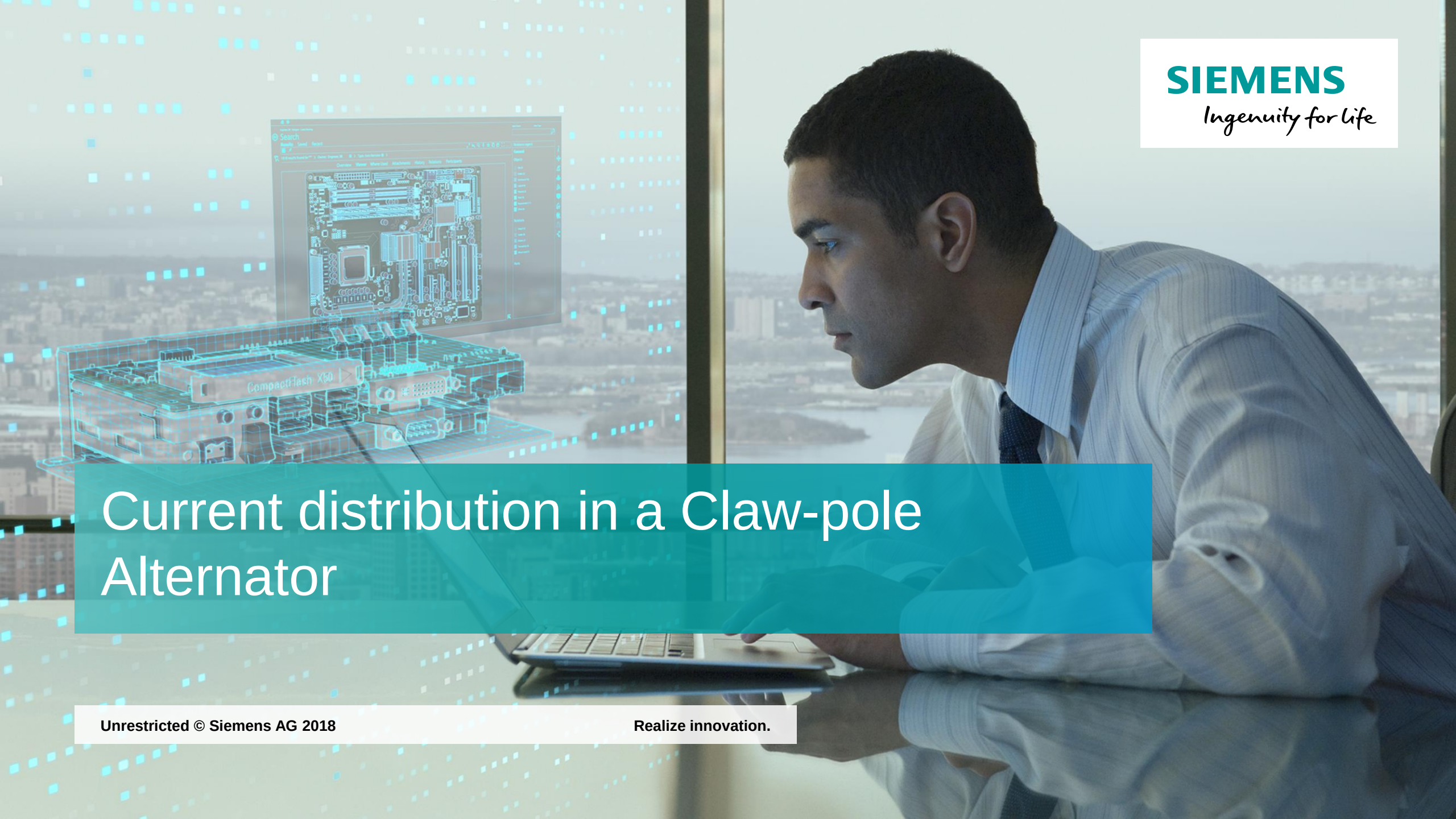
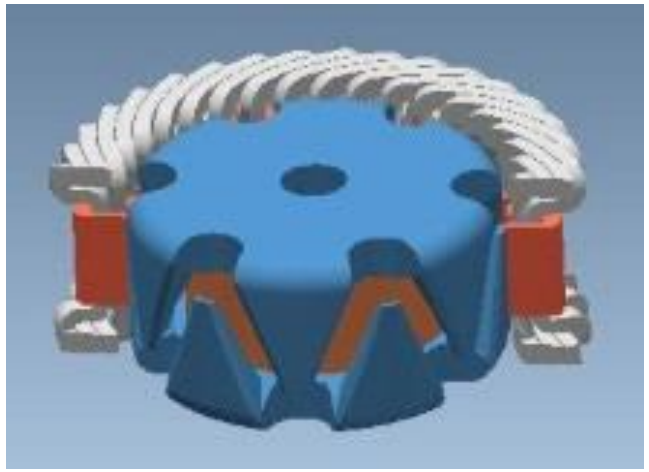


