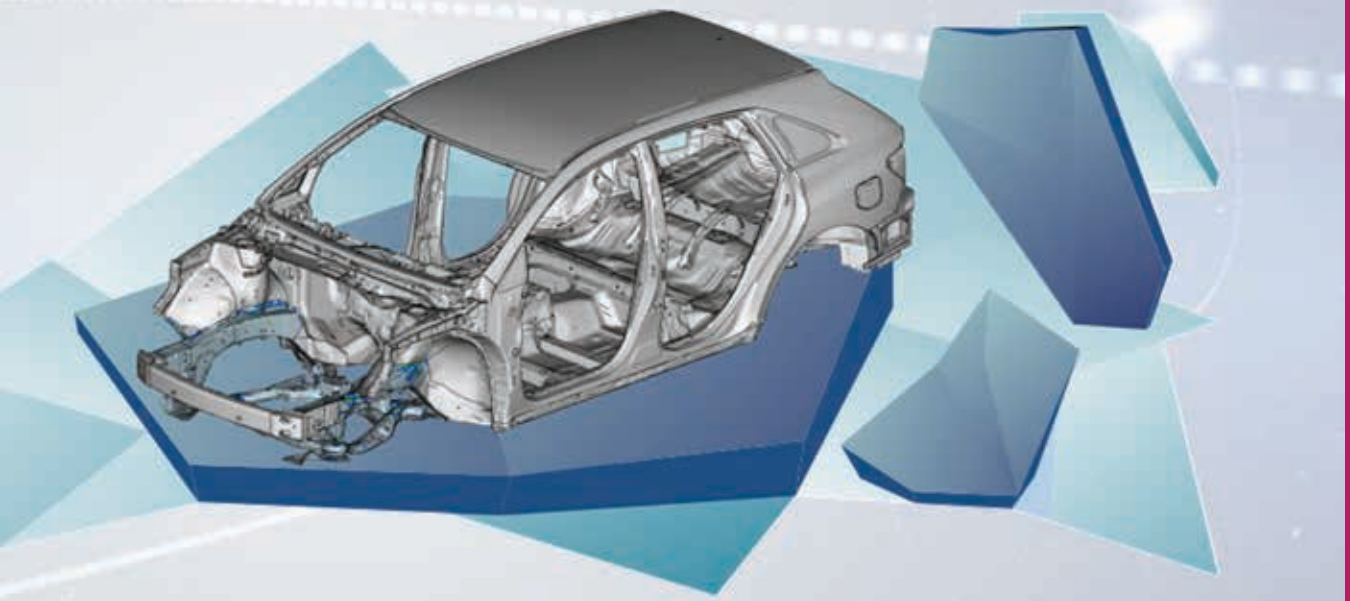
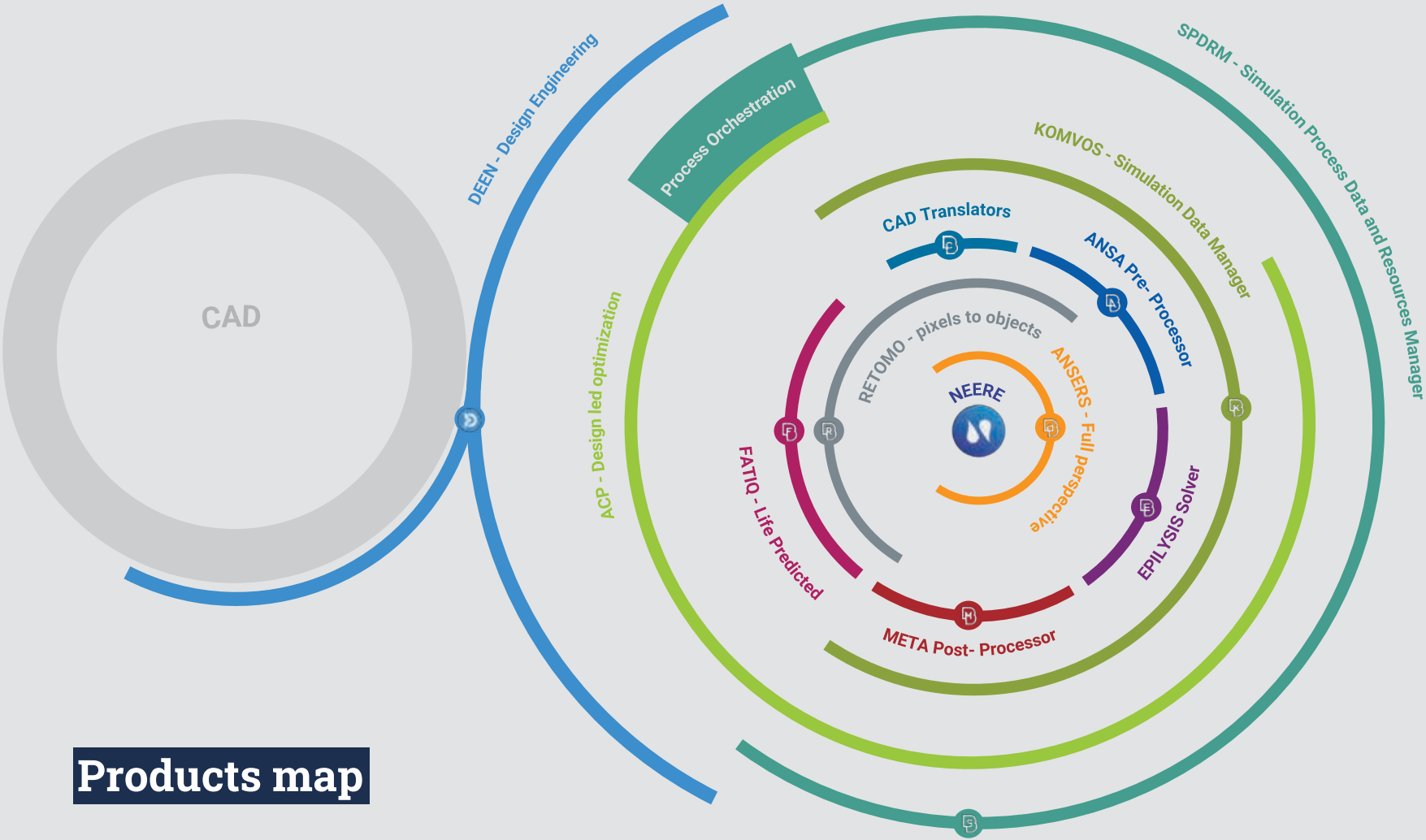
FATIQ

LIFE PREDICTED



Fatigue life prediction made easy



Products map

What is FATIQ

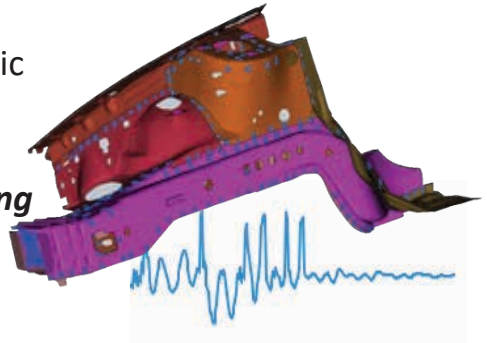
Stress – Life method

Palmgren-Miner rule

Time domain

Input
Pseudo - static
Transient

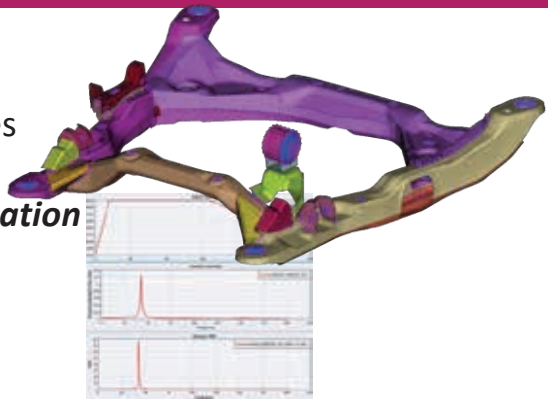
Cycle Counting
Rainflow



Frequency domain

Input
FRF
PSD Stresses

Cycle Estimation
Dirlik
Rayleigh
Rice
Powell



Mean stress correction

Goodman
Gerber
Soderberg

What is FATIQ

v24.0.0

Strain – Life method

Palmgren-Miner rule

Time domain

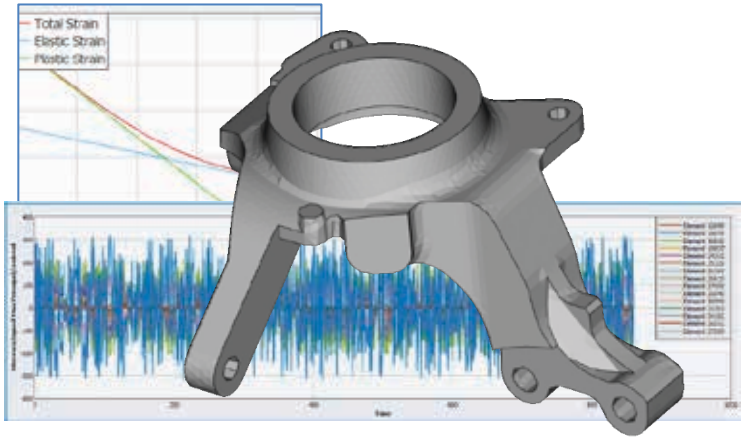
Input

Pseudo - static

Transient

Cycle Counting

Rainflow



Mean stress correction

Smith-Watson-Topper

Morrow

Customer requests

"Can you enhance random response tool of META in order to calculate fatigue results ?"

"Does EPILYSIS support embedded fatigue keywords ?"

"Is there a session command available in META in order to perform the rainflow algorithm ?"

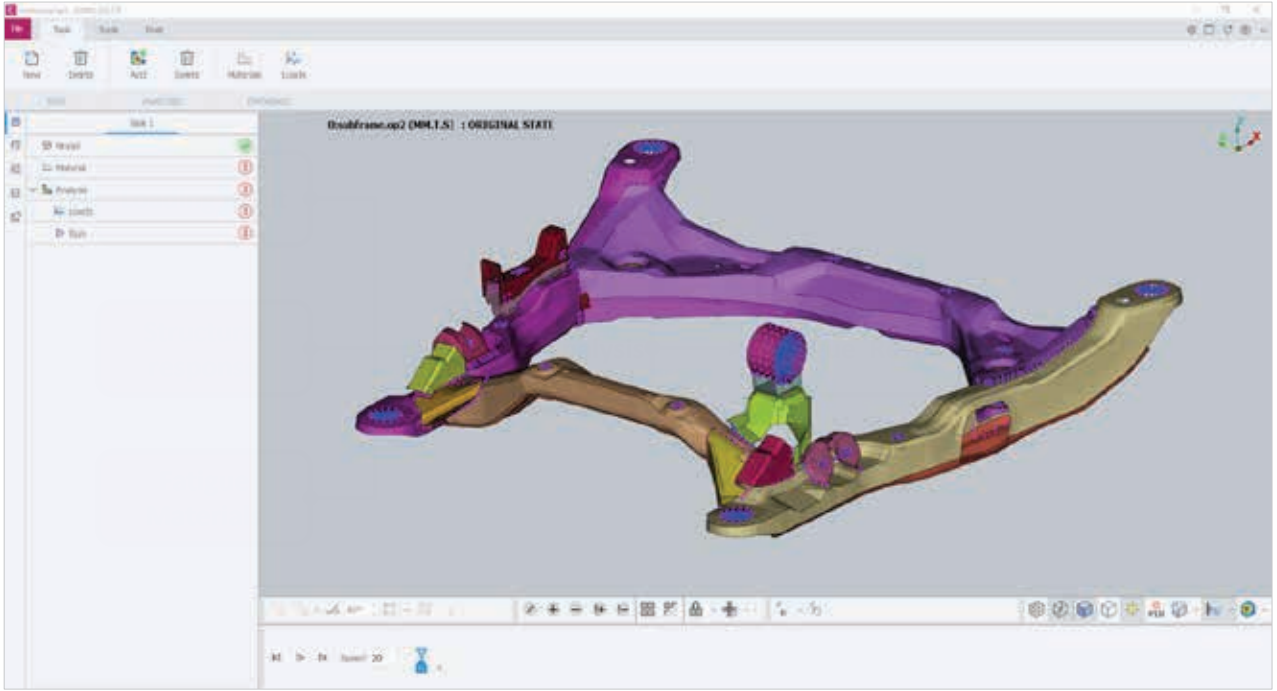
"Do you (as BETA) provide any scripts that calculate fatigue ?"

