

# **Permeability Work Cell for Fibrous Reinforcements**

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## **ABSTRACT**

Liquid composite moulding technologies such as RTM have established themselves in the industry. The reason for this establishment can be found in the high manufacturing potential of these processes. In the case of RTM this potential encompasses short cycle times, high fibre volume fractions, high surface quality, and the possibility of implementing complex geometries. In the wake of this development, process simulations like LIMS or PAM-RTM have become more important since they enable engineers to determine the precise location of injection gates and vents in moulds according to the properties of the fibrous reinforcement to be used. In order to use process simulation tools the engineer is supposed to know precisely the components of the permeability tensor of the reinforcing material as a function of the degree of compaction. In principle there are two ways of determining the required permeability values, i.e. either to measure it experimentally or to rely on the use of software that will provide the permeability based on the assumption of representing a reinforcement structure by means of idealized unit cells.

A permeability measurement work cell was developed at the Institut für Verbundwerkstoffe GmbH. It consists of an aluminium mould with integrated dielectric sensors and a LabVIEW based control software. These sensors allow to monitor the progression of the flow front at any point in time. Consequently, the 2D permeability of any given fabric can be determined within minutes. This paper introduces the set-up, the software, and the capabilities of an standardised approach to measure the 2D permeability of fibrous reinforcements in an easy and efficient manner.