



CASE STUDY /

Ansys + Grundfos

“Our company has a 50-year experience with motor design simulation for our applications and we have more than 5,000 designs in our database. We have developed simulation tools internally and with external partners, all of it based on analytical calculations. However, these tools have their limitations, especially when multiphysics simulation like EM, thermal, and mechanical are required for new development. Therefore, we are pleased with Ansys Motor-CAD and how easy it is to transfer our existing designs into the software. In Motor-CAD, we can also add new simulations, such as simulations that require FEA, but still maintain the knowledge we have built through our many years of experience with motor design and production within the new setup.”

Keld Folsach Rasmussen
Chief Engineer / Grundfos Holding A/S

/ Challenges

Like many longstanding industrial companies, historically, Grundfos relied upon internally developed toolsets for electric machine design, which include customized code bases, legacy tools, and various third parties. Additionally, in-house analytical tools are usually dedicated to specific motor topologies. This means that third-party finite elements analysis (FEA) simulation tools are needed to calibrate analytical results and parametrize geometries, which typically requires a large amount of scripting.

/ Engineering Solution

By implementing Ansys Motor-CAD, Ansys Maxwell, and Ansys optiSLang, Grundfos streamlined their electric machine design process and accelerated development. With Motor-CAD, Grundfos simplified the FEA process with parametrized geometry templates and motor-specific analysis and outputs. Specifically, Motor-CAD's multicore functionality for analysis across the motor's full operating range in the torque-speed plane drastically accelerated FEA and minimized the need for manual scripting. Additionally, Motor-CAD's thermal and mechanical modules enabled a seamless integration and workflow with EM and provided critical insights earlier in the design and development processes. To maximize the new Motor-CAD workflow even more, Grundfos applied optiSLang to integrate optimization algorithms to high-fidelity simulations and Maxwell to create full 3D FEAs.

/ Benefits

- Enabled Grundfos to predict the acceptable level of demagnetization of permanent magnet motors, without sacrificing their robustness and reliability.
- Reduced motor development cost and time to market by allowing Grundfos to uncover and avoid over-engineered motor designs, as well as to improve their simulation capabilities.
- Empowered the engineering design team to perform optimization of the interior permanent magnet (IPM) motors and combine mechanical and electromagnetic considerations, which was difficult to achieve in the past five decades of the company history of motor simulations.
- Contributed to an increase in team collaboration between the mechanical and electrical (power electronics) teams. Other teams that have benefited from the use of Motor-CAD include fluid, electromagnetic, and thermal engineering.



Grundfos single-stage, in-line pump for use in heating, cooling, industrial processes, water supply, and more.



Grundfos MGE, standard motor with integrated frequency converter with rated energy efficiency IE5 level.

/ Company Description

Based in Denmark, **Grundfos** is one of the largest water pump manufacturers in the world. In addition to manufacturing pump units, including circulator, submersible, and centrifugal pumps, **Grundfos** develops electric motors for pumps and separate merchandising as well as electronics for pump controls and other systems. **Grundfos** is driven to pioneer solutions to the world's water and climate challenges and improve quality of life for people.



Grundfos ALPHA, high efficiency variable speed circulation pump.

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