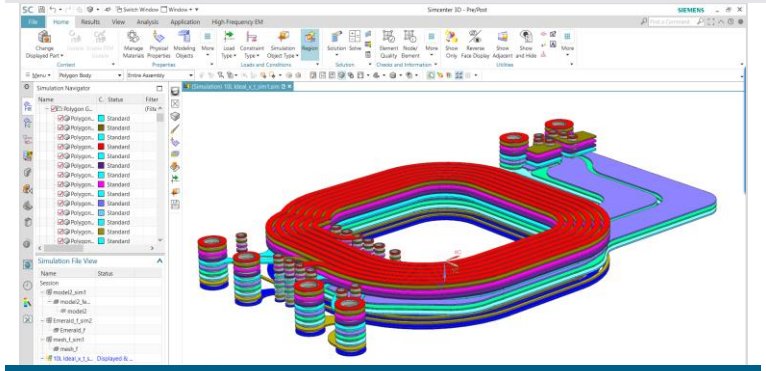
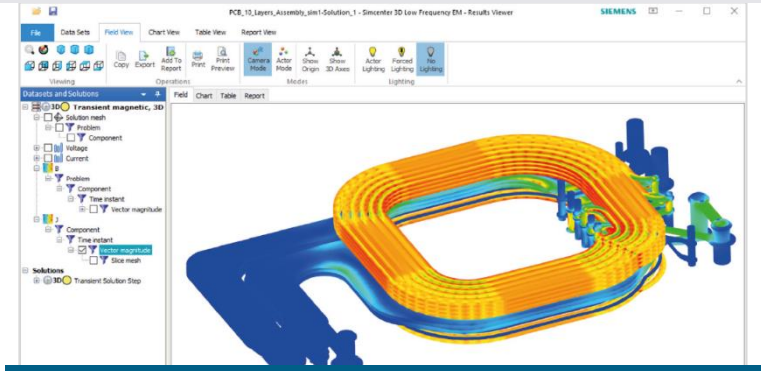
SALCOMP
Designing Planar Transformers with Simcenter 3D for Electromagnetics

- Optimize the transformer design
- Saved at least one prototype round, which is one month of development time
- Determine where material is being overused to save costs and reduce weight

Significantly reduce the development time with Simcenter 3D for Electromagnetics



Current Density Distribution in the Windings



Detailed Planar Transformer CAD Model

- Advanced electromagnetics simulation solution for low and high frequency issues of complex geometry imported from Altium ECAD
- Develop planar magnetics transformation process for design and development of chargers
- Succesful benchmark over Ansys Maxwell

"With accurate simulation results, like those we get from Simcenter 3D Electromagnetics, you can reduce the number of design experiments to get to the planar transformer parameters you need." Lauri Puranen, Magnetics Manager

