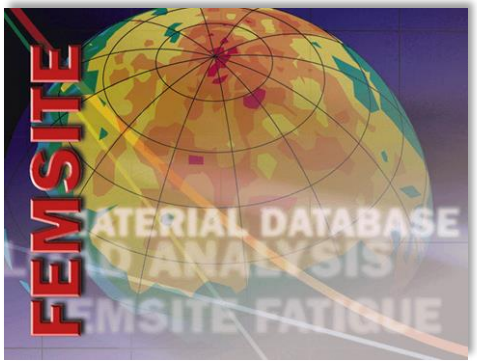
FEMSITE 4.8
Pushing the Limits

Introduction of
Modules and Functionalities

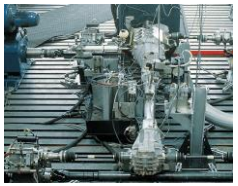


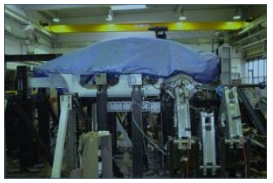
FEMSITE: Modules and Functionalities

FEMSITE

a commercial software product of MAGNA

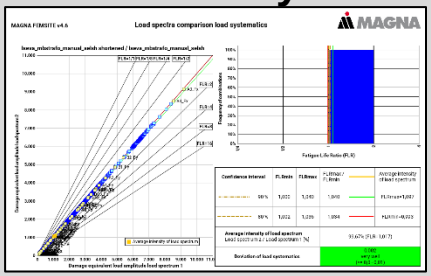
FEMSITE is a workflow oriented software product which covers the complete structure durability process in the automotive development. More than 20 years of development and validation experience are concentrated in FEMSITE.



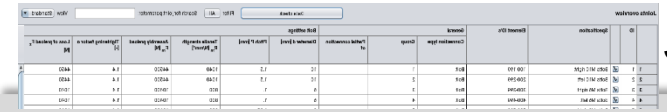


Online classification

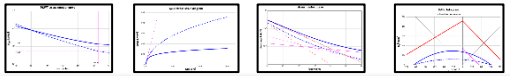
Load Analysis



Analysis and preparation of load spectra from measurement or MBS simulation for simulation and test rigs

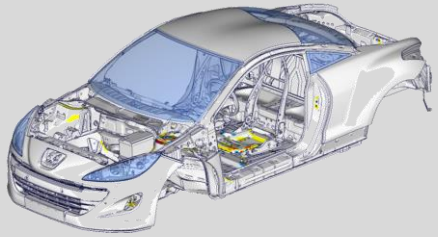


Joints database



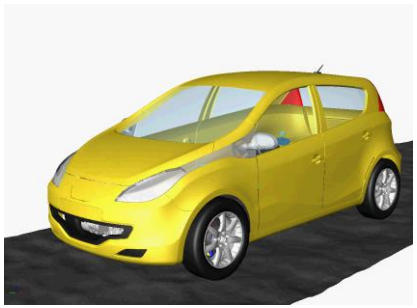
Material database

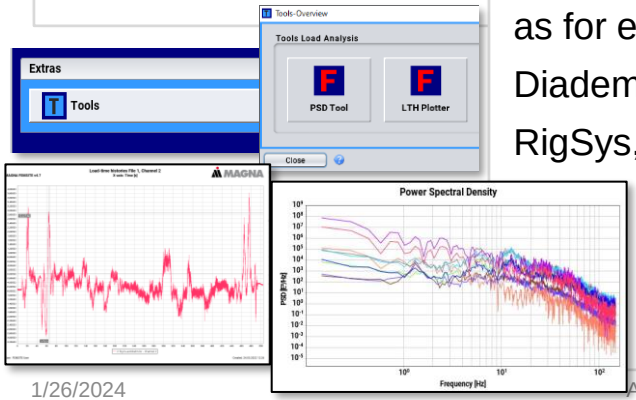
Fatigue



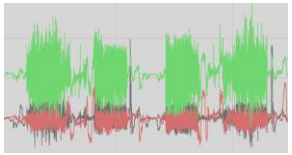
Design, analysis and optimization of components and complete vehicles based on linear or nonlinear simulation results combined with measured or simulated load time histories regarding → Stiffness, Strength and Fatigue

