



VZLÚ optimizes the development of composites rotor blades using infusion simulation software PAM-RTM

THE CHALLENGE

VZLÚ, the Czech Aeronautical Research and Test Institute, develops rotor blades for the aeronautics industry.

Using ESI's PAM-RTM simulation software to perform the infusion process, VZLÚ engineers were able to optimize the mold design before its production and prevent defective molds. Thanks to PAM-RTM, the use of the autoclave technology is no longer needed, and VZLU engineers make higher quality, lighter and more reliable blades.

THE BENEFITS

- Accelerate the mold design and lower production costs
- Reduce the weight of the rotor blades structure
- Decrease energy consumption
- Minimize noise emissions and vibrations
- Generate best practices in mold design for further projects

"PAM-RTM helps improve the probability of problem free infusion process of the first produced part. It is very effective for rectifying imperfections of infusion discovered during the production process."

Vilém Pompe, Head of R&D Composites Department, VZLÚ

VZLÚ is the Czech Aeronautical Research and Test Institute, developing and testing various types of components for the aeronautics industry such as rotor blades, industrial fans, aircraft engines, and satellite equipment. VZLÚ uses a chain of simulation software that covers the complete design and development, testing and certification, as well as production loop in the field of composite materials. ESI's PAM-RTM software is a key part of this chain for infusion simulation of dry reinforcements.

Performing rotor blade infusion

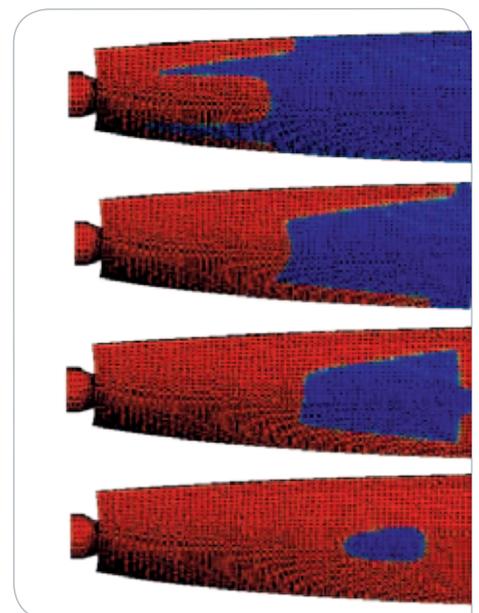
Using composite materials in the aeronautics industry, and especially for rotor blades, is one of the most effective ways to reduce weight thus energy consumption and to minimize noise emissions and vibrations.

Liquid Composites Molding (LCM) processes such as Resin Transfer Molding (RTM) or Vacuum Assisted RTM, are well adapted to the production of composites blades. They generate high quality components without autoclave, and with parameters typical to the design of rotor blades, for instance jointless and seamless sandwich spars, that are not achievable with other technologies.

To design the production mold, optimize resin distribution channels, material consumption, and other process parameters specifications, VZLU needed a reliable



CAD model of the rotor with its 20 blades



Flow front evolution during infusion process
Resin – dry preform

simulation tool that could communicate intuitively with the design and production tools.

VZLÚ chose PAM-RTM for current and future research and development projects related to composite aircraft propellers and similar rotors. Some of the projects help their clients replace autoclave composite technologies with infusion processes that are low cost and more flexible, enabling a variety of materials and new design opportunities.

“There are several reasons why VZLÚ selected PAM-RTM. First, the product fit well with the software and data chain used by our institute and covered most of the infusion composite technologies of our interest. Second, the support provided by the local ESI representative was very valuable to a research institute such as ourselves.”

Vilém Pompe, Head of R&D Composites Department, VZLÚ

Saving costs with molding simulation

Typical molds designed for RTM processes are very expensive and if the inlets, outlets, and internal distribution of the resin do not meet optimal configuration requirements, the mold will quite often not be used at all.

PAM-RTM allows VZLÚ engineers to optimize the mold design before its production and to adjust process parameters, such as mold and matrix tempering, viscosity influences, gel time considerations, and so on, before any physical trials.

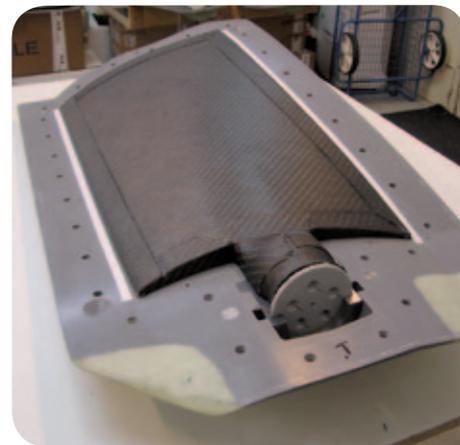
Thanks to their skilled and experienced engineers and their use of PAM-RTM simulation software, VZLÚ engineers can

now design new molds in less time at lower cost. With this added experience and better process understanding, they can also easily adapt typical tool designs for products such as rotor blades. In other words, not only do VZLÚ engineers not start from scratch with each new project, they also reduce production cost and time of prototypes and test specimens.

VZLÚ, being a research establishment, is committed to always better understanding process parameters and providing solutions capable of saving their clients time and resources. Avoiding the production of defective molds is a very effective way to meet such goals.



Serial composite blade ready for installation



Production of the first blade prototype. Dry reinforcement in the mold before matrix infusion (RTM process)

To find out more about ESI's Composites Simulation Suite, please visit: www.esi-group.com/composites&plastics

ABOUT VZLÚ

Aeronautical Research and Test Institute (VZLÚ) is a national centre for research, development and testing in aeronautics and space in Czech Republic. As a multi-discipline research organization, VZLÚ exploits synergic effects and also contributes to progress of automotive, rail, defense, security and power industry and civil engineering. The major multidisciplinary fields of VZLÚ include: aerodynamics, structure strength and durability, material and corrosion engineering, composite materials and technologies, and accredited testing. In the field of product development, VZLÚ is focused on rotor blades, industrial fans, aircraft engines and satellite equipment. For further information, please visit: www.vzlu.cz.

ABOUT ESI GROUP

ESI is a pioneer and world-leading provider in virtual prototyping that takes into account the physics of materials. ESI has developed an extensive suite of coherent, industry-oriented applications to realistically simulate a product's behavior during testing, to fine-tune manufacturing processes in accordance with desired product performance, and to evaluate the environment's impact on performance. ESI's solutions fit into a single collaborative and open environment for End-to-End Virtual Prototyping, thus eliminating the need for physical prototypes during product development. The company employs over 750 high-level specialists worldwide covering more than 30 countries. ESI Group is listed in compartment C of NYSE Euronext Paris. For further information, visit www.esi-group.com.



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