"Can I use the META interface and tools on fatigue results ?"

Goals

1. Intuitive software with minimal user input
2. User-friendly for all levels of expertise
3. Streamline analysis setup with reusable workflows
4. Interactive and comprehensive results overview
5. Rapid and reliable results

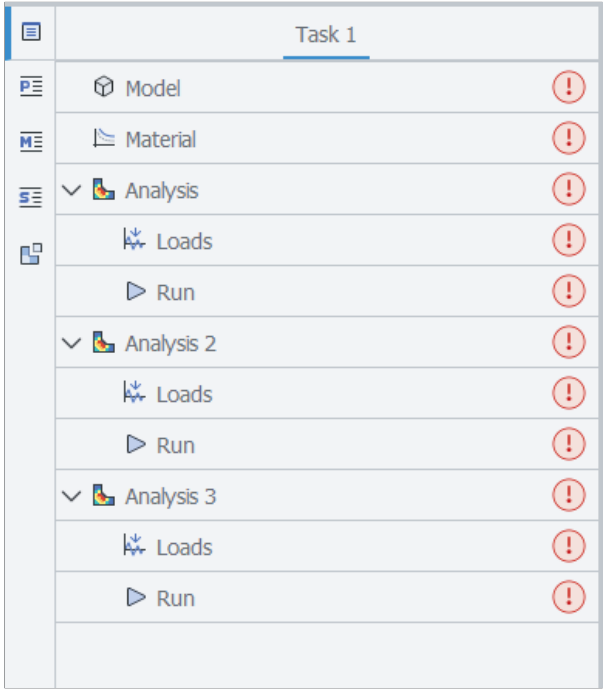
Key features

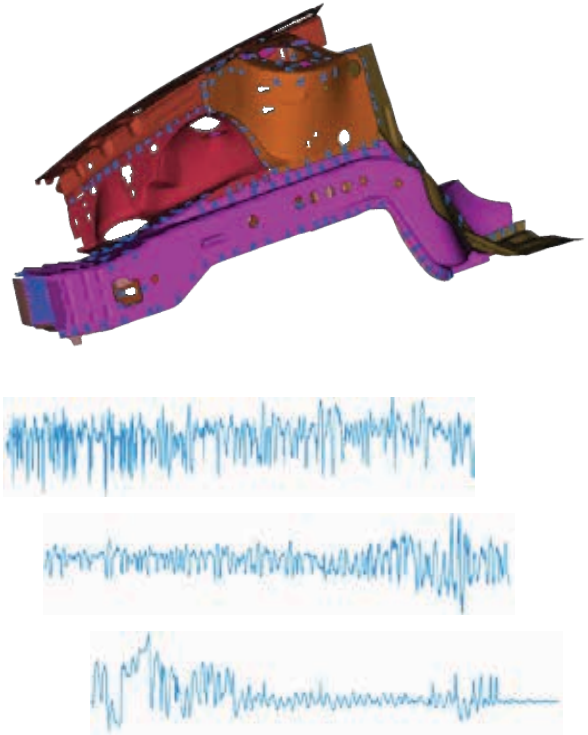


Workflow set-up

- Set up your analysis in a stepwise manner.
- Suitable from novice to expert users.
- Minimize user-imposed errors.

Key features

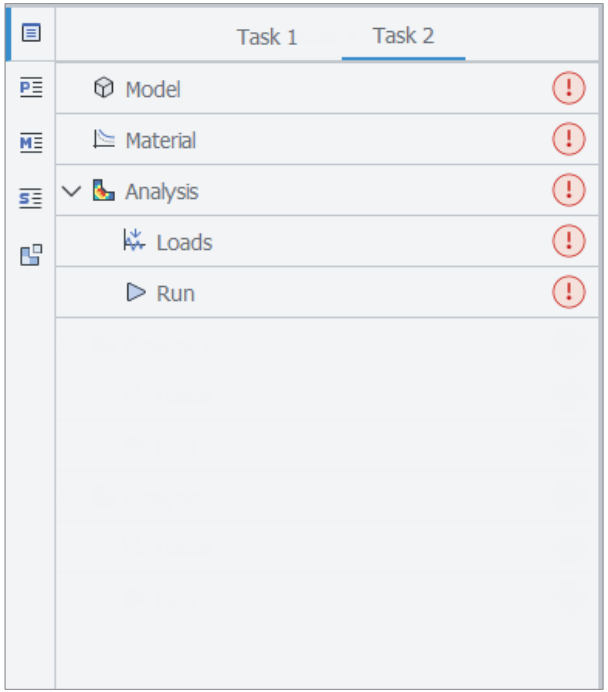




Workflow set-up

- Set up multiple analyses for the same model

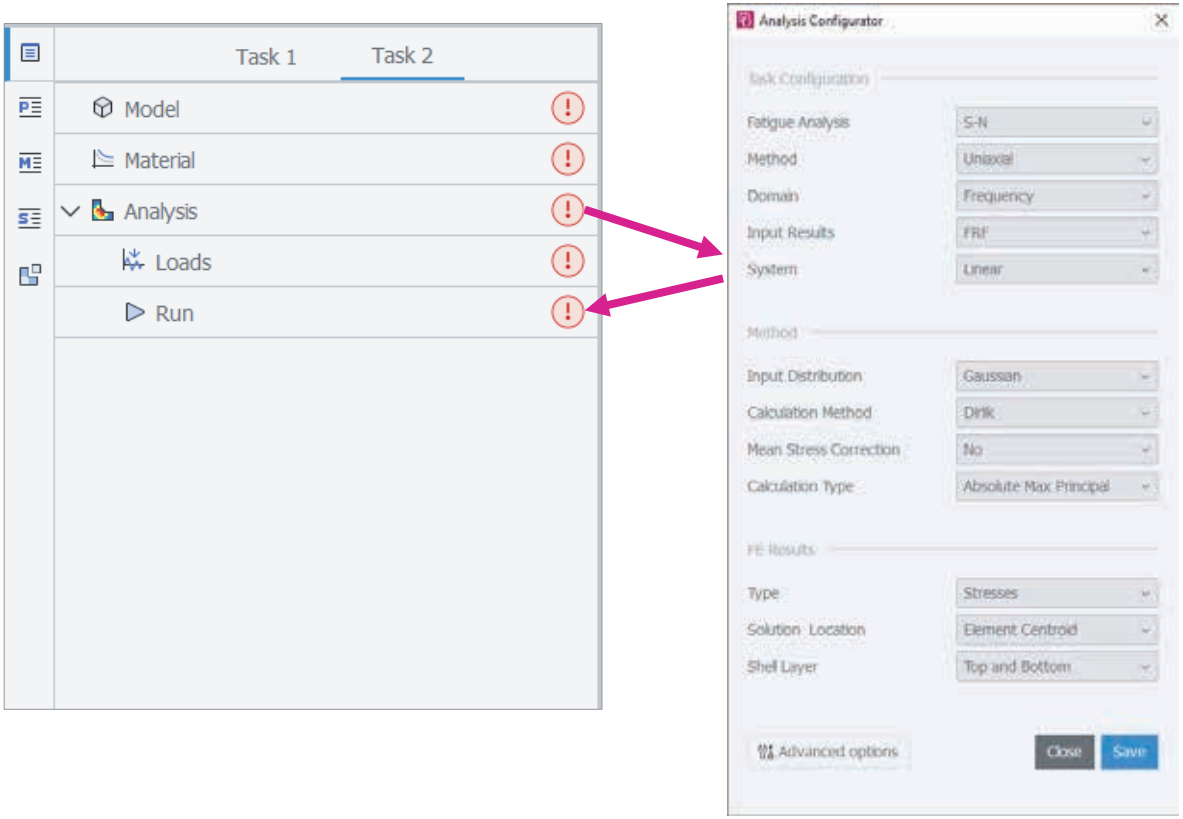
Key features



Workflow set-up

- Set up workflow tasks with different models in a single session.