Module FEMSITE Load Analysis



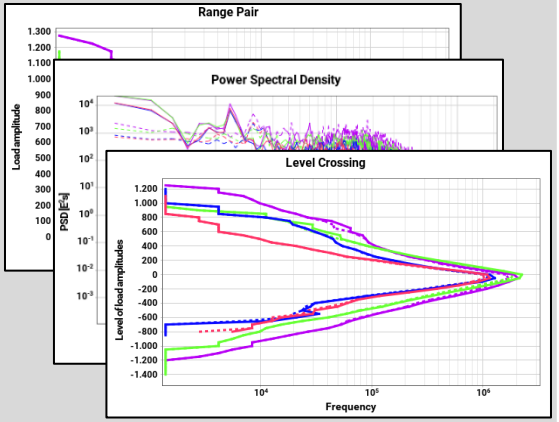


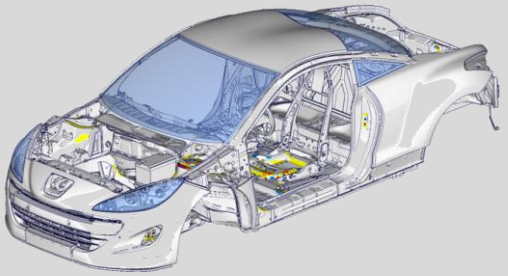
Virtual and / or physical road load data



Analysis of measured or calculated load spectra.
Supports a variety of established data formats, as for example: Diadem/Diadago, RPCIII, RigSys, DASYLab, Adams, DADS, ASCII, TDM, etc.

FEMSITE





Large number of evaluations available such as PSD, rainflow matrices, statistic values,…

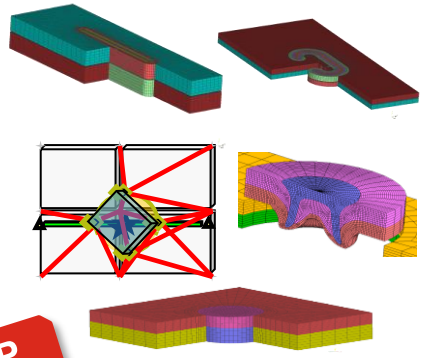
Main functions are:
- load spectra comparison
- selective shortening
- MBS/FEM interface
- signal editing
- representative lap
- shaker program generation
- block program generation

USP

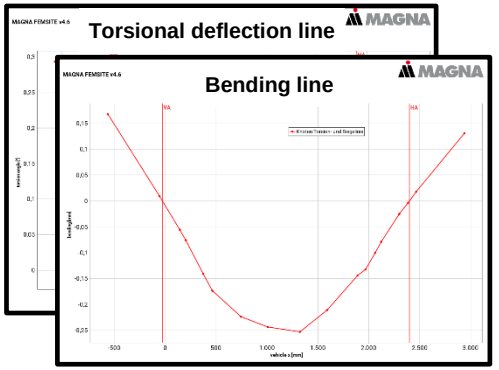
Transformed and / or selective shortened load time histories will be used on test rigs or for simulation

Module FEMSITE Fatigue – Part 1

Node independent generation of joining technique without any modification of mesh.
Also available as interface in preprocessors **Medina**, **Hypermesh** and **ANSA**



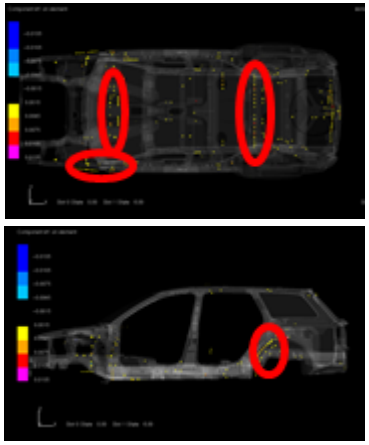
USP

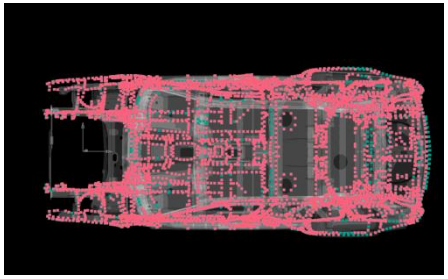


Global characteristics of a car body such as **torsion**, **bending stiffness** and other evaluations available.