Current distribution in a Claw-pole Alternator

Current distribution in a Claw-pole Alternator

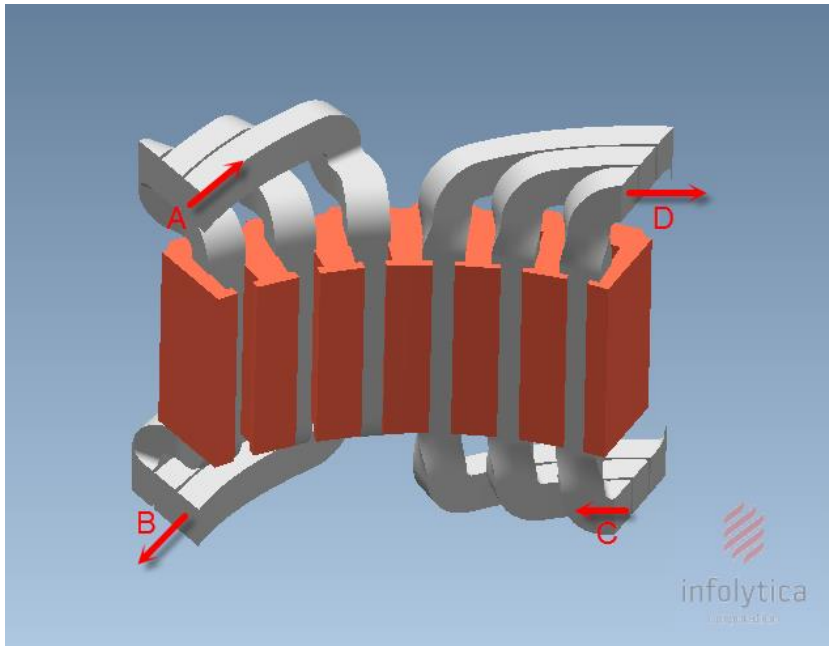
SIEMENS
Ingenuity for life



The device is a claw-pole automobile alternator with a three-phase output winding on the stator. A field coil around the rotor core is used to induce flux in the output windings as the rotor spins.

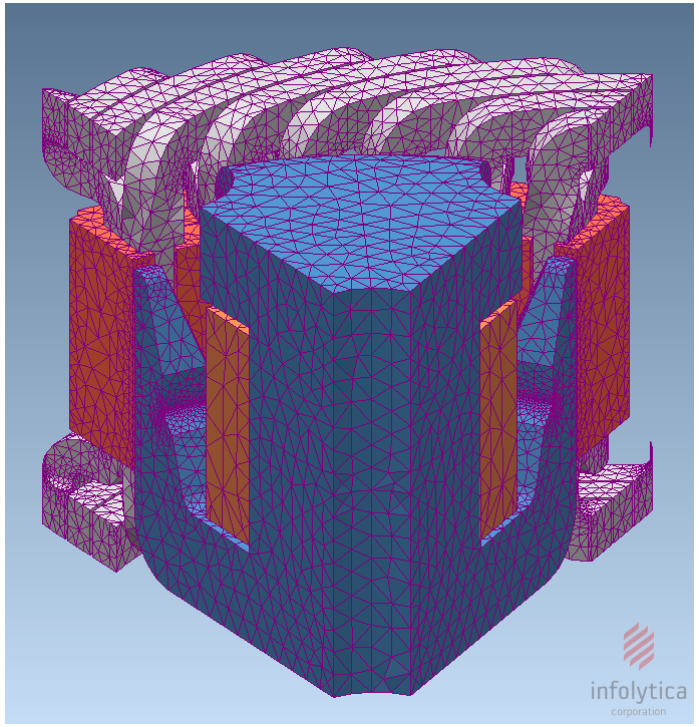
The full model is shown here, however for simulation purposes, two symmetry planes are matched with an even periodic boundary condition. The Simcenter MAGNET 3D analysis model consists of a 60 degree section comprising one rotor pole pitch pair.

