VEXTEC Solution Areas

Our clients need **solutions** (or better solutions) in at least one of the following **three categories** for their metallic products.

We help our clients to ***save time and money*** by:

Reducing

physical testing burden for qualification of new materials/sources

Accelerating

push of Additive Manufacturing (AM) into standard production

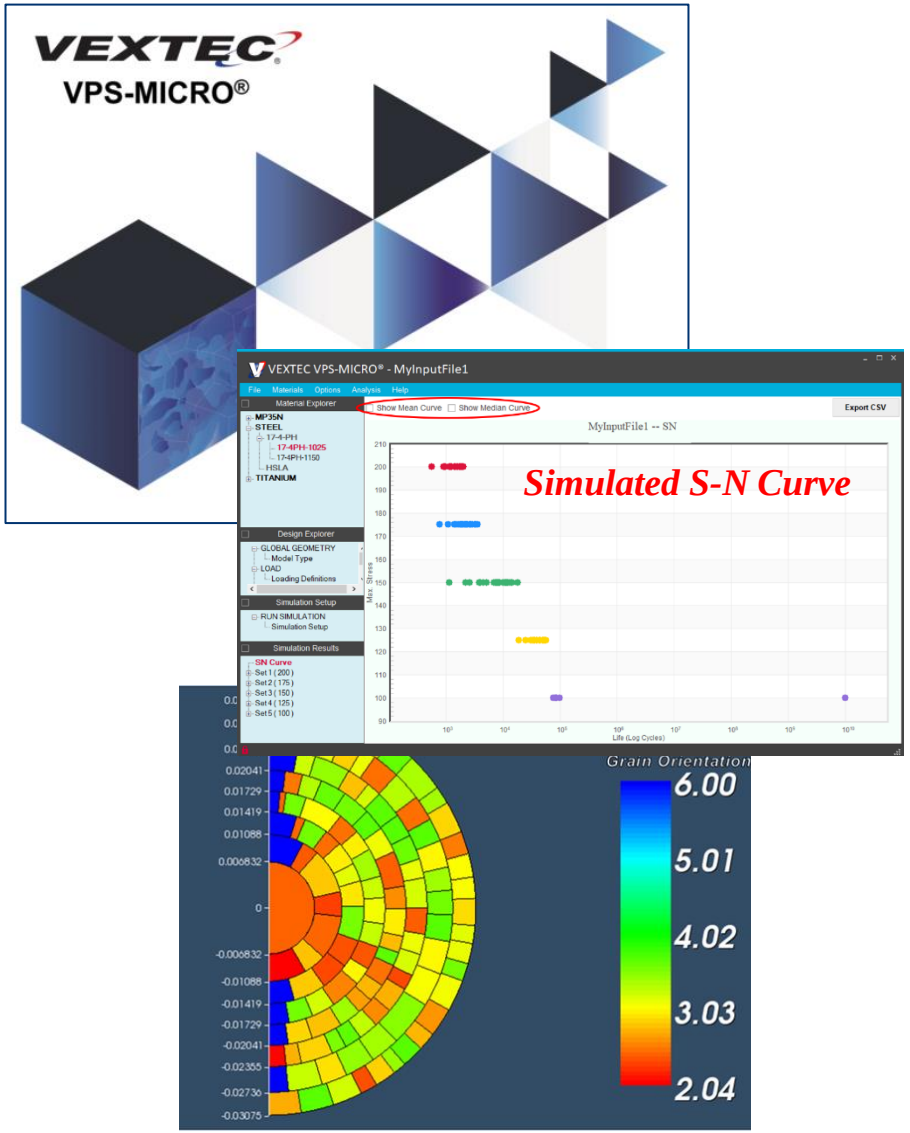
Identifying

causes of component fatigue failure

VPS-MICRO Software

Simulated Performance Testing

- Windows desktop tool
- Wide range of applications
  - Standalone tool for simple specimen geometry models
  - Integrate FEA models for complex geometry of full-scale components
- Outputs
  - Simulated S-N fatigue curve
  - Virtual fracture surface
  - Detailed statistical analysis
- Customizable software product
  - Interface with standard FEA software
  - Predict risk of failure from complex in-service loading spectrums

