JMAG new feature

Demo and presentation

September 30th, 2026

POWERSYS

POWERSYS

AGENDA_

1. V25.1 - Demo 1 : automatic thermal eq. circuit

2. V25.1 - Main new features

3. V25.2 - Demo 2 : JMAG-SBO

4. V25.2 - Main new features

POWERSYS

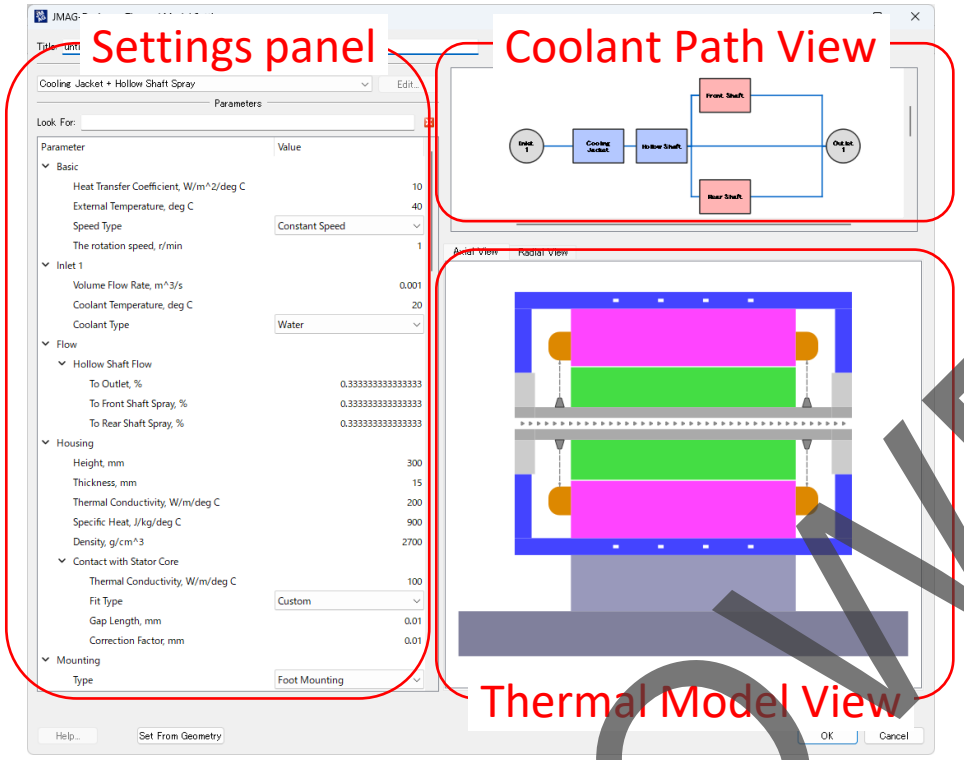
POWERSYS

1. V25.1 - Demo 1 : automatic thermal eq. circuit

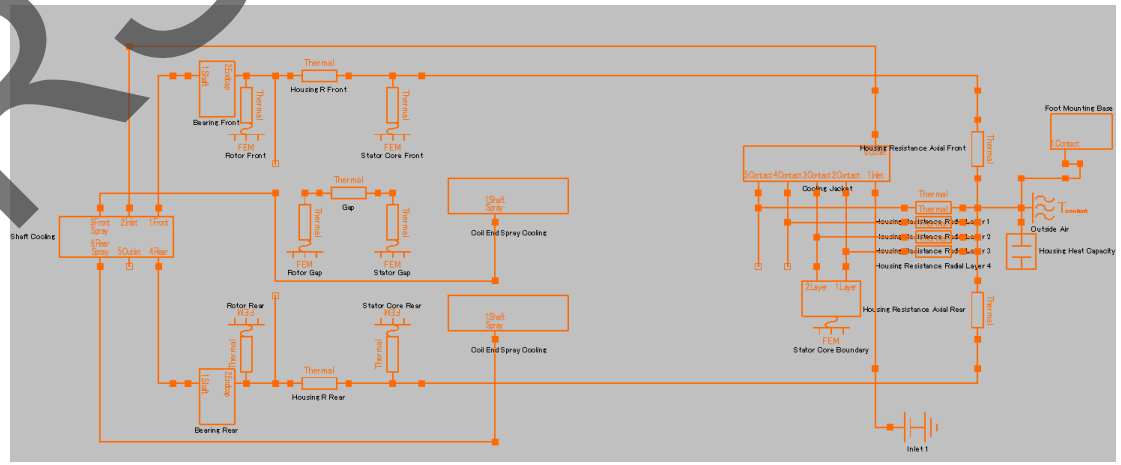
POWERSYS

Thermal model settings (Overview)

- Model cooling system visually



Thermal Model Settings Panel



Automatically generated thermal circuit

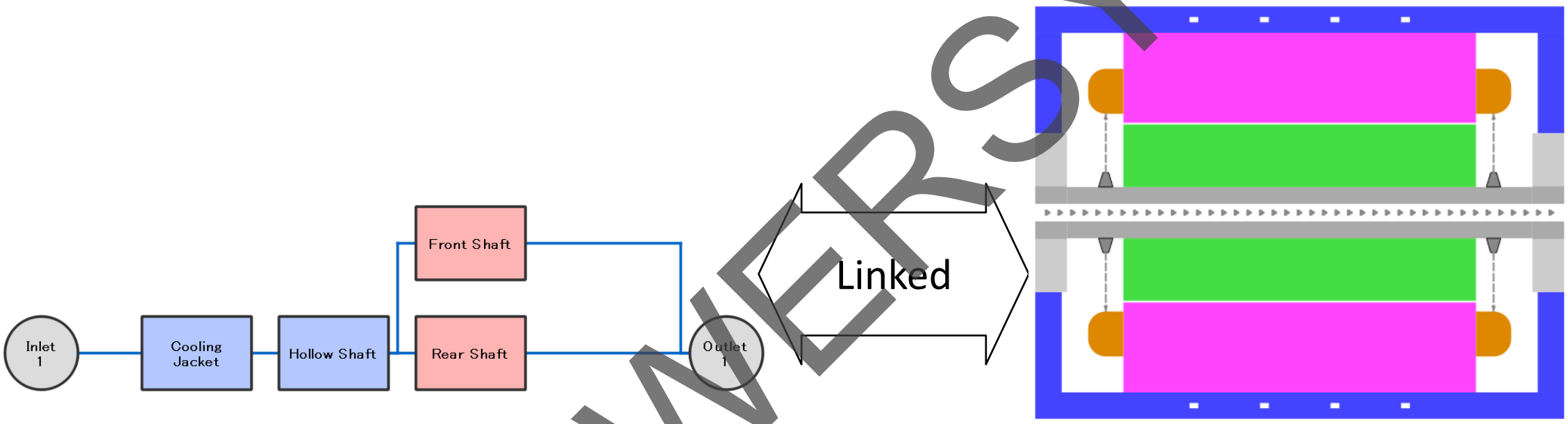
Thermal model setting panel and auto-generated thermal circuits

The thermal model setting panel consists of a setting panel, a cooling path view, and a thermal model view. The contents of the setting panel are reflected in the cooling path view and thermal model view, and conditions and thermal circuits are automatically generated.

