

Marshall Space Flight Center

Material Design Database Development for Thermal Insulation

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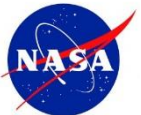
Insulation Materials Database

- Genesis
 - Asbestos removed from component list
 - Thermal Performance Boost
 - Lower erosion rates
 - Lower inert material weight
 - “Drop In” Replacement
 - Retention of processes and equipment
 - Minimize equipment costs
 - Minimize training costs

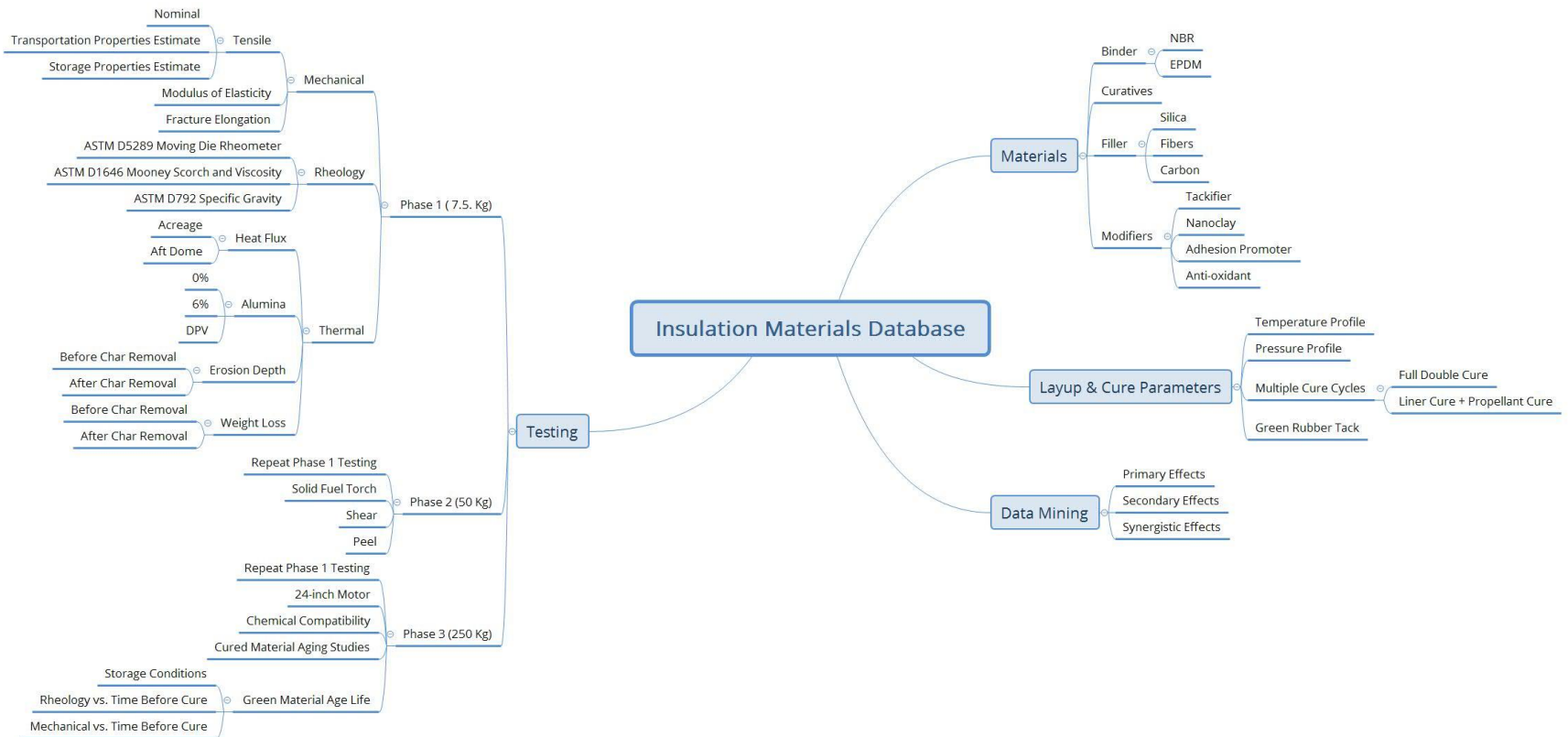


Insulation Materials Design Database

- Unintended Consequences
 - Unknown effects of constituent change
 - Mechanical properties
 - Flow
 - Lay-up and Handling
 - Force Fit of Process Parameters
 - Reduced attempt at optimization
 - Retention of counter productive elements
 - Reduction of Rigor



Insulation Materials Design Database