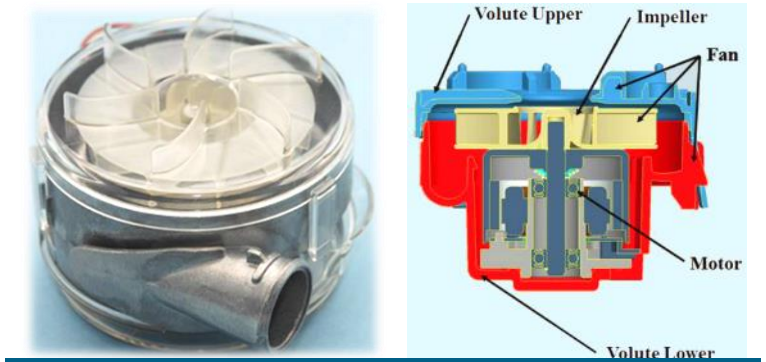
SIEMENS

ResMed

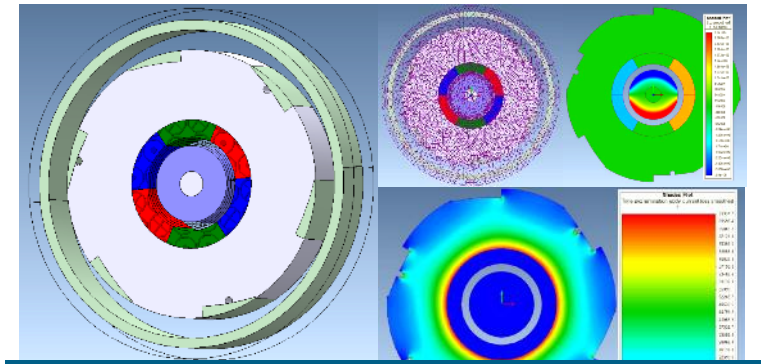
Simcenter MAGNET key in designing efficient variable speed blowers in respiratory medical devices

- Maximize efficiency and torque constant
- Minimize the phase current
- Reduced torque ripple
- Determining the variable speed operation range

Simcenter MAGNET helps ResMed design portable compact respiratory devices



Motor-blower fan configuration



Motor in Simcenter MAGNET for loss anals

- Transient motor analysis including a 6-step inverter drive for a blower fan was done in Simcenter MAGNET to estimate the optimum firing angle(s) that minimized current, torque ripple and losses, while maximizing efficiency and torque constant.

"Simcenter MAGNET allow us to accurately estimate the efficiency of small high speed motors due to higher operating speeds (frequencies), and drive switching effects. Hence, we are able to design compact portable respiratory devices with extended battery life than before."

Aleksandr Nagorny, ResMed Motor Technologies

SIEMENS

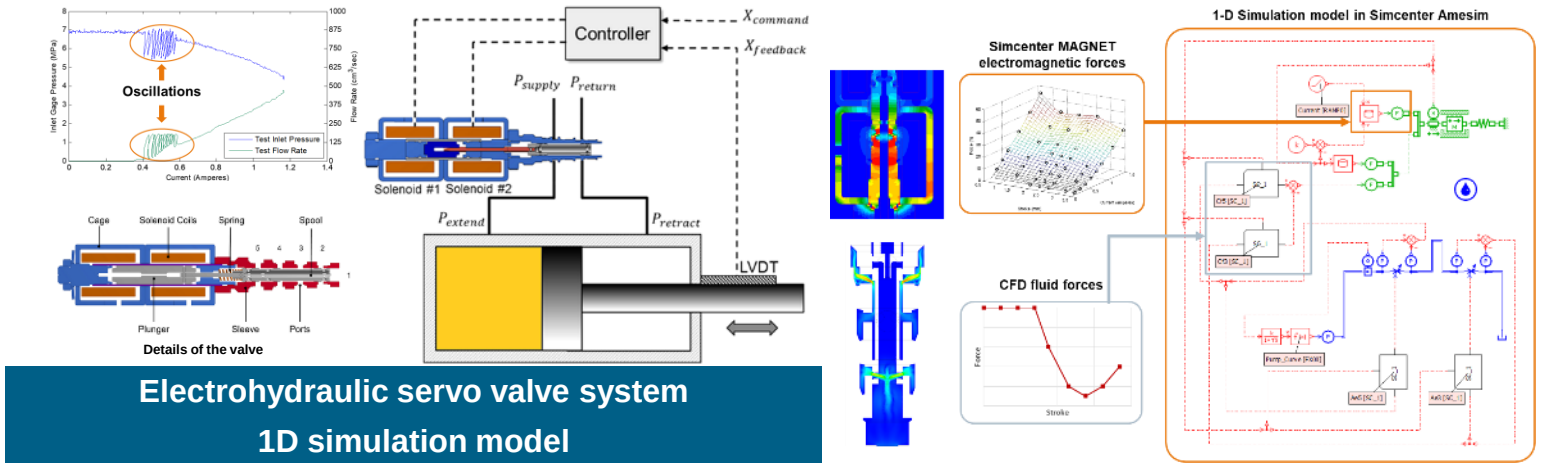
Parker Hannifin Corp., Aerospace

Simcenter MAGNET and Amesim instrumental in suppressing oscillations in flight control valves

During the test of an EHSV hydraulic valve, oscillations were observed. To be effective in their suppression, the developed dynamic 1D model had to:

- include all the physics,
- be fast for “what if analysis”, and
- accurate.

