

Contents of Work Package WP 07 NVH of Road and Off-road Vehicles

2-WP07: NVH of Road and Off-road Vehicles

Coordinator of the WP

BUT, prof. Ing. Václav Píštěk, DrSc.

Participants of the WP

Brno University of Technology – prof. Ing. Václav Píštěk, DrSc.; Zetor Tractors – Ing. Stanislav Mitáš, Ph.D.; Kargroup – M. Berka; Brano – R. Valášek; CTU in Prague – Z. Neusser

Main Goals of the WP

Design optimization and NVH reduction for high driving comfort by using simulation combined with technical experiments - systems for measurement, assessment and identification.

- 2-WP07-001 (ZV) | Tractor cabin with increased comfort.
(• Gfunk - funkční vzorek), BUT, ZETOR
- 2-WP07-002 (ZV) | Gears mounting for high transmitted torque and low impact on NVH.
(• Gfunk - funkční vzorek), BUT, ZETOR
- 2-WP07-003 (ZV) | Shock absorber for special operation conditions.
(• Gfunk - funkční vzorek), BUT, KAR

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Partial Goals for the Current Period

Assembly and testing of the tractor cabin with the increased comfort, comparison of the technical experiment and simulation results.

Numerical simulation of transmission error, reduction of NVH at different gears type.

Testing of shock absorber functional specimen

Determination of difference at gears to minimize NVH

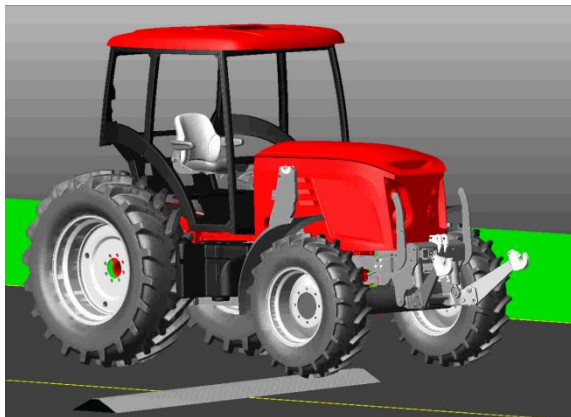
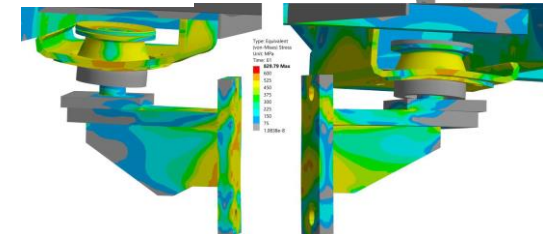
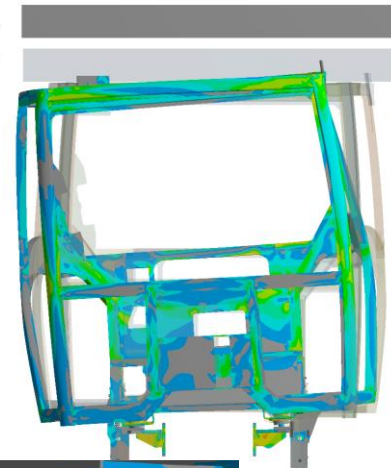
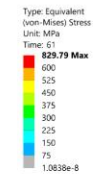
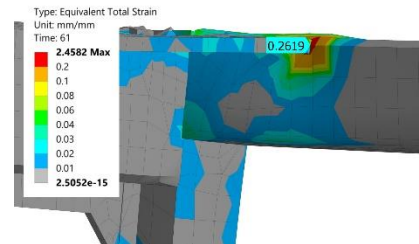
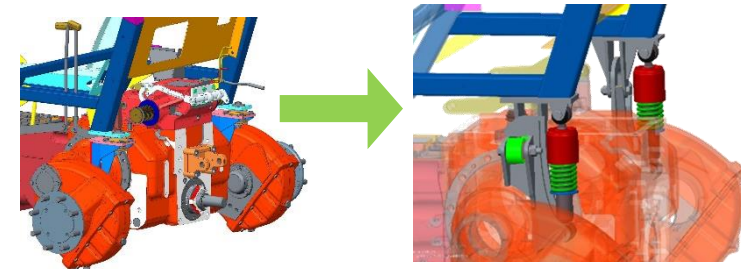
- 2WP07-004 | Door lock system with a significantly lower noise level when opening and closing door of passenger car. (• Gfunk - funkční vzorek), CTU FME, BRANO
- 2-WP07-005 | Papers/conferences related to NVH. (• O - ostatní výsledky), BUT, ZETOR