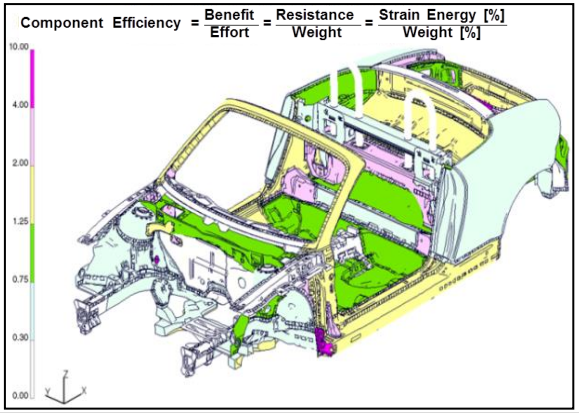
Identification of **stress conditions** of **spotwelds**, areas with **high deformation** in a **flange** based on several load cases in early project phases.
optimization regarding number and position.

USP





Component related evaluations to identify parts which have a large influence on a certain load case.



Variante 1 /2	Variante 1	Variante 2
Lastfall	Torsion	Biegung
Erstelldatum:	21-Nov-12	21-Nov-12

Netz	Bezeichnung	Spannung [N/mm2]		Dicke [mm]		Element-anzahl		Masse [kg]		Verformungsarbeit [% von Auswertegr.]		Nutzungs-zahl [-]	
Variante:		1	2	1	2	1	2	1	2	1	2	1	2
1100	HALTEBOCK HILFSR. HI re	28,93	2,77	1,75	1,75	336	336	0,421	0,421	0,049	0,014	0,390	0,111
1110	SCHWELLER AUSSEN li	55,63	11,94	1,75	1,75	3154	3154	9,009	9,009	3,220	3,292	1,203	1,230
1145	SCHWELLER AUSSEN re	56,56	12,23	1,75	1,75	3142	3142	9,002	9,002	3,340	3,446	1,249	1,288
115	DECKBLECH LTR Teil 1 re	3,59	1,87	1,60	1,60	246	246	0,379	0,379	0,007	0,002	0,063	0,017
1180	SITZQUERTRAEGER li	29,63	74,72	0,70	0,70	2260	2260	1,953	1,953	0,332	7,546	0,573	13,603
1185	SITZQUERTRAEGER re	31,01	82,84	0,70	0,70	2242	2242	1,954	1,954	0,332	7,392	0,573	12,732
120	LTR VO TEIL 1 li	15,59	0,30	2,00	2,00	467	467	0,873	0,873	0,049	0,000	0,187	0,001
1205	VST FUEHRUNGSSCH VO	4,41	69,65	2,00	2,00	256	256	0,341	0,341	0,004	7,562	0,042	74,578
1235	VST FUEHRUNGSSCH HI	5,91	31,27	2,00	2,00	176	176	0,359	0,359	0,008	1,707	0,075	16,566
1240	ABSCHLUSSTEIL TUNNELBR. li	53,96	51,52	1,00	1,75	999	999	1,245	1,245	0,298	2,421	0,907	6,546
125	LTR VO TEIL 1 re	5,87	0,40	2,00	2,00	483	483	0,887	0,887	0,029	0,001	0,111	0,003
1250	ABSCHLUSSTEIL TUNNELBR. re	64,84	38,29	1,00	1,00	998	998	1,242	1,242	0,310	2,069	0,839	5,606
1275	VST FERSENBLECH	15,15	35,42	1,25	1,25	1498	1498	1,926	1,926	0,150	2,798	0,262	4,890
1290	ZWISCHENSTUECK LTR li	26,50	15,88	1,75	1,75	330	330	0,432	0,432	0,197	0,532	1,537	4,141

