

Problem: Carbon Dioxide Emissions from Aircraft

Aircraft turbine engines are the largest source of carbon dioxide emissions within the U.S. transportation sector, which is not yet subject to greenhouse gas regulations. Airline carbon dioxide emissions rose 70% faster than predicted according to the International Council on Clean Transportation. The total increase over the past five years was equivalent to building about 50 coal-fired power plants. Environmental/ thermal barrier coatings (E/TBCs) applied to ceramic matrix composites (CMCs) offer significantly better protection against a hot corrosive environment of the engine and hold the promise for future “super” turbines with reduced carbon dioxide emissions.

Solution: MesoEqs™ Technology

Sunergolab Inc has developed, for the first time, MesoEqs™ multi-physics peridynamic software to overcome current inadequate material design of E/TBC CMC systems

MesoEqs™ applies peridynamics, a new theory that unifies the description of continuous media, cracks, and discrete particles

MesoEqs™ is based on multi-physics equations which are valid everywhere, including discontinuities

MesoEqs™ does not need an external criterion for crack initiation and propagation

MesoEqs™ discards requirements on mesh size

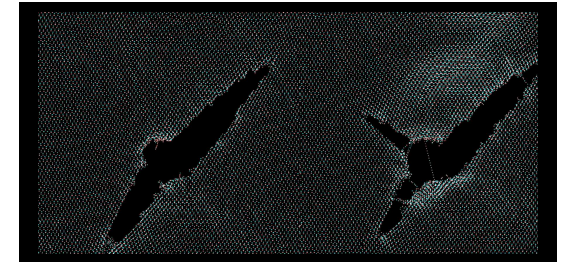


MESOEQS MULTI-PHYSICS
PERIDYNAMIC SOFTWARE
FOR REDUCING TURBO
ENGINE PRODUCTION
TIMES AND DIMINISHING
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AVIATION EMISSIONS

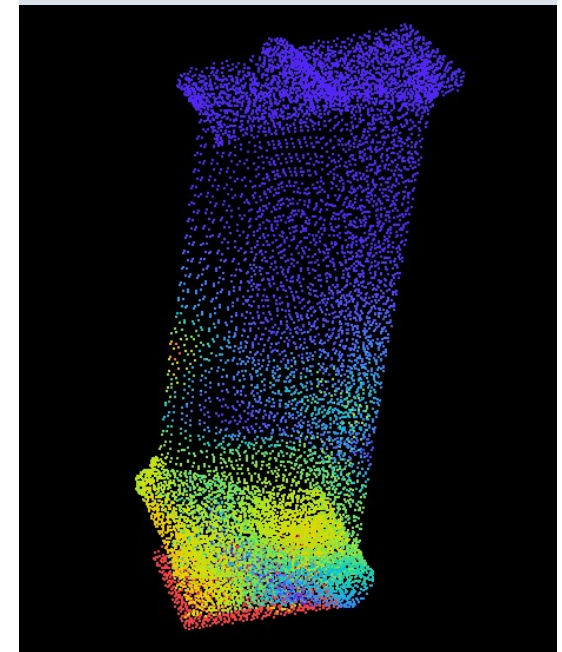
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Product

- ✓ Ansys license packaged with the peridynamics software
- ✓ The best of Peridynamic and traditional Finite Element Methods
- ✓ Optional remote access and a Pay-as-you-go license
- ✓ 24/7 Unique expert support

Customers

MesoEqs™ base customers are designers and manufacturers of advanced material and components for turbine engines for aerospace and defense applications

Market

MesoEqs™ target market is Aero-Engine Coatings Market, projected to reach \$1.2 Bn in 2024 as stated by Stratview Research

MesoEqs™ Key Benefits

- ✓ Predictive multi-physics of E/TBC CMC systems

MesoEqs™ can predict multi-physics of E/TBC CMC systems with 3-D mesostructural discontinuities and heterogeneities

Existing FEM software must deal with ambiguity of derivatives of displacement at discontinuities

MesoEqs™ can naturally manage large deformation gradients and incorporate damage models unconstrained by mesh size

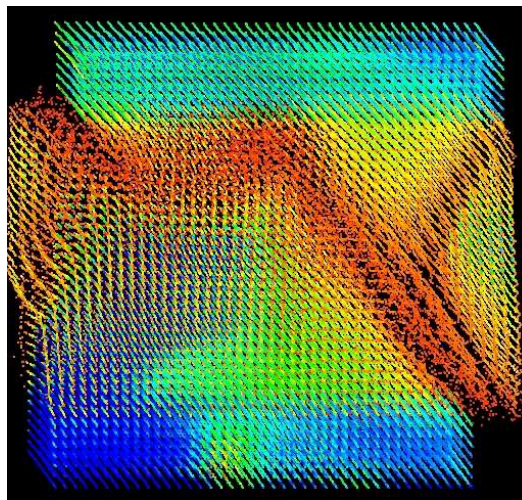
Damage models in existing FEM software typically impose requirements on mesh size

- ✓ The best of FEM and Peridynamics

MesoEqs™ software can provide the best of both worlds: the peridynamic model is applied in regions susceptible to material failure, while the FEM model is applied elsewhere

- ✓ Unique expert support

Sunergolab Inc. works in partnership with primary developer of the MesoEqs™ peridynamic solver and primary initiator of peridynamic method



These benefits deliver value to customer by

- ✓ Designing stable E/TBC CMC systems
- ✓ Complementing laboratory testing with predictive analysis
- ✓ Reducing turbo-engine production times
- ✓ Diminishing carbon dioxide emissions from Aircraft

Partners

SunergoLab is seeking industry partners for

- Integrated demonstrations of MesoEqs™ in close collaboration with partner for its relevant application
- IP generation for designing new materials and manufacturing processes

Further development and validation can also be funded through Small Business Innovation Research (SBIR) and Broad Agency Announcement (BAA) Programs



SunergoLab Inc.

Sunergo is translated from Greek as “work together”. Sunergolab Inc. teams with academia/national laboratories (Sandia National Laboratories) to enable the use of mesoscale predictive software in forward-thinking materials applications. The SunergoLab team has 50+ years working in field of CAE and FEM, core competencies in material processing and aerospace, and 20+ years of managerial experience. The team also leverages the expertise of Dr. David Littlewood (the primary Peridigm developer) and Dr. Stewart Silling (the initiator of Peridynamics).



SunergoLab
working together

Learn more at www.sunergolab.com