

SIMULATION DATA MANAGEMENT – THE MATERIALS PERSPECTIVE

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ABSTRACT

As hardware and software advances enable ever-increasing application of ever more powerful simulation techniques, the emergence in recent years of approaches to manage the associated processes and data has been essential. One of the often underestimated but nonetheless fundamental components is the need for managed provision of suitably-validated materials property data, in the right formats for the required CAE models, within engineers' routine workflows, and with full traceability. The implications of incorrect or inappropriate materials data on the validity of simulation results can be profound. This presentation will report the experience of materials information specialist Granta Design, working with companies from a variety of industrial sectors.

There are few published sources of data applicable where material boundaries are being pushed – for composites and other lightweight design approaches, for high temperature applications, for advanced crash simulations – and tests therefore need to be commissioned to characterize company-specific materials. This is an expensive process – yet surveys show that the resulting data are invariably only used once before being “forgotten”, due to the lack of a central materials information repository. Meanwhile, searching and assessing alternative sources of data is a time-consuming and non-value-adding task for simulation engineers.

The Materials Data Management Consortium (MDMC), a group of leading engineering enterprises and government agencies, has defined the materials data lifecycle and the best practices needed to support its key phases: data acquisition, data analysis, deployment to Design and CAE, and maintenance. Historically, from a CAE perspective, the maintenance aspect in particular has often been over-looked. In reality, materials properties are not “fixed” entries in a library or database – rather they evolve and are updated as additional R&D and testing are carried out, simulation results and field service experience are fed back, processing variations are monitored over time, or suppliers are changed. Full traceability requires correlation between the materials specified and approved in the design, the material models used in simulation, and the actual materials used in manufacture. And with increasing

collaboration between teams, sites and partners, CAE materials models need to be accessible consistently and reproducibly across the extended enterprise – subject to formal version control of model derivation, and access control to ensure applicable usage of the results.

The importance of materials information management to support CAE is thus being increasingly recognized and addressed, and not only in very large organizations. Typically the domain of materials specialists, it is notable that some of Granta Design's customers have recently implemented solutions initiated and managed by the simulation teams. These initiatives were driven by lack of validated and traceable material data, limited project time and pressure to reduce costs.

Illustrated by case studies and results of industry surveys, this presentation will report on the improvements and benefits realized by implementing effective management of materials information and CAE material model derivation. The parallels of "lessons learned" between materials information management and overall simulation data management will also be explored.

SUGGESTED THEMES

Simulation data management; CAE materials models; materials data integration; traceability