Case studies in Composite Data Management

AIRBUS HELICOPTERS AND VESTAS BLADES TECHNOLOGY

The Challenges of Composite Data Management

If you characterize, qualify, or design with composites, it's important to make best use of all available information—from internal testing, QA, research and design; and from the best external reference sources. Capturing and managing company materials information is inherently difficult. This data is complex, specialist, and typically distributed across an organization. Effective materials information management requires collation from multiple, ever-changing sources. Data is constantly updated as further testing is done or as new or improved materials become available. Without one consistent 'gold source' of data that is accessible in a controlled manner to the relevant engineers, designers and technicians, time is wasted finding the right data. One survey[1] found that 50% of expensively-gathered materials knowledge is not re-used and that staff often duplicated previous work. Composite data is particularly challenging, due to the multi-component nature of these materials and the strong dependence of their properties on factors such as geometry and processing. How do leading engineering enterprises respond?

Airbus Helicopters

At a Granta web seminar, **Nicolas Capelle**, Composite Process Engineer & Material Data Management Specialist at Eurocopter's Materials & Processes Laboratory, explained a project to effectively manage the complexities of composites materials. Eurocopter has since been renamed Airbus Helicopters. He focused on their project to create a single source of materials data available across multiple Airbus Helictopter sites (initally, for over 100 users at 3 sites in France and Germany), eliminating previous issues due to scattered 'islands' of data in different locations.

Airbus Helicopters used the GRANTA MI™ software to build their system, which they call 'AMAZE', easily creating data structures to capture: general information from suppliers (e.g., technical datasheets and safety datasheets); all of their mechanical, physical, and chemical tests; legacy data extratced from written documents; and data from external test labs.

Test results are captured through a workflow in which, first, a test program is defined, then work orders to manufacture a panel or part are created, and then test orders that specify the testing procedures to be followed. All of this documentation is captured and linked to the test results and the analysis of these results, which is used to verify test coefficients, eliminate outliers, and determine statistical values and design data. This ensures full traceability—data can be

[1] Granta Design Industry Survey, 2012

inspected and its full context understood. Access control ensures that users see only data for which they are authorized. Data can be exported for use in FEA and, once appropriately validated, made available to the Design Office.

The key benefits of the system are:

- **Traceability**, protecting key intellectual property and enabling audit of design data
- **Risk reduction** by avoiding "private storage" of data by designers
- **Multi-site harmonization** for the generation of allowable values.

Vestas Blades Technology

In a separate web seminar, Dr Ian Stewart, Manager of Design for Manufacture and Systems at Vestas Blades Technology discussed a 3 year-old on-going project to manage materials information for the design and manufacture of wind turbines. Vestas have implemented the GRANTA MI system to meet requirements including:

- Managing data to support their iterative design process. This demands capture of results from bulk material characterization work, but also of the specific manufacturing features of their large composite structures. Related data must linked and accessible in a usable way
- Capturing performance data as a function of cost, enabling Vestas to balance these factors as they push materials boundaries
- Storing lifetime data for fatigue calculations—a robust and statistically-valid population of such data helps to improve product reliability
- Meeting certification requirements on control and quality of data.

Dr Stewart commented that the database structure proposed by Granta to achieve these goals "works very well", storing design, pedigree, and test data in a reliable manner. The GRANTA MI system enables users to navigate quickly and find what they're looking for. This contrasts to life before the system, when data was stored in Excel sheets and supplier documents across numerous servers. The result is a significant time saving.

The workflow for handling composite data has been optimized. The data goes through a process from test specification, to performing tests, analyzing results, reducing the data, and applying safety factors. A lot of these steps can be automated and made easier. The system copes well with complex, multi-axial, orthotropic materials and with process history. It provides greater statistical confidence in Vestas data, which is useful from a management point-of-view as it helps with decisions on where to focus resources in gathering new data. Finally, the design and simulation data that results from this process can be integrated straight into the ANSYS FEA software and CAD packages used by analysts and designers. Dr Stewart concluded that it had been "hugely advantageous to involve ourselves and get on board with Granta."

Further information

GRANTA MI product information: www.grantadesign.com/products/mi/composites.htm

Recordings of these web seminars are available. Contact Granta for details.