Activities in 2-WP07: NVH of Road and Off-road Vehicles

2-WP07-001 Tractor cabin with increased comfort

New concept of the Cabin suspension mounts

- CAD design
- Certified ROPS computational structural analysis
 - Deformation energy
 - Strain limitations
 - Design optimization
- Test drive over an barrier
- Input parameters
 - Experimental approach (mass, CoG)
 - Virtual prototype (inertia moment)

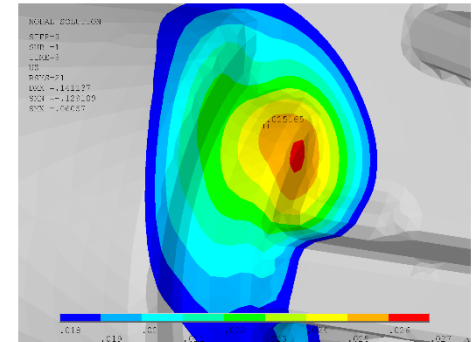
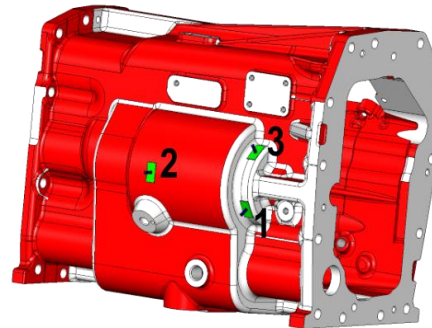


Activities in 2-WP07: NVH of Road and Off-road Vehicles

2-WP07-002 Gears mounting for high transmitted torque and low impact on NVH

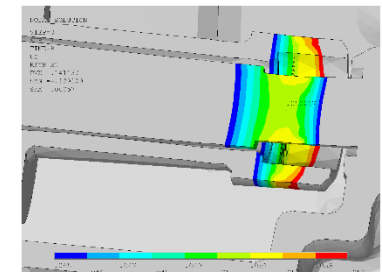
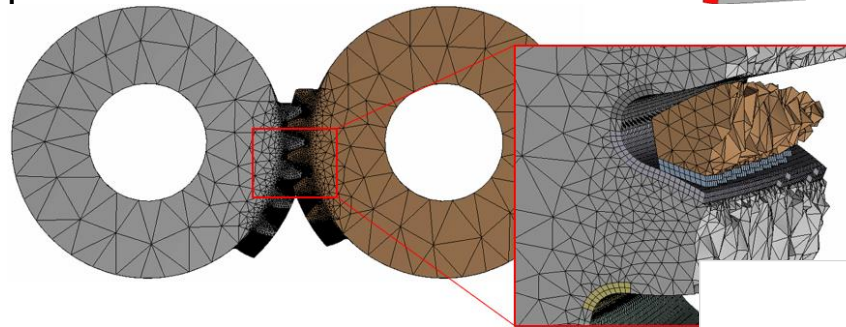
Transmission key component deformation

