SOLUTIONS FOR DEVELOPERS

FATIGUE & DURABILITY FOR RUBBER

Endurica's production-ready workflows for mastering rubber durability are used throughout the world by leading firms in many business sectors. Endurica CL™ is the original and only commercial fatigue simulation application that accurately predicts elastomer durability.

ELASTOMER FATIGUE ANALYSIS SOFTWARE

For Finite Element Models

Endurica CL™ Our original, full-featured solver for elastomer fatigue analysis.

Endurica DT™ Digital Twin option for incremental analysis of multiple load histories and residual life.

Endurica EIE™ Efficient Interpolation Engine option — speeds lengthy calculations from days to minutes.
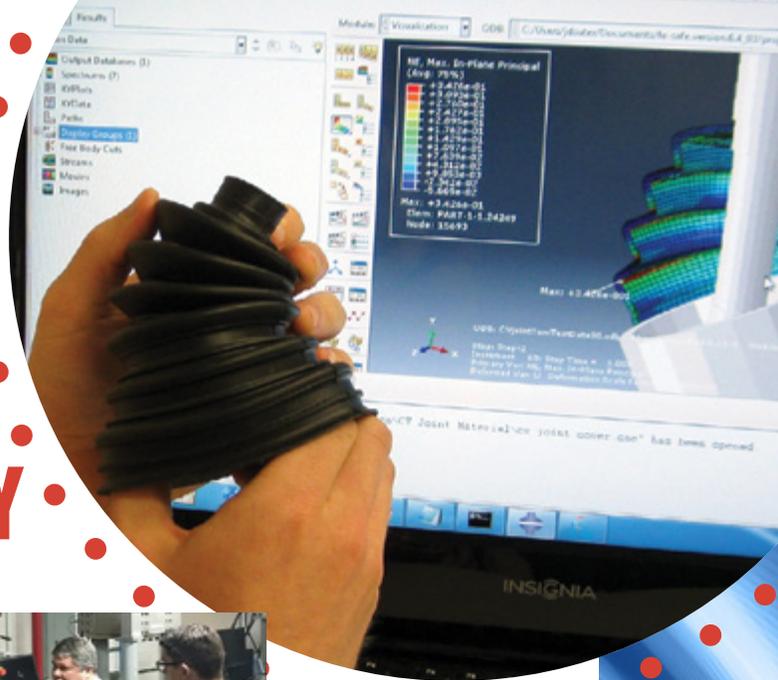
MASTER TRAINING

Principles and practices for reliable design of components:

- Application of Rubber Fatigue Analysis

- Characterizing Elastomer Fatigue Behavior for Analysis & Engineering

Become an Endurica #FatigueNinja: a highly-skilled engineer who understands the fatigue fundamentals of rubber and is trained in the use of Endurica solutions to: #GetDurabilityRight

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Endurica
Get Durability Right®

TESTING INSTRUMENTS

Endurica methods in your own lab. Our testing solutions provide time-efficient, high-accuracy, reliable results.

Our partnership with instrument producer Coesfeld GmbH & Co. KG offers you proven, fully supported testing systems that are specialized for engineering analysis of elastomer durability.

For more information:
endurica.com/testing-instruments

Intrinsic Strength Analyser

Tear & Fatigue Analyser

Instrumented Chip & Cut Analyzer

"In the automotive industry, from design to launch is becoming more and more of a time crunch. This is what the Endurica software does in conjunction with our testing. It allows us to cut that timing down, and allows our customer base — the automotive, heavy truck and off-highway engineering staffs — to do their job and not worry about if they have a durability problem."

Steve Pohlman, Tenneco Inc.,
Vice President and General Manager of Global Elastomers

As reported by Kyle Brown in *Rubber & Plastics News*, July 24, 2017

TESTING SERVICES

Fatigue Property Mapping™
Know Your Material

Inventory of the fatigue capabilities of your material:

● Material parameters ready to use with nonlinear finite element codes: Abaqus, ANSYS and MSC/MARC through fe-safe/Rubber™ and Endurica CL™.

● Full support for both nucleation (ε-N or σ-N) and crack propagation (dc/dN) analysis methods.

● Accurate and timely results via uniquely reliable and productive test strategies.
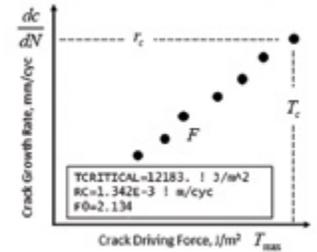
Take your material's fatigue capabilities into account to reduce risk and cost of development iterations.

Endurica's elastomer and rubber durability consulting services lead the industry with proven results and can make the difference in your project's success. Engage our fatigue specialists to solve your durability issues quickly and confidently.

Endurica offers:

● 100% Focus on Elastomers and Durability
● Leading Technology
● Deep Experience
● Legal Sensitivity
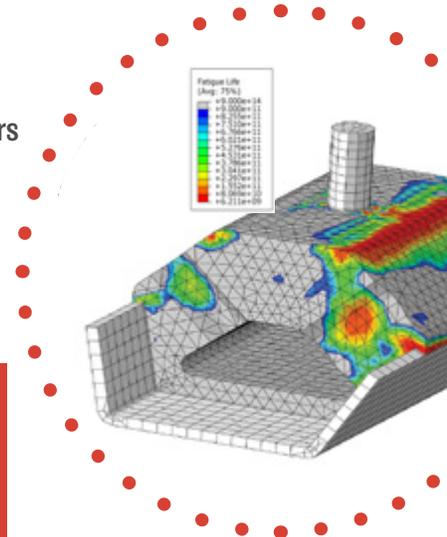
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 Endurica

 Endurica

 info@endurica.com

Endurica
Get Durability Right®

FATIGUE & DURABILITY FOR RUBBER
CAE SERVICES

WORLD LEADING EXPERTISE

Endurica's fatigue specialists are rubber industry experts who engage our technology portfolio to quickly and confidently solve your issues.

