

## APPLICATION SPOTLIGHT

# TIRE MANUFACTURERS



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Endurica provides the world's most complete CAE workflows for fatigue analysis of tires. Use our tool set and proven procedures to meet your development requirements.

## CAPABILITIES

- Evaluate the durability of tire compound formulations long before molding your first tire.
- Understand the impact of tension, shear, bending, and compression on tire durability during design work.
- Check every potential failure site in the tire, and every potential crack orientation.
- Evaluate your tire design's durability under different loads, speeds, inflation pressures and temperatures early in development.
- Simulate the FMVSS and ECE R30 durability and high-speed tire tests.
- Understand the effects of road hazards and tire abuse.

## SIMULATION PROCEDURES FOR TIRES

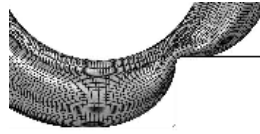
- Support for both steady state and transient rolling
- Symmetric results transfer for 2D to 3D and 3D to 2D
- Support for axi- and cyclic- symmetry
- Material models:
  - Temperature
  - Ageing
  - Strain crystallization
  - Ozone attack

**Endurica CL**™  
*Fatigue Analysis Software*

**Endurica DT**™  
*Incremental Fatigue Solver*

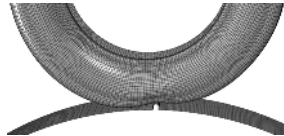
## TRANSIENT ROLLING /IMPACT

- Compute damage due to impacts by combining results from steady state and transient rolling
- Combine steady state and transient rolling using Endurica's symmetric results transfer procedures 2D to 3D and 3D to 2D



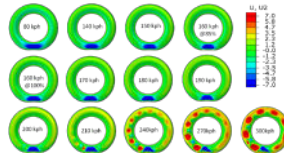
## ROLLING RESISTANCE

- Use Endurica's steady state rolling features with hysteresis and temperature dependent material models.



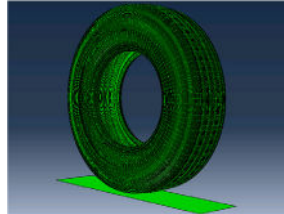
## HIGH SPEED / FMVSS / ECE30

- Combine multiple-stress/strain and temperature solutions according to the FMVSS / ECE30 schedule to accrue damage and calculate tire residual life.
- Predict speed rating during design.



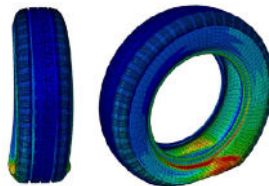
## STEADY STATE ROLLING

- Endurica automatically recognizes Eulerian streamlines in steady state rolling analyses.



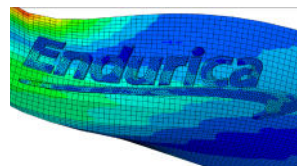
## TREADED TIRE

- Steady state rolling also works for cyclic symmetry/ treaded tire.



## SIDEWALL LETTERING

- Surface cracking on tire sidewalls is a key indicator of ozone attack which can limit useful life.



## C-SUITE INSIGHTS



### DEAL WITH RUBBER'S "SPECIAL EFFECTS"

Endurica material models capture the essence of tire material behavior: strain crystallization, temperature and rate dependence, ozone attack, ageing, etc.

### SUSTAINABILITY BEGINS HERE

Sustainable development does not have to risk performance. Validate durability with Endurica models. Pre-cycling is the key - Endurica's design for durability workflow saves energy, time, money, and materials.

### RIGHT THE FIRST TIME

Avoid unnecessary development iterations by simulating early in the design phase. Right the first time equals new products to market faster.

### PROVEN RESULTS

Endurica's workflows have been extensively validated over the past two decades. Find out why 13 of the top 20 global rubber product manufacturers use Endurica in their operations.

 2020 TIBBETTS AWARD WINNER

# Endurica

Get Durability Right®

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