- Numerical approach
- Experimental approach

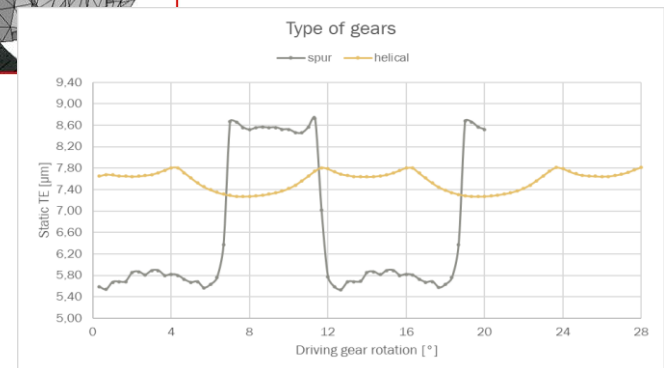
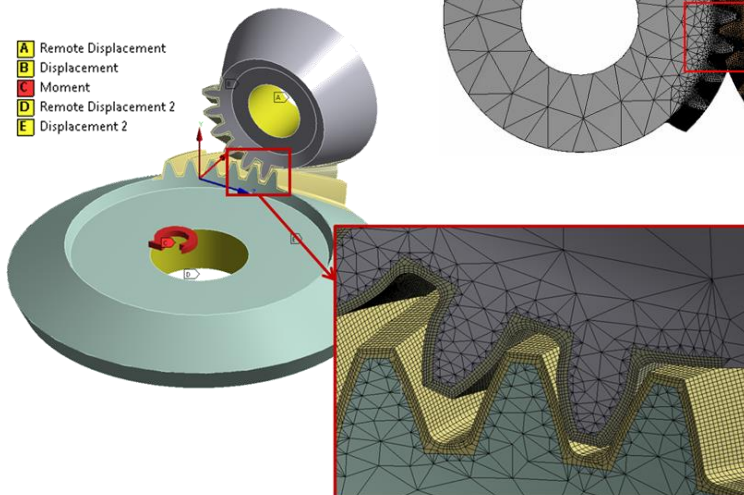


Transmission error

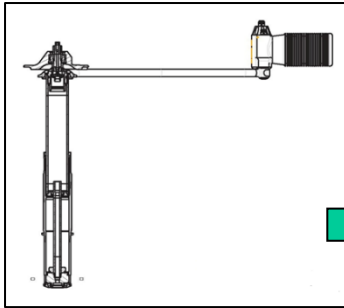
- Numerical approach



- A** Remote Displacement
- B** Displacement
- C** Moment
- D** Remote Displacement 2
- E** Displacement 2

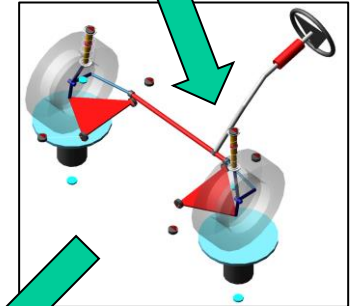
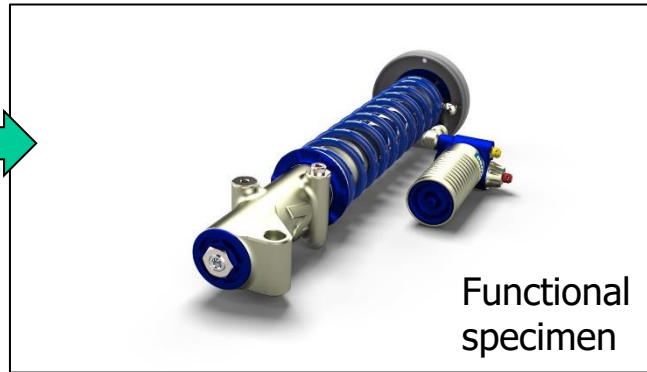
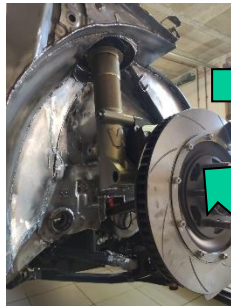
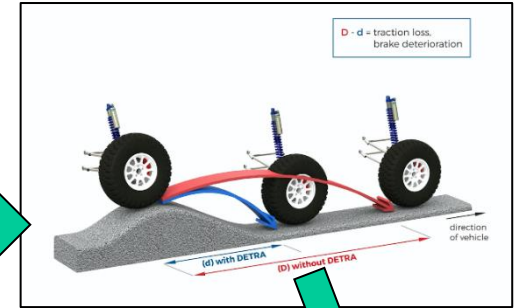