A few examples:

For a **MARINE** customer with **wave-induced loads and a tight design deadline**, Endurica:

- characterized the client's material.
- completed FEA.
- performed fatigue analysis of design options.

OUTCOME: Demonstrated capability to operate safely for target life.

An **AUTOMOTIVE PARTS SUPPLIER** bidding on OEM business was **looking for an extra edge**. Endurica completed analysis of the proposed design under OEM-specified load cases.

OUTCOME: Enabled supplier to demonstrate the durability of their design to the OEM and captured the contract.

Company making **ELECTRIC CARS** needed **bushing redesigned to support battery weight**. Engaged Endurica for study of three proposed designs. Endurica:

- simulated bushing under road loads.
- identified most durable option.

OUTCOME: Successful product launch on a tight timeline.

AGRICULTURAL SYSTEMS DEVELOPER
Endurica **investigated a case of cracks developing in early product returns from the field.**

OUTCOME: Endurica's analysis diagnosed the cause of the cracking and provided insights the developer used to correct the issue.
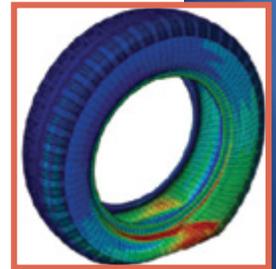
RAW MATERIALS SUPPLIER with a new material needed to show benefit to clients. Endurica:

- characterized new material and several current alternatives.
- compared simulated performance in a range of products: tires, transmission mount, bushing, flex joint.

OUTCOME: Enabled raw materials supplier to build prospect confidence in the new material leading to increased sales.

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Legend values:
+1.000e+15
+2.610e+14
+6.813e+13
+1.778e+13
+4.642e+12
+1.212e+12
+3.162e+11
+8.254e+10
+2.154e+10
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+1.000e+08

: +1.191e+08
m: PART-1.1199
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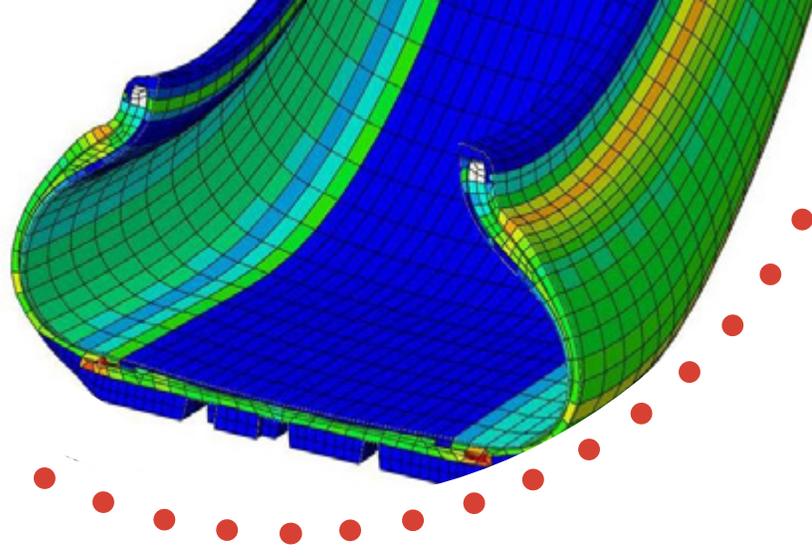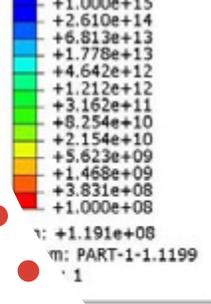
C-SUITE INSIGHTS

TOP EXPERTISE
We'll take you straight to the answers you need. We wrote the Endurica and fe-safe/Rubber™ fatigue solvers, and the testing specs for the Fatigue Property Mapping™ testing service. We have partner relationships with top labs and simulation companies globally.

ON DEMAND
Get simulation capacity for your organization right when you need it and avoid the costs of maintaining permanent capacity.

FLEXIBLE SCOPE
Endurica has experience with project scopes ranging from 1 day to several years and multiple partners. We have worked with leading companies in many sectors: aero, auto, civil, offshore, consumer, medical devices, electronics, raw materials.

TECHNOLOGY TRANSFER
Looking for a fast way to implement Endurica methods in your organization? Engage us on a startup project to build momentum and maximize technology transfer.

Endurica LLC
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Suite 201
Findlay, Ohio 45840 USA
+1.419.957.0543 | endurica.com

LIFELEFT™ DURABILITY SIMULATION SERVICE

Send us your specifications:
- part geometry
- load cases
- material properties
  (or let us test them)

Our report contains:
- expected life and failure mode
- life contours plotted on finite element model
- failure location
- identification of most damaging load case(s)
- design diagnostics to optimize durability

LEGAL SENSITIVITY

Durability studies frequently center on sensitive intellectual property and liability concerns. Endurica routinely works under customer non-disclosure agreements. Get Durability Right® with confidence that you've engaged professionals who will put your interests up front and deliver the highest quality results.