Simcenter solutions used in the detection and suppression of oscillations in an electrohydraulic servo valve (EHSV)



Electrohydraulic servo valve system 1D simulation model

- The solenoid’s EMAG force map was generated as a function of stroke and current in Simcenter MAGNET. The dynamic 1D model was implemented in Simcenter Amesim to detect the oscillations, which were suppressed by modifying the valve body (spool).

“Without the accuracy of Simcenter MAGNET in computing electromagnetic forces, it would have been difficult to develop a dynamic 1D model. To be of use on the detection and suppression of valve oscillations, the model had to be able to detect minute changes on the force balance on the valve.”

Ashok Zopey, Sr. Principal Engineer, Parker Hannifin Corp.

SIEMENS

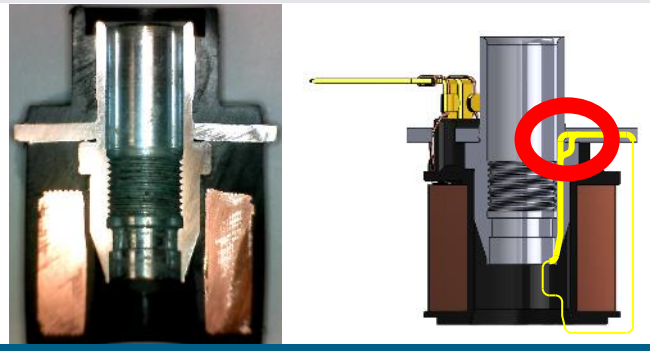
Standard Motor Products (SMP)

Simcenter MAGNET digital twin reveals the source of the subpar performance of an engine airflow control valve

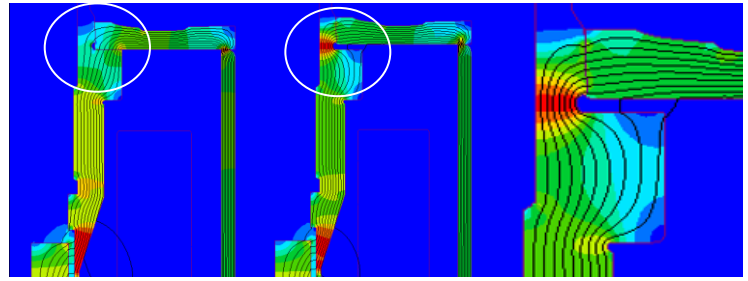
Performance lab testing revealed the valve had a lower force than expected

- The solenoid cap was not contacting the pole as designed
- This introduced a small gap
- The effect of the small gap on performance was initially dismissed

Simcenter MAGNET key in troubleshooting an airflow control valve



Cross section view and the expected path of the magnetic flux



Magnetic flux paths: (a) as designed, (2) with a gap, and (3) zoomed-in gap area

- The solenoid valve was analysed in Simcenter MAGNET as designed (no gap), and as supplied (0.38 mm gap) to determine the cause of the incorrect coil current. The flux density distribution around the cap region was important in locating the source of the poor performance.

"Simcenter MAGNET gave us insight in what was causing the lower force of the solenoid valve system, that could not be inferred from tests. This shows the complimentary nature of digital twins, which is invaluable in product performance evaluation to meet the design targets."