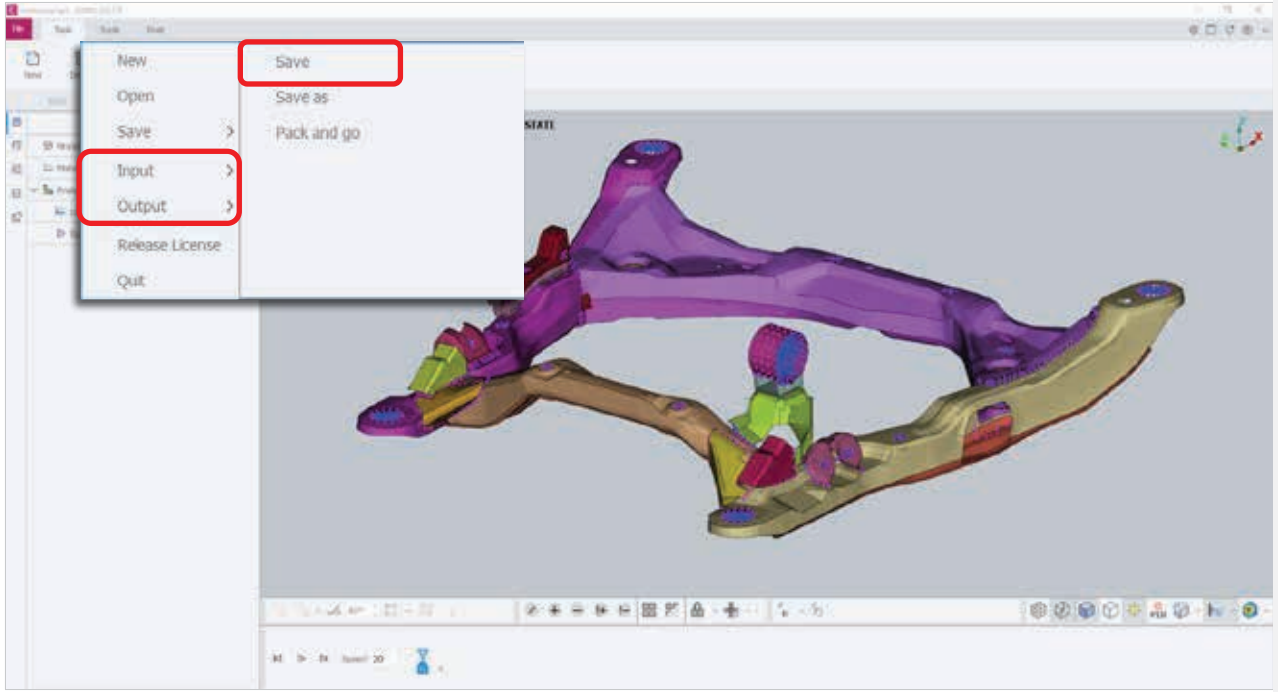
Key features



Workflow set-up

- Set up the analysis workflow with the aim of the Analysis Configurator

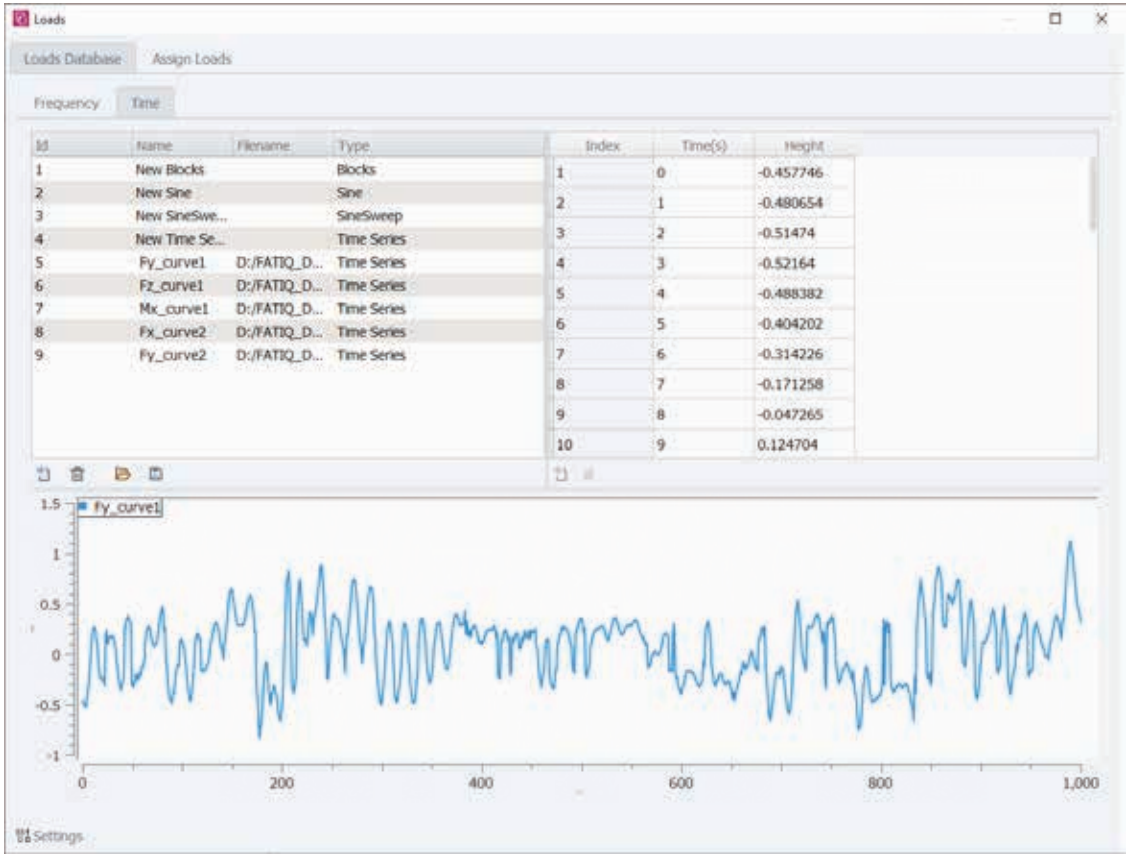
Key features



Interface

- Reads FE results from NASTRAN, ABAQUS, ANSYS and METADB.
- Saves workflow templates in XML format.
- Saves the complete Pre- and Post Processing work in a project.
- Pack and Go option to compress project in a single file.
- Runs in batch mode

Key features



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Load database

- Load definition

Frequency

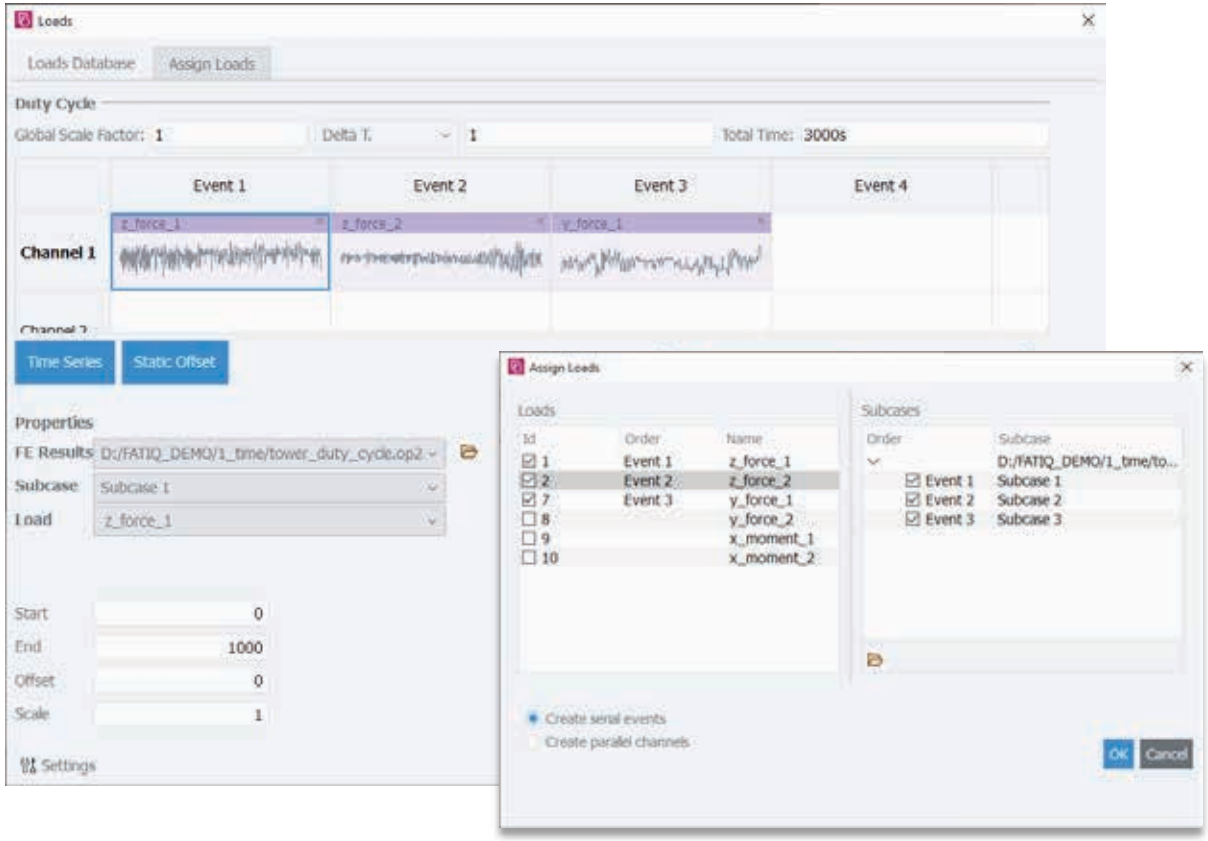
  - PSD
  - Sine
  - Sine Sweep
  - Narrow Band

Time

  - Time Series
  - Amplitude Blocks
  - Sine
  - Sine Sweep

- Reading load curves from various solver formats.

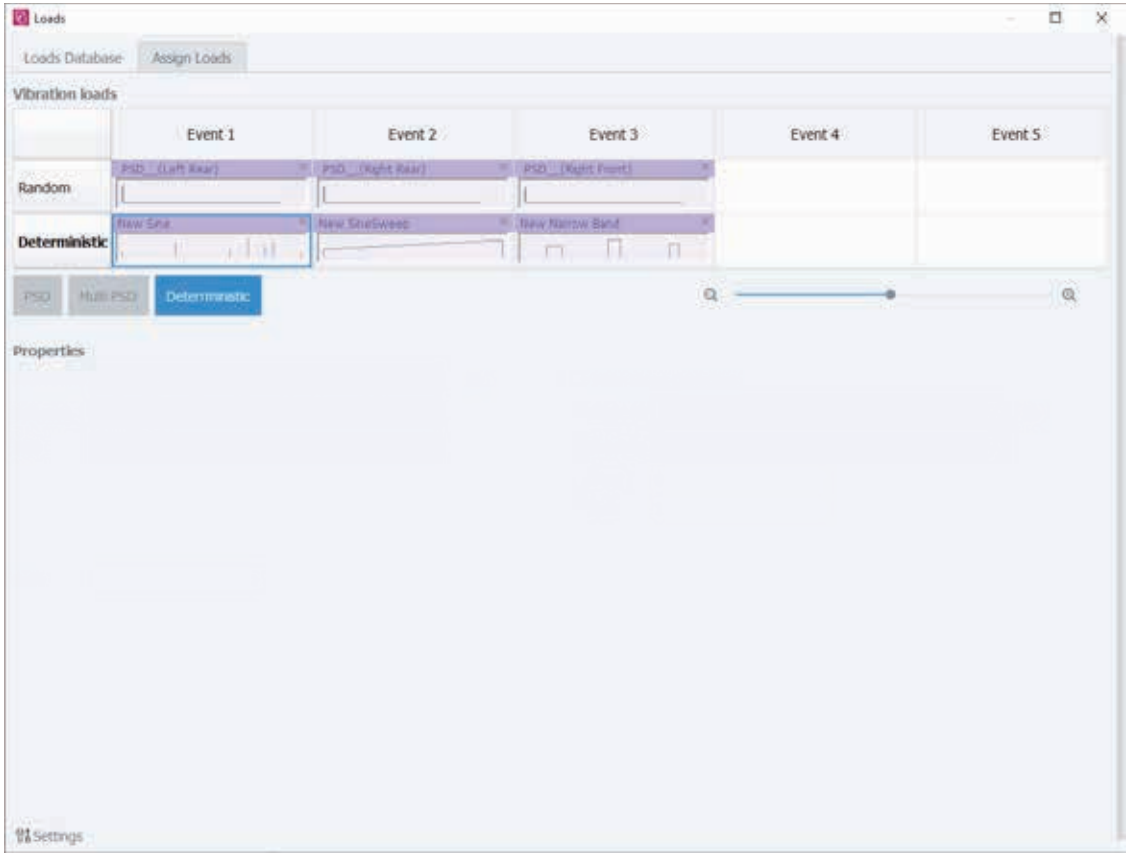
Key features



Load assignment

- Duty cycle overview.
- Set up of many parallel or serial events with just few clicks.