POWERSYS

Thermal Model Settings
(Coolant Path View/Thermal Model View)

- Intuitive understanding of cooling mechanisms



Coolant Path View　　Thermal Model View

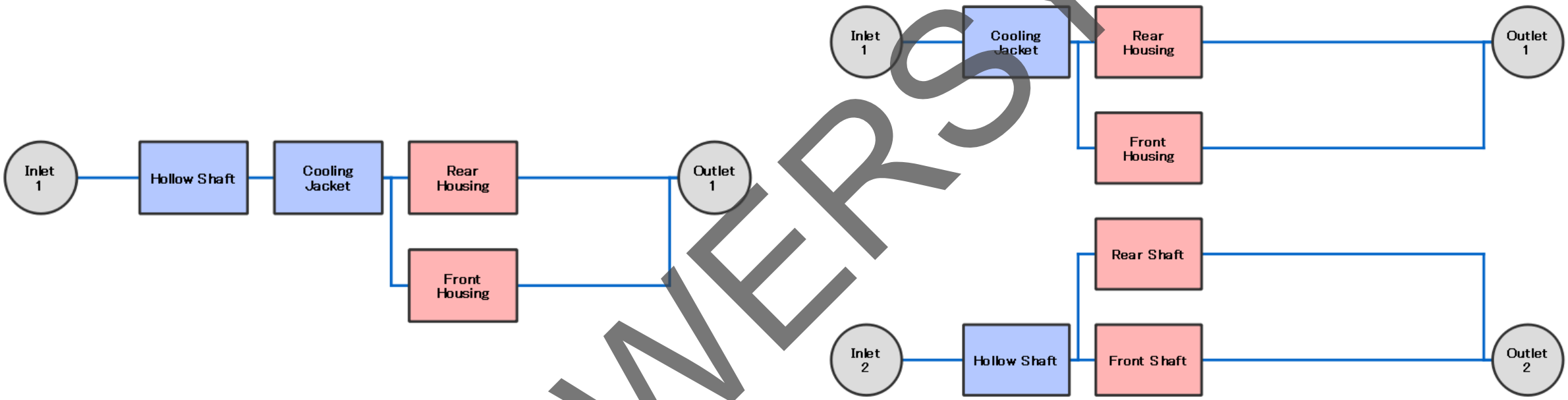
POWERSYS

Coolant path view and thermal model view

From the coolant path view, it can be seen that the coolant flows from the cooling jacket to the shaft cooling and flows out through the front and rear shaft sprays. In the thermal model view, you can understand the cross-sectional shape and arrangement of the cooling jacket, and the cooling mechanism that cools the coil end by the spray of the coolant for shaft cooling.

Thermal Model Settings (Coolant Path Editor)

- Custom features support various coolant systems



Original cooling path

Customized cooling path

Customizing the Coolant Path

The original coolant path has a single inlet that flows through the cooling jacket after shaft cooling and leads to the housing spray. In the updated coolant path, the inlet is separated, and it flows to the outlet after housing spray and shaft spray.

POWERSYS

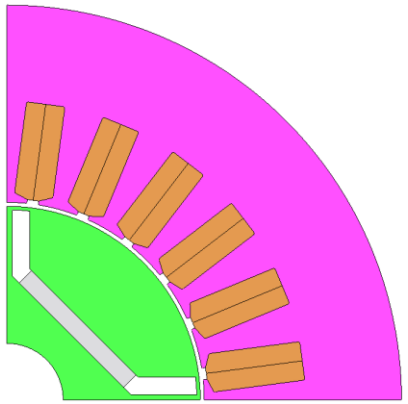
2. V25.1 - Main new features

POWERSYS

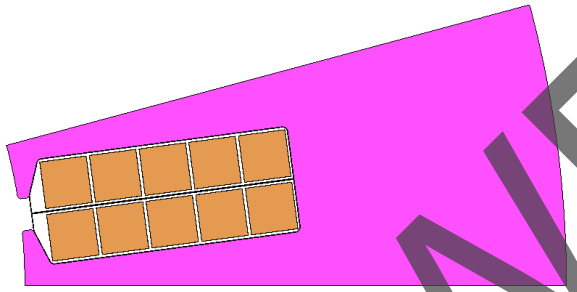
Expanding the Scope of Multi-disciplinary Optimization

- Supports optimization calculations with different model geometries for magnetic field, structural, electric field, and thermal analyses…

