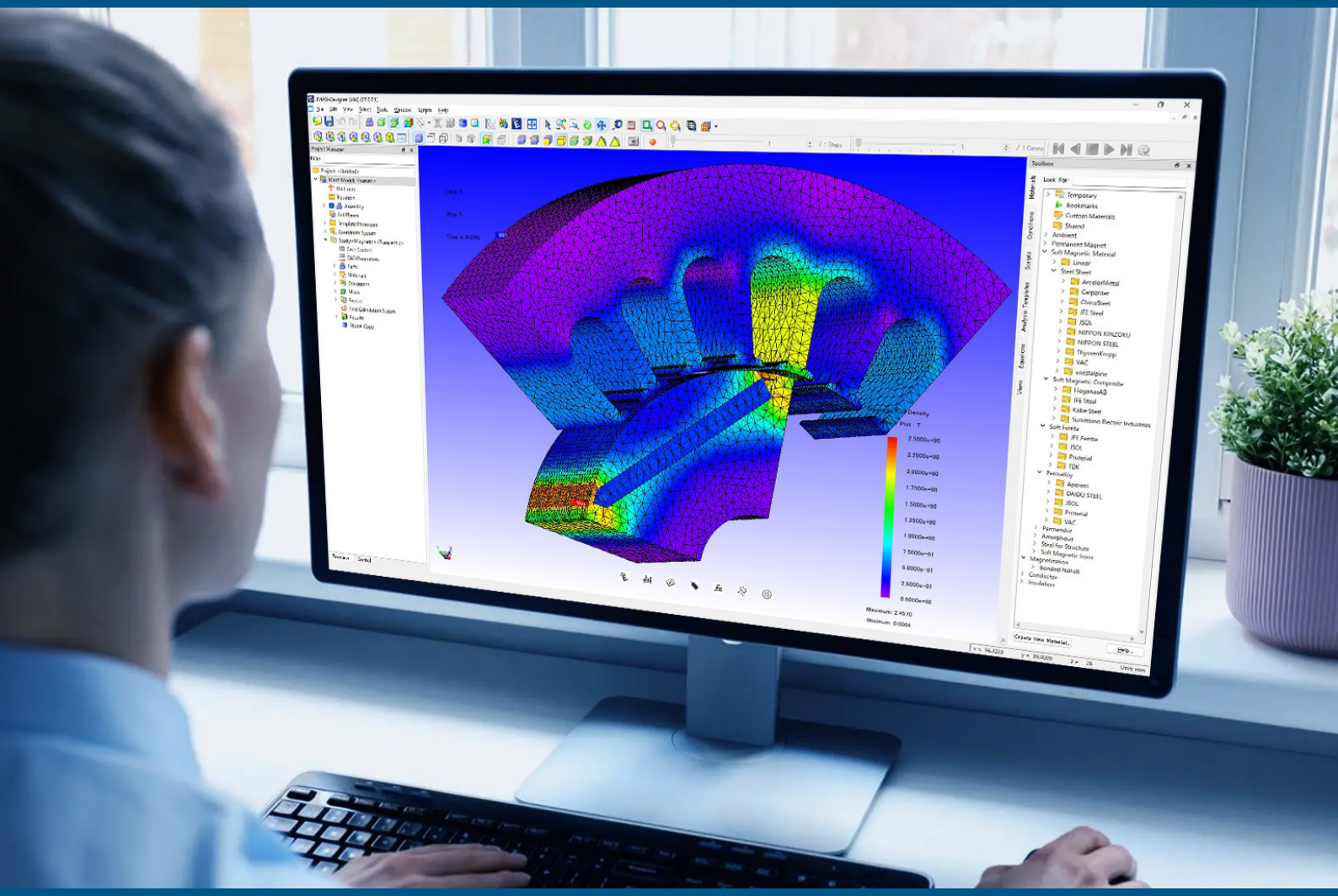
JMAG CASE STUDY

How JSOL Achieved a Decade of Software Development Gains in JMAG with Integrated SDKs