THE ENDURICA DIFFERENCE

Learn more at:
www.endurica.com/rubber-durability-consulting
Call today to discuss YOUR special project:
+1.419.957.0543

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Endurica
Get Durability Right®

Fatigue Life
(Avg: 75%)
+9.000e+14
+9.000e+11
+8.255e+11
+7.510e+11
+6.766e+11
+6.021e+11
+5.276e+11
+4.531e+11
+3.786e+11
+3.041e+11
+2.297e+11
+1.552e+11
+8.069e+10
+6.211e+09
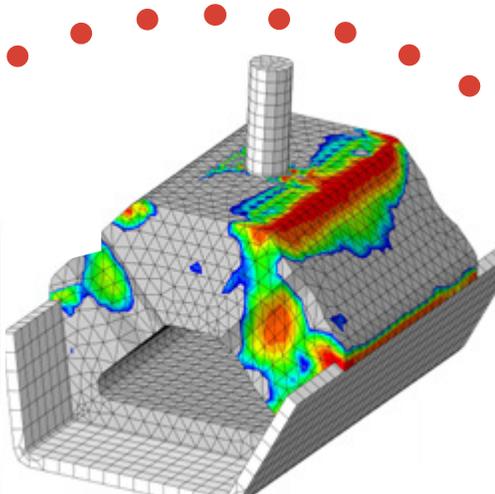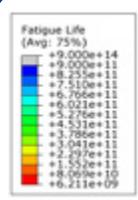
MATERIAL CHARACTERIZATION

Fatigue Property Mapping™
Know Your Material

Success is riding on your compound. Don't leave its fatigue behavior uncharted. Our characterization service offers test modules for probing each of the behaviors that govern your material's fatigue performance.

Whether you seek higher durability, or lower cost without compromising durability, Endurica's Fatigue Property Mapping™ service offers you a comprehensive inventory of the fatigue capabilities of your material. Get Durability Right® in your development and analysis projects with our uniquely efficient, reliable, and physics-based testing protocols.

BENEFITS

- Material parameters ready to use with simulation software: Abaqus, ANSYS, Marc, fe-safe/Rubber™ and Endurica CL™.
- Full support for both nucleation (ε-N) or (σ-N) and crack propagation (da/dN) analysis methods.
- Accurate and timely results via uniquely reliable and productive test strategies.
- Reduced risk and cost of development iterations when you take your material's fatigue capabilities into account.
- Leverage your material's full potential by properly aligning its capabilities with the application's demands.

THE ENDURICA DIFFERENCE

Learn more at:
www.endurica.com/elastomer-testing-characterization/
Call today to discuss your testing project: **+1.419.957.0543**

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GET DURABILITY RIGHT® WITH ENDURICA'S FATIGUE PROPERTY MAPPING

Hyperelastic Module
Simple, planar, equibixial tension Mullins Effect
- Required as prerequisite to Finite Element Analysis, lab ambient temperature
- One temperature between -40°C and 150°C
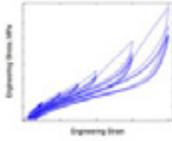
Core Fatigue Module
Fully relaxing behavior from both nucleation and fracture mechanical perspectives
- Required for fatigue analyses
- User specifies one temperature between -40°C and 150°C
- Fully relaxing (R=0) Conditions for all fatigue tests
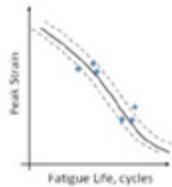
Intrinsic Strength Module
Quantify endurance limits
- Recommended for cases with fatigue life longer than 10^6 cycles
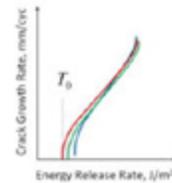
Extended Life Module
Quantify endurance limit, estimate aging rate of stiffness, intrinsic and ultimate strength
- Recommended for cases with fatigue life longer than 10^6 cycles, and when aging must be taken into account
- Quantify Arrhenius ageing law parameters
- Basic and Advanced time/ temperature options available
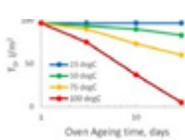
Thermal Module
Quantify dissipative properties, thermal properties, temperature dependence
- Recommended for cases involving significant self-heating, thermal expansion, or thermal gradients
- User specifies three additional (to FPM-C) temperatures between -40°C and 150°C.
- Basic and Advanced options available
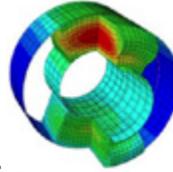
Nonrelaxing Module
Quantify strain crystallization min and mean strain effects
- Recommended for cases where fatigue loading is never fully relieved to zero
- One temperature between -40°C and 150°C Test is run under range of nonrelaxing (R>0) conditions
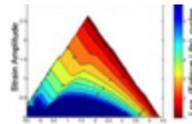
Reliability Module
Weibull statistics for strength and crack precursor size populations
- Recommended when probability of failure needs to be estimated
- Testing is conducted at room temp. 23°C
- Weibull analysis parameters relating frequency of occurrence to size of crack precursor
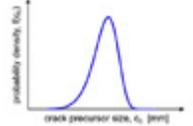
Creep Module
Quantity creep crack growth rate effects
- Recommended for cases involving long periods under static load
- User specifies one temperature between -40°C and 150°C
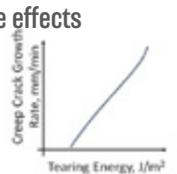
Cyclic Softening Module
Quantify cyclic softening effects
- Recommended for cases where degradation limits durability
- User specifies one temperature between -40°C and 150°C
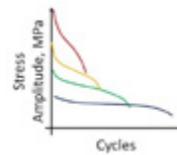
C-SUITE INSIGHTS

RIGHT-SIZE YOUR TESTING
Use our modular framework to meet your program requirements, from rapid screening to deep characterization.

