

# What is “State OF The Art” in the Fiber Composite AFO Industry?

Since the launch of ToeOFF® we have continued to develop new fiber composite AFOs. We have also continued to invest in manufacturing technology to raise laminate quality.

The introduction of ToeOFF®2.0 resulted in a significant leap forward in technology terms. The advanced technologies utilized, were based on research output conducted by leading Scientists within the Fiber Composite Industry. To challenge our new manufacturing technology, a benchmarking test with our products was designed under supervision from external experts. These tests included benchmarking tests against both research output and internationally established AFO brands manufactured with fiber composites.

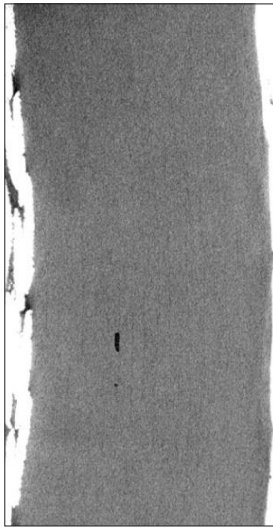
Void content is the term used to describe the porosity levels with a given material. It is widely accepted within the materials science community and composite industry in general, that a premium quality laminate should have a void content of less than 0.5%. It is further recognized and accepted that laminates with a void content of 1% or greater, will exhibit a reduction in mechanical properties and as a consequence a reduction in performance, strength and durability.

These tests were performed by third party experts and the tests consisted of:

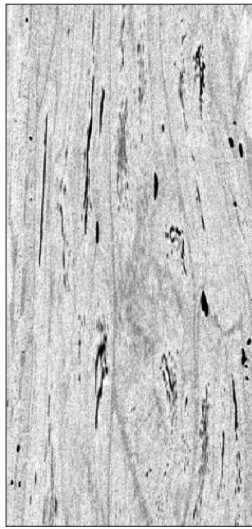
a) Image Capture: Using Computer Tomography (CT) and performed by Luleå University of Technology(LUT), department Of Materials Science. Images were captured from scans of specimens taken from seven AFO composite braces. Up to one thousand CT images were taken from each brace in a predetermined location (same approximate location in each brace).

b) Void Content Readings: Using a standard software package and performed by an independent materials scientist and composite industry expert. To quantify the void content in each brace, 20 of the CT images from each AFO were randomly selected and taken evenly throughout the thickness of the specimen to obtain an average value of the void content. The table below shows the average percentage void content of the seven tested braces.

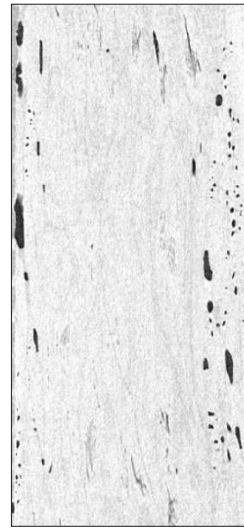
Brace	Average Void Content (%)
ToeOFF®2.0	0.2
BlueROCKER®	0.1
Competitor I	2.7
Competitor II	2.3
Competitor III	2.1
Competitor IV	2.6
Competitor V	3.0



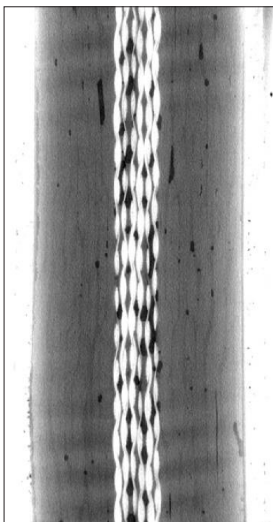
ToeOFF®2.0



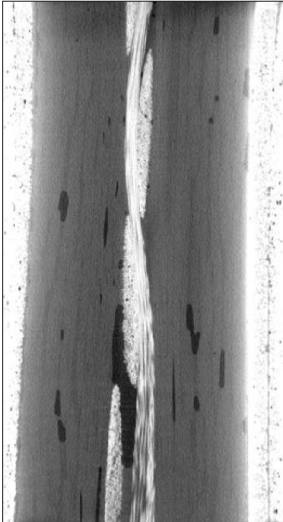
Competitor I



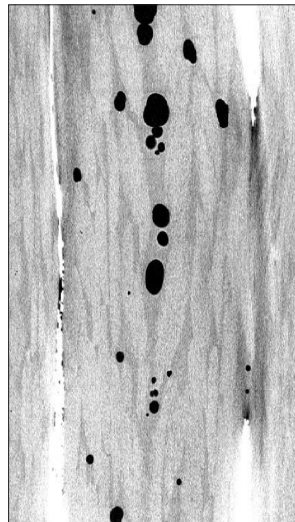
Competitor II



Competitor III



Competitor IV



Competitor V

Conclusion: The results showed that investments in both product and manufacturing R&D have been successful. An average Void Content of 0.1% - 0.2 % is considerably lower than the established threshold value for a premium quality laminate of 0.5 % as has been established in Scientific Literature. Void content above 1.0% will have a negative effect on the laminate with a reduction in Mechanical Properties as a result<sup>1</sup>.

*Reference*

1. Costa ML, de Almeida SFM, Rezende MC. *The influence of porosity on the interlaminar shear strength of carbon/epoxy and carbon/bismaleimide fabric laminates. Composites Science and Technology 2001; 61: 2101-2108.*