VAP® membrane-assisted low pressure infusion

The trapped air and reaction gases typical for closed infusion processes can result in weak spots in the finished lightweight components. The EADS-patented Vacuum Assisted Process (VAP®) uses the characteristics of semi-permeable state-of-the-art membrane systems to exert vacuum over the entire area of a resin-infused mould to remove trapped air and volatiles in an efficient and reliable manner.

VAP® membrane systems are developed and produced by EADS partner Trans-Textil GmbH, which also licenses their use in the non-aerospace sector. In a joint showing with EADS, Trans-Textil will be exhibiting new technical solutions for VAP® membrane-assisted low pressure infusion at the JEC Composites Show, underscoring intensification of their colaboration.

Uniform vacuum and consistent flow front

In conventional vacuum infusion processes, the entire assembly has to be extensively flushed with the infusion medium under reduced pressure (vacuum) until it can safely be assumed that is no more air or gas trapped inside the mould. Plus the vacuum has to be reduced towards the end of the infusion process to prevent the resin from boiling.

In the VAP® approach, a pliant microporous membrane system – which is permeable to air and volatiles but not to matrix materials – is applied to the resin-infused mould to separate the resin from the breather layer and enable evacuation of pockets of air and volatiles through the micropores and along the breather layer. The vacuum acts evenly over the entire area for degassing of trapped air and volatiles during and after the infusion process.

Trans-Textil GmbH • Andreas Hänsch • Tel. 0049-8654-6607-770 • ahaensch@trans-textil.de

The even action of the vacuum yields a very homogeneous resin flow, while its action at all contact points on the membrane system reliably removes dry spots, even after completion of infusion, without the need to reduce the vacuum. The resulting improvement in flow front management makes it possible to achieve the desired fibre volume content without porosity or fluctuations in matrix thickness.

Users of the VAP® process benefit from faster infusion, shorter throughput times and consistent results. Moreover, existing tools can be used, thus reducing the initial investment, and since fewer venting fumes escape in the closed process, occupational safety is heightened. Plus Trans-Textil submits its VAP® membrane systems to bench-scale testing under realistic conditions to ensure their suitability for various resin types and process variants.

Volume production of complex integral assemblies

The VAP® process particularly comes to the fore in the volume production of large complex components in which many smaller parts are integrated. Excellent component quality, the absence of trapped air and gas, and consistent and reproducible results add up to make it the most cost-effective vacuum infusion process on the market.

The largest integral assembly involving stringer and skin injection in a single shot to ever be produced according to the VAP® process consists of the 7 x 4-metre cargo door built for the Airbus 7 transport aircraft by Premium AEROTEC GmbH – geometrically complex structural component located in a highly stressed area of the fuselage and thus subject to high physical loads. Other fields in which the VAP® process has proved its worth consist of radar-deflecting submarine conning towers and wind turbines blades having to withstand enormous stresses.