LEVERAGE YOUR STRENGTH
Know your material's physics so you can leverage its full capabilities in your application.

PLUG AND PLAY
Our testing modules deliver compatible results that plug right into our fatigue solvers.

SCALE UP YOUR CAPACITY
Planning to implement these in your own lab? Use our testing service to keep product development moving while you scale up.

ENDURICA PRESENTS

RUBBER FATIGUE SIMULATION SOFTWARE

Endurica's fatigue solvers show how your design will endure in specific application scenarios within all three major nonlinear finite element codes: Abaqus, ANSYS and MSC/MARC.

Endurica's software is the first (and only) commercial FEA software to predict when and where cracks will show up in an elastomer product with complex loading history and geometry. Endurica's methods are in use across the globe by virtually all industry sectors.

BENEFITS

- Save the costs of build and break experiments for well-qualified designs.
- Quickly see how changes to material behavior, part geometry, or load history influence fatigue life.
- Inform design decisions with a patented tool that has been continuously developed for more than a decade, and successfully validated against a wide range of benchmarks and real-world problems.

- Find out where your part might develop a crack, how long it can be expected to endure, which events are damaging and which are harmless.
- Communicate effectively about durability issues with realistic, physics-based presentation of simulation results.

THE ENDURICA DIFFERENCE

Learn more at:
www.endurica.com/fatigue-solver-software
Call today to request a trial: **+1.419.957.0543**

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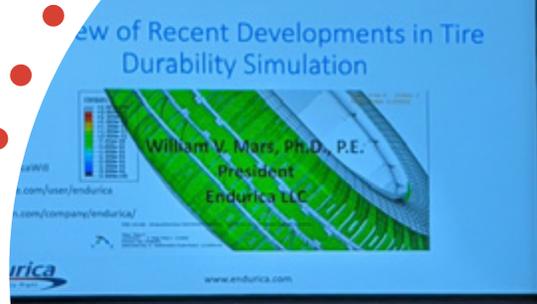
COMPREHENSIVE SOLUTIONS FEATURES GRID
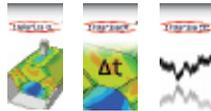
MATERIALS DATABASE	CL	DT	EIE	fe-safe/Rubber™
MATERIAL MODELS				
Materials database	x	x		x
Hyperelastic laws: Neohookean, Arruda-Boyce, Mooney-Rivlin, Reduced Polynomial, Van der Waals, Ogden	x	x		x
Mullins Effect	x	x		x
Crack Growth Rate laws: Thomas, Lake-Lindley, table-lookup	x	x		x
Crystallization laws: None, Mars-Fatemi, table lookup	x	x		x
Ozone attack, creep crack growth	x	x		x
Temperature dependence: coefficient or table-lookup	x	x		coefficient only
Hysteresis / Self-heating: powerlaw, Kraus, Table-Lookup	x	x		
PROCEDURES				
Critical plane analysis	x	x		x
Total formulation fatigue solver	x			x
Rainflow counting w/time indices preserved for event identification	x	x		x
Block cycle generation from road loads	x			
Signal defeaturing	x			
Rolling structures (ie tires) with axi- or cyclic- symmetry	x	x		
Periodic results transfers for tires	x	x		
Diagnostics: critical plane vector, load history on critical plane, crack open/close history	x	x		x
Endurica Viewer	x	x		Note 1
Incremental formulation fatigue solver		x		
Ageing	x	x		
Security encryption	x	x		
Block cycle schedules / multi-step protocols		x		Miner's rule
Sequence effects		x		
Restart capability		x		
Stiffness loss cosimulation		x		
Residual life		x		
Digital Twin applications		x	x	
Nonlinear load/displacement->stress/strain map			x	
Auto-generation of FE model boundary conditions for map generation			x	
1, 2 or 3 independent input channels			x	
Mapping methods: Case Vectors, Spiral Grid, User-Defined			x	
Accelerated strain history generation			x	
Multi-threading / parallel processing	x	x	x	x
Damage extrapolation		x		
FE CODES				
Abaqus	x	x	x	x
Ansys	x	x	x	
MSC/Marc	x	x	x	
fe-safe/Rubber			x	
LICENSING				
Node-locked	x	x	x	
Network floating	x	x	x	
Annual lease	x	x	x	Available only
Perpetual	x	x	x	through
Maintenance and support	x	x	x	Dassault
Single site, Regional, Global	x	x	x	Systems

Note 1 - Available as free download from Endurica for licensed fe-safe/Rubber™ users.

2021-09

C-SUITE INSIGHTS

DURABILITY WINS NEW BUSINESS
Show your customer who is the boss of durability. Let us help you win their business.

RIGHT THE FIRST TIME SAVES BIG
Missing the durability qualification resets your development cycle and puts you back big time. Let us support your people with our tools and expertise.

GET THERE FIRST
Getting design decisions right for durability will get you to market faster.

START WITH QUALITY
Don't let poor durability turn into costly reliability or warranty issues.

FUTURE PROOF YOUR BUSINESS
Ask about our Digital Twin capabilities. Get durability online for your IoT and Big Data applications.

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Endurica CL™

FATIGUE ANALYSIS SOFTWARE

Give Endurica CL™ a finite element simulation of your loading history, specify your material(s), then CL computes the fatigue life of your rubber part.

