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An Affordable Simulation Tool for RTM Process

Yuexin Duan, Mingren Yin, Dan Li, Zhiyong Liang and Zuoguang Zhang
Beijing University of Aeronautics and Astronautics,
Beijing 100083, P.R. China

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RTM process is considered an affordable and environmental friendly manufacture technology for the advanced composites. One of the major difficulties of RTM applications is related with complex resin flow behavior during mould filling. A mold filling simulation tool, named BHRTM-2, is developed based on numerical models of RTM process and FEM/CV method. BHRTM-2 is developed in Windows environment and a powerful snapping function is also provided, which let operator can easily determine the injection and vent locations. The automatically mashing function for complex plate shape part is also featured. The pressure field, resin flow front, filling time and dry spot of mold filling can be predicted with the simulation tool. The operation window of the tool is shown in Fig. 1. After Imputing the geometry parameters of the part, the FEM mesh can be automatically created without the aid of other expansive FEM software (such as PATRAN). The created mesh is also given in the Fig.. The modification and reset parameters for individual node of the mesh, such as permeability and definition of injection port and outlet, can be easily operated with the inserted snapping function of the software. The flow front of the mold filling of the part is illustrated in Fig. 2. The important pressure fields of mold filling are visualized, which can be seen in Fig. 3. The influences of permeability, injection pressure and viscosity of the resin on the processes can be well simulated with the developed tool. The theoretical and experimental verifications of the mold filling simulation are also illustrated and case studies are given in the research. The developed tool is an affordable and use friendly simulation tool for RTM process.

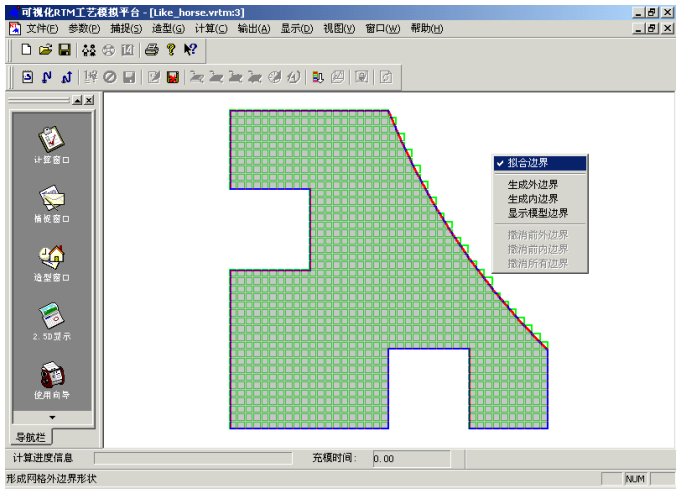

Fig. 1 Main operation window and the automatic meshing of the part

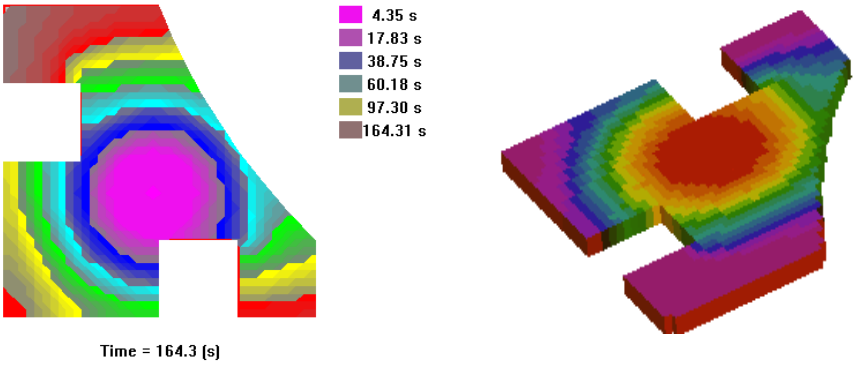

Fig. 2 Flow front simulation of Mold Filling

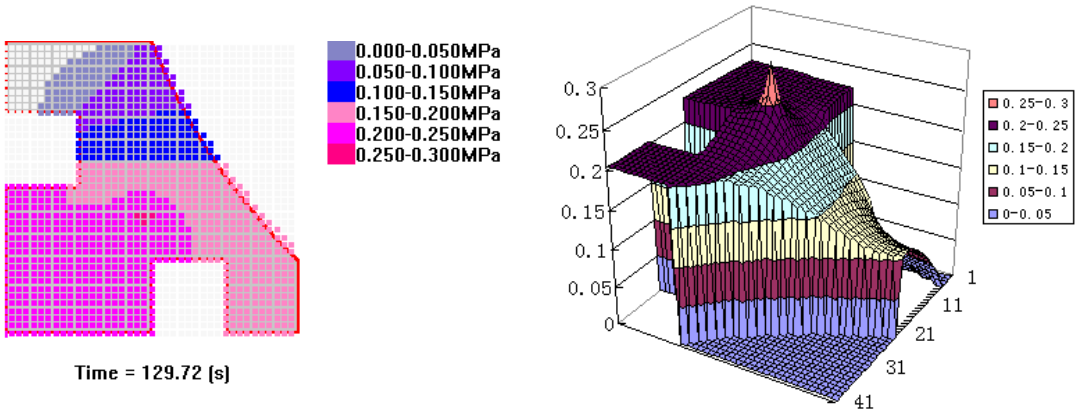

Fig. 3 2D and 3D pressure fields of mold filling