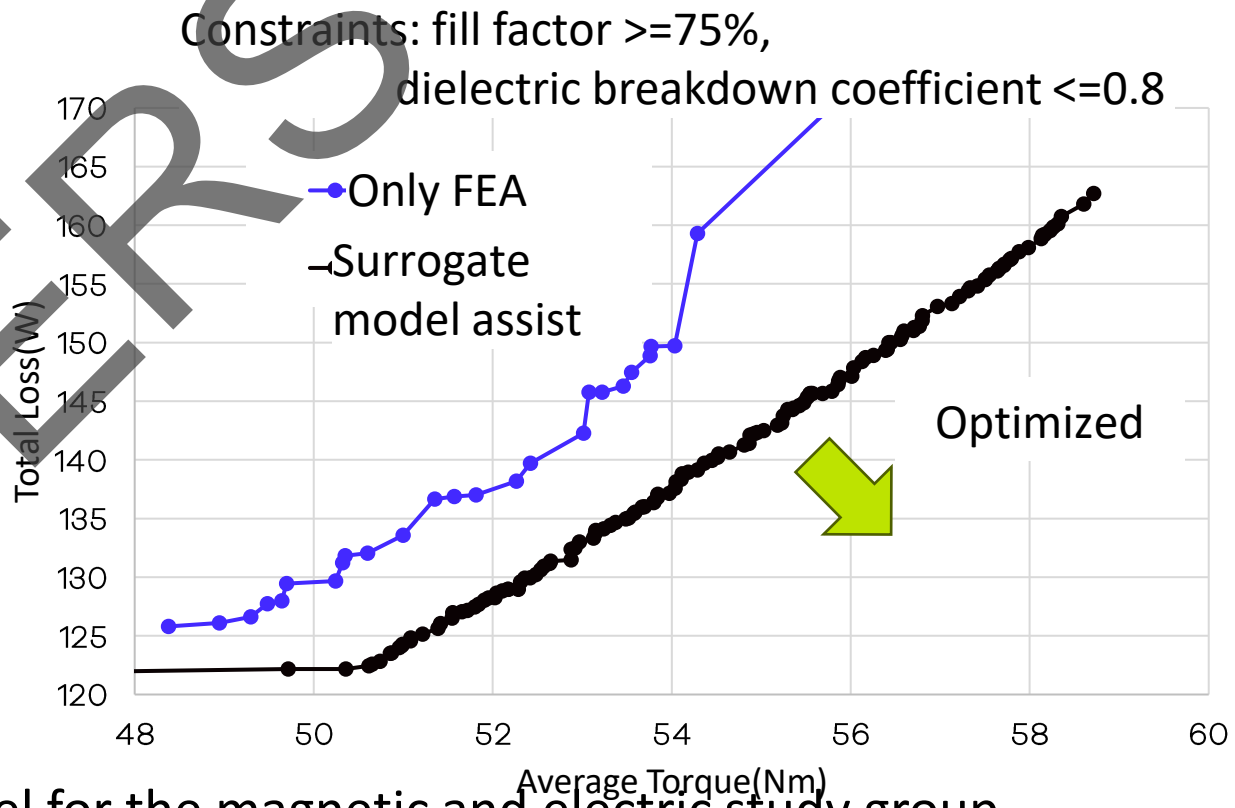
Analysis group



Bulk coil geometry
for magnetic study
(Torque, Loss, …)



Wire coil geometry
for electric study
(Dielectric strength, …)



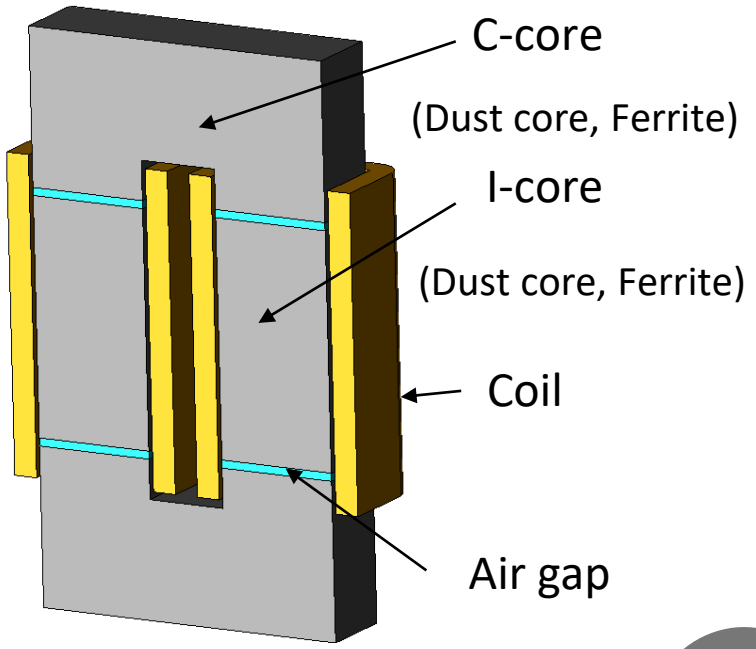
Optimization using the surrogate model for the magnetic and electric study group

By checking feasible geometries of both the magnetic and electric studies using the surrogate model, more feasible solutions have been found at the same computational cost.