BENEFITS

- Calculate fatigue life and failure location on your part.
- Diagnose and resolve material, geometry, and loading issues to get durability right.

- Mobilize quickly with ready-to-use workflows that give you the edge.
- Scope analyses to fit your aim and budget with support for both "draft quality" and "high accuracy" simulations.

FEATURES

- CL offers the right material models for capturing your elastomer's behavior.
  - Nonlinear hyperelastic stress-strain behavior, Mullins effect, and cyclic softening.
  - Rate laws for both cycle- and time-dependent crack growth, including threshold effects and ozone attack.
  - R-ratio effects for both strain crystallizing and amorphous materials.
  - Temperature and ageing dependence of material properties.
  - Viscoelastic dissipation.

- CL provides support for:
  - Infinite Life method
  - Safe Life method
  - Safety Factor
  - Repeats to failure

- CL offers accurate accounting of damage accrual under multiaxial, variable amplitude loading history.
  - Crack precursor growth tracking based on Fracture Mechanics.
  - Critical Plane Analysis checks every potential crack orientation and location to find the true worst case.
  - Rainflow Counting on history of the critical plane.
 - Reports fatigue life as repeats of the given history.

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```
+1.778e+13
+4.642e+12
+1.212e+12
+3.162e+11
+8.254e+10
+2.154e+10
+5.623e+09
+1.468e+09
+3.831e+08
+1.000e+08

+1.191e+08
ART-1-1.1199
```

TECHNICAL NOTES

- Compatible FEA solvers: Abaqus, Ansys, MSC/Marc
- OS: Windows or Linux
  Licensing: node-locked or network shared; lease or perpetual

Road Load
Damage Sphere
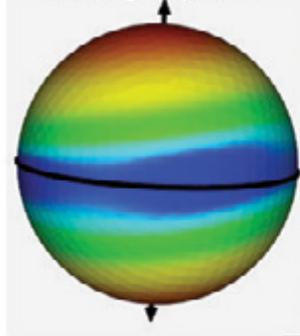
Critical Location
Life=36,240

