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# Electrifying efficiency

## New partnership sees ArcelorMittal electrical steels included in world's most advanced modelling tool

**As one of the world's leading suppliers of electrical steels, ArcelorMittal has recently partnered with JMAG – a very advanced software modelling tool for electrical machines developed by Japan's JSOL Corporation. The partnership will ensure machine manufacturers have access to the latest data on ArcelorMittal's fully processed electrical steels, enabling them to create more efficient and compact motors.**

Demand for highly efficient electrical motors is growing rapidly. The main drivers behind this growth are increased demand for electric vehicles and new regulations on machine efficiency. To achieve these targets, a complete redesign of electrical machines is necessary. This includes new geometries, new materials, and new types of machine.

### ArcelorMittal data available for simulations

In the past, new electrical machines were developed using a series of mathematical calculations which were proven by prototyping. The higher the precision of the calculations, the fewer prototypes were needed to achieve the final design.

The JMAG suite of software facilitates these calculations and reduces the number of prototypes required. "Advanced material information enables our customers to make successful and accurate simulations, but

it is not always easy for them to obtain the latest data," notes Yusaku Suzuki, marketing manager at JMAG. "Now all manufacturers can access the ArcelorMittal information they need and use it to perform simulations."

JMAG selected ArcelorMittal as a partner due to our advanced research work, especially in modelling finite elements analysis. "ArcelorMittal's geographical presence is also important for us, especially in the development of electrical vehicles," explains Dr Yamada, product leader for JMAG. "ArcelorMittal's electrical steels are primarily produced in Europe, where electric vehicle development is proceeding very quickly. Through our partnership, JMAG can offer the most advanced and accurate level of simulation for hybrid and fully electric vehicles."

JMAG includes many modules and features which allow designers to analyse the

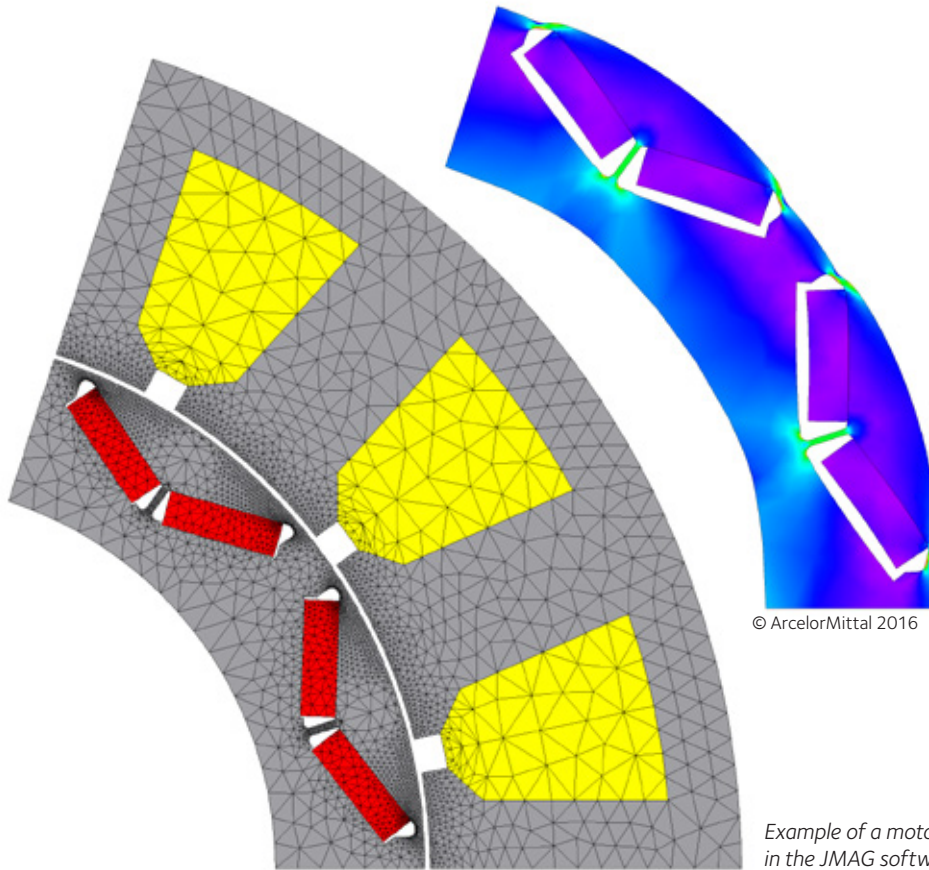
electromagnetic, thermal, and mechanical aspects of machines. This allows manufacturers to create compact machines with higher power density.