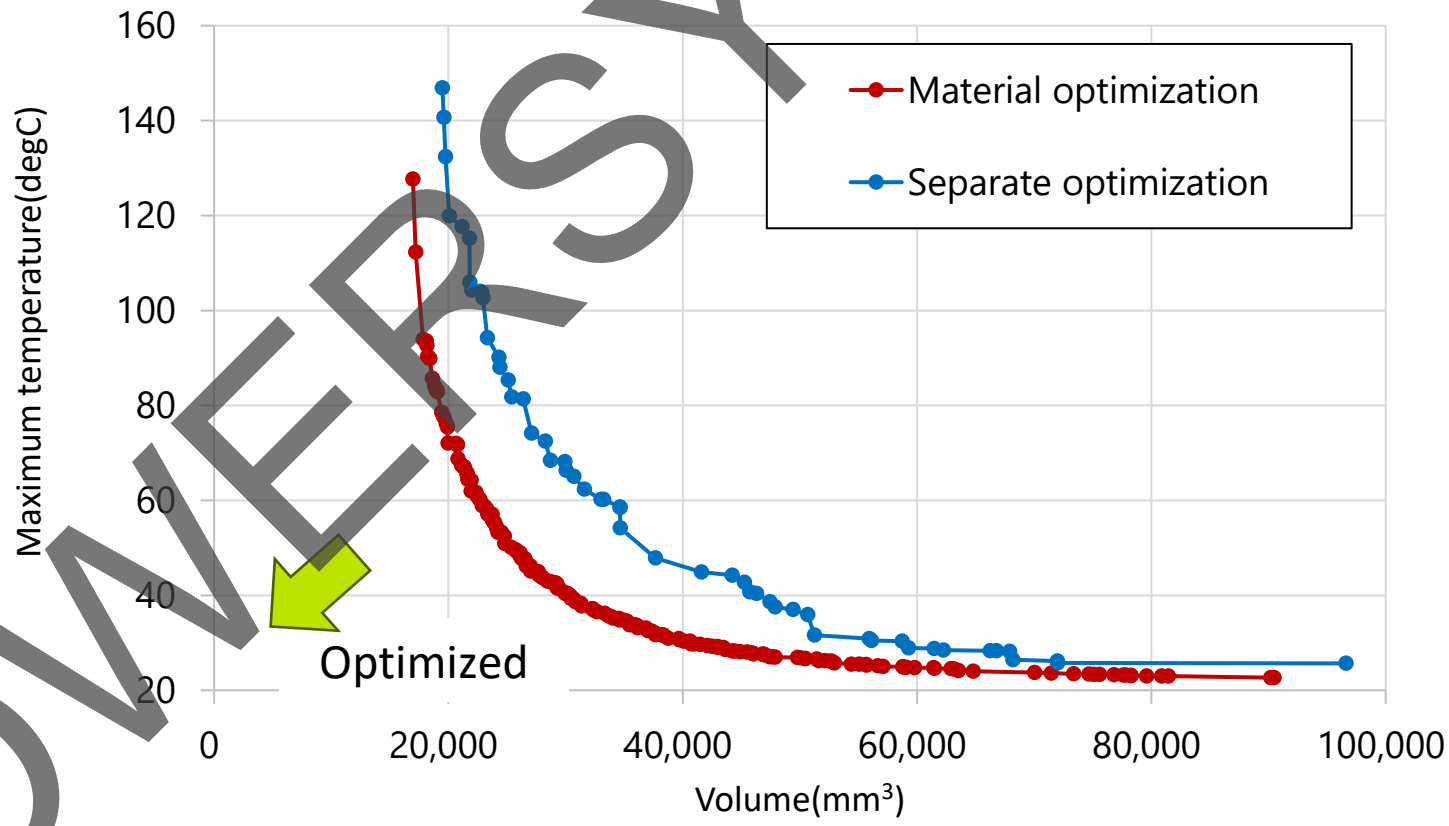
POWERSYS

Support Material Variables in Analysis Groups

- Material optimization with multi-physics analyses



DC reactor



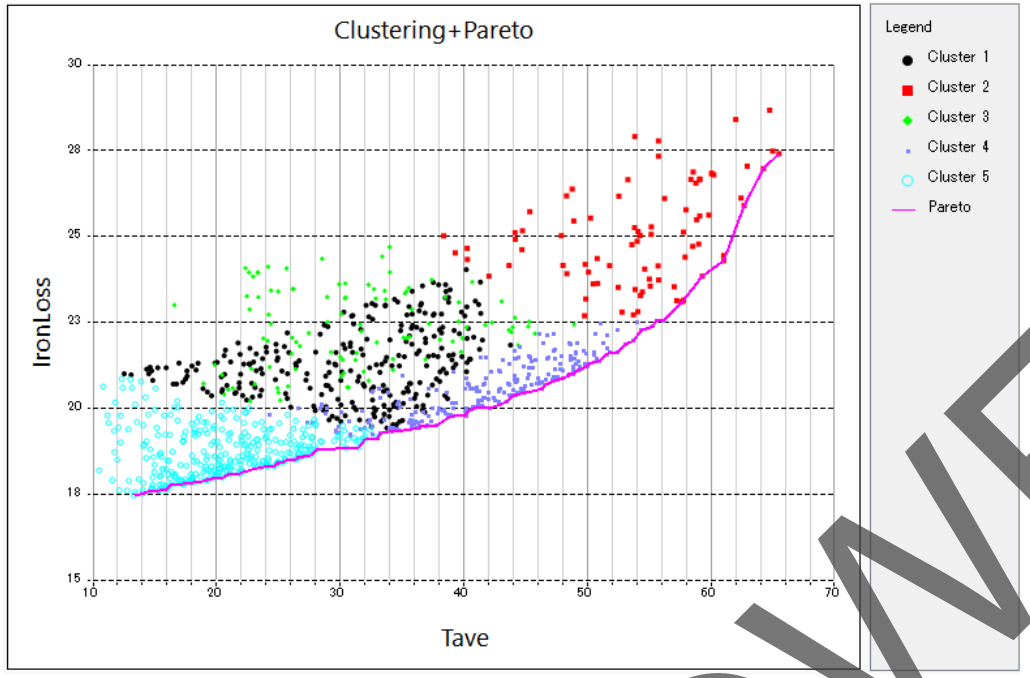
Optimization of the core material for a DC reactor

The core material and geometry were optimized while evaluating inductance and temperature. This achieved a better design than conducting shape optimization for each material separately, without increasing the computational cost.

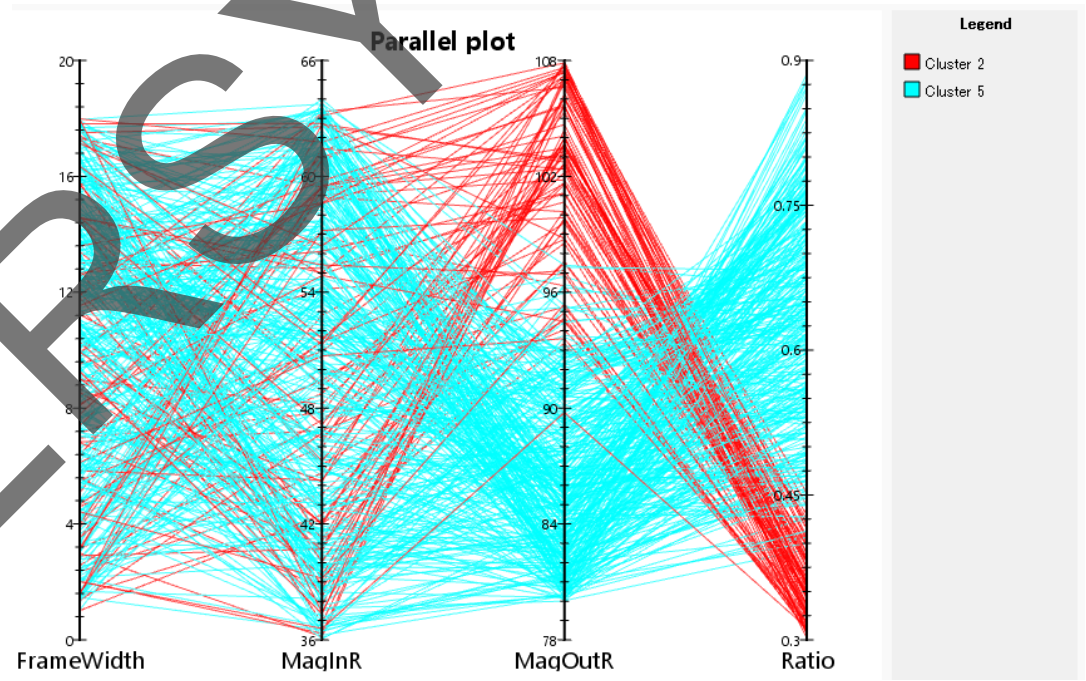
POWERSYS

Data Analysis in JMAG Design Explorer [5]

- Efficient analysis of massive parametric and optimization results.



