Design Optimization using Adhesive Bonding

Creating a design tool for industry

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Problem Statement

Need an effective adhesives design tool

- Manufacturer-provided adhesives properties can be insufficient:
  - Not relevant geometry
  - Not relevant environmental condition
  - Not correct inputs for optimal modeling method
Approach & method

- Determine basic adhesive material properties of strength and toughness
- Conduct tests under environmental conditions of interest
- Incorporate results into a design tool for adhesive bonding
Current state of practice & research

- Adhesive manufacturer-provided properties may be insufficient:
  - Incorrect material properties
  - Unsuitable environmental conditions
  - Inapplicable geometry
Deliverables & benefits

- An adhesives design tool custom-made for sponsor specific geometry and environmental conditions
  - Determine the most-effective modeling techniques for adhesives
  - Determine fundamental material properties for adhesives under prevailing environmental conditions
  - Combine these elements into a design tool
Project plan

- Year 1:
  - Determine adhesives to be included
  - Define appropriate analysis techniques
  - Determine needed material properties to effectively predict adhesive performance
  - Determine environmental conditions under which adhesive properties are to be obtained

- Year 2:
  - Conduct tests to obtain needed material properties under environmental conditions
  - Combine analysis and modeling techniques with material properties to create a design tool to optimize adhesive performance.
How ours is different

- This project provides a design tool to optimize adhesives performance
  - in geometries specifically relevant to the sponsors
  - Under environmental conditions of relevance to the sponsors and currently unavailable in the literature or from manufacturers
    - Temperature
    - Humidity
    - Atmospheric pressure
    - Etc.
Industrial relevance

This project has potential benefit to all industrial companies using, or considering the use of, adhesives in products.