STATOR WINDINGS OF THE CLAW-POLE ALTERNATOR



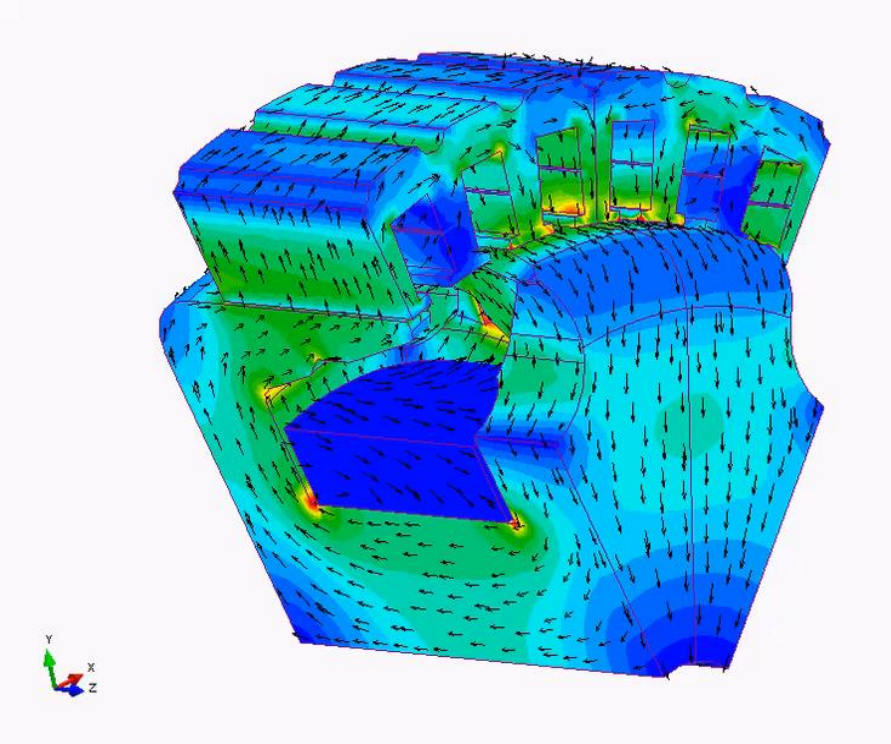
The stator windings of this alternator were created using the multi-segment sweep feature of Simcenter MAGNET. The current distribution is automatically calculated using the tetrahedral mesh of the coil segments. A periodic boundary condition linking these two planes ensures that the computed current distribution will flow in through point A (as indicated on image), out through B, in through C and finally out through D on its way back to A again.

MESHING THE CLAW-POLE



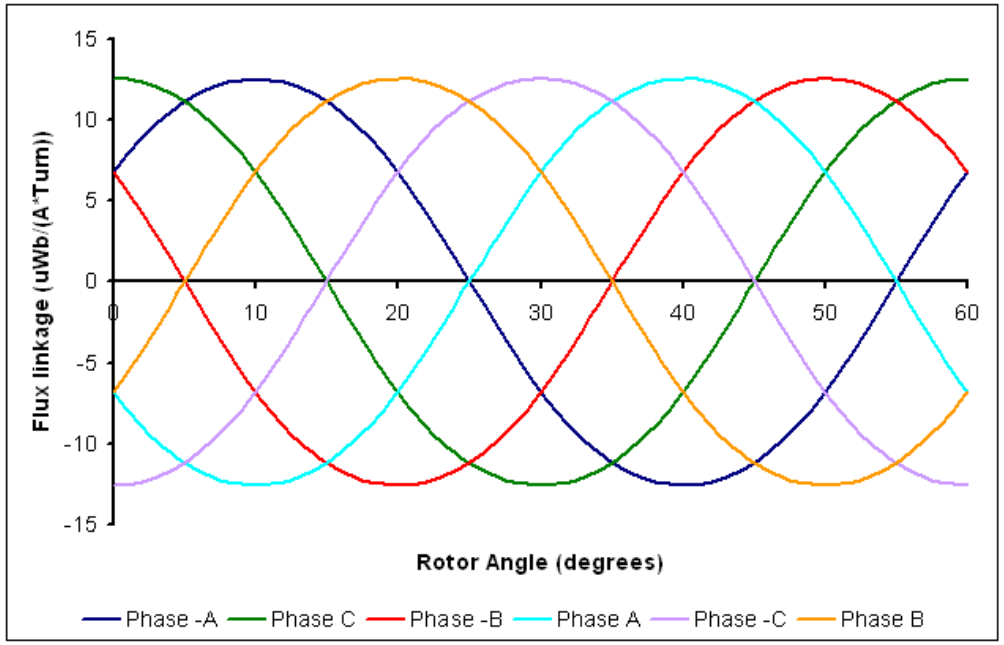
The complete mesh has approximately 410,000 tetrahedra and 70,000 nodes.

FLUX DENSITY PLOTS OF THE CLAW-POLE ALTERNATOR



Simcenter MAGNET's arrow and shaded plot of flux density for the rotor rotated by 20 degrees from the aligned position. Note that the periodic boundary condition is applied to non-planar surfaces in this case (the air gap between the rotor and the stator).

FLUX LINKAGE OF THE STATOR COILS



This graph shows the flux linkage of the stator coils at different rotor positions. The flux linkage in any one coil will complete a cycle every 60 degrees of rotor rotation. Since there are six coils in the section actually modeled, the complete waveform can be constructed by only solving at rotor positions between 0 and 10 degrees.