Key features

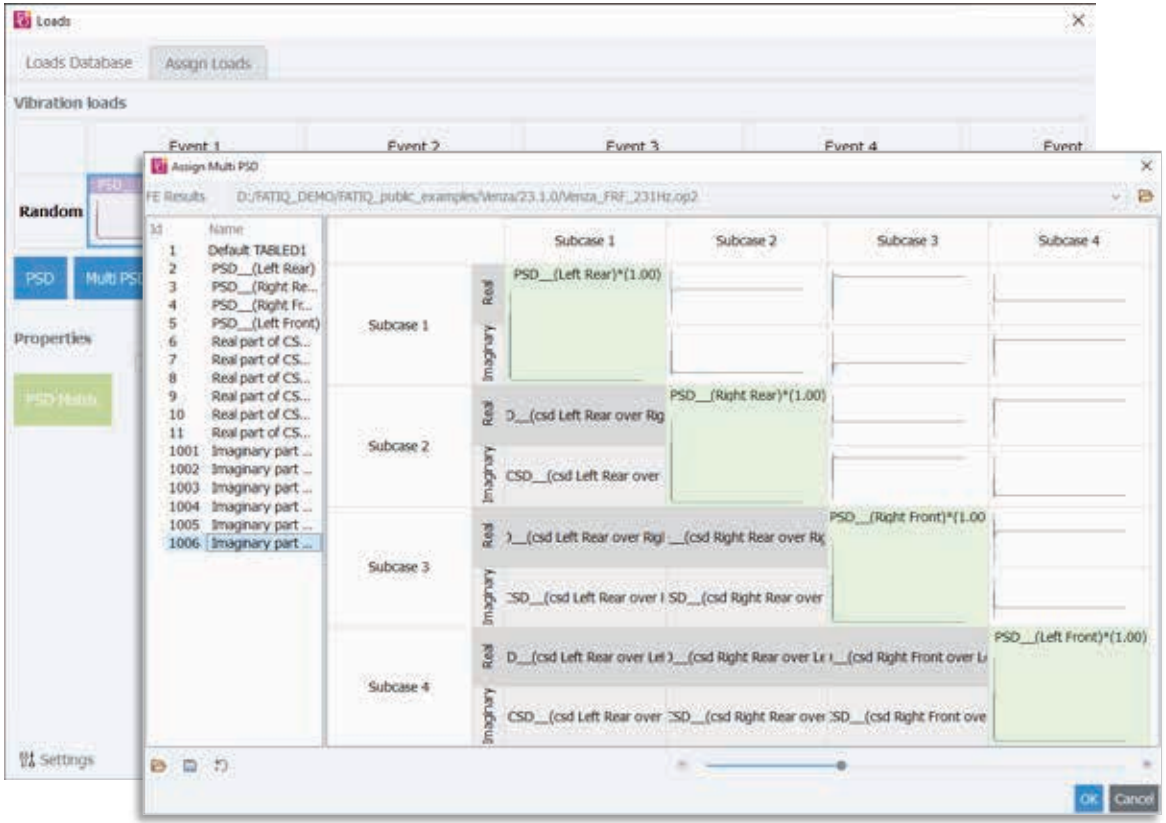


v24.0.0

Load assignment

- Combination of random with deterministic loads

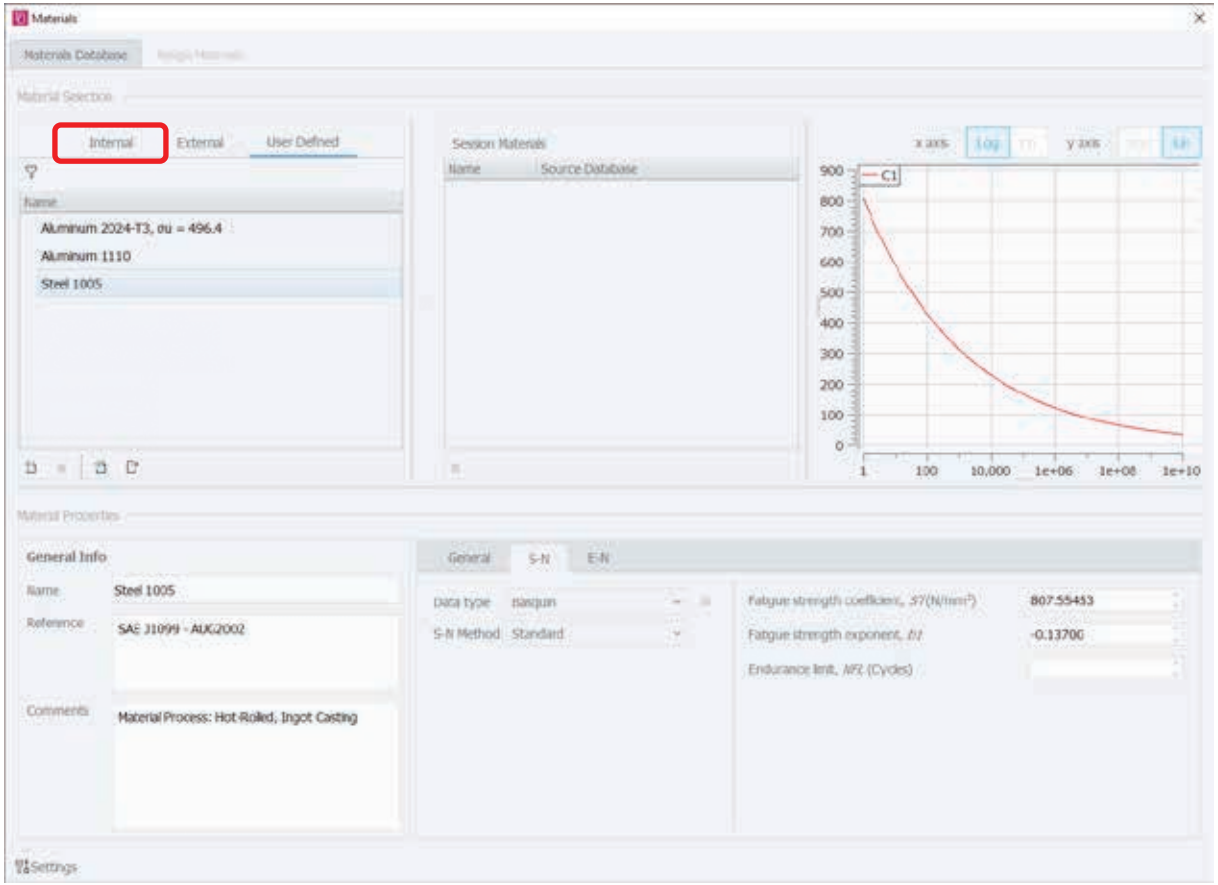
Key features



Load assignment

- Intuitive set up of multiple - correlated input.

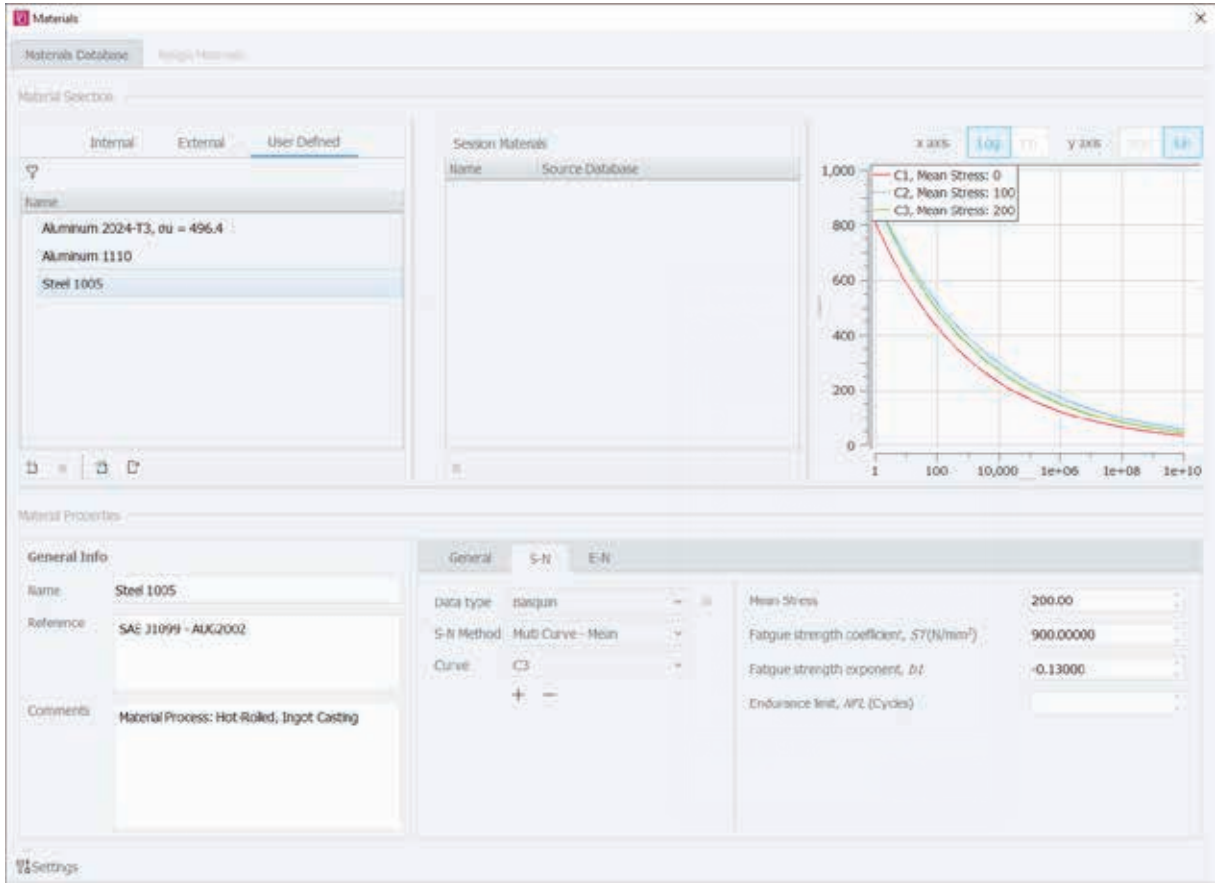
Key features



Material database

- Internal database of more than 80 fatigue materials for metals and alloys.
- Open format to read external material databases
- User defined materials