Data on magnetic and electrical fields, stress distribution, vibration, and a range of other criteria can be analysed. "You can even integrate the control mechanisms required to drive the machine into the JMAG modelling tool. Using other software, this step has to be done manually," explains Sigrid Jacobs, electrical steels portfolio director for ArcelorMittal Global R&D.

### Collaboration announced at CWIEME

The collaboration between ArcelorMittal and JMAG was announced at the CWIEME coil winding expo held in Berlin during May 2016. ArcelorMittal's booth featured posters showing calculation examples, and the beneficial effect of ArcelorMittal's electrical steels on machine efficiency. During a conference presentation, JMAG also unveiled its latest technical assistance for electrical machine modelling.

"JMAG provides very advanced technical assistance for modelling," notes Sigrid Jacobs. "It can simulate both the magnetic and



Improved mechanical stress calculations in JMAG allow designers to create smaller electrical machines

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Example of a motor model created in the JMAG software

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mechanical behaviour of an electrical steel in a machine. But it can also account for the effects of manufacturing on the electrical steel. That way the OEM knows how the real machine will behave during use."

### Fostering communication

Information on ArcelorMittal's fully processed electrical steels was added to JMAG on 1 May 2016. "Customers with a JMAG licence can access this information now," notes Sigrid Jacobs. "They can then contact us for additional information or support."

Dr Yamada believes this will foster communication between machine engineers and ArcelorMittal's R&D specialists: "JMAG creates a community of users who have a lot of ideas for improving electrical machines. We recommend our customers make direct contact with ArcelorMittal to discuss these concepts."

### Non-oriented (NO) offer

ArcelorMittal's non-oriented fully processed electrical steels have guaranteed magnetic properties which meet or exceed the requirements of EN 10106:2015. We also offer a fully processed high frequency grade with guaranteed magnetic properties in accordance with EN 10303:2015. This norm defines standards for thin electrical steels used at frequencies above 100 Hz.

ArcelorMittal's complete NO offer includes low alloy grades which have excellent magnetic permeability, thermal conductivity, and punchability. We also offer alloyed grades with very low losses, even at higher frequencies. A wide range of coatings are available, allowing manufacturers to enhance punchability, reduce inter-laminar losses, and improve corrosion protection.

### iCARE® electrical steels for mobility

While JMAG now includes details of ArcelorMittal's fully processed grades, our range of electrical steels is far more extensive.

iCARE® is ArcelorMittal's dedicated range of electrical steels for mobility solutions. Produced at ArcelorMittal Saint-Chély d'Apcher (France), the range includes:

- iCARE® Save: steels with very low losses.
- iCARE® Torque: steels with high permeability.
- iCARE® Speed: steels for high-speed rotors.

ArcelorMittal is already working with OEMs on the second generation of iCARE® grades which are tailor-made to meet OEM requirements. Many of these new electrical steels will start to appear in production vehicles around the end of the decade. ArcelorMittal will add the most promising solutions to our catalogue of electrical steels in the near future, enabling OEMs to develop the next generation of highly efficient electrical mobility solutions.

### More info:

[automotive.arcelormittal.com/icare](http://automotive.arcelormittal.com/icare)

### More info:

[jmag-international.com](http://jmag-international.com)

### More info:

[industry.arcelormittal.com/electricalsteels](http://industry.arcelormittal.com/electricalsteels)