Activities in 2-WP007-003 Shock absorber for special operation conditions



a) McPherson strut concept and 3D design

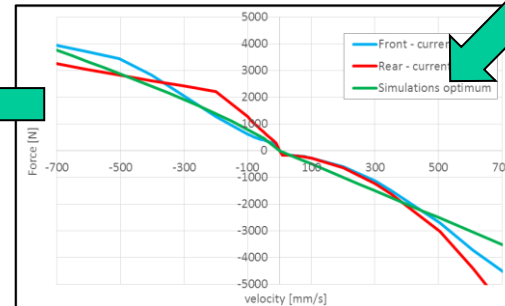
b) Research and development of new damper technologies



f) McPherson dampers dyno and onroad testing

c) Use of multibody model for the optimisation of new damper technologies and for design of basic damper F-v curve

e) Damper parts manufacturing and assembly

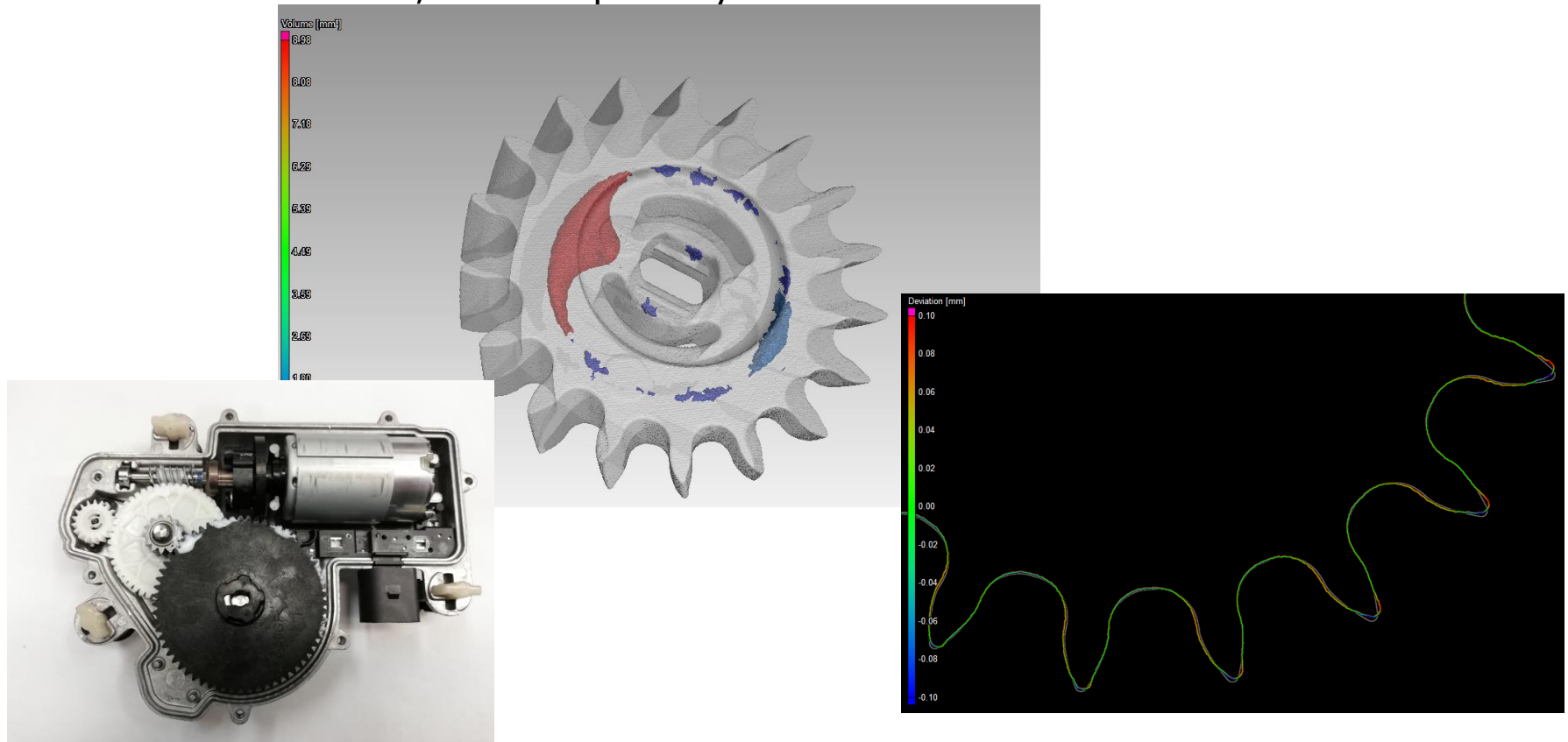


d) Damper hydraulic concept and models to reach the curves

Activities in 2-WP07: NVH of Road and Off-road Vehicles

2-WP07-004 Door lock system with a significantly lower noise level when opening and closing door of passenger car

- Door lock system: Current solution
 - Experimental analysis identifies the smallest plastic gear as a noise source
 - Current solution, teeth shape analysis



Fulfillment of goals and deliverables of Contents of Work Package WP 06 R&D for High Efficiency Turbocharging

Current State of Deliverables, Milestones and Fulfillment of Goals

- 2-WP07-001 (ZV) | Tractor cabin with increased comfort. (• Gfunk - funkční vzorek), BUT, ZETOR - **finished**:
 - The tractor cabin was modified based on the results from numerical simulations. Functional sample was built in 2020 and the final testing will be performed.
- 2-WP07-002 (ZV) | Gears mounting for high transmitted torque and low impact on NVH. (• Gfunk - funkční vzorek), BUT, ZETOR - **in progress & no major delays**:
 - The gears mounting was designed by using numerical approach. The experimental validation of the effect will be performed in November.
