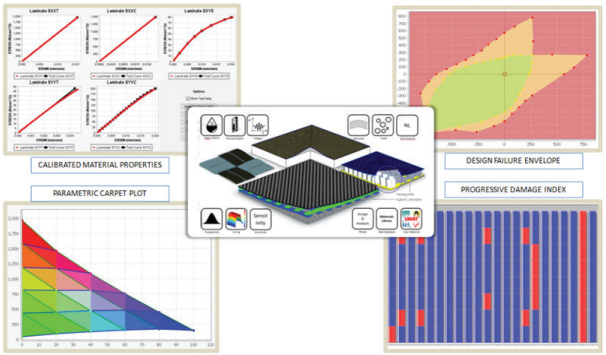
AlphaSTAR

MCQ

OVERVIEW

MCQ (Material Characterization & Qualification) is the material modeling tool that enables ultra-rapid design and analysis of advanced composite materials, such as continuous & discontinuous PMC, CMC and MMC. MCQ is analytically based utilizing a unit cell approach for assessing material behavior. It models all types of composite architecture, including 2D/3D woven and braided material using multi-scale physics-based micro/macro mechanics formulations. It accounts for "as built" and "as-is" states taking into consideration manufacturing defects, and effect of uncertainties in material properties and specimen geometry. MCQ output can be used as input into finite element solvers such as Abaqus, Ansys, Ls-dyna, NX-Nastran, and MSC-Nastran. Fast, powerful and an easy to use, MCQ is the solution for your material modeling needs.



CAPABILITIES

- **Progressive Failure Analysis:** Material degradation models to predict strength, modulus, laminate and layer by layer damage evolution process
- **Material Non-linearity:** Predict in-situ matrix stress-strain curve from in-plane shear ASTM standard test data
- **Ply Mechanics:** Verify ply properties from fiber and matrix constituent properties and variation in fiber and void volume ration
- **Laminate Mechanics:** Predict laminate level material properties using fiber/matrix, ply properties as input along with braid cards for fabric, woven or 3D architecture
- **Allowables:** Predict strength allowables based on simple test data and material & fabrication uncertainty in the composite laminate material
- **Fatigue Life:** Reverse engineer in-situ stress versus cycles to failure curve for fiber/matrix, ply, and laminates
- **Manufacturing Defects:** Predict the effect of defects, such as fiber waviness, on ply level properties
- **Curing:** Predicts viscosity, degree of cure, modulus, and shrinkage vs. Time/Temperature

BUSINESS VALUE

- Rapid assessment of properties
- Reduction in testing with cost savings
- Validated material library
- Strength allowable for reliability
- Identification of damage initiation/propagation to failure
- Identification of damage/failure modes
- Results verified with test data
- Multi-scale progressive failure analysis