NEW FEATURES FOR 2022 R1

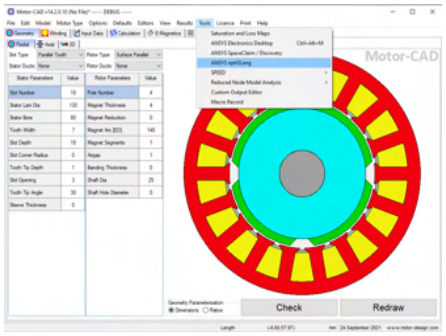
Motor-CAD v15

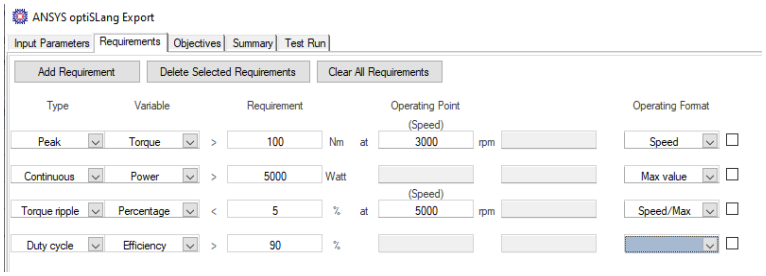
Version 15 of Motor-CAD software contains many exciting new features, including: **requirements-based multiphysics optimisation set-up**, **NVH analysis**, **export to Ansys Discovery** and more.

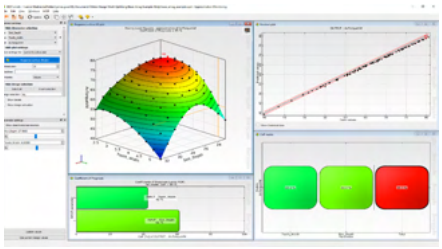
New Feature: Requirements-Based Multiphysics Optimisation Set-up

Complex, multiphysics optimisation analysis processes can be simply set up by specifying parameter ranges, requirements, and multiple objectives through a new integrated interface. This significantly simplifies the process and does not require user scripting.

- Allows users to create a fully set up optiSLang project ready to run based upon a base machine design in Motor-CAD.
- No scripting required – removes a significant amount of the workflow. Can go from a Motor-CAD file to an optiSLang MOP just via GUI interaction.
- This feature is also useful for more experienced users. The exported script can be used as a template to customise and create more complex procedures. Fully compatible with the current Python node methodology.
- Available for BPM, SYNCREL and IM machine types.



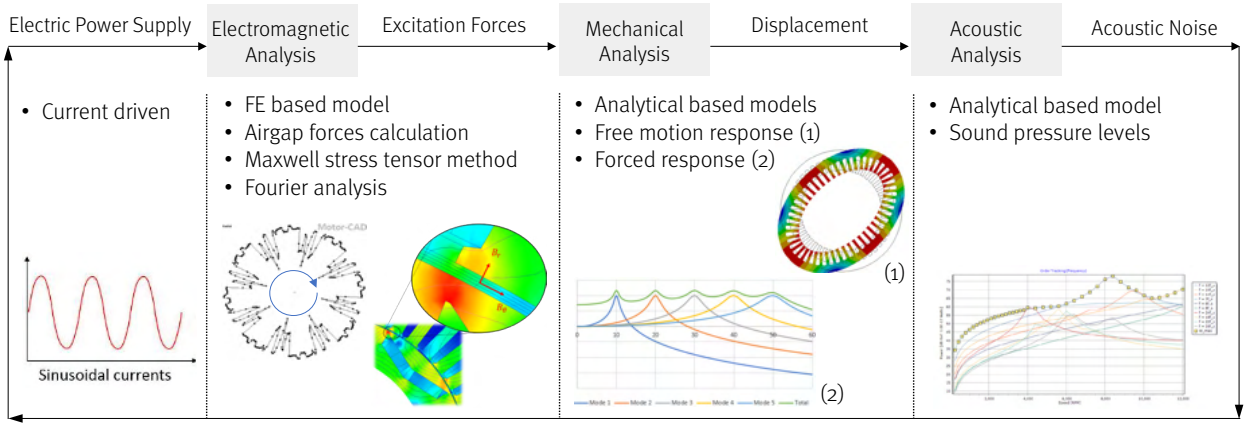




New Feature: Noise, Vibration & Harshness Analysis

The Noise, Vibration and Harshness (NVH) of an electric machine can now be rapidly evaluated and assessed in the early stages of design and included as part of the multiphysics evaluation of a candidate design. This helps to avoid NVH issues arising at the later stages of development where the cost of change is high. Motor-CAD is the only electric machine design tool on the market to offer NVH alongside electromagnetic, thermal, and mechanical analysis.

