

## FEM THERMAL MODEL OF A COMPRESSION DRIVER

### COMPARISON WITH EXPERIMENTAL RESULTS

Milan will host the 144th international AES convention from 23th to 26th May 2018. Faital, world renowned Italian manufacturer of automotive and professional loudspeakers, will be present at this event with a technical report entitled:

#### **“FEM thermal model of a compression driver: comparison with experimental results”**

This is a seminar, held by Marco Baratelli and Grazia Spatafora, showing the results of work carried out by Faital research and development department in San Donato Milanese.

In the first phase the speakers will describe the thermal performance typical of compression drivers and the possibility of predicting their behaviour in the design phase through FEM simulation.

In the second part, they will underline how the results of this predictive study on thermal simulations have been confirmed in the experimental phase, thus allowing application of this model in the future design of other drivers.

The workshop starts by considering that, although a compression driver for the reproduction of high frequencies is an efficient electroacoustic transducer, it converts a very high quantity of the energy it receives into heat.

It is therefore essential to ensure that each driver in the design phase is able to withstand the power needed to be achieved, dissipating most of the generated heat.

Also considering the fact that woofers are able to dissipate heat better thanks to a larger cone excursion, while in compression drivers the diaphragm undergoes very minimal movements.

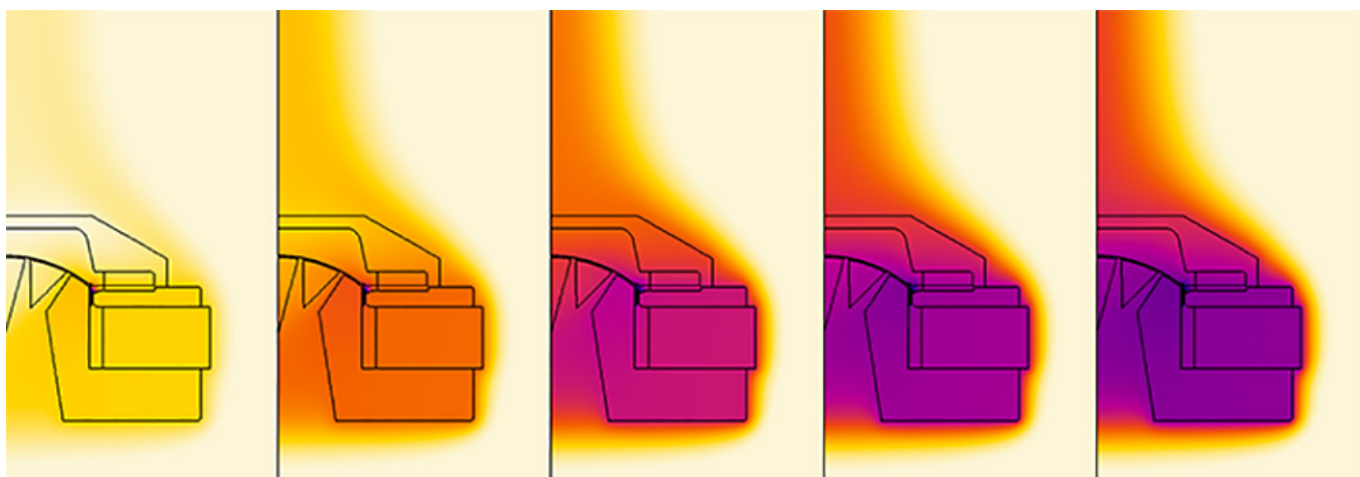
The study will explain how it is possible to anticipate at what temperatures the coil and the magnetic circuit will operate and therefore avoiding permanent damage.



This is directly influenced by the geometry of the device and the materials used, which allow an estimate of the effect of dissipative phenomena (conduction, convection and radiation).

The model works by assigning to the project the actual power at which the speaker must work and by knowing how much of this power is not transformed into an acoustical power but transformed into heat.

From here it is possible to see at what temperature the coil works, then understand how the driver reacts and eventually make corrective actions, if necessary, so reducing the number of prototypes needed during the design phase.



*Driver and surrounding air temperature evolution within a 2 hour time-frame simulation*

Faital is developing several predictive models that allow the speaker to be evaluated even before it is prototyped for the first time so as to optimise the development process.

Flavio Naggi, Commercial Director of FaitalPRO, emphasises: "We have focused on the development of this theoretical predictive model using Finite Element Analysis that allows us to accurately predict the working temperature of a professional driver.

This process allows us to improve the design of magnet assemblies to better manage the thermal aspect of a working loudspeaker.

The numerical models developed on some existing drivers have been validated by experimental measures assessing a difference between real temperature and simulated results by the model of around 5%. In short, a great success in the validation of our measures applicable to all our future



PROFESSIONAL LOUDSPEAKERS



loudspeaker designs."

**Faital will present this technical paper twice: in the afternoon of May 23rd during a dedicated technical session and also the next morning, on May 24th, 10.00-10.45 AM on the PSE Stage.**