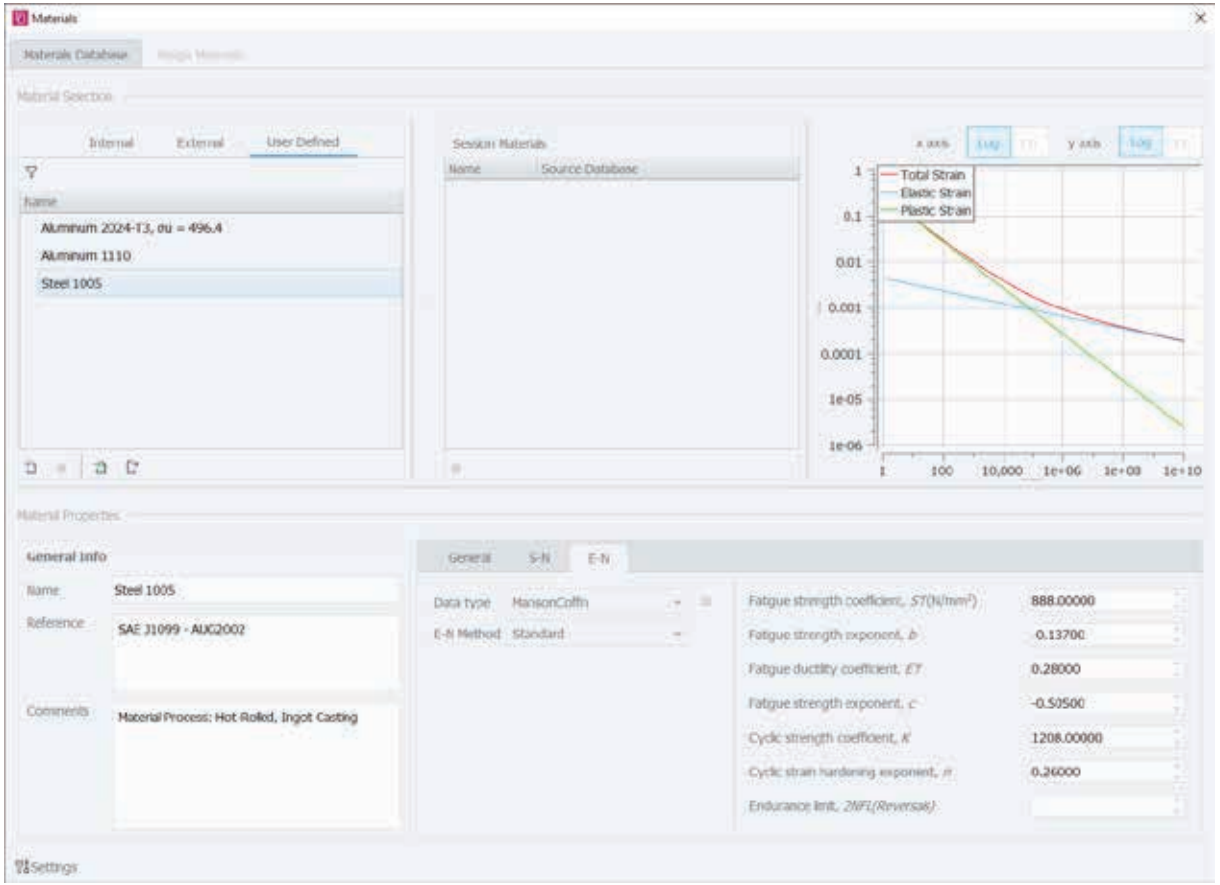
Key features



Material database

- Material data type according Basquin or MMPDS equation or as data table.
- Support of multi curve materials.

Key features

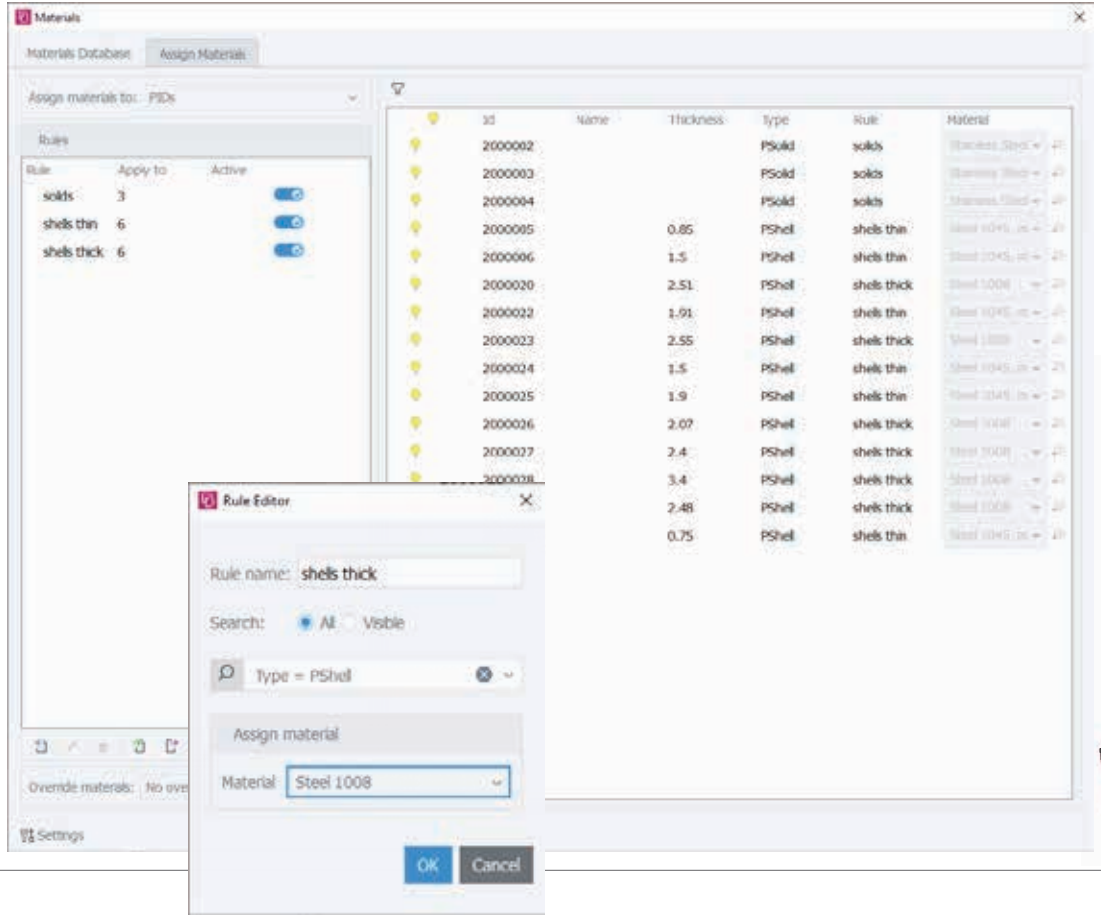


v24.0.0

Material database

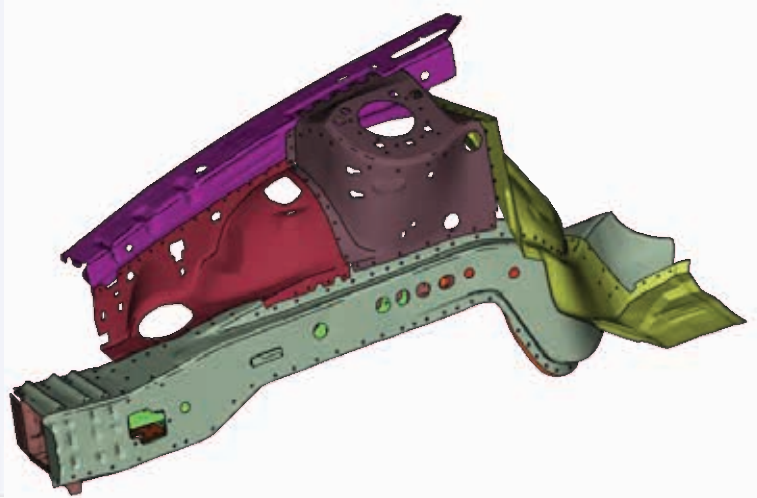
- Support of E-N properties in version 24.0.0

Key features

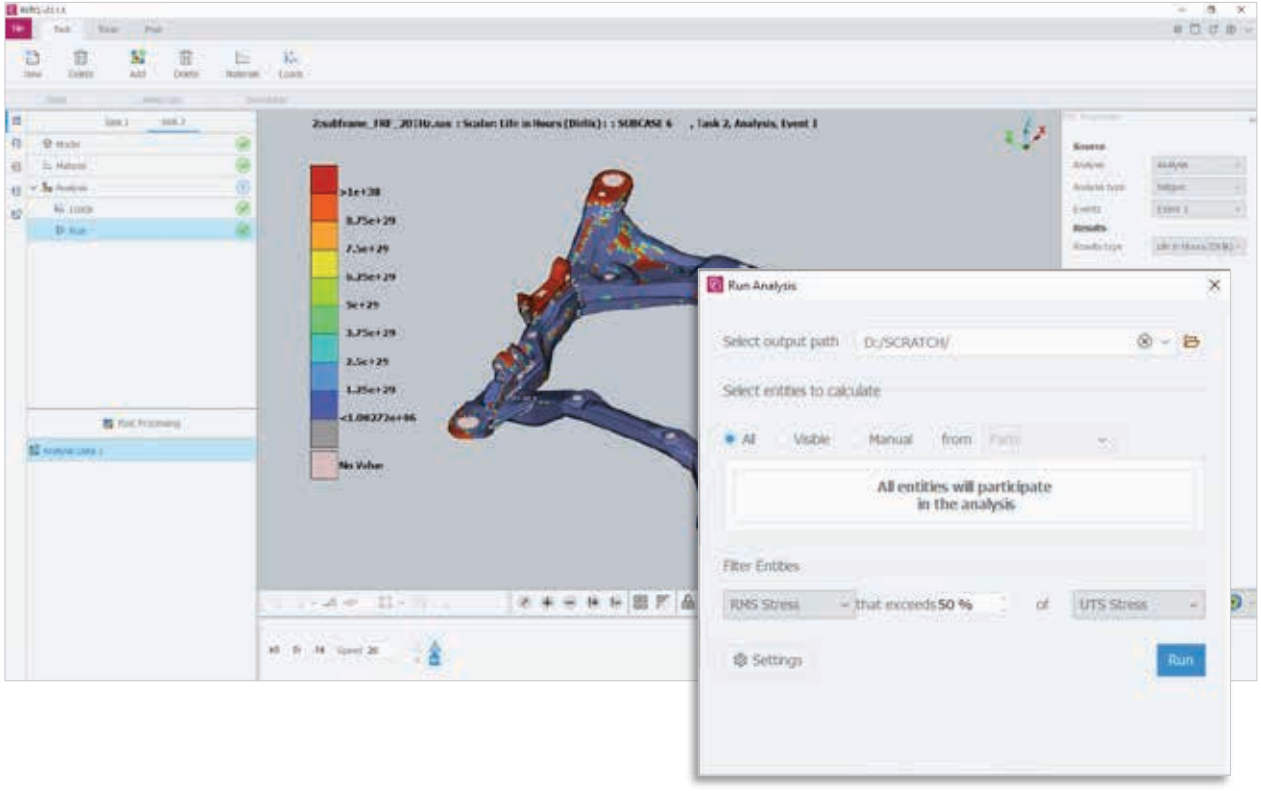


Material assignment

- Sophisticated rules for material filtering and assignment facilitates the set-up especially on large and complicated models.