```
Fatigue Life-1
+2.49e+15
+1.00e+07
+6.21e+06
+3.86e+06
+2.40e+06
+1.49e+06
+9.25e+05
+5.74e+05
+3.57e+05
+2.22e+05
+1.38e+05
+8.55e+04
+5.31e+04
+3.30e+04
```
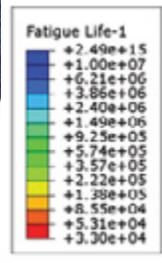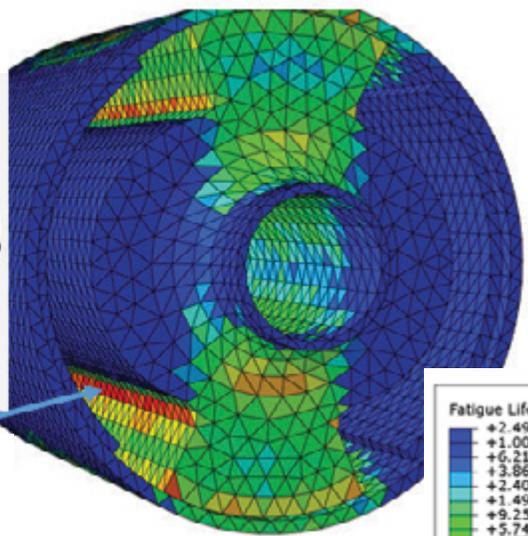
THE ENDURICA DIFFERENCE

Learn more at:
www.endurica.com/fatigue-solver-software/endurica-cl
Call today to request a trial:
+1.419.957.0543

C-SUITE INSIGHTS

FOCUS ON PRODUCT TECHNOLOGY
Our tools free you up to focus on getting your product right. Avoid the costs of deep methods development programs.

UNMATCHED ACCURACY
Don't waste your time with outdated, low-accuracy methods. Critical Plane Analysis is the gold standard for handling realistic load cases.

SHORT LEARNING CURVE, LARGE USER BASE
Our tried-and-true workflows will have your team winning on durability. We've trained hundreds of "fatigue ninjas," and we can bring your team up to speed in a few days.

LIGHTWEIGHTING, SUSTAINABILITY, COST-REDUCTION
The trick is to do it without sacrificing durability. Use our code to quickly eliminate non-viable solutions.

SUPPORT FOR POPULAR FEA CODES
One license gives you support for all of the major elastomer FEA codes: Abaqus, Ansys and MSC/Marc.

Endurica LLC
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Endurica DT™

INCREMENTAL FATIGUE SOLVER

NE, Max. Principal
(Avg: 75%)
+1.800e+00
+1.000e+00
+9.169e-01
+8.338e-01
+7.508e-01
+6.677e-01
+5.846e-01
+5.015e-01
+4.185e-01
+3.354e-01
+2.523e-01
+1.692e-01
+8.617e-02
+3.097e-03

Endurica DT™ is our incremental solver and is an add-on to Endurica CL™. Give DT a series of load cases and it updates you on the remaining life of your rubber part. DT simulates how rubber changes over time.

BENEFITS

- Realistic use cases. Match the load cases and schedule for simulation with what your part experiences during product durability testing.
- Realistic material behavior. Account for load and material property evolution with time.

- Realistic end-of-life criterion. Simulate stiffness-based end of life criteria (i.e. end of life at a percentage of component stiffness loss).

FEATURES

- DT analyzes damage over a series of load cases that you specify (examples: block cycle schedule, FMVSS multi-step tire testing, histogram bins).
- DT tracks damage state evolution in terms of cycles applied, crack size, maximum-ever strain energy density, equivalent ageing time, and cyclic softening.
- DT calculates residual life / residual strength at the end of each scheduled load case.

- DT offers co-simulation workflows for ageing and cyclic stiffness loss analyses in which the stress-strain solution is updated due to material property evolution.
- DT offers a Digital Twin capability for structural health monitoring applications.

10 min.@ 240kph

10 min.@ 270kph

10 min.@ 300kph
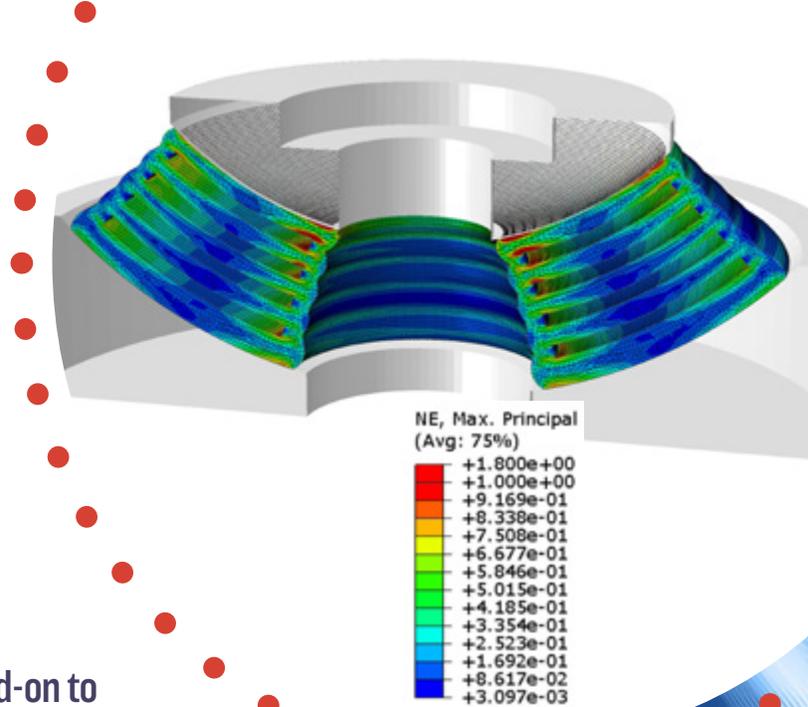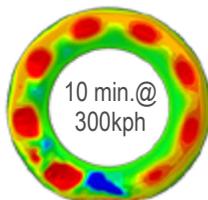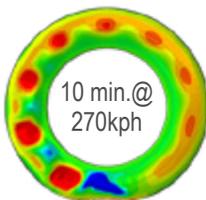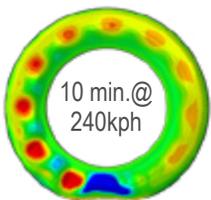
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Endurica

Get Durability Right®

TECHNICAL NOTES

- Compatible FEA solvers: Abaqus, Ansys, MSC/Marc*
- OS: Windows or Linux
- Licensing: node-locked or network shared, lease or perpetual

*CoSimulation workflow not yet supported.

45 km(30min) Break-In **Impact** **Run-Out**
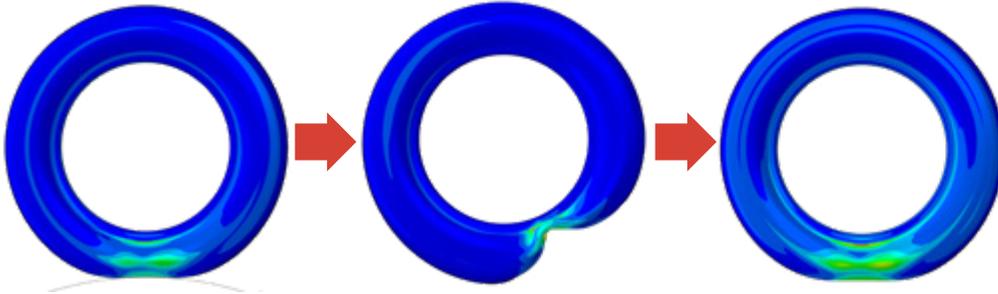
Digital Twin Applications

Asset Manager

Digital Twin Server

Maintenance Notifications

Sensor Data

Residual Life Update Requests

Damage Updates

Asset

Simulation Server
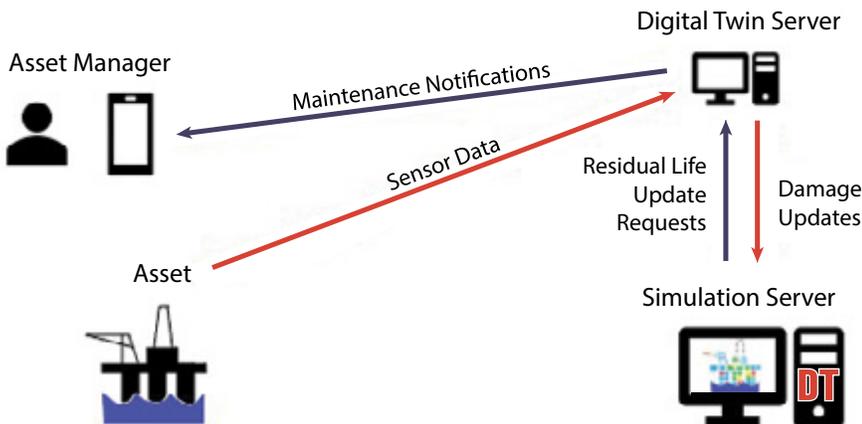
THE ENDURICA DIFFERENCE

Learn more at:
www.endurica.com/fatigue-solver-software/endurica-dt
Call today to request a trial: **+1.419.957.0543**

C-SUITE INSIGHTS

DURABILITY WINS NEW BUSINESS
Show your customer who is the boss of durability. Let us help you win their business.

RIGHT THE FIRST TIME SAVES BIG
Missing the durability qualification resets your development cycle and puts you back big time. Let us support your people with tools and expertise.

GET THERE FIRST
Getting design decisions right for durability will get you to market faster.

START WITH QUALITY
