

## Mechanical modal analysis of hydrogenerators

The magnetically-induced vibration in electrical machines is one important topic of interest since undesirable effects can be associated to it, such as possible damages, life span reduction and consequent audible noise. In the particular case of Hydrogenerators, some peculiarities are present. One of them is that the stator frame has a significant influence on the excited eigenmodes. As illustrated in Fig. 1, these are normally vertical machines and their stator frames consist of shelves and structural columns that transmit the rotor and turbine weight to the housing foundations. Taking into account these effects for such a large structure in time-cost effective manner consists a real challenge, since available analytical models assumes the stator core only as a free cylinder in space and FE models depend on the accuracy of employed equivalent material properties and boundary conditions at interfaces between frame/core/foundations.

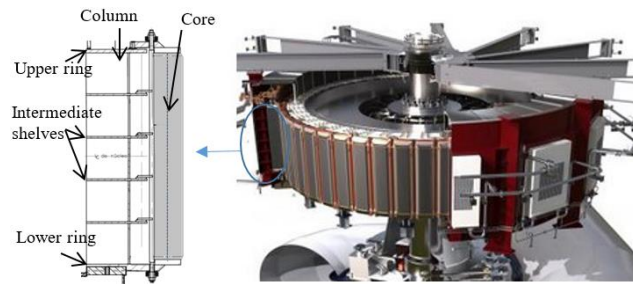


Fig. 1: Typical cross-section of a hydrogenerator [Source: Voith]

Based on that, the present work aims to set-up suitable FE models to determine the eigenfrequencies and eigenmodes of the stator of a hydrogenerator. This includes:

- Familiarization with the electromagnetic vibration problem in electrical machines
- Familiarization with FE mechanical modal analysis using Ansys Workbench and Mechanical APDL
- Creation of a mechanical model in Ansys for an example machine
- Evaluation of the impact of different boundary conditions at interfaces between frame/core/foundations through the comparison of different calculations
- Evaluation of the impact of material properties through the comparison of different calculations



### Forschungsschwerpunkt:

Elektromobilität / Aviation

Großmaschinen

Industrieantriebe / Mechatronik

### Inhalt:

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