem)
12. **Plot transient response of temperature during cooling process**

Repeat step 8 to get a graph for cooling process
13. Show a cross-section of Al sphere

Results → Thermal1 (right click) → Section clipping
14. *Plot temperature distribution inside Al sphere*

By using ‘Probe’, pick points on cross-section across the sphere and plot to check the temperature distribution inside sphere.