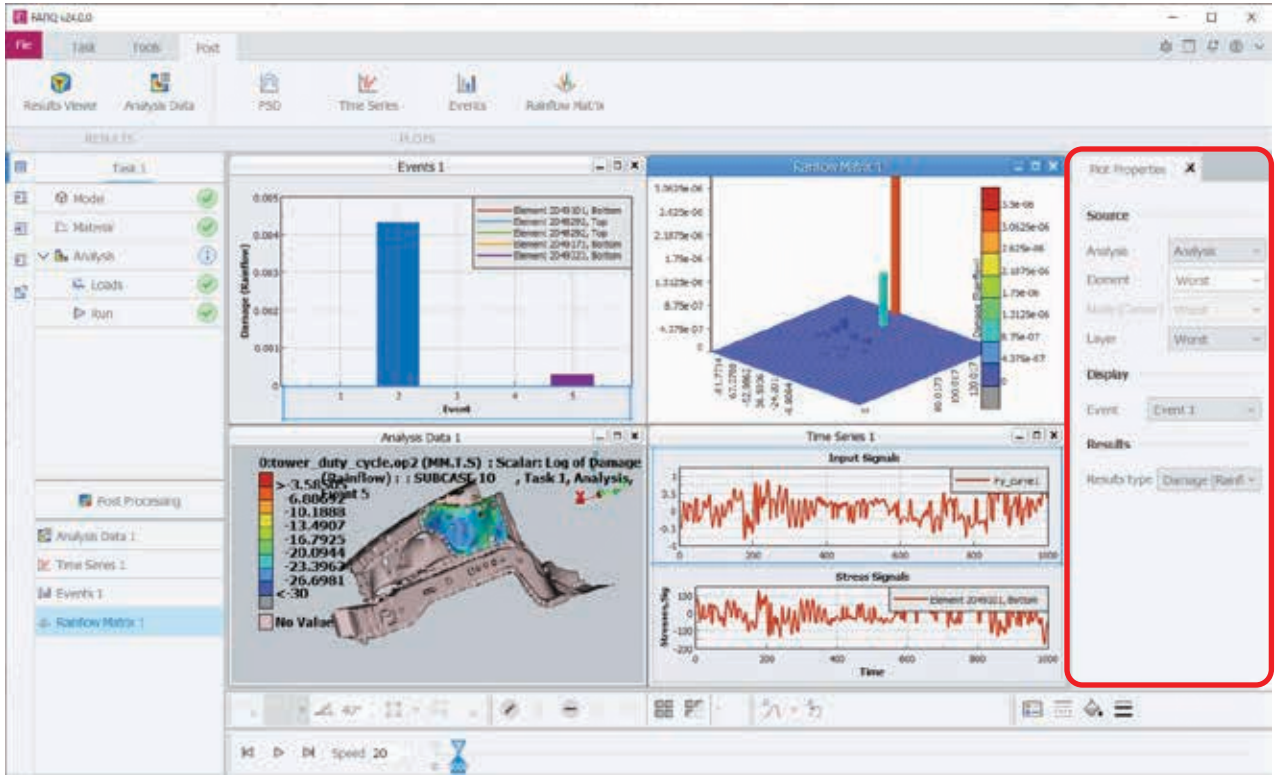
Key features



Hot spot filtering

- Filtering of hot spots to narrow analysis in critical areas.

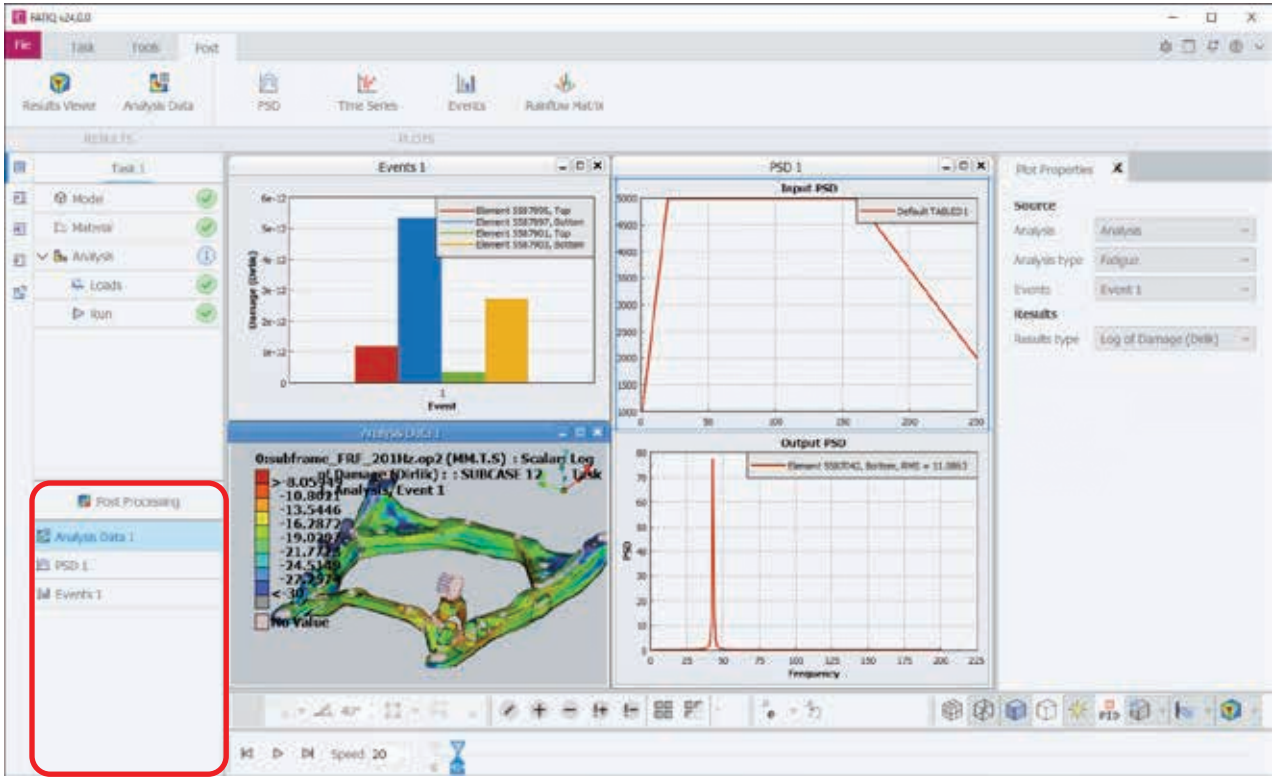
Key features



Interactive post-processing

- Dedicated plots such as, PSD plots, Event graphs, Rainflow matrices and 3D fringes.
- Interactive Properties for the selected plots

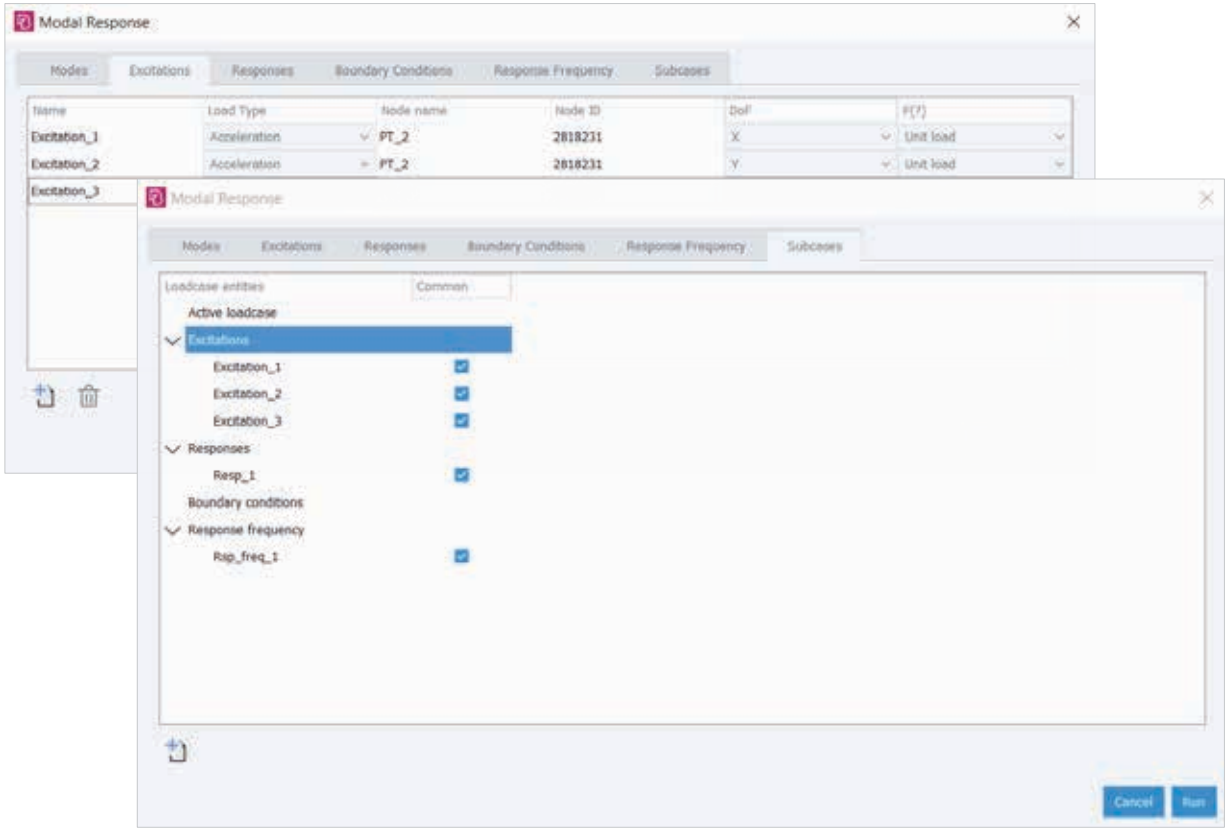
Key features



Interactive post-processing

- Dedicated plots such as, PSD plots, Event graphs, Rainflow matrices and 3D fringes.
- Easy handling and plot overview through the Post Processing Tasks