Motor-CAD NVH Analysis Workflow



NVH simulation loop: single and multiple operating points

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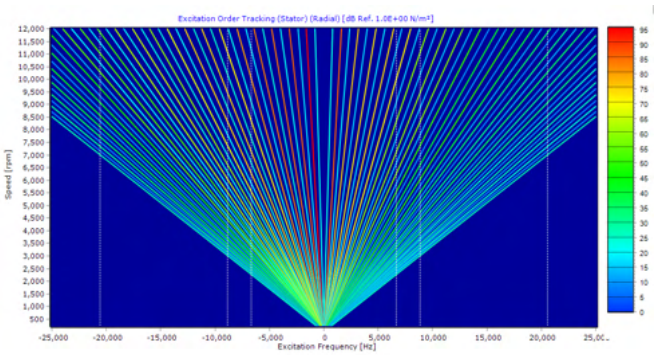
New Feature: Noise, Vibration & Harshness Analysis [continued]

Calculating Excitation Forces

- 1D and 2D Time and Frequency analysis of radial forces using Motor-CAD Electromagnetic FEA Solver.
- Force calculations for single/multiple operating points.
- Campbell diagram shows dominant harmonics across speed range.
- Force export for high fidelity NVH analysis in dedicated tools.
- Available for BPM, SYNCREL and SRM machine types.



Campbell diagram

Calculating Displacement

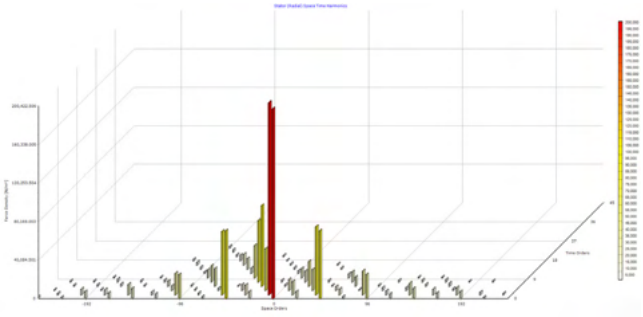
- Based on fast analytical structural models

Free motion response:

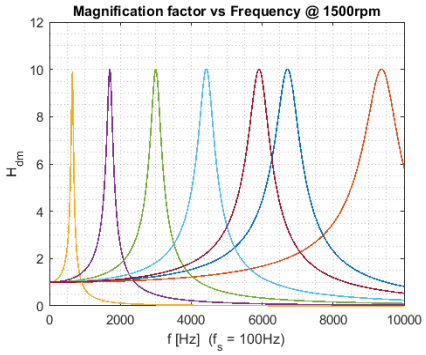
- Modal Analysis based on equivalent thin ring model
- Calculate natural frequencies of stator structure.

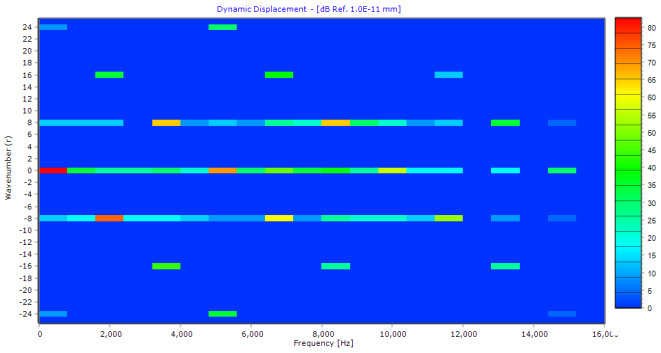
Forced response:

- Static displacement calculation
- Effect of resonance visualised as magnification factor
- Dynamic displacement calculation
- Dynamic velocity provides input into acoustic models
- Dynamic acceleration direct measure for vibration.



