# **MTRL 466 MEETING MINUTES**

| **Project Name:** | Process Modelling for Adhesive Bonding of Aluminum Automotive Sheet |
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| **Group:** | 1 |
| **Current Meeting:** | Wednesday, October 19, 2011 |
| **Minutes Prepared By:** | Adam Ohashi |

**Attendees:**

*Dr. Chad Sinclair*

*GROUP 1: Jerry Chang, Michael Fu, Judy Makmillen, Adam Ohashi*

**Agenda:**

* **Gantt chart / timeline review:**
  + Need to prepare Gantt chart for last half of the term
    - All modes need to have completed validation
    - Determine when our models can be coupled
    - Determine how to “calculate” efficiency of our combined processes
    - Complete economic analysis
    - Final report/presentation
* **Heat transfer model – Next Step:**
  + Confirm appropriate values for epoxy
    - Can use adhesive model’s heating value to determine heat from epoxy
  + Complete validation used to justify parameters/data for numerical model
    - Determination of Δx
  + Find conductivity dependence on composition
  + Heating orientation (1 side vs. both sides)
  + From Chad: “The next step we have to do is to compare the numerical model against an analytical solution for heat transfer where we have temperature gradients inside the aluminum.”
* **Recovery model – Next Step:**
  + Find data for lower temperature testing (140C – 200C)
    - Can use this data to:
      * Find pre-strain dependence of model
      * Find relation between activation volume and temperature
  + From Chad: “How do you determine whether you have the "best" values for U0 and V?”
* **Precipitation model – Next Step:**
  + Create a 5%-95% confidence interval for the Avrami equ. to account for stress drop (from previous meeting)
* **Adhesive model – Next Step:**
  + Provide the heat transfer model with heat transfer data for epoxy
  + Progress on sensitivity testing
* **Economic Analysis:**
  + What sort of economic analysis do we want to complete?
    - Do we want to follow one similar to Dreisinger’s groups? (large-scale analysis)

**Minutes:**

Meeting start time: 2:10pm

Meeting end time: 3:10pm

* Heat transfer model
  + Consider thickness of aluminum plates/ epoxy
    - Newtonian range is approximately 1 cm thickness
    - Thickness should not be critically important in outcome of model
  + Further validation
    - Heating profile; semi-infinite slab, constant surface temperature
* Coupling the models
  + Combine heat transfer, recovery, recrystallization and curing into one spreadsheet
  + Link all related cells (ie.: time, temperature, epoxy heat generation)
  + Use one spreadsheet per node?
* Optimization of Process
  + Curing: approx. 95% cured = mechanically sound
    - Constraint:
  + Softening: approx.
  + Hardening: approx.
  + Graphically present optimal values
    - Temperature vs. heat transfer coefficient plot
    - Series of curves for each part of model (curing, softening, hardening), all values of (T,h) above the curves meet conditions and are considered valid
      * Time is implicit
    - Choose the limiting point on plot at the smallest time, find cost relationship to time
* Economic Analysis
  + Determine costs associated with paint baking, energy/operating costs
    - Capital required for an annealing booth, paint station, etc.
      * Can use contacts from local companies for pricing
  + Develop a new processing facility (large scale)

**Action Items:**

* Extend the Gantt chart to cover the remaining 3 weeks until final presentations/report
* Heat transfer model validation
* Have heat of curing added to heat transfer model
* Couple the models
* Analyze process optimization with constraints
* Quantify the economics of our process
* **Next meeting: Friday, November 4th, 2011 @ 1:30pm**