- 2-WP07-003 (ZV) | Shock absorber for special operation conditions. (• Gfunk - funkční vzorek), BUT, KAR **in progress & no major delays**:
 - The final testing will be carry out in november and in december 2020.

Fulfillment of goals and deliverables of Contents of Work Package WP 06 R&D for High Efficiency Turbocharging

Current State of Deliverables, Milestones and Fulfillment of Goals

- 2WP07-004 | Door lock system with a significantly lower noise level when opening and closing door of passenger car. (• Gfunk - funkční vzorek), CTU FME, BRANO - **in progress & no major delays:**
- 2-WP07-005 | Papers/conferences related to NVH. (• O - ostatní výsledky), BUT, ZETOR - **in progress & no major delays:**
 - The used approach for reducing NVH parameters was published in three articles, the last article is in progress.

Fulfillment of goals and deliverables of Contents of Work Package WP 06 R&D for High Efficiency Turbocharging

List of Due Deliverables and Their Added Value

- **2-WP07-001 (ZV)** – performed changes on the tractor cabin will significantly increase the drivers comfort and positively affect the Zetor competitiveness on the market
- **2-WP07-002 (ZV)** - performed changes on gears mounting will significantly increase the NVH comfort and positively affect the Zetor competitiveness on the market
- **2-WP07-003 (ZV)** – new shock absorber will positively affect the competitiveness on the market.
- **2-WP07-004** – New door lock system increase the drivers comfort and increase the potential of the product on the market.
- **2-WP07-005** –papers presentation improve position of the BUT and Zetor which increases market potential.