MAGNA FEMSITE v4.6 **CarBody - PlotEl's**

Element ID	Change in length [mm]
front_door_left	
Load Case 100, Group 401	
131	0,184937
132	-0,150879
front_door_left	
Load Case 200, Group 401	
131	-0,015503
132	-0,033203

v49: Ecological footprint

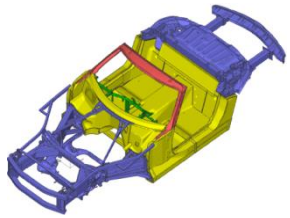
USP

Different **input** and **output interfaces** available:

- **Nastran:** op2, Bulk Data
- **Patran:** Neutral file format
- **Abaqus:** odb
- **Medina:** bif / bof
- **Universal** file format

Module FEMSITE Fatigue – Part 2

Steel body



Multi-material body

Aluminum body

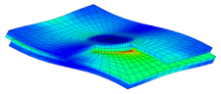
USP

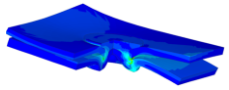
Damages calculation based on

- Quasistatic
- Transient modal
- Transient
- Frequncy response FE results!

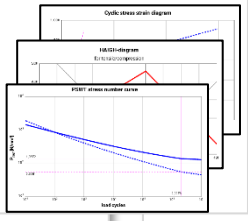
USP

Joining

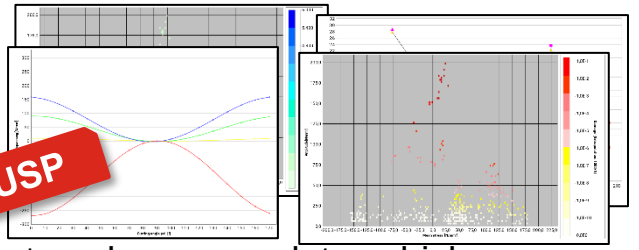




Material data



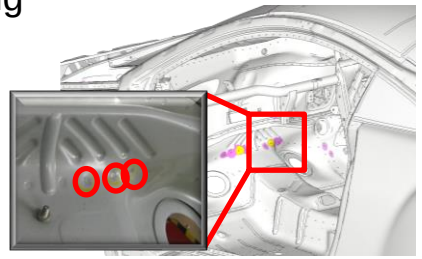
Large amount of detailed evaluations to **analyze** the local behavior of **critical positions for complete load spectra**



USP

Damage / safety calculation for single parts or large complete vehicles for **basic material** and joining techniques like **spotwelds**, **self piercing rivets**, bondings and seamwelds regarding **complete load spectra**

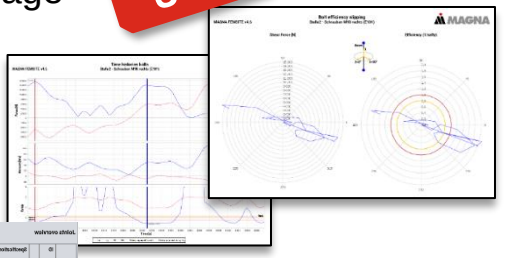
Damage calculation of **composite** materials in longitudinal, cross direction and for shear-stress for each composite ply

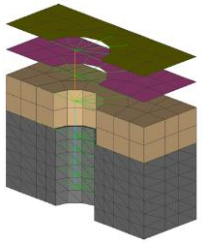


Identification of critical load cases: systematic detection of stress conditions which cause significant damage

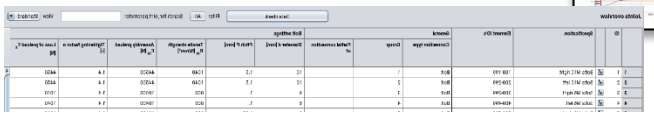
USP

Simulation for bolts: Safety against slipping and safety against breakage with detailed evaluation