Does your product still function after misuse or abuse? Calculate residual life to find out.

FUTURE PROOF YOUR BUSINESS
Ask about our Digital Twin capabilities. Get durability online for your IoT and Big Data applications.

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+1.419.957.0543 | endurica.com

Endurica
Get Durability Right®
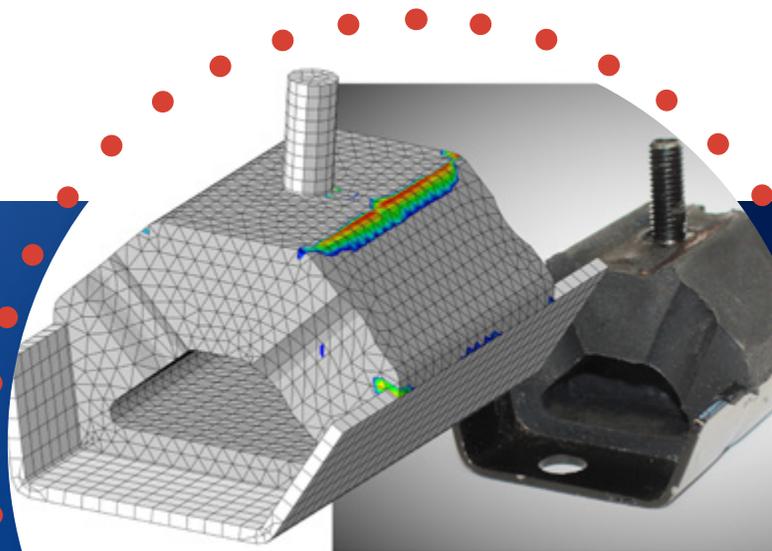
Endurica EIE ™

FAST LOADS PROCESSING

Endurica EIE™ is the fast way to go from lengthy multi-channel load signals to fatigue life prediction. Use EIE with either CL or DT to simulate the full experience of your part in service.

BENEFITS

- Simulate durability impacts of full-length loading signals.
- Speed up strain history generation by orders of magnitude, compared to direct FEA solution.
- Achieve real-time load processing speeds for digital twin applications.

FEATURES

- EIE makes it easy to map nonlinear load spaces having up to 6 independent channels (channel can be load, displacement, rotation, etc.). User has full control over map discretization.
- EIE automatically generates boundary condition commands to drive your finite element model(s) through motions required to map grid points.
- EIE's channel reduction feature optimizes efficiency for map generation and interpolation.

- EIE interpolates multichannel input signals in .csv format via the map to rapidly generate strain history for your finite element model.
- EIE offers multi-threading and binary I/O for unprecedented execution speed.
- EIE produces strain history ready for analysis with CL, DT, and fe-safe/Rubber™.

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TECHNICAL NOTES

1) Define the input channels
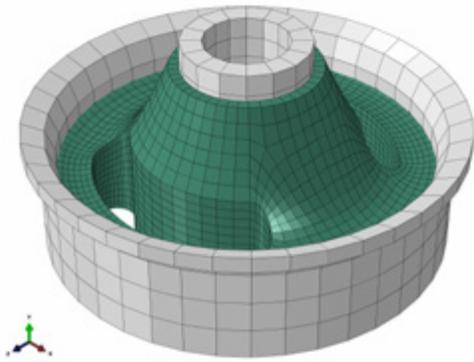
2) Populate the nonlinear interpolation map
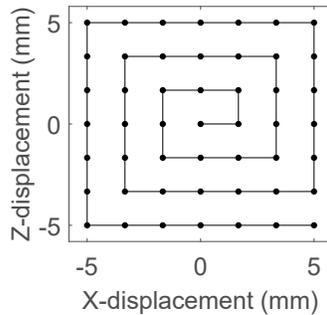
3) Solve for strain history

4) Solve fatigue life

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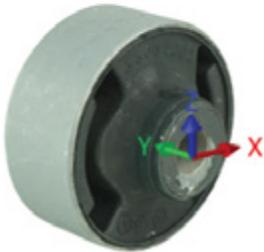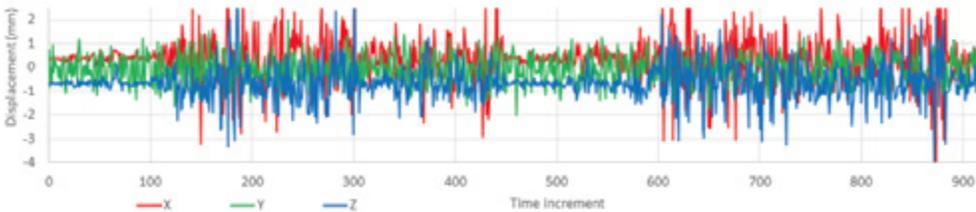
C-SUITE INSIGHTS

MAKE THE MOST OF YOUR FEA LICENSE
Free up your finite element solver license. With EIE, FE solve time is reduced by orders of magnitude! What once took days is now completed in minutes.

MORE REALISM
Get closer to your customer's true use cases - Model full road load histories.

MORE LOAD CASES
EIE's high efficiency lets you look at ALL of your customer's use cases.

BREAK THE ANALYSIS PARALYSIS
Don't get stuck on convergence issues. EIE's flexible load space mapping methods get you out of 'convergence jail'.

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THE AMERICAS DISTRIBUTOR OF COESFELD

TESTING INSTRUMENTS

Test Fatigue Performance in your own lab using Endurica protocols running on Coesfeld instruments. Our partnership with instrument producer Coesfeld GmbH & Co. KG offers you proven, fully supported testing systems that are specialized for engineering analysis of elastomer durability.

COESFELD
MATERIALTEST

Intrinsic Strength Analyser

- Measures cutting forces on an instrumented blade of controlled sharpness.

- Indicates the threshold fracture mechanical strength of a polymer network (i.e. the mechanical fatigue threshold) with a test that runs in an hour.

- Based on the Lake and Yeoh procedure.

BENEFITS

- Fully automated test execution with high test productivity.

- High test reliability via built-in quality control and noise minimization strategies.

- Full compatibility with modern durability simulation codes Endurica CL™ and fe-safe/Rubber™.

- Easy-to-use, works-every-time test setup — take the guess-work out of specifying test conditions.

- Fully supported by the world's leading experts in elastomer durability and in testing instrumentation for the rubber industry.

- Intuitive operation. Automated control, data acquisition and reporting.

- Supported in the Americas by the world leaders in elastomer durability testing methods.

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C-SUITE INSIGHTS

PLUG AND PLAY
Go with the solution that works right out of the box and integrates with your CAE workflows.

HIGH PRODUCTIVITY