Clustering and Pareto curve(Torque-Ironloss)



Parallel plots(for Cluster2,5)

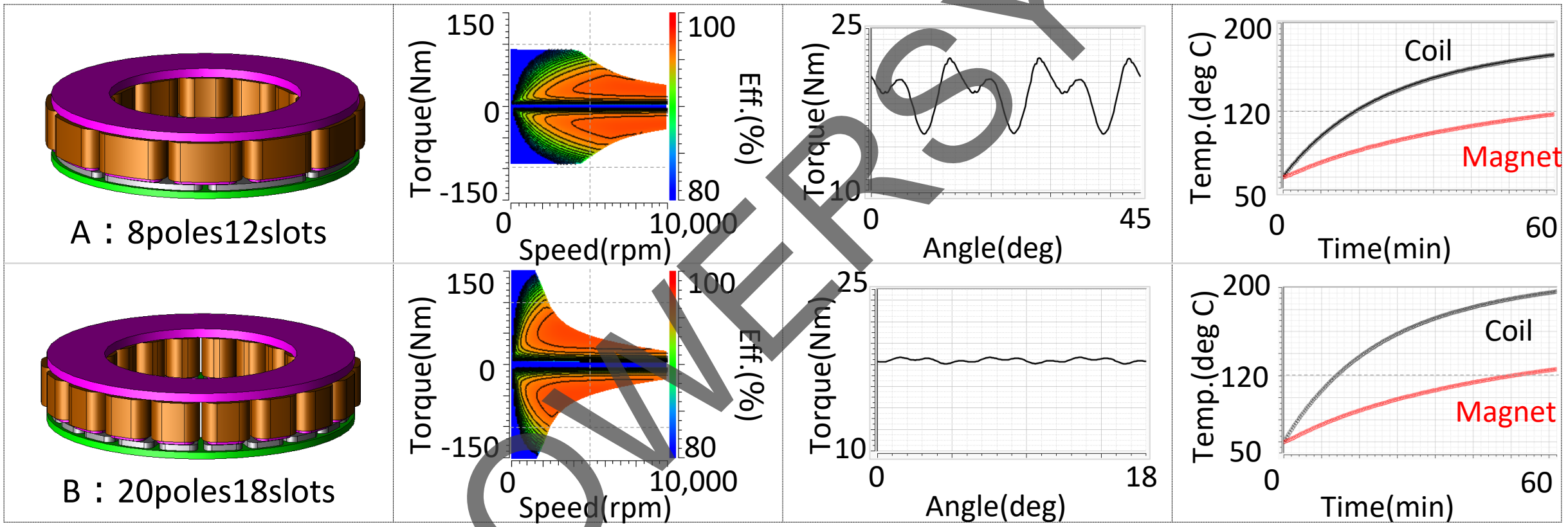
Analysis using clustering and parallel coordinates plot

The left figure shows the clustering results and the Pareto curve. The right figure displays each cluster using a parallel coordinates plot. For example, comparing Cluster 2 (red), which has high torque and high iron loss, with Cluster 5 (light blue), which has low torque and low iron loss, it can be seen that the design variables “MagOutR” and “Ratio” exhibit an inverse correlation.

POWERSYS

Addition of motor type for axial flux motor in Express

- Multi disciplinary evaluate for single-rotor / single-stator design



Comparison of AFM (Single Rotor/Single Stator)

Design B showed the characteristics of high torque and small torque ripple. On the other hand, design A has little torque drop even at high speed. In Design B, it was confirmed that the temperature of the components tends to rise due to the increase in core loss due to the increase in the number of pole slots.

POWERSYS

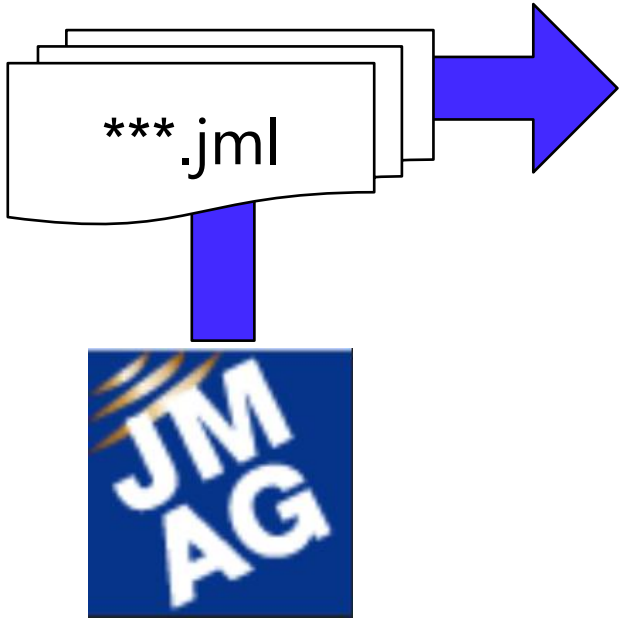
3. V25.2 - Demo 2 : JMAG-SBO

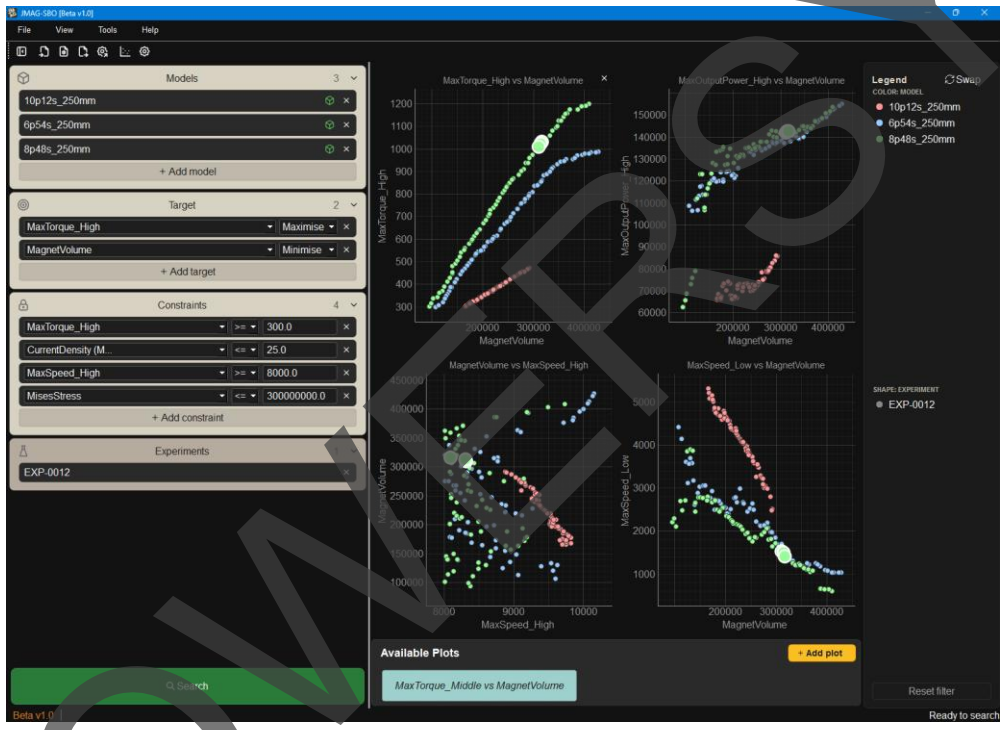
POWERSYS

JMAG Surrogate-Based Optimization Tool (JMAG-SBO)