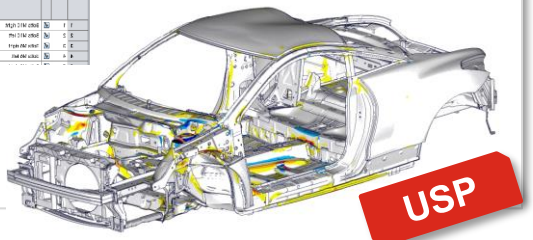




Joints database



Animation sequence of the **load spectra** to analyze local stress conditions

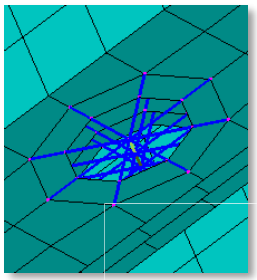


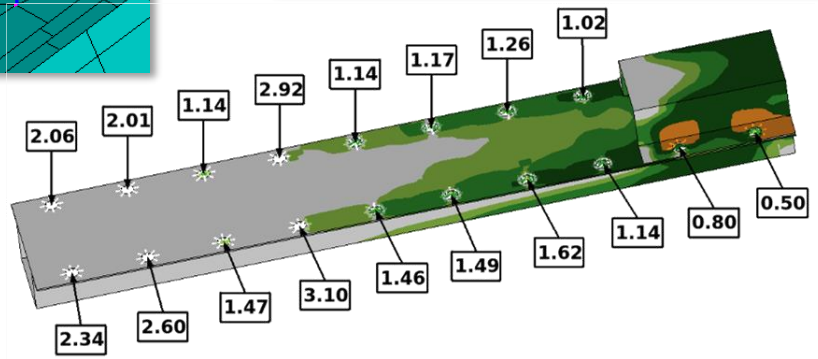
USP

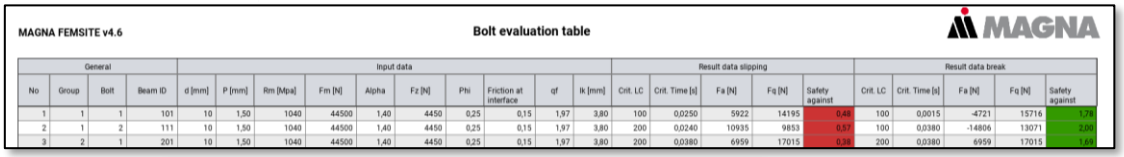
Module FEMSITE Fatigue – Bolt safety calculation

