Oven Simulation

Complex Conditions in the Baking Process

Automotive paint shops for coating a body-in-white have highly complex, multi-stage processes. Several layers of coatings and paints are stacked on top of each other not only for visual appeal, but also to protect against corrosion.

After each layer is applied, a paint-drying oven takes care of curing and hardening. These ovens are required to dry and cure the multi-stage e-coatings layers. Perfect operating conditions have to be defined beforehand, otherwise, the glue between the lightweight components of the car body run the risk of breaking with the heat of the oven. Thus, it is very important that the oven provides uniform distribution of heat for body-in-white for curing and hardening without harming the materials like sheets and glues. This process lasts more than 90 min in which every detail at any moment in time is crucial. Wrong temperature information accumulates over time and leads to mistakes and deformation.

ALSIM Sense Oven Simulation

To solve this problem with utmost accuracy, we use a combination of numerous ALSIM platform solvers. Until now, simulation users had to accept various trade-offs concerning resolution, process time and domain. Our oven simulation overcomes all these obstacles and disadvantages. We have the capability of depicting the whole industrial oven process at each moment in time. Further, discretization is significantly higher than ever before. This allows us to show an accurate simulation of the air flow and provide our customers with full insight into thermal management (radiation, convection, conductivity) which lets us optimize the car body early in the design phase. This in turn, saves a lot of time, costs and pressure from the production line. In addition, we can optimize the entire oven process by providing energy-saving insights and valid data on the condition of the materials used and their suitability. In summary, our simulation software has accurate calculations, is fully automatic and extremely fast (<24h). SENSE Oven complements the oven process and optimizes design.