2D Frequency domain force analysis

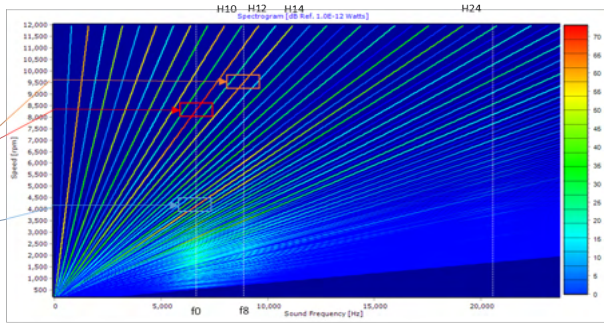


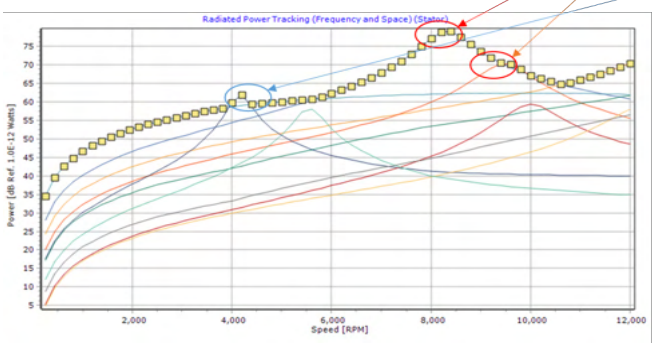


Dynamic displacement & magnification factors

Calculating Acoustic Noise

- Based on fast analytical acoustic models.
- Spectrograms and spatiograms quantify acoustic response across speed range.
- Order tracking provides further insight for root cause analysis and identifying measures to reduce noise.

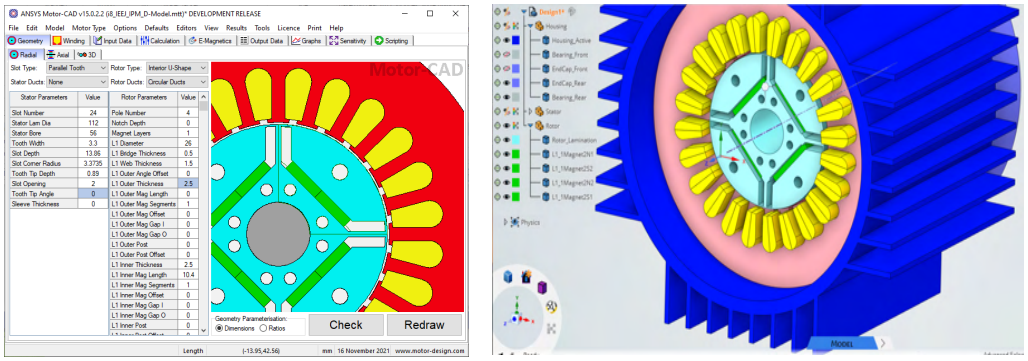




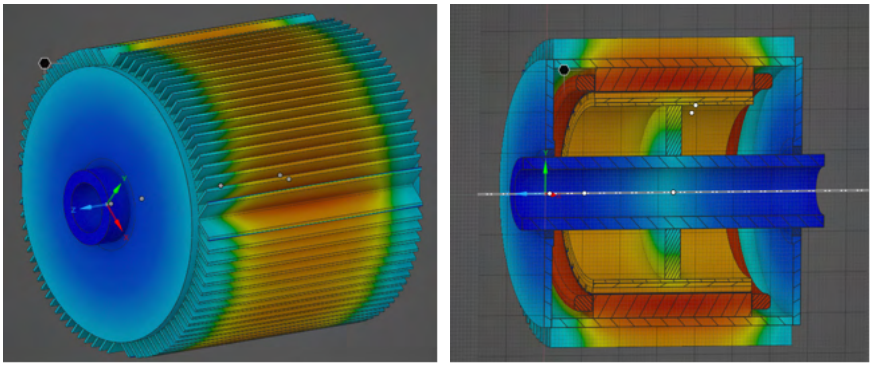
New Feature: Export to Ansys Discovery

Models in Motor-CAD can now be transferred to Ansys Discovery seamlessly and automatically, enabling the use of the Ansys Fluids and Structural solvers more easily during the electric machine design process.

- New feature in Motor-CAD v15 enables easy export of 3D geometries from Motor-CAD into Ansys Discovery for use in the Ansys Toolset.
- This export option is achieved using Python scripting.
- Ability to export geometry that is not available in Motor-CAD template.
- Export custom geometry in Motor-CAD defined from dxf.
- Geometry exported from Motor-CAD can then be used for more detailed analysis in Ansys Discovery.



Machine geometry in Motor-CAD (left) and Ansys Discovery (right)



Thermal analysis in Ansys Discovery

There are many other new features and enhancements in Motor-CAD v15:

- New tapered tooth SRM geometry
- Rounding of duct corners
- Calibration of Induction Machine equivalent circuit parameters
- Magnet Data Fitting
- Granta Material Database
- DXF Import Interface
- Multiphase Winding improvement
- Concentric winding improvement
- Improved custom conductor placement

- Load / save winding pattern
- Python scripting interface
- Improved custom output
- SYNC machine Rotor Damper Bars
- Improved AC winding loss calculation
- New geometry ratios for IM machines
- Endwinding overhang calculation
- IM1PH machine added operating points

Now available to download from the Ansys Customer Portal