David Huryat, Standard Motor Products

SIEMENS

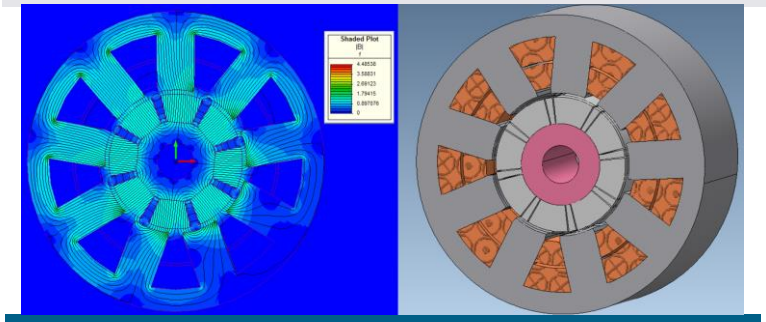
Project Beyond, University of Sherbrooke, QC, CANADA

The vehicle's light & efficient motor delivers victory at the Shell Eco-marathon Americas 2016

The Beyond Team designed the winning vehicle of the 2016 Shell Eco-marathon.

It was propelled by a light and efficient motor, designed in Simcenter MAGNET.

Simcenter MAGNET contributes to the lightweighting of an EV powertrain



Motor model in Simcenter MAGNET

Motor Prototype

- Searching for an efficient and lightweight motor design was automated by parameterizing the motor model in Simcenter MAGNET. Hence, there was no need to pre-process different configurations, which made the design exploration fast.

"The parametric capability of Simcenter MAGNET allowed the automation of the motor design exploration process, which resulted in a light, efficient and reliable design."

Raphael De Roy, Electrical Engineering Department, University of Sherbrooke

SIEMENS

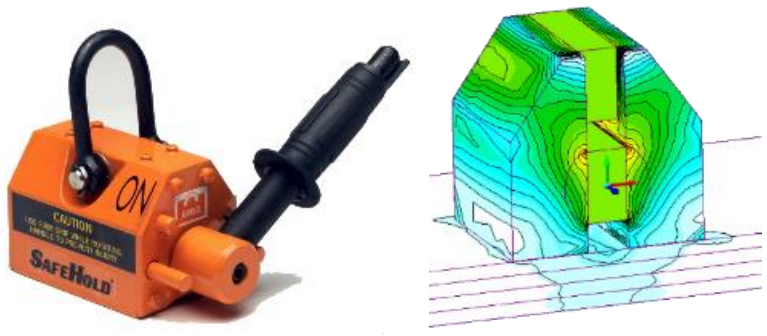
ERIEZ

Simcenter MAGNET shortens the payback period of a separator with improved recovery

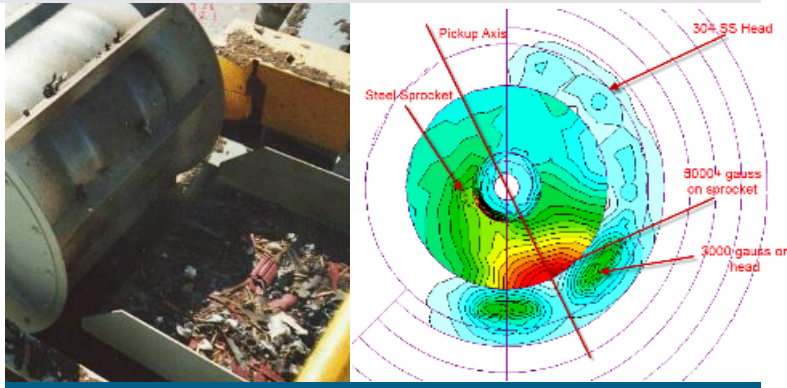
The new P-Rex separator design:

- Shortened the payback period (< 6 months)
- Reduced the drive chain wear
- Improved metal recovery
- Improve drum utilization
- Minimized the drum's eddy–current heating