Market
CAE

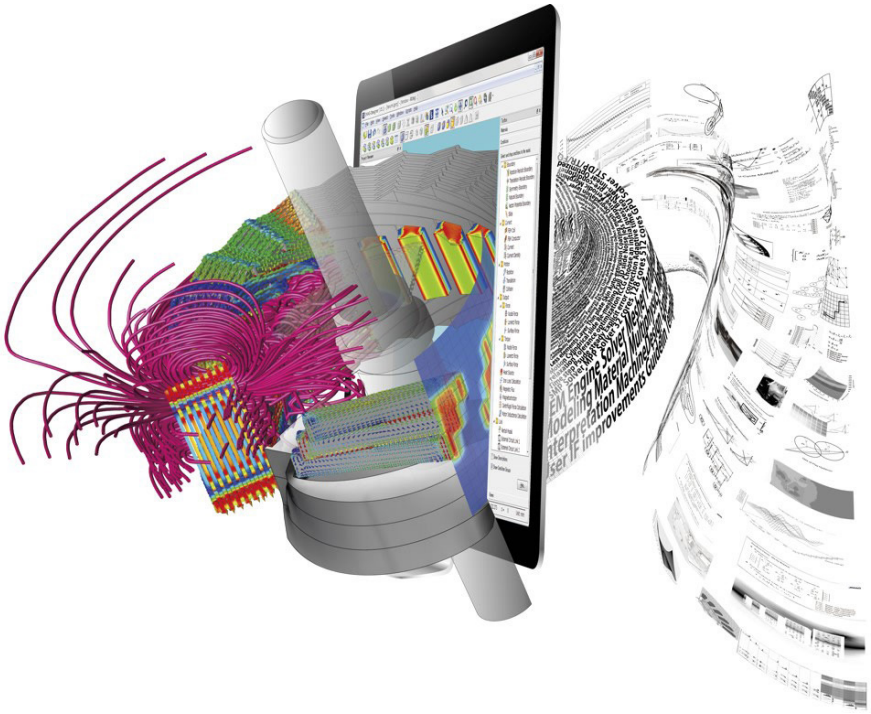
Product & Services
3D ACIS Modeler,
3D InterOp, HOOPS Visualize,
3D ACIS Defeaturing

Electromagnetic Field Analysis Software – JMAG Solidifies Value Proposition through Spatial's comprehensive 3D geometry processing technologies

JMAG, a simulation software for electromechanical design developed by JSOL CORPORATION, required 3D geometry handling, reliable CAD import across multiple formats, interactive operations, and defeaturing capabilities for analysis.

SUMMARY

The integration of Spatial's Software Development Kits (SDKs) enabled JSOL to reduce software development time significantly, and the functionality provided became a vital component that underpins the value of JMAG.



THE COMPANY

JSOL CORPORATION was established in 2006 as a spin-off from the Japan Research Institute, and celebrates its 20th anniversary in 2026. Its origins trace back to Japan Information Service Co., Ltd., founded in 1969 as an affiliate of Sumitomo Bank, which later evolved into the Japan Research Institute. Since 2009, JSOL has been jointly owned by NTT DATA and the Japan Research Institute, and operates in both IT and CAE fields. One of its flagship solutions is the electromagnetic field analysis software **JMAG.**

JSOL's electromagnetic field analysis software, JMAG, integrates engineering knowledge with advanced simulation technologies to accelerate development and improve performance in the design of electric devices such as motors and transformers. Particularly in the automotive industry, where improving efficiency, cost, and performance are critical, JMAG provides robust support for entire development process from initial design to final product commercialization, earning high trust from manufacturers both in Japan and abroad.

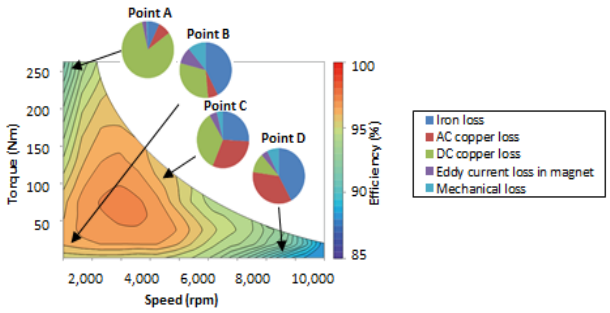
> "One of the greatest advantages lies in the seamless integration of components for data conversion and visualization, centered around 3D ACIS Modeler. From the perspective of software development and maintenance, it is also highly beneficial that all necessary components can be sourced from a single provider—Spatial Corp."
>
> ~ Mr. Yuya Yamashita, IT Professional(CAE), JSOL CORPORATION JMAG Business Company

JMAG: Electromagnetic Field Analysis Software

JMAG is a CAE software that is focused on electromagnetic field analysis, supporting the multi-disciplinary design and optimization of electrical devices, including motors, actuators, and transformers. It features an internal geometry modeling tool, allowing users to create and edit 2D and 3D shapes directly within JMAG without relying on external CAD software. This enables flexible parametric design and optimization.

JMAG supports importing various CAD formats such as DXF, STEP, and IGES, allowing existing design data to be seamlessly utilized for analysis. The software offers a wide range of analysis capabilities, including static magnetic fields, transient response, frequency response, topology optimization, and coupled thermal-structural analysis, enabling highly accurate simulation of realistic operating environments.