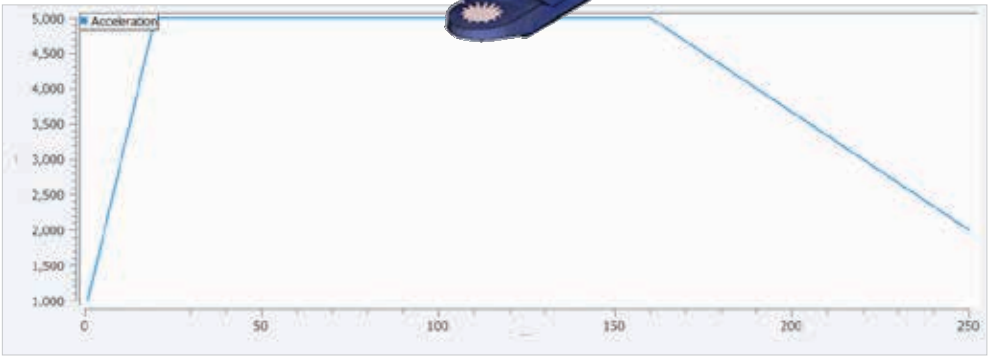
Key features



Tools

- Modal response builder enhanced tool

Performance

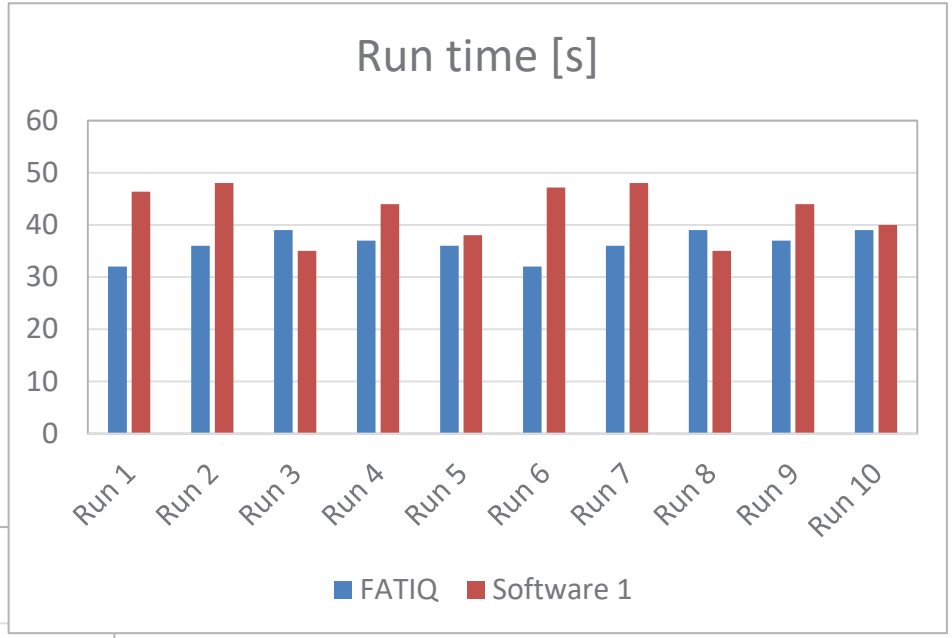


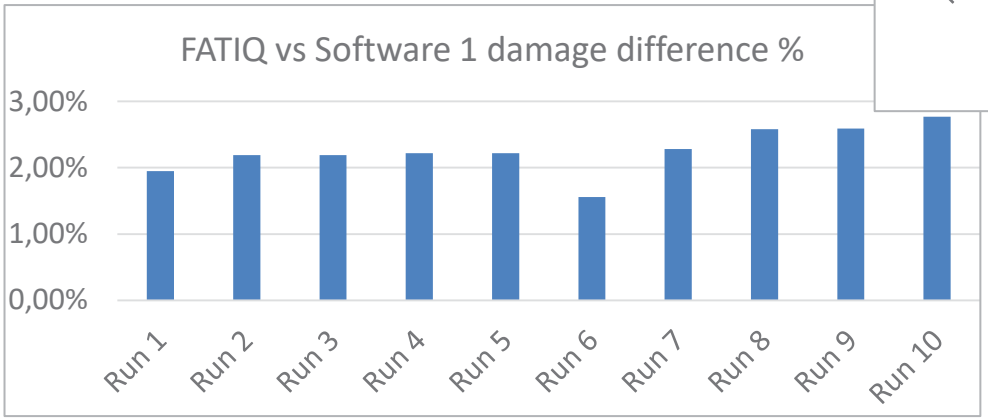
Frequency domain – PSD Load

- Stress evaluation: ***Von Mises***
- Fatigue life estimation method: ***Dirlik***
- Solution location: ***element corners***
- Artificial mean stress correction effect from equivalent static loading

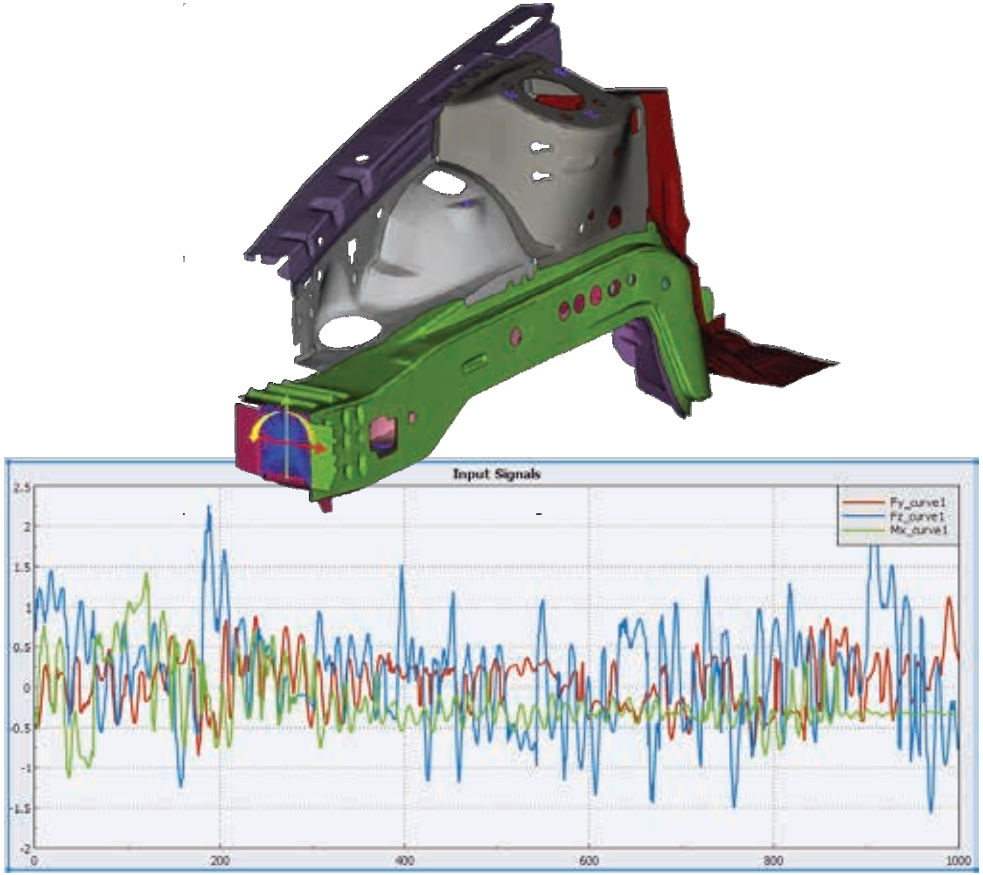
Test Cases		
	Mean Stress Correction	Material Type
Run1	-	Basquin
Run 2	Goodman	Basquin
Run 3	Goodman (Only Tension)	Basquin
Run 4	Gerber	Basquin
Run 5	Gerber (Only Tension)	Basquin
Run 6	-	tabular data
Run 7	Goodman	tabular data
Run 8	Goodman (Only Tension)	tabular data
Run 9	Gerber	tabular data
Run 10	Gerber (Only Tension)	tabular data

Performance





Performance

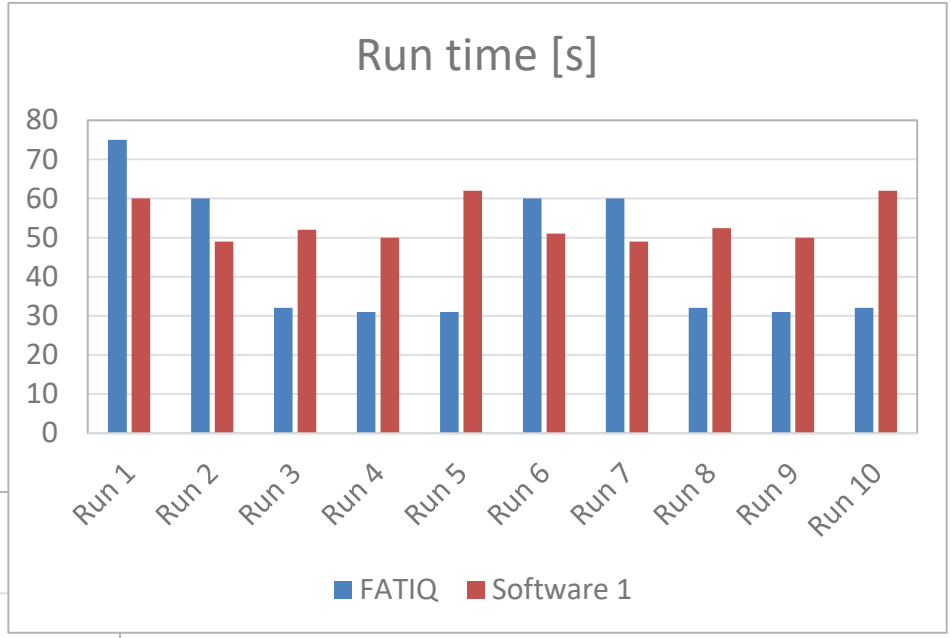


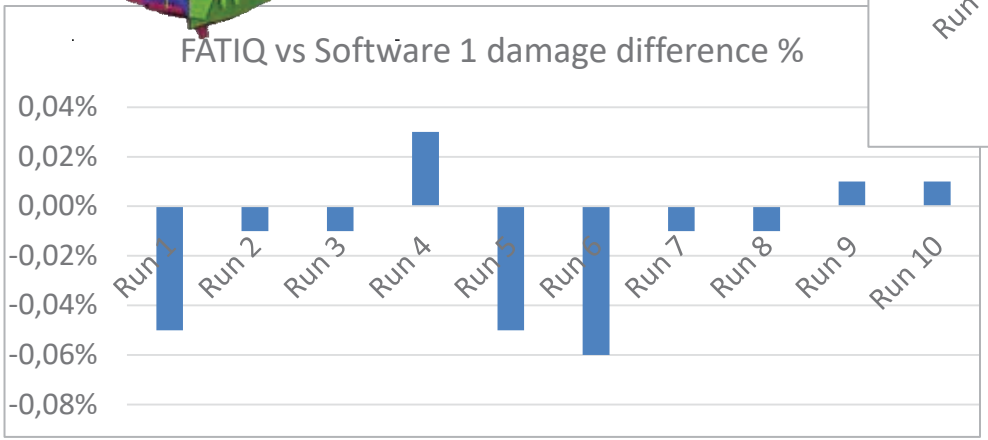
Time domain – Pseudo static

- Stress evaluation: ***Signed Max Principal***
- Cycle counting: ***Rainflow***
- Solution location: ***element corners***

