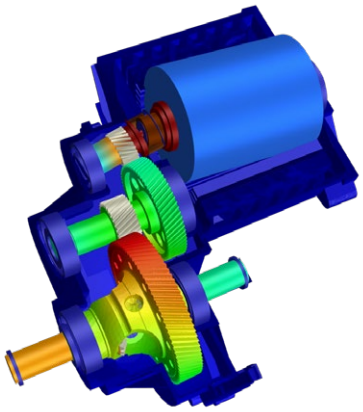
HEXAGON

Romax 2021

Democratising technology, enabling collaboration

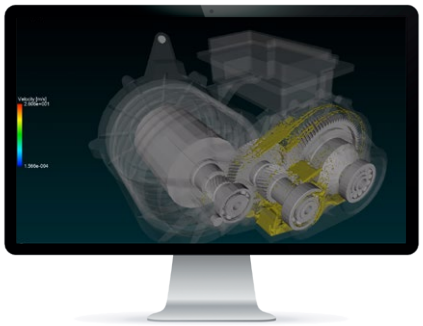
With new features across the simulation portfolio, Romax 2021 is focused on enabling our customers to democratise advanced technologies and to work in more collaborative ways.

Virtual gear manufacturing with Dontyne - closing the loop on gear simulation and manufacturing



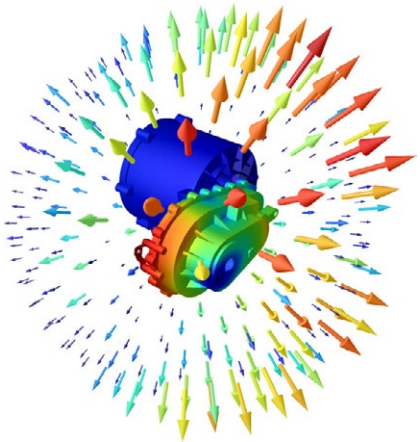
- Gear manufacturing simulation capability from Dontyne embedded into Romax Enduro's gear design and analysis tools.
- Consider gear design, analysis and manufacturing together virtually for the first time.
- Improve collaboration between gear designers and manufacturers.
- Reduce development costs, decrease time to market, and increase confidence in the manufactured product.

Lubrication simulation with Particleworks - democratising CFD analysis



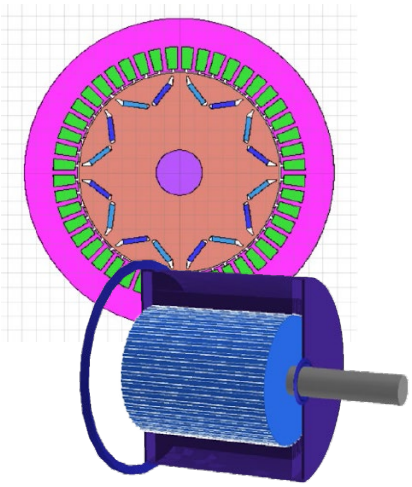
- New interface between Romax Energy and Particleworks enables CFD analysis to be performed early in the design process.
- A true "CAE-led design" process, enabling transmission engineers and non-CFD specialists to conduct informative CFD simulations.
- Gain insight into lubricant distribution within the transmission and understand the effect on churning losses.
- Optimise for efficiency, improve product quality and reduce time to market.

In-vehicle NVH simulation with VI-grade - real-time sound quality assessment



- Expanded interface with VI-grade's technology, to apply a CAE-led design approach to the world of vehicle NVH testing.
- Automatically calculate and export Romax Spectrum's accurate gearbox and electric powertrain noise and vibration prediction for use in the VI-grade NVH simulator, which uses a mix of test and simulation data to provide a virtual driving experience that accurately represents in-vehicle noise from all sources.
- Presents complex CAE simulation results in a way that anyone can interpret and understand, to democratise advanced technologies and aid with cross-departmental collaboration.

Interface with JMAG-Express - integrating mechanical and electromagnetic solutions



- Link to Romax Concept (fast simulation tool for early stage development of the complete electric drivetrain) and Romax Evolve (multi-fidelity environment for mechanical simulation of electric machine durability, NVH and efficiency) from JMAG-Express, a concept-level online parametric design tool for motor electromagnetic performance.
- Fast, easy workflow at the concept and sizing development stage when design iterations need to be at their most efficient.
- Enhanced workflow integration for motor designers looking to understand motor and electric powertrain efficiency performance right from the start.

Further enhancements include:

Modelling and optimisation:

- Import REXS files, a standardised file format for exchange of geared system CAE models.
- FE speed improvements for a significant decrease in model preparation and solve times.
- Improvements to batch running and parametric study, to enable even more wide-ranging optimisation and sensitivity studies.

NVH analysis:

- Electric machine NVH workflow enhancements, including for skew and eccentric rotors.
- Show velocity on housing in Acoustic Analysis - to see the local structural deformations at the same time as the acoustic results and use this to interpret the source of any directional noise.

Concept design:

- Efficiency maps and drive cycle analysis with an electric machine drive system - easily assess the efficiency and performance of different EV powertrain design concepts whilst considering the most important tradeoffs (cost, weight and performance) to select the optimum motor/ transmission combination.

Gear design and analysis:

- ISO 6336 parts 1,2,3,6:2019 and part 5:2016 cylindrical gear rating.
- Six degree-of-freedom tooth contact model and multiple nodes for gear mounting - a more complex contact model for improved gearbox transmission error (GBTE) analysis.

Efficiency analysis:

- Inclusion of motor efficiency maps, to calculate overall energy loss for an electrified driveline.
- Romax bearing drag model extended to support roller bearings.
- Stacked 2D power loss chart.
- Seal frictional moment for SKF friction model, to analyse bearing seal loss alongside other loss sources.

Bearing design and analysis:

- SKF bearing calculations from SKF's cloud calculation service embedded into Romax software.
- Hybrid bearings, with steel rings and ceramic rolling elements.
- New specialised bearing type: asymmetric taper roller bearings.
- New results available: bearing ring hoop and radial stresses due to press fits.
- Application of micro geometry profile modifications to inner/outer surface of hydrodynamic journal bearings.