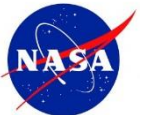
Insulation Materials Design Database

- Baselines
 - Materials
 - NBR
 - PBI Fibers
 - Curatives
 - Modifiers
 - Testing
 - Mechanical
 - Thermal
 - Flow & Handling



Insulation Materials Design Database

- 110+ Formula Variations completed Phase 1 Testing to date
- 3 Formulations in Phase 2 Testing
- 2 Formulations in Phase 3 Testing

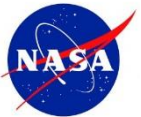


Insulation Materials Design Database

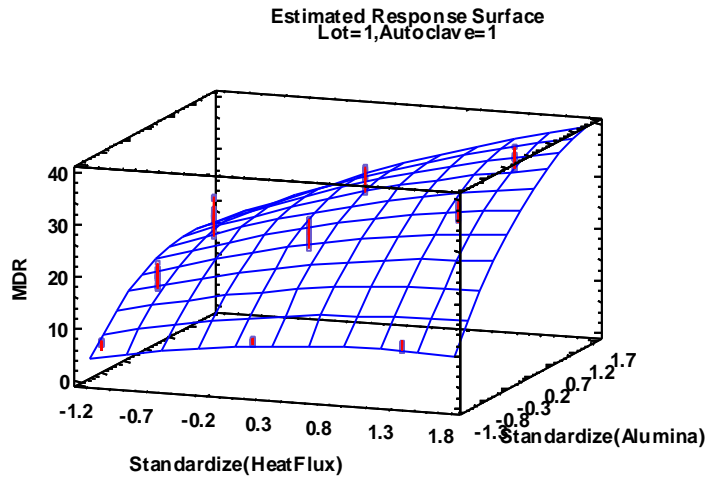
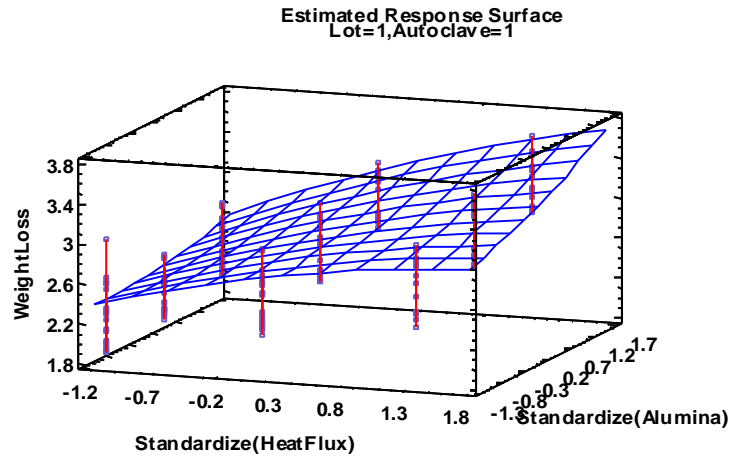
- Next Steps
 - Additional Modifiers
 - Density reduction without loss of thermal/mechanical properties
 - Expanded Testing
 - Equilibrium thermal properties
 - Motor Property matching (Pressure, Temperature, Chemistry)
 - Scale Up
 - Soliciting technical partners



Backup Slides



Thermal Response Surfaces



MDR – Maximum Decomposition Rate