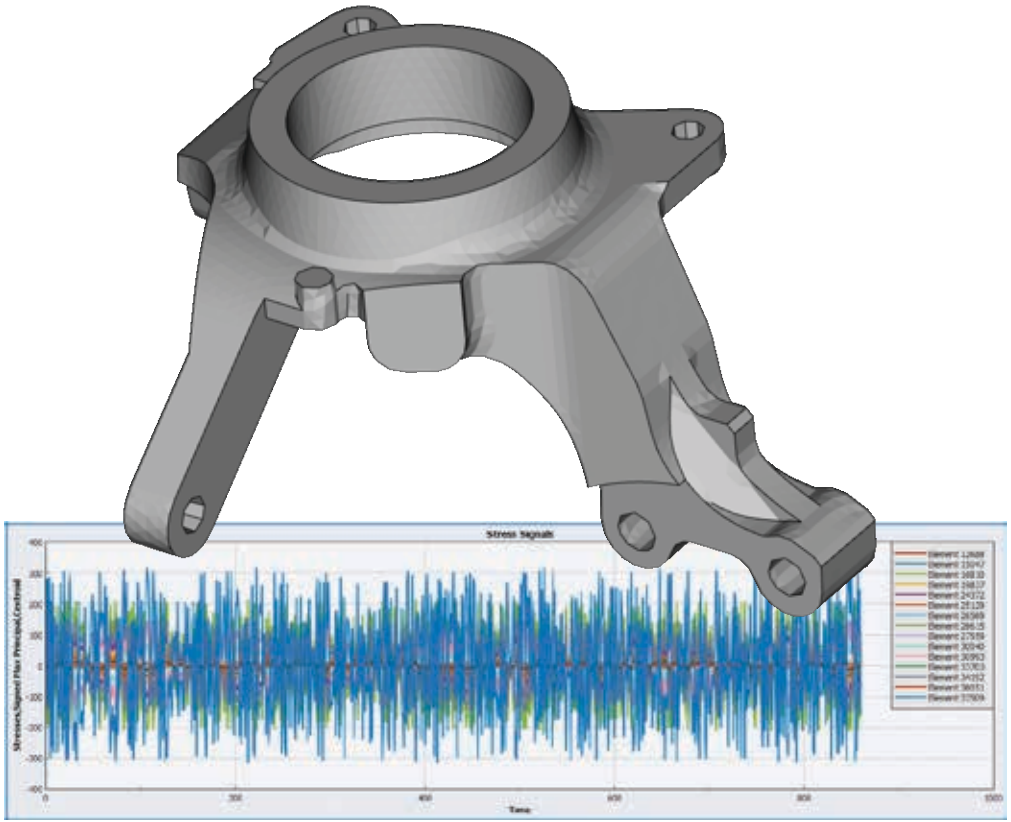
Test Cases		
	Mean Stress Correction	Material Type
Run1	-	Basquin
Run 2	Goodman	Basquin
Run 3	Goodman (Only Tension)	Basquin
Run 4	Gerber	Basquin
Run 5	Gerber (Only Tension)	Basquin
Run 6	-	tabular data
Run 7	Goodman	tabular data
Run 8	Goodman (Only Tension)	tabular data
Run 9	Gerber	tabular data
Run 10	Gerber (Only Tension)	tabular data

Performance





Performance

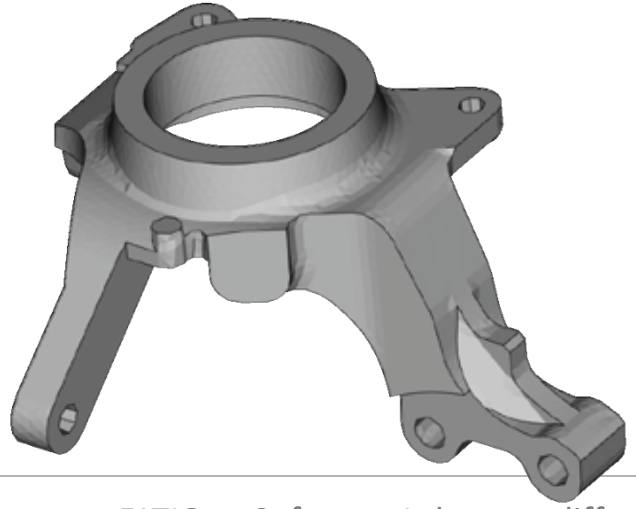


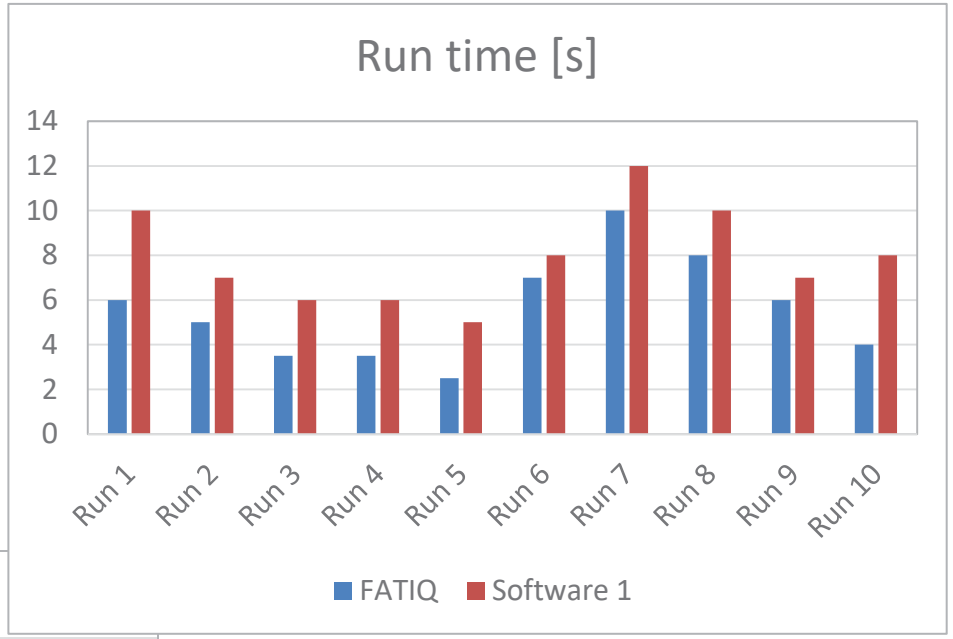
Time Domain - Transient

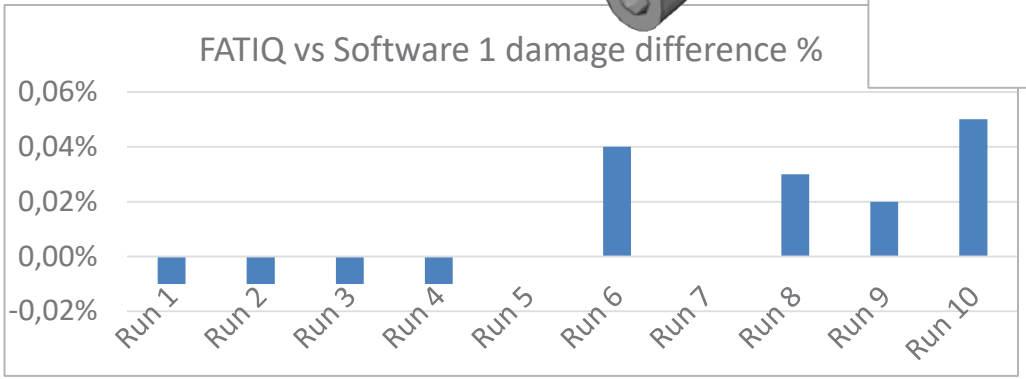
- Stress evaluation: ***Signed Max Principal***
- Cycle counting: ***Rainflow***
- Solution location: ***element centroid*** (15 elements)

Test Cases		
	Mean Stress Correction	Material Type
Run1	-	Basquin
Run 2	Goodman	Basquin
Run 3	Goodman (Only Tension)	Basquin
Run 4	Gerber	Basquin
Run 5	Gerber (Only Tension)	Basquin
Run 6	-	tabular data
Run 7	Goodman	tabular data
Run 8	Goodman (Only Tension)	tabular data
Run 9	Gerber	tabular data
Run 10	Gerber (Only Tension)	tabular data

Performance





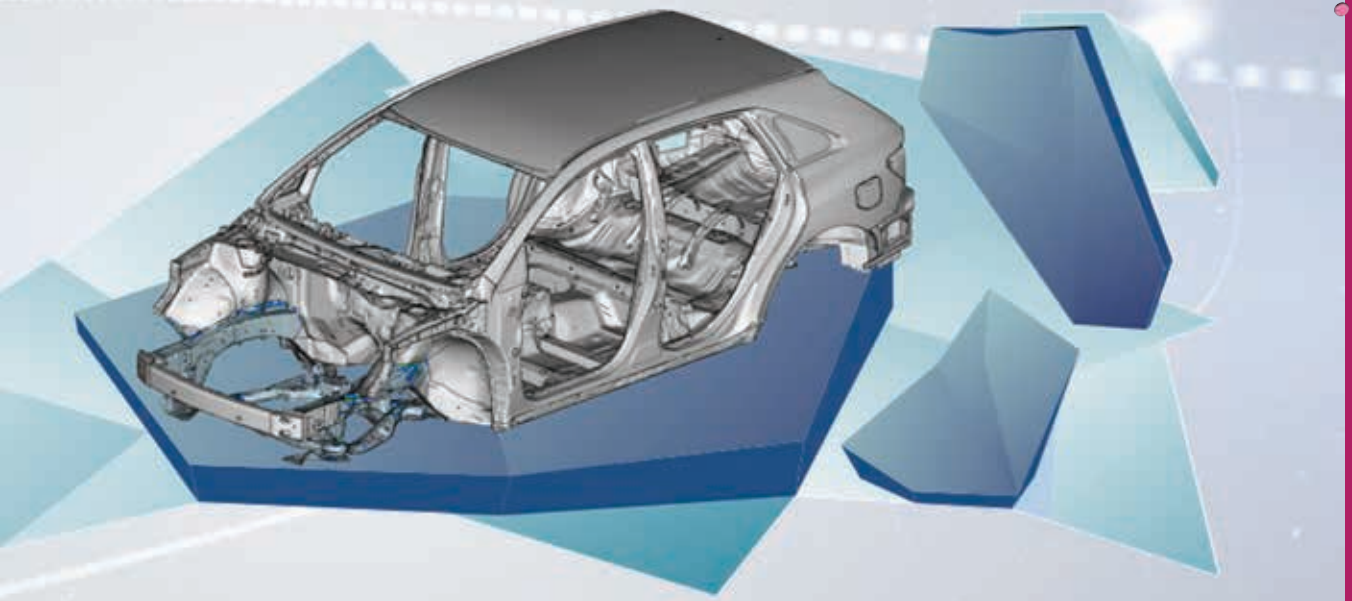


Future development

1. Multiaxial fatigue analysis
2. Spot-weld and seam-weld fatigue modeling
3. Non-Gaussian system
4. Signal processing
5. Stress gradient effect
6. Connect to optimization
7. Connect to data management

FATIQ

LIFE PREDICTED



prediction

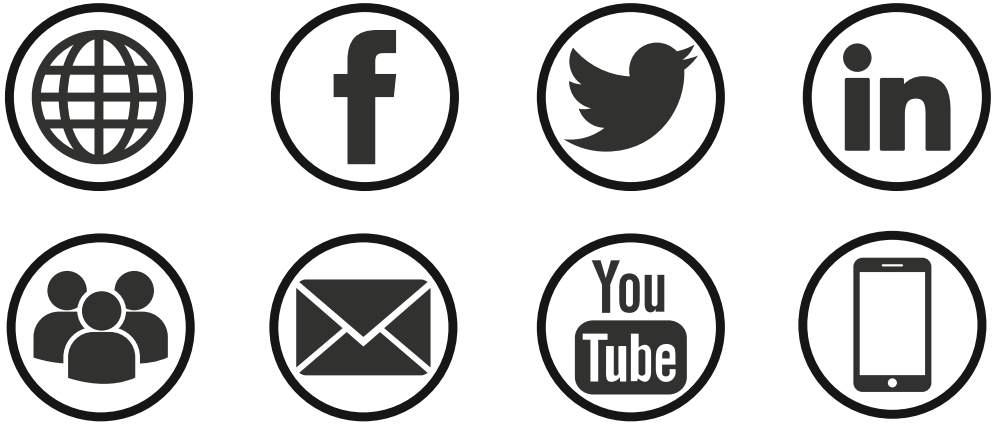
ma

Thursday, 14:00, Demo Session 6E, Venus I

Key features and use cases of FATIQ

Christos Tegos
BETA CAE Systems

BETA
SIMULATION SOLUTIONS



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