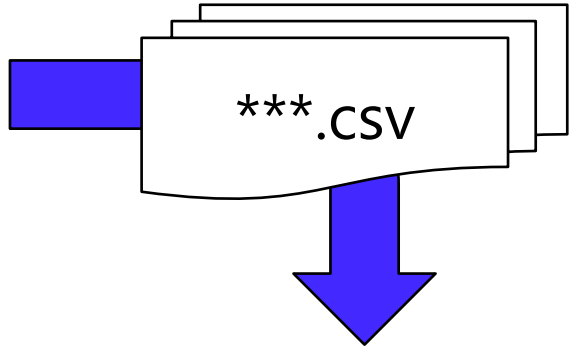
- Quick optimization with JMAG surrogate models is available.

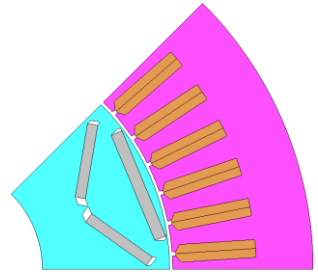
JMAG Surrogate Models





Design parameters





Optimization using JMAG-SBO

By simply setting the objective functions and constraints, users can perform optimization calculations simultaneously for multiple surrogate models. Results are displayed instantly, allowing for a multi-disciplinary evaluation based on multiple graphs. It is also possible to export the resulting design parameters and study them in detail with JMAG-Designer.

