

# CADFEM Consulting

## Simulation of Car Body Drying Using Virtual-PaintShop®

Development of a Drying Oven Model for the Use at a BMW Plant

Your contact person:

Dr.-Ing. Heiko Schüler

Phone: +49 (0)371 334 262 12

E-Mail: heiko.schueler@cadfem.de

### Task

BMW uses simulation tools to ensure a first-class quality of its cars. The VirtualPaintShop® (VPS/DRY) is an integral part of the BMW production process. VPS/DRY is used to simulate the drying process of car bodies after painting. For that reason a VPS/DRY model of the drying oven is required (oven model).

### Solution

The simulation of car body drying processes requires a reliable model of the drying oven. The VPS/DRY oven model takes into account the heat transfer by conduction, convection and by radiation. Furthermore, measurement data, drawings and technical descriptions are considered.

Temperature-time graphs at 39 measurement points of the BMW roadster Z4 were checked in order to obtain a high-quality oven model. A very good agreement between measurement and simulation was achieved, as shown as an example at the speaker bracket (figure 3).

Additional measurements on other car bodies confirmed that the transfer of the once-determined oven data to these car bodies show good results.

### Benefit for the customer

VPS/DRY simulations give an insight in the curing of paint, adhesives, bake-hardening steels and aluminium alloys in early development stages. Also mechanical deformations and stresses can be analysed, due to the transient temperature profile in the oven.

The results are used to optimize the production, reduce prototypes and increase paint quality.

The portability of the results is important to simulate model variations within a short response time (over night).

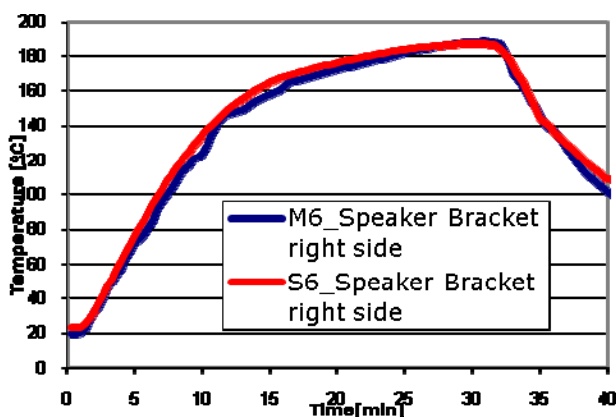


Fig. 3: Temperature vs. time at the speaker bracket, (measurement: blue simulation: red)

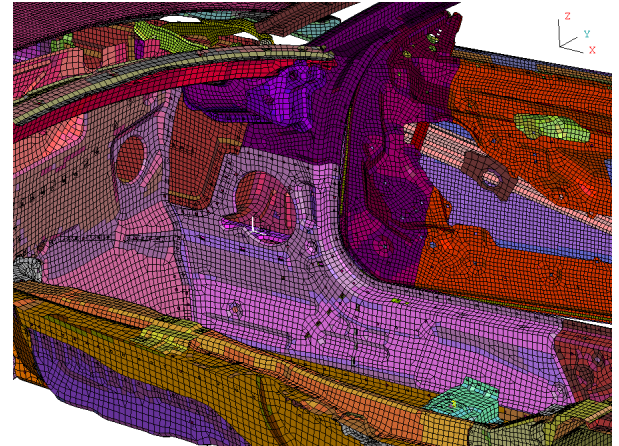


Fig. 1: VPS/DRY model of the BMW Roadster Z4 car body

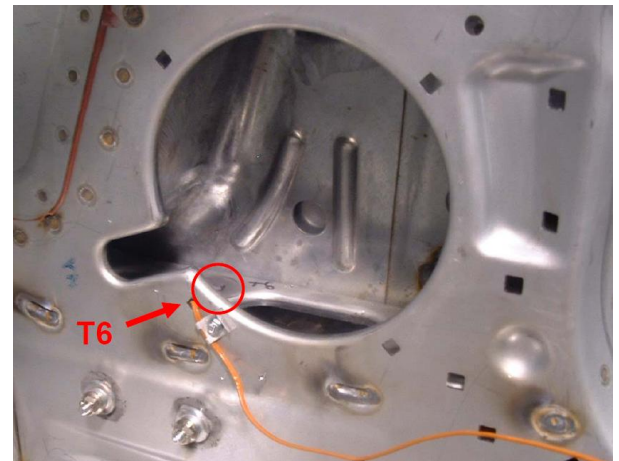


Fig.2: Measurement point speaker bracket

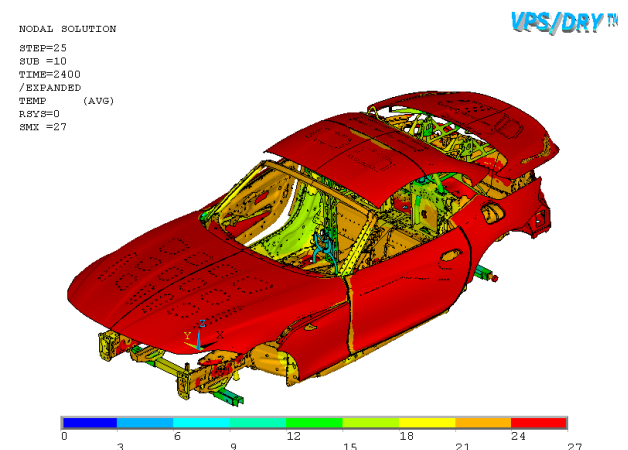


Fig. 4: Dwell time [min] above 170°C

By courtesy of BMW AG, Munich, Germany