INTEGRATED ENGINEERING SOFTWARE

German scientific institute uses simulation software for range of testing

IFW Dresden, a Scientific Institute based in Dresden that focuses on solid state physics and materials science research, has been using INTEGRATED Engineering Software's AMPERES modeling software for advancing some major projects it is working on.

Formally known as The Leibniz Institute for Solid State and Materials Research Dresden, IFW Dresden is a non-university research institute. It is concerned with modern materials science and combines explorative research in physics, chemistry and materials science with technological development of new materials and products. Its main research program is focused on functional materials which hold a key position in many fields of application: superconducting and magnetic materials, thin film systems and nanostructures as well as crystalline and amorphous materials.

The Institute has been using INTEGRATED Engineering Software's 3D simulation program AMPERES for over five years now and initially acquired the software specifically to aid in the calculation of superconducting magnetic bearings and its applicability for superconduction trains. Using the software for three dimensional simulations, the stray field distribution above the magnetic track is optimised so that levitation forces are maximized acting on the superconducting vehicle. AMPERES is also used for testing both the magnetic switch for optimal use and the calculation of forces that act between the magnetic blocks which are used to build up the magnetic track. IFW has been so pleased with the results using the software that in 2009 they invested in the revised version and it is now used by many teams in the Institute.

IFW Dresden also promotes the work of young scientists and the training of technical staff and one area that the trainees are working on with AMPERES 3D modelling is the Magnetic Force Microscope (MFM). The software is used to calculate the stray field distributions of very tiny magnetic tips with different distances away from the tip, performing quantitative MFM.

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Until now it has only been possible to take qualitative images but with the aid of these simulations they are able to work towards quantative evaluation of the measured signals. In particular they are modelling pyramidal shaped MFM tips and calculating their stray field distributions.

The AMPERES modeling software is also used for work on a magneto optical microscope. For this it is essential to test and optimize the stray field geometry of in-plane magnets to create the best values of strength and homogentity of magnetic fields in order to study the behaviour of magnetic domains in magnetic fields.

The team working on the Electro Chemistry project, where the corrosion process of magnetic material is under investigation, also used AMPERES. Magnetic fields can affect electro chemical corrosion in aqueous electrolytes and they normally localize and enhance the corrosion process. During the corrosion process of ferromagnetic metals the geometry parameters and the resulting flux density distribution in front of the electrodes can be important. So the team needs to simulate the strength the magnetic forces induced and, therefore, establish how they influence the corrosion process. They simulate the whole experimental set up, optimize it, and achieve high gradients of flux density or, in other cases, to avoid it.

IFW Dresden was founded in 1992, originally part of one of the largest and well renowned materials science centres in the former GDR. It employs about 400 people, among them 190 scientists, mostly physicists, chemists and materials engineers. 80 of them are young scientists working in the IFW on their doctoral thesis. About 100 guest scientists from all over the world come every year to work at the IFW.