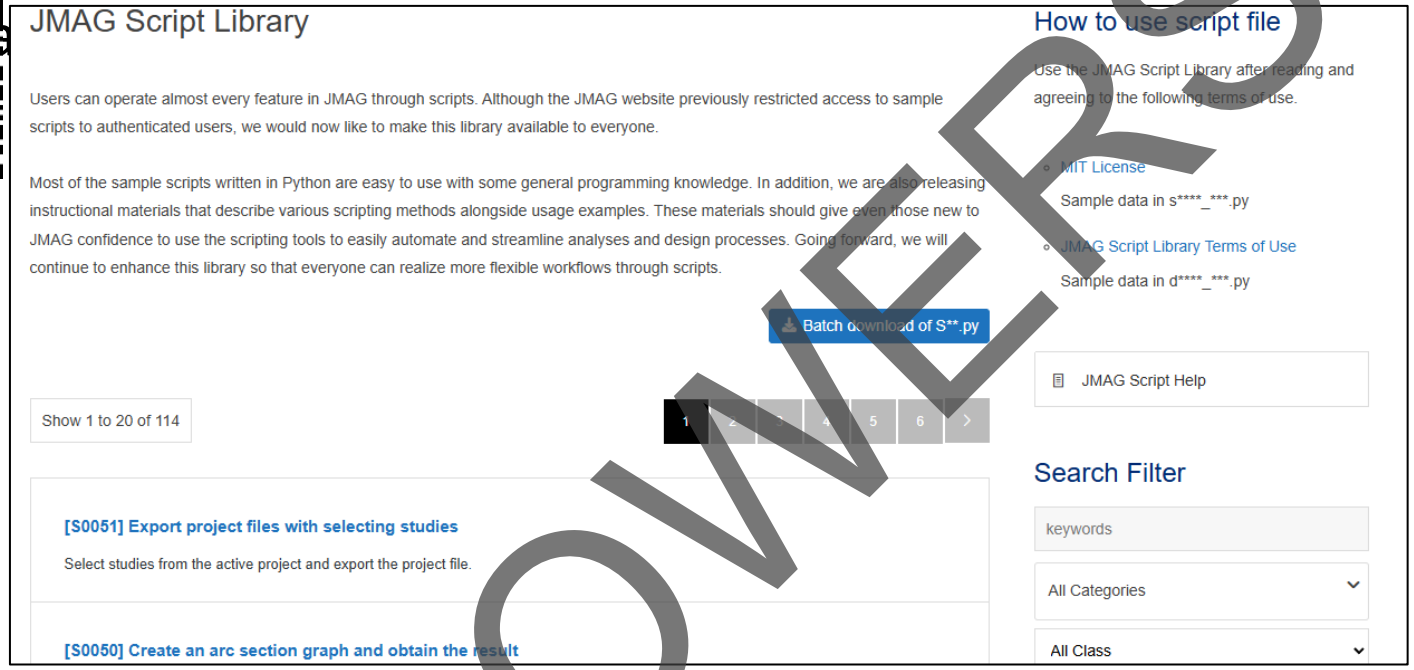
POWERSYS

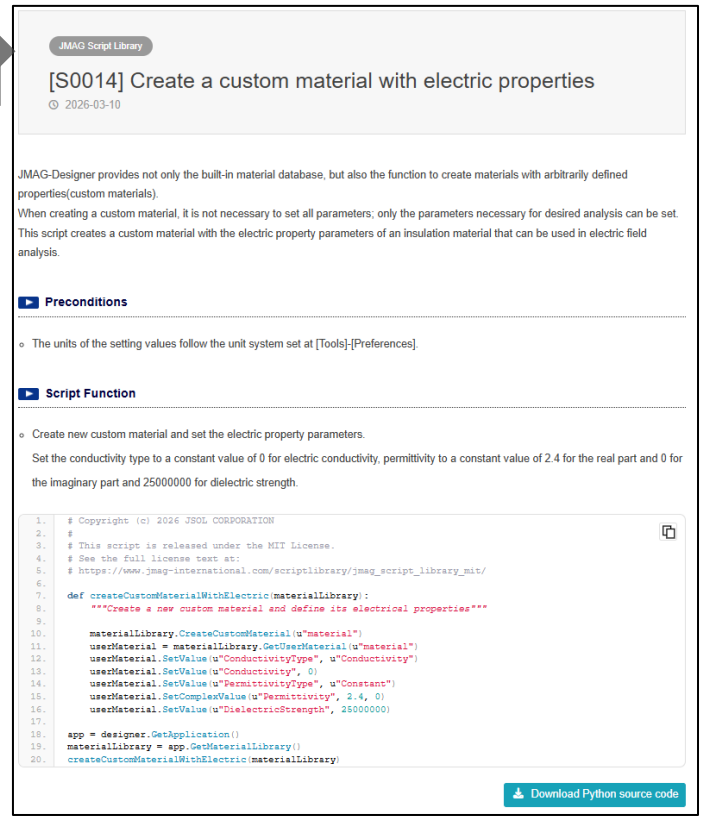
4. V25.2 - Main new features

POWERSYS

Script Libraries Are Being Added Continuously

- To support the automation of JMAG operations, script API





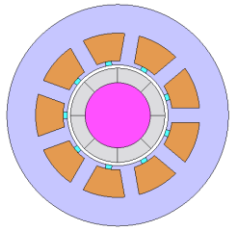
JMAG Script Library

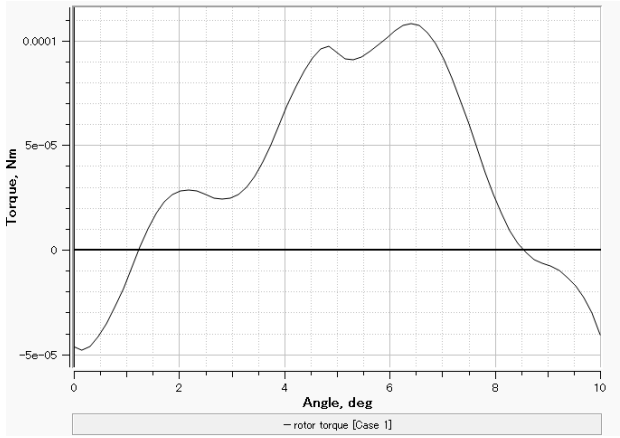
Over 100 examples covering a wide range of JMAG operations are now available. Each example includes an overview and preconditions alongside the source code to be easily understood by both humans and AI. The source codes are available for batch download.

POWERSYS

Provide JMAG Agent Skills for AI Agents

- Operate JMAG and Solve Problems Using Natural-Language Instructions.

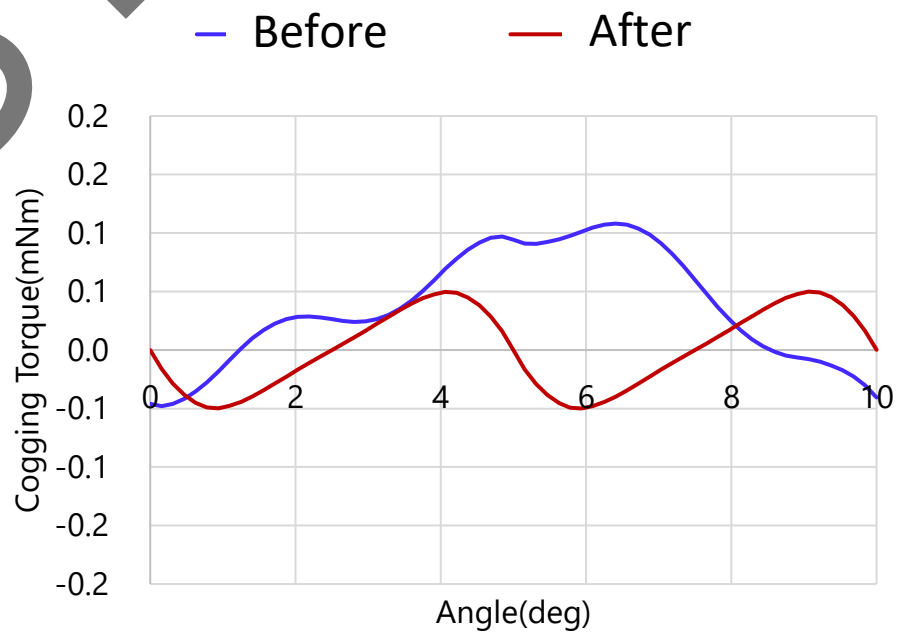




Before

"I calculated the cogging torque of the motor. Please examine whether the cogging torque is physically reasonable. If it is not reasonable, please make improvements."

Prompt



After

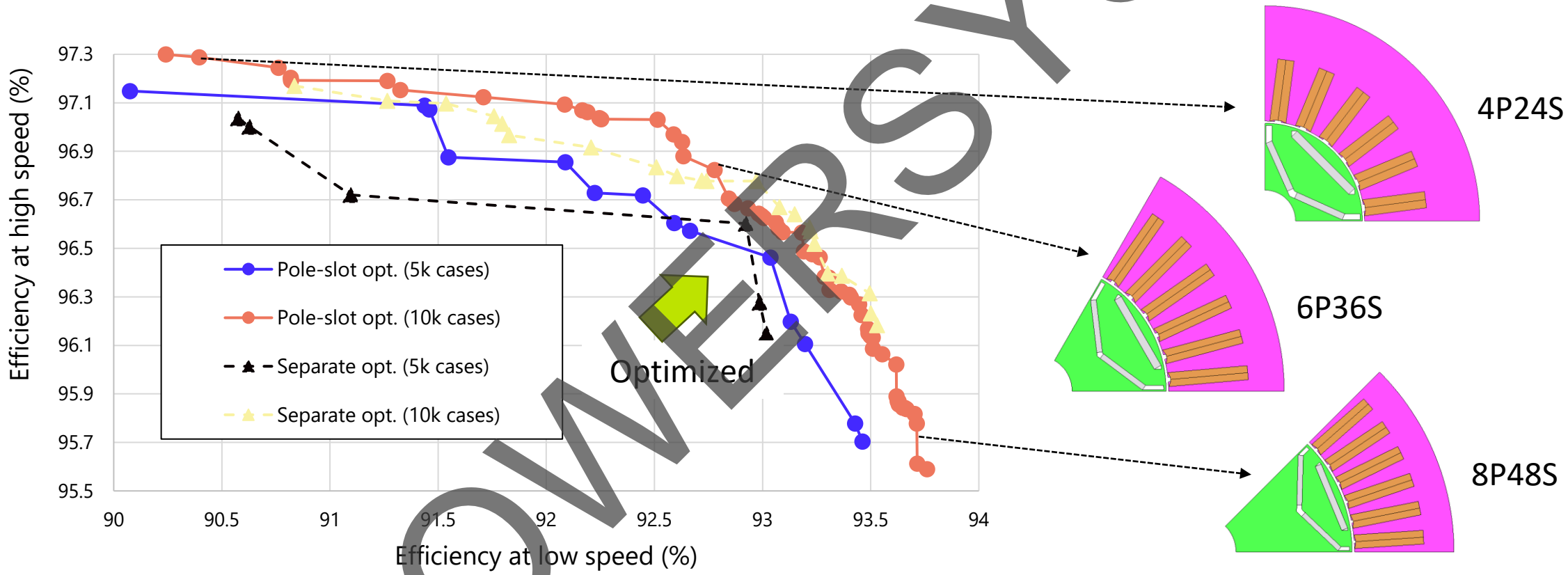
Autonomous Improvement of Cogging Torque Analysis by an AI Agent

