

# The Office of Technology Management

UNIVERSITY OF TEXAS  ARLINGTON

Tech ID: UTA 15-24

## Measurement of Local Effective Permeability for Complex Composite Structures

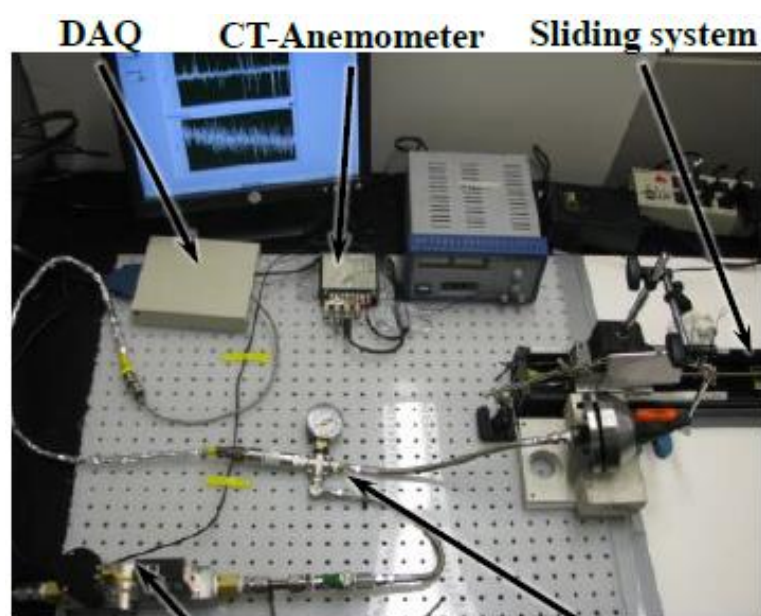
**INVENTORS:** Luca Maddalena, Stefano Gulli

### TECHNOLOGY NEED

In order to determine the strengths and limitations of porous structures, such as composite materials, it is important to obtain a local description of some characteristic properties like permeability. Standard methodologies for permeability measurement provide only average permeability values that do not always reproduce the correct aerothermal and mechanical response of the full-scale components. Hence, local permeability values are required in order to perform accurate numerical simulations to predict potential failures of full-scale structures due to local imperfections/defects and to help minimize the costs deriving from experimental tests.

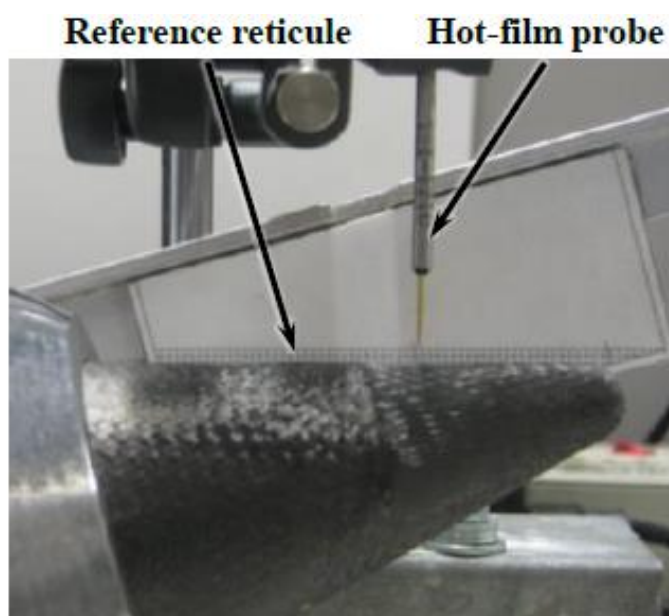
### INVENTION DESCRIPTION/SOLUTION

UTA researchers have developed a new, non-intrusive method of characterizing effective permeability at local levels for complex porous structures. Hot-film anemometry and X-Ray computed tomography are used in conjunction to identify the characteristic probing area of interest for the measurements and the correct distance of a sensing probe used to measure the local blowing. The local blowing is then used to predict the effective permeability. This method is applicable to porous materials of any shape and thickness. With this method, the costs deriving from experimental tests at both the design and optimization levels is minimized.



Mass-flow controller External plenum chamber

a)



Reference reticule Hot-film probe

b)

Test setup for permeability measurements.  
a) Assembly; b) Alignment system

### APPLICATIONS

- Aerospace components
- Amphibious vehicles
- Electronic components
- Nuclear reactors

### KEY BENEFITS

- Measurement of the effective permeability of any type of structure at the local level
- No damage to tested components
- Better interpretation of the impact of local imperfections/defects on the strength and heat-transfer capability of full-scale porous structures
- Correct boundary conditions necessary for validation and development of models for the numerical simulation of fluid-flow and heat transfer through porous media

### STAGE OF DEVELOPMENT

Prototyped and tested

### INTELLECTUAL PROPERTY STATUS

Patent Pending



**More about the Inventor:**  
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