Additional features include output tools such as efficiency maps and torque waveforms, as well as integration with circuit simulators through JMAG-RT, enabling seamless collaboration with control design processes. Automation through scripting and batch processing, combined with distributed computing for enhanced speed, allows users to execute the entire workflow—from design to analysis and optimization—in a unified and efficient environment.



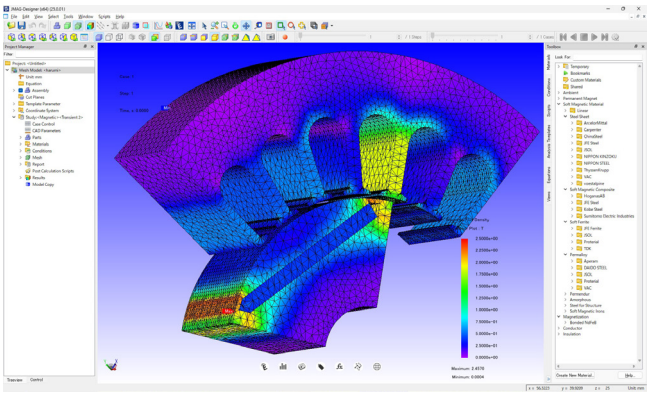
Efficiency map during prototype and verification stages

JMAG's competitive edge lies in its highly accurate electromagnetic field analysis capabilities and its integrated CAE environment that enables a seamless workflow from design to optimization. JMAG provides a well-balanced simulation environment, offering speed, accuracy, flexibility, and scalability, which helps strengthen competitiveness in product development.

CHALLENGE

Internal Development Effort for Supporting 3D Geometry Handling Pulls Time and Focus from Core Competencies

JMAG faced the challenge of determining how much internal development effort should be devoted to supporting 3D geometry handling. As JMAG is a CAE simulation software specializing in electromagnetic field analysis—and 3D CAD-based design has become mainstream—enhancing 3D modeling capabilities was essential. However, building a complete geometric processing infrastructure in-house was not feasible, and the adoption of reliable and scalable third-party libraries became necessary.



JMAG-Designer

Additionally, JMAG users utilize a wide range of CAD software. This diversity required JMAG to support the reliable import of CAD data across multiple formats. 3D InterOp, a robust translator was essential, especially as CAD systems are updated annually, which imposes continuous development burdens.

JMAG adopted Spatial's 3D geometry engine, 3D ACIS Modeler, in the early 2000's. At the time, integration between 3D CAD and CAE was not common, and 2D analysis was still dominant in electromagnetic field simulation. However, the JMAG development team foresaw the need for high-precision simulations using 3D models and began laying the foundation early on.

Once the use of 3D ACIS Modeler to leverage 3D models for CAE workflows was well established, the gap between design-oriented CAD models and CAE-ready geometries became increasingly apparent:

- **Design models** replicate real product geometry in fine detail
- **CAE models** must exclude minor features that do not affect analysis results, as they increase simulation time and resource consumption – this is allowed by 3D ACIS defeaturing

This mismatch posed a significant hurdle for users—especially when design and simulation are handled by different teams—since simplifying geometries for CAE use often required tedious back-and-forth with the design department.

> "Beyond the value of the Spatial components themselves, the continued, attentive, and timely local support has contributed greatly to the trusted relationship we've built over the past 20 years."
>
> ~ Mr. Yuya Yamashita, IT Professional(CAE), JSOL CORPORATION JMAG Business Company

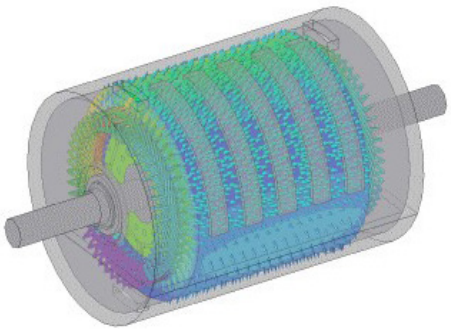
> "The greatest value of the Spatial SDKs lies in having established a development framework that allows us to focus on enhancing JMAG's core value. As a result, JMAG's simulation engine has evolved to a level that significantly surpasses its competitors in terms of processing performance."
>
> ~ Mr. Yuya Yamashita, IT Professional (CAE), JSOL CORPORATION JMAG Business Company

SOLUTION

Integrated Software Development Kits Provide Benefits to both Developers and End Users

JMAG's core strength lies in its simulation technology, which focuses on electromagnetic field analysis. To accurately handle complex 3D geometries, a reliable geometry engine was essential. 3D ACIS Modeler, 3D InterOp, and HOOPS Visualize fulfilled these requirements with their robust kernels, interoperability for wide range of 3D CAD formats, and flexible scalability, making them ideal for JMAG's integrated design and analysis environment.