Over 25 years of separator design using Simcenter MAGNET



Switchable lifting magnet



P-Rex separator, and its field analysis

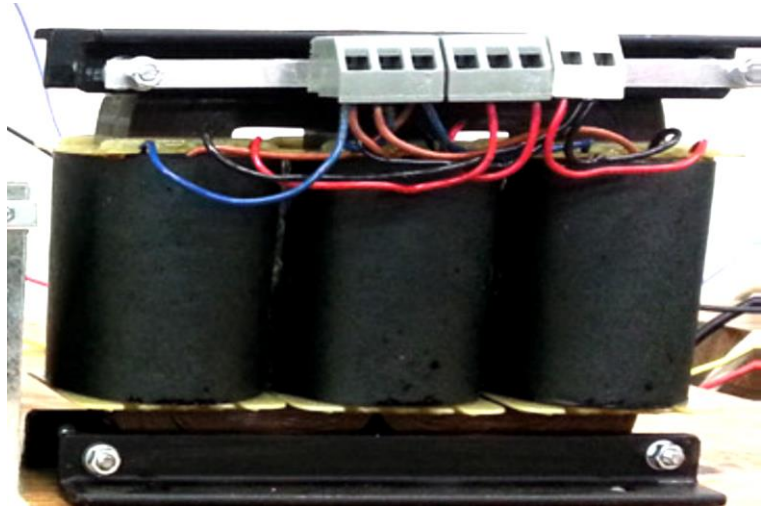
- The field analysis of the P-Rex separator in Simcenter MAGNET, allowed the elimination of the dead and drop zones, which improved material recovery. Higher separation efficiency (higher fields), resulted in heating of the drum; necessitating accurate eddy-current field analysis.

"The field analysis of the P-Rex separator in Simcenter MAGNET, resulted in a new design with improved recovery, and shorter payback period of less than six months."

Mike Ross, Eriez

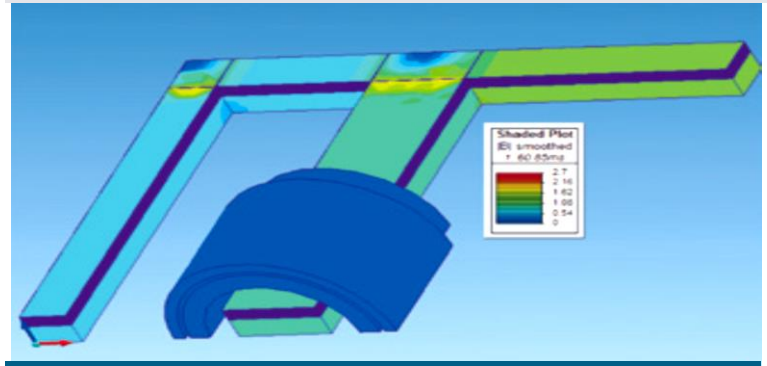
SIEMENS

University of Cape Town
Avoiding the next major power black-out with Simcenter MAGNET

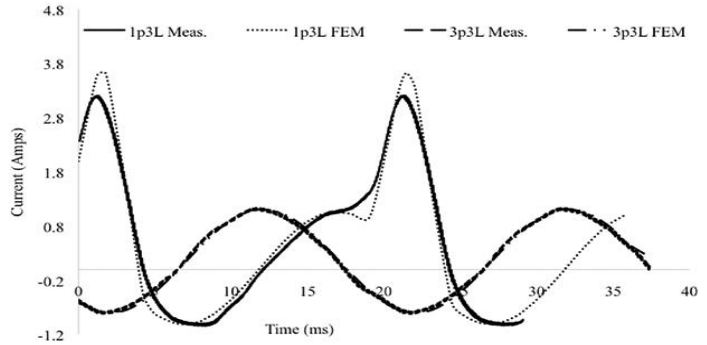


- Validated an improved GIC calculation approach that includes time response of power transformers
- Found the importance of including details in the transformer core joints for better representation of the practical transformers

Simulating geomagnetically induced currents (GICs) in transformers in Simcenter MAGNET



Flux distribution simulation with excitation



Primary current wave form test vs simulation

- This approach with Simcenter MAGENT allows for better modelling of the stray flux when designing for geomagnetically induced currents under both AC-DC excitation

"The combination of practical testing guided by the preliminary FEM simulations yielded some important results regarding the flux distribution under simultaneous AC-DC excitation."

Hilary Chisepo PhD (Eng) Candidate, University of Cape Town, South Africa

SIEMENS