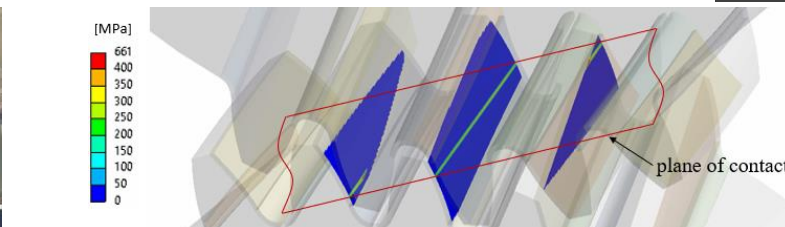
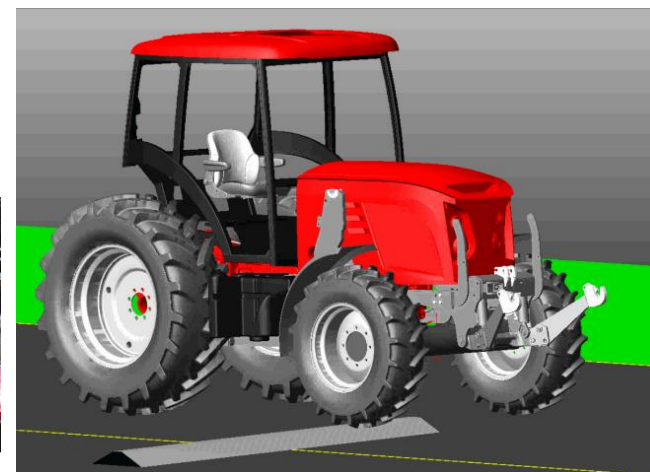
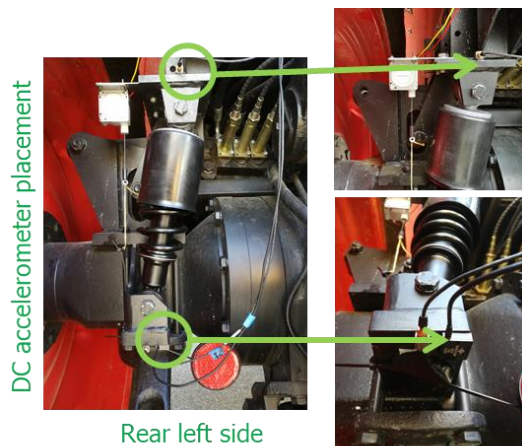
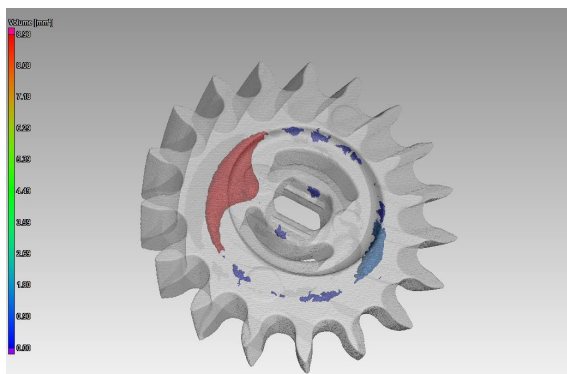
Activities in 2-WP07: NVH of Road and Off-road Vehicles

Acknowledgment

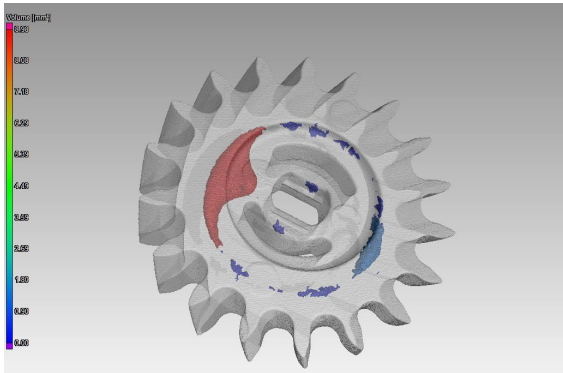
This research has been realized using the support of Technological Agency, Czech Republic, programme National Competence Centres, project # TN01000026 Josef Bozek National Center of Competence for Surface Vehicles.

All the help has been gratefully appreciated.

Výtah z prací 2019-2020 na WP 07 NVH silničních a off-road vozidel



Results of Contents of Work Package WP 07 NVH of Road and Off-road Vehicles



DC accelerometer placement



Rear left side