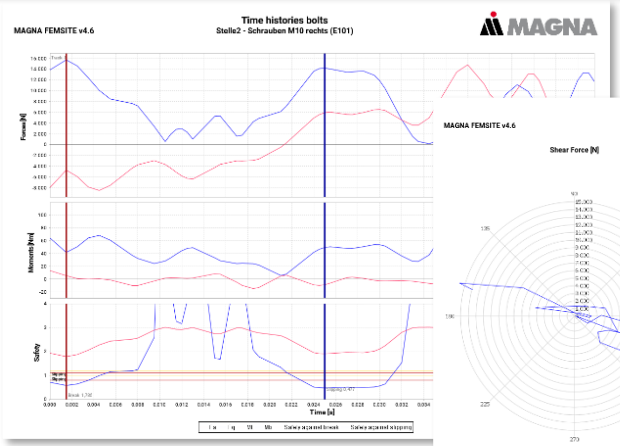
USP

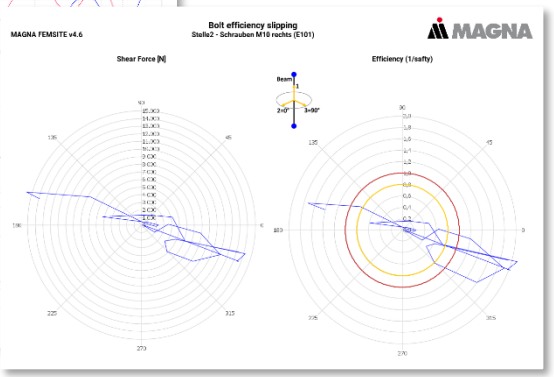
- FEMSITE supports efficient **bolt safety calculations** (safety against **slipping** & safety against **overload breakage**) in time domain
- Bolt types are managed in the central **FEMSITE Joints database**
- Bolts can be easily defined in preprocessor Ansa.
- **Export** of the results for common **postprocessors** is available
- **Special detailed evaluations** can be performed in FEMSITE
  - Bolt evaluation table
  - Time-history plots of bolt forces, moments and safety values
  - Bolt efficiency slipping
- **Recalculation of the bolts** allows the user to modify bolt parameters and quickly rerun the bolt calculation without FE- solver
- **Basic load cases bolts** allows the user to directly study basic load cases from an FE-calculation



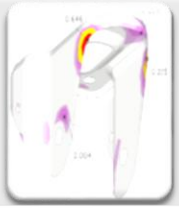






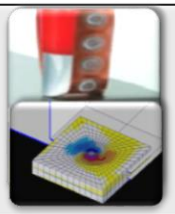


FEMSITE V4.8: New Features



Fatigue / Safety Analysis

- Safety against fatigue fracture
- Acceleration of safety calculation
- Averaging of stresses only for elements with corner stresses
- Evaluation of relative Minima/Maxima – New color highlighting

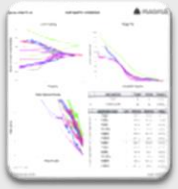


Joining / Tools

- Extension of LTH plotter for PSD diagrams and statistics
- Adjust the stiffness values of spotwelds if the diameter is smaller than DIN
- Editing a bolt: the dependencies to other parameters are considered
- Check of spotweld position
- Adaptations during generation when a PID is contained in several parts

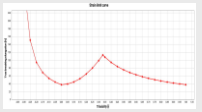
Structure

- Improved handling of variables for automatic evaluations in Pre-Module
- CarBody + Fatigue Multiaxial: Reading of Nastran bulk data files
- Send diagnostic information
- Pack FEMSITE job file with all dependencies into zip file
- Search + replace
- Optimization of memory usage
- Writing out a FEMSITE PSD csv file



FEMSITE Load Analysis

- Block program generation from load spectrum for chassis and powertrain
- Tool for creating Shaker test programs
- Support of load spectra with more than 2,1 billion time steps
- Support virtual iteration of excitation signals (concept)
- MBS-transformation: Automatic assignment of the load types based on the units
- Load spectra analysis for the chassis: calculation of the distance based on the wheel speeds
- Online classification: remove individual tracks from the evaluation,



Material Database

- Export non-linear characteristics to Nastran
- Extension Triaxiality + structural damping
- All specifications for materials written into the solver deck
- Encrypted material files: survival probability and range of dispersion are now visible

Workflow ANSA / META

- Critical bolt forces based on Abaqus odb files can now be displayed

Interfaces

- ABAQUS 2022 is supported now
- Export of Sets in Medina bif format
- Critical bolt forces can be exported to Abaqus
- Prototype HDF5 export based on Animator a4db format
- Concept HDF5 import for Permas (result data only)

Five reasons to develop structure and durability with FEMSITE

- **FEMSITE** is a workflow oriented software which covers the complete development process for automotive industry including **stiffness, strength and durability** USP
- **FEMSITE Load Analysis** for processing and validation of **load spectra**
- **FEMSITE** can handle very **large models** (~10,000,000 elements) with **full joining technique** for complete load spectra. Very short calculation time due to **DMP-parallelization** and **intelligent filtering** of **elements** and/or cutting planes USP
- **FEMSITE** is best in class regarding the **cost / functionality** ratio
- **FEMSITE** has been developed and validated in many **project applications** across the **OEMs** for more than **25 years**

Engineering references

contact persons: gerhard.kepplinger@magna.com
phone: +43 664 8840 2973

m.hofer@magna.com
phone: +43 664 8840 5748