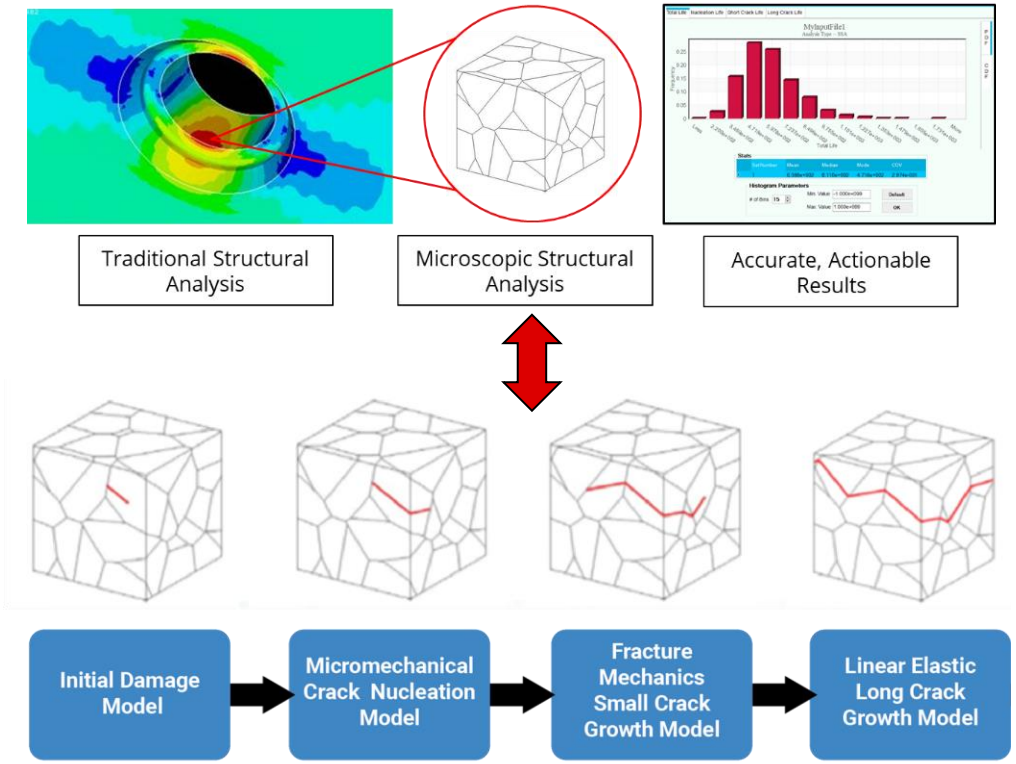


Software Partners:

ANSYS® SIMULIA MSC Software®

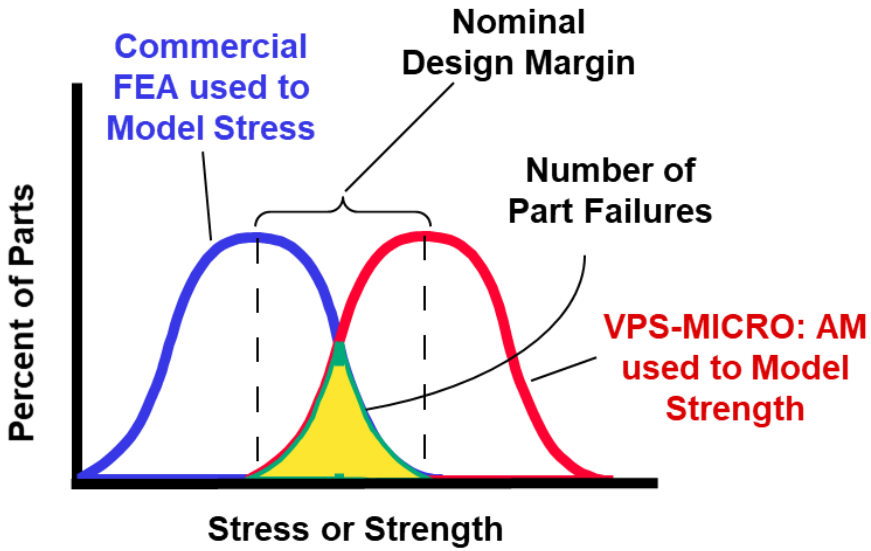
How Does VPS-MICRO Work?

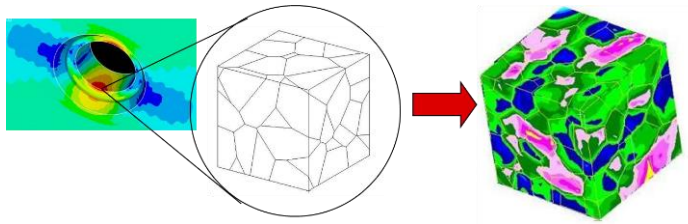
- VPS-MICRO links microstructure to macrostructural FEA to
  - Predict scatter in fatigue
  - Predict complex part failure rates
  - Identify the allowable microstructural tolerances in the manufacturing process
- VPS-MICRO uses physics-of-failure modeling to analytically predict the cause and extent of fatigue failure



VPS-MICRO + Additive Manufacturing

- Just as FEA uses a digital representation of the part to model the stresses, VPS-MICRO uses a digital representation of the material to model strength
  - Fatigue strength is the big cost driver and is governed by the material microstructure
  - VPS-MICRO addresses fatigue strength
  - VPS-MICRO creates digital models of the material microstructure
  - VPS-MICRO simulates effects of surface roughness from as-built AM components





Modeling Fatigue Stress at the Microstructural Level

With AM the need for analytical software is even greater, due to the difficult-to-test-for internal surface roughness of as-built complex geometries

What Makes VPS-MICRO Unique?