Traditional open-duration fatigue tests mean lack of control over testing schedule. Use our finitely-scoped methods to take back control of your testing schedule.

LOW NOISE
Endurica testing methods significantly reduce scatter and get more reliable data.

AUTOMATE YOUR TESTING
Free up lab techs with fully automated test execution.

QUALITY
Go with the global market leader for vision-based crack growth testing systems: Coesfeld.

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Tear & Fatigue Analyser

- Measures crack growth under dynamic loading cycles.
- Produces the crack growth rate curve as a function of applied tearing energy.
- Produces parameters for describing effects of strain-crystallization on crack growth.
- Includes protocols for both fully relaxing (R=0) and nonrelaxing (R>0) conditions.
- 50% less data scatter than prior art methods.

Instrumented Chip & Cut Analyser

- Measures chip and cut resistance of rubber compounds under cyclic impact loadings.
- Highly instrumented to enable control and measurement of forces and displacements during impact to mimic conditions experienced in demanding applications.
- The instrument can be also be operated in full contact mode as a friction and wear measurement device.

COESFELD
MATERIALTEST

FATIGUE & DURABILITY FOR RUBBER
TRAINING

Endurica's training brings you up to speed quickly on the principles governing fatigue failure and on the best practices for testing, design and analysis of rubber components.

YOUR INSTRUCTOR

Dr. Will Mars the founder of Endurica, is a registered Professional Engineer with a PhD in Mechanical Engineering and the Mars-Fatemi Law of Durability to his credit, along with multiple patents. He is an international authority on the failure mechanics of rubber and an engaging instructor who makes highly-technical theories understandable.

"I want others in my company to take the Endurica training — durability is a complex subject and Endurica's framework is very helpful in navigating durability issues successfully. There is value here for our testing people, for our product engineers, for our materials people, and of course for our simulation people."

— Pedro Bastias, Ph.D.,
Trelleborg Sealing Solutions Americas

TRAINING IS AVAILABLE AT YOUR SITE

Endurica's professionals can provide customized training at your location anywhere in the world.

Contact us with your durability challenge via email at info@endurica.com.

#FatigueNinja: a highly-skilled engineer who understands the fatigue fundamentals of rubber and is trained in the use of Endurica solutions to Get Durability Right®.

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MASTER WORKSHOPS

Endurica's training will enlighten you on the principles that govern fatigue failure in rubber, and on best practices for testing, design and analysis that let you win on durability.

$$N_f(\theta, \varphi) = \int_{c_0}^{c_f} \frac{1}{r(T(\theta,\varphi,c))} dc$$

Characterizing Elastomer Fatigue Behavior for Analysis and Engineering

Plan and execute effective fatigue testing programs to take your simulations further

Application of Rubber Fatigue Analysis with Endurica Software

Make the most of Endurica's simulation workflows: CL, DT, and EIE

C-SUITE INSIGHTS

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SPEAK ENDURICA
Make durability a core competence for your material and product teams, Supercharge your development programs by getting your team on the same page with Endurica training.

BENCHMARK BEST PRACTICES
Our testing and simulation strategies are the most productive and reliable in the industry. We dare you to learn why and how.

COMPLETE DURABILITY WORKFLOW
Align your internal processes to consistently produce durability. Our programming addresses the whole process from raw materials to finished product in the field.

DON'T REINVENT THE WHEEL
Struggling with fragile, homebrewed methods? Our tried and true methods have been used successfully in many applications. Why not yours?

DELIVER RESULTS
Our tools and training are science-based and application-focused. Lectures, demos, and exercises will put you in a position to deliver durability.

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