**MOTIVATION AND APPROACH**

- **Benefit**: MMC's are lightweight and offer increased stiffness and strength
- **Approach**: Develop a Tape Placement Process
  - Purchase and produce MMC prepreg tape
  - Determine/model processing parameters for consolidation of two tapes
  - Scale-up and automate the tape placement process

**BACKGROUND**

- **Ultrasonic Consolidation**
  - Sonotrode Oscillation
    - Oxide layer deterioration
    - Elastic-plastic deformation
  - Sonotrode Rotation
    - Weld duration
    - Production rate

**WELD COMPONENTS**

- **Stack**
  - Horn (Sonotrode)
  - Boosters
  - Anvil
  - Material
- **Controller**
  - Speed
  - Amplitude
  - Pressure
  - Ultrasonics time delay

**PROCESS MODEL**

- Include frictional heating (surface flux) and deformational heating (volumetric heat generation) in Heat Equation
- 2D Thermal B.C.'s
  - Surface flux between foils
  - Volumetric heat throughout foils
  - Convection on all sides

**THERMAL MEASUREMENTS**

- Using a front mounted IR camera, it is possible to measure the temperature distribution on the surface of the foils at the nip point.

**FUTURE WORK**

- Determine "Good Weld" criterion
- Couple thermal and mechanical models
- Design experiments to validate mechanical and thermal model

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