

Siemens Magnet Technology

The aim of this project is to develop a new approach to designing the formers used to support the super conducting magnets within the MRI scanners.

Typically these formers are bulky uniform structures, produced to cope with the rigorous measures of magnetic positional tolerances. GRM were able to significantly reduce the volume of the material necessary to produce the former via the use of topology optimisation with the well-known FEA code [Genesis](#).



In order to perform the topology optimisation on this part several factors needed to be considered. Siemens Magnet Technology provided the design space, loading and functional requirements that the design had to adhere to.

The loading conditions of an MRI scanner are very complex as it is required to withstand various loads including transportation loads, loads induced by large magnetic fields, and loading resulting from operating in temperatures close to absolute zero. Topology optimisation was the most suitable technique to determine the most efficient design layout to support the multiple loading requirements that the former would be subjected to.

Converting topology results into fully functioning designs is not always a straight forward task, however due to GRM having extensive experience in both design and analysis the task was carried out efficiently.



From the results for optimising the former a design scheme was developed taking into account Siemens's preferred manufacturing methods along with a significant opportunity for cost and mass savings in the MRI scanner range.

The end result was a significantly lighter former which would withstand the complex load conditions and severe temperatures.