An example of improving the cogging torque waveform of an 8 poles, 9 slots motor. Using JMAG Agent Skills, the AI agent autonomously identified the issue,selected the appropriate functions, and adjusted the mesh to improve analysis accuracy.

POWERSYS

Optimization for Pole-Slot Combination

- Find optimal designs across several pole-slot combinations.



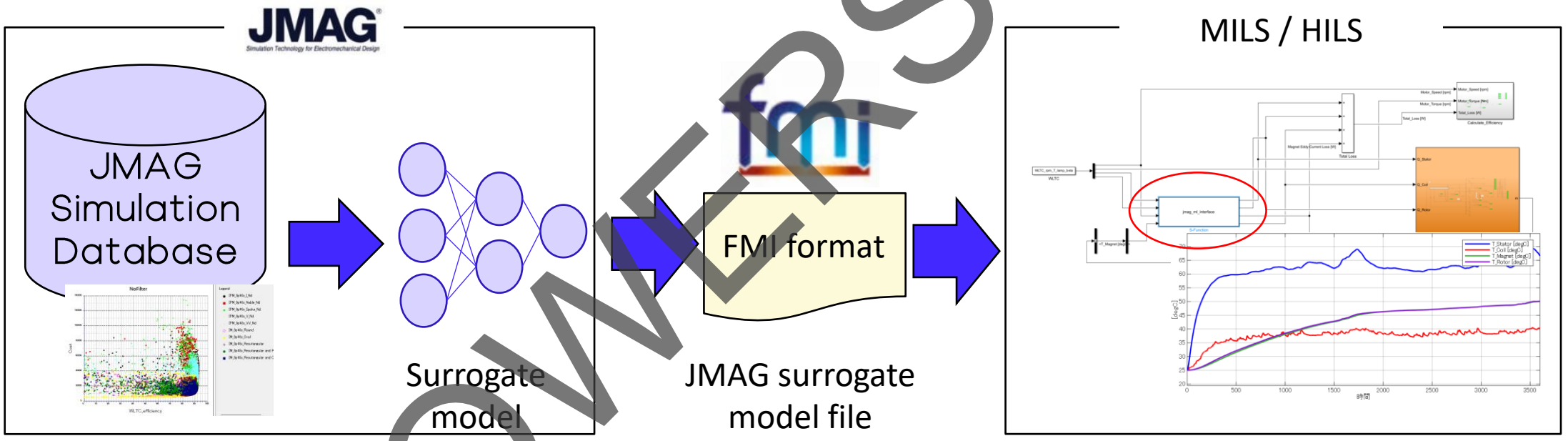
POWERSYS

Optimization for pole-slot combination and dimension parameters

The pole-slot combination and dimension parameters are optimized simultaneously. The optimization progress is better than doing dimension-parameter optimizations for each pole-slot combination separately for an equivalent number of calculation cases.

FMI Support for JMAG Surrogate Model

- Export JMAG surrogate models in FMI (Function Mock-up Interface) format and utilize JMAG FEA results in various MILS/HILS platforms



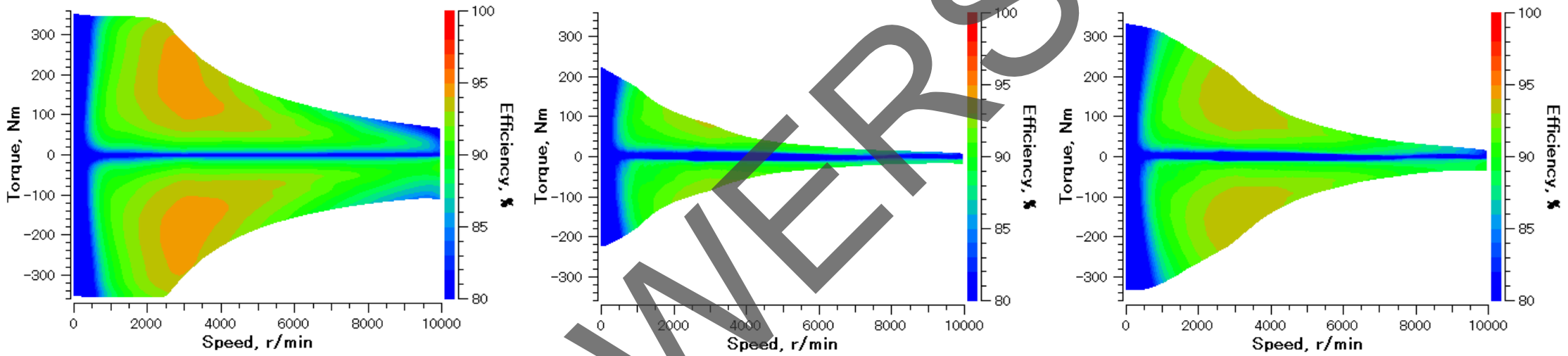
Using JMAG Surrogate Models in MILS/HILS

JMAG surrogate models can be exported in FMI format, the standard for MBD. JMAG surrogate models can be used in various MBD tools without requiring tool-specific interfaces.

POWERSYS

N-T Curve and Efficiency Map Calculation Considering Field Coil Temperature Constraints

- Calculate N-T curve and efficiency map of wound-field synchronous motor considering short-time operating conditions.



Fixed temperature (60 deg C)

Continuous rating with temperature limit (180 deg C)

Short time rating with temperature limit (180 deg C)

N-T and Efficiency Map Calculation Considering Temperature Constraints

Wound-Field Synchronous Motor performance is limited by armature and field coil temperatures. Coil temperature limit is 180 deg C. The maximum torque is highest under fixed temperature, followed by short-time and continuous ratings. This enables evaluation of temperature-dependent operation range.

POWERSYS

THANK YOU

Your contact team

POWERSYS

POWERSYS