- Simulates fatigue at the microstructural level, where damage occurs
- Captures the variability of material processing, manufacturing, and in-service conditions probabilistically
- Flexible computational architecture allows usage of multiple material models

Get answers in minutes, not months or years

Perform countless trade-off-studies, sensitivity analyses, virtual DOEs

Optimize material choices/designs, optimize structural designs, optimize inspection and maintenance schedules

VPS-MICRO Annual Subscription Model

- Annual Subscription for software license and support:
  - Floating license, unlimited users, single project at any given time
  - Access to VEXTEC materials library
  - Complete user training for at least two users--training process will also validate methodology, as training will result in a specific alloy addition to the materials library and the ability for VEXTEC to address almost all potential use cases
  - VEXTEC ensures that our customer is fully supported in its use and implementation of VPS-MICRO

"We succeed, when you succeed!"

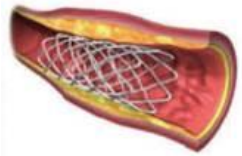
Selection of Our Partners and Users

Partnerships with our clients are formed on convenient terms:

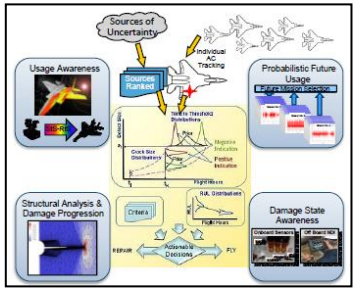
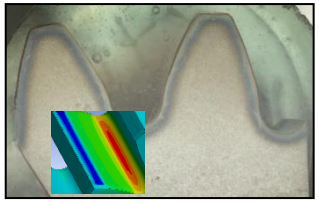
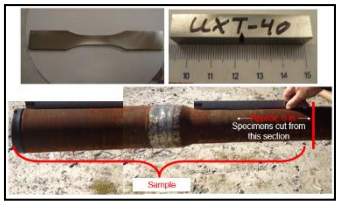
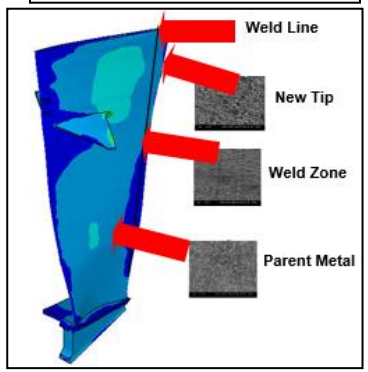
Software subscription packages (licensing and support)

Consulting engagements

Demonstrated Returns on Investment

	Industry	Client Type	Project Description
	**Aerospace**	**Airline (American Airlines)**	➢ Simulated lubrication changes & identified fix ➢ FAA approved ➢ $4M/year saved on bearings
	**Automotive**	**Engine Maker (Cummins)**	➢ Simulated 150 designs & identified top 3 ➢ $5M saved on engine block development program
	**Industrial Equipment**	**Manufacturing**	➢ Forecasted maintenance schedule based on current usage ➢ $3M saved in reducing manufacturing line downtime
	**Healthcare**	**Medical Devices (Boston Scientific)**	➢ Evaluated material suppliers for different markets ➢ Avoided expensive developmental test program

Successes in Multiple Applications

Application	Client Type	Application and Client Benefit
 **Computational Framework**	**Defense, Medical Device**	➢ Developed a multi-physics, multi-disciplinary ecosystem for realistic digital simulation ➢ Accurately tracked performance of assets and predict optimum maintenance/repair schedule
 **New Product Development**	**Automotive, Engine Maker**	➢ Simulated multiple designs and variable loads for hundreds of material variations ➢ Down-selected a finite number of feasible candidate designs
 **Second Source**	**Medical Device, Oil & Gas, Automotive**	➢ Compared low-cost, easily-available candidate with current premium option ➢ Recommended strategic substitution that generated positive financial impact
 **Repair Engineering**	**Aerospace, Energy, Automotive**	➢ Demonstrated repaired components are equivalent to new components ➢ Significant cost savings achieved by using repair and remanufacturing techniques

Thank You!

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