Thanks to these integrations, JMAG development team could focus on advancing simulation technologies without being hindered by the foundation of 3D modeling. This has enabled JMAG to deliver unique value of integrated environment for design and analysis, through features such as CAD-less design, topology optimization, coupled thermal-structural analysis, and integration with MATLAB/Simulink. As a result, users experience tangible benefits such as shorter design cycles, fewer prototypes, and improved product performance.



Thermal Analysis for Motor Design

3D ACIS Modeler within JMAG provides the following functionality:

- **Brep Structured Data:** The foundation for precise 3D geometry definition and processing
- **Sweep Operations:** Extrusion, rotation, etc.
- **Boolean Operations:** Union, subtraction, intersection
- **Fillet Creation:** Edge rounding
- **Imprint Function:** Essential for generating contact surfaces required in electromagnetic field analysis; crucial for maintaining mesh consistency between different components

3D InterOp within JMAG provides the following functionality:

- **Supports high-precision** import of a wide range of 3D CAD formats, always updated to the latest versions.
- **PersistentID:** In CAE simulation, engineers must test a large number of geometry variations. Applying separate settings for each variation is impractical. PersistentID retrieved via InterOp allows reuse of CAE settings across different geometries, significantly reducing configuration effort during design studies.

HOOPS Visualize within JMAG provides the following functionality:

- **Scene Graph:** HOOPS's graphical data structure enables easy interactive operations such as selecting, displaying, and hiding complex model structures.
- **Rendering Engines:** Seamless switching between multiple engines such as OpenGL and DirectX. Flexible support for diverse graphics cards enables stable rendering environment.

At the time HOOPS Visualize was introduced, a wide variety of graphics cards were available from numerous manufacturers, and driver updates occurred frequently. In such a rapidly changing environment, developing and maintaining a proprietary rendering engine was extremely challenging.

To address this, JMAG adopted HOOPS Visualize as a standardized rendering layer. This allowed the software to ensure compatibility with various graphics cards and minimize the impact of driver-related issues, resulting in a more stable and reliable rendering environment.

3D ACIS Defeaturing functions within JMAG include:

- **Fillet Removal**
- **Hole Removal**
- **Allows users to make necessary geometry changes** for simulation without reverting to CAD or relying on the design department.

Through the adoption of 3D ACIS Modeler, 3D InterOp, and HOOPS Visualize, JMAG was able to significantly reduce the development workloads associated with 3D geometry infrastructure, focusing on its core strength—simulation technology.

This led to several key achievements:

- Realization of high-precision 3D electromagnetic field analysis
- Establishment of simulation environment without reliance on external CAD tools
- Seamless workflow from modeling to analysis
- Stable mesh generation and maintained accuracy even for complex geometries

KEY INSIGHTS

ONE STOP 3D SDK PROVIDER - ACCELERATING JMAG DEVELOPMENT BY UP TO 10 YEARS

Spatial provides a one-stop solution for the SDKs required for 3D geometry processing, which has significantly improved the development efficiency of JMAG. As a result, it has been evaluated that the development period could be shortened by approximately 5 to 10 years compared to in-house development. Furthermore, many functions made possible directly through Spatial SDKs have become vital components that underpin the value of JMAG.

Local Expertise and Continuous Post-Implementation Services is part of recipe for development success

Having Japanese engineers as the primary point of contact enables seamless communication without time zone constraints. The face-to-face meetings and the presence of a dedicated local support system offer trust, ensuring reliable and continuous support even after implementation.

Foundational SDKs Illuminate the Future of JMAG

In future product development for JMAG, the JSOL team aims to accelerate the design process by incorporating simulation, utilizing not only geometric information from CAD but also design details such as dimensional constraints and various feature parameters. Additionally, by seamlessly integrating design proposals generated in JMAG with the CAD environment, JSOL aims to enhance the entire workflow—from electrical device design through to manufacturing—making it more efficient.

About Spatial Corp

Spatial Corp, a Dassault Systèmes subsidiary, is the leading provider of 3D software development toolkits for technical applications across a broad range of industries. Spatial **3D modeling**, **3D visualization**, **3D meshing** and **CAD translation software development toolkits** help application developers deliver market-leading products, maintain focus on core competencies, and reduce time-to-market. For over 35 years, Spatial's 3D software development toolkits have been adopted by many of the world's most recognized software developers, manufacturers, research institutes, and universities. Headquartered in Broomfield, Colorado, Spatial has offices in the USA, France, Germany, Japan, China, and the United Kingdom. For more information on Spatial's latest updates and product offerings, please visit **www.spatial.com.**

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