FEMFAT Use Cases

Fatigue Analysis Software
by MAGNA / Engineering Center Steyr GmbH & Co KG

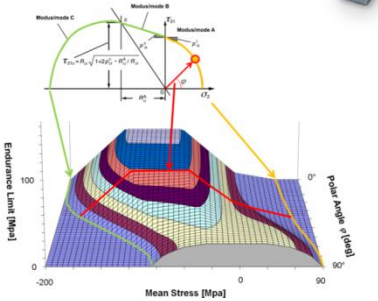
Multipurpose Cross Member
Innovation project ECS & Teufelberger Composite GmbH

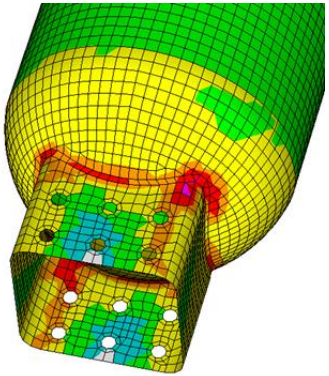
Challenge

- Defining dimensions of layers and fiber orientations.
- Comparison of different designs regarding fatigue.

Solution

- Fatigue Assessment of combined structure (steel + Continous Fiber Reinforced Plastic (cFRP) with FEMFAT
  - Considering mean stress influence, enhanced Puck criteria …
  - Considering load history data (multi axial loading).
  - Correlation with tests in fatigue laboratory.





Benefits

- Observation of critical fatigue locations and service life in an early stage of a project.
- Efficient structure optimization based on simulation results.
- Reduced necessary test program -> product development cost and time savings.

Altair

Fatigue analysis for a Gearbox for ZF Friedrichshafen

Challenge

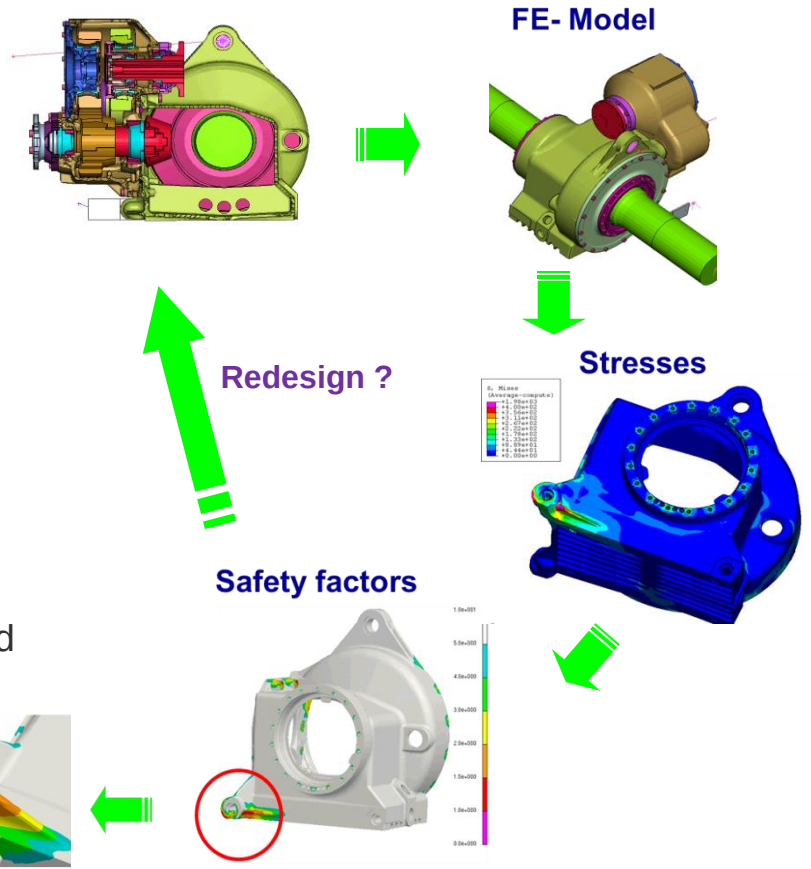
- 15 load cases were used in the model
- Detect local critical areas for the Gearbox and suggest improvements for design

Solution

- Fatigue analysis in FEMFAT transMAX from
- Several local modifications (3 loops)
  - A sub-model was used to update the local modifications.

Benefits

- Lead time reduction by submodelling-> time was reduced down to 5.5% compared to the first analysis.
- Cost savings for at least 2 prototypes.



*With courtesy of ZF Friedrichshafen

Optimization of a Gearbox Cover Mercedes AMG

Challenge

- An improved design for the cover has to be found by means of the topology optimization.

Solution

- Topology optimization process
  - FEMFAT results are essential to the process.

Benefits

- Critical fatigue locations specify, in detail, the areas where the optimization can be made:
  - Low safety factors request for more material;
  - High safety factors indicate the areas of unnecessary weight.