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The research for this paper was undertaken by:
Richard Haxby, **Katie Pearce**, **Ian Scott**,
Clare Tittershill & **Claire Williams**. It was originally presented at the European Seating Symposium in Dublin, Ireland (June 2016).

References:
1 Fisher SV, Szymke TE, Apte SY, Kosiak M. (1978). Wheelchair cushion effect on skin temperature. Archives of Physical Medicine and Rehabilitation. 59 (2), p68-72.
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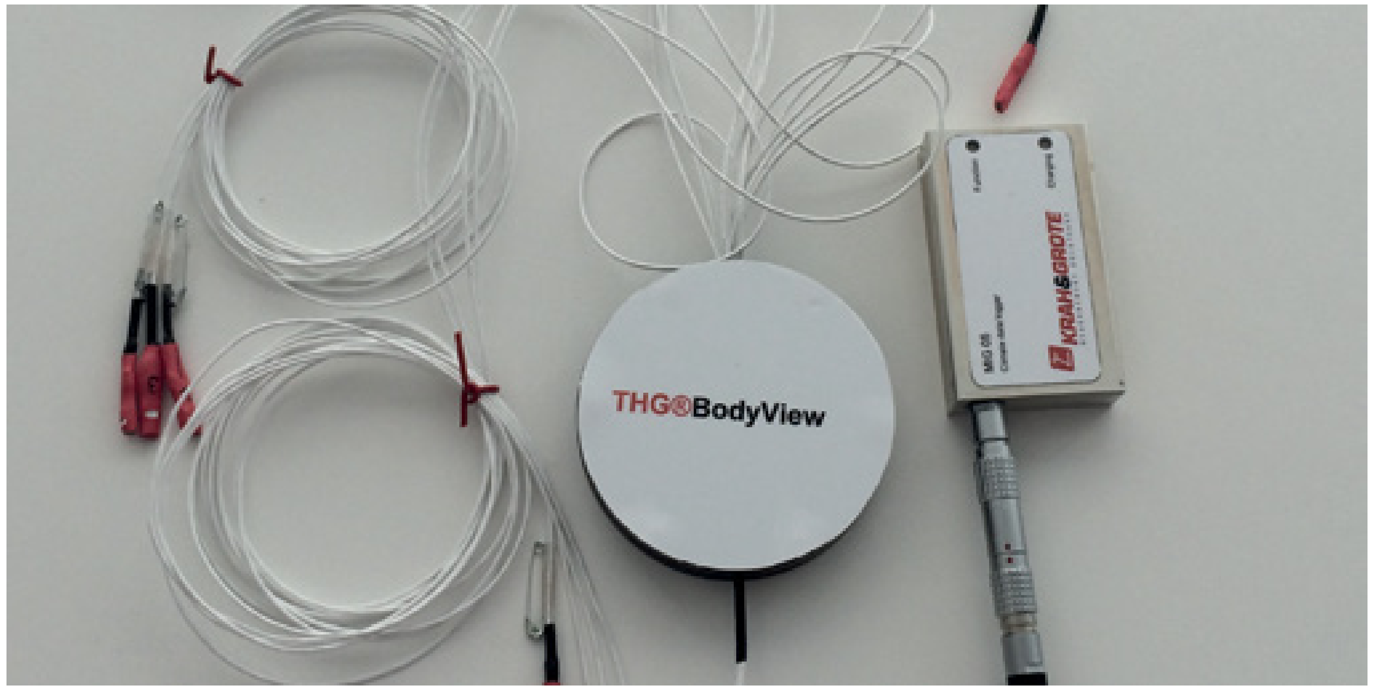
Seating & Dartex® Microclimate

Outline

It is well documented that managing skin temperature and moisture levels is important for maintaining skin integrity; for example, a 1°c increase in skin temperature leads to a 13% increase in metabolic demand (Fisher, Szymke, Apte and Kosiak, 1978 [1]). Relative humidity also affects the strength of the stratum corneum: at a relative humidity of 100% the stratum corneum is 25 times weaker than at 50% relative humidity (Brienza and Geyer, 2005 [2]).

Studies in the automotive industry have demonstrated a strong correlation between the absolute humidity in the air between driver and seat and their perceived comfort (Morena, Krah and Kurz, 2012 [3]). When someone sits in the same position for long periods of time, air cannot circulate around the seat contact areas, which creates a localised microclimate where the air is warmer and more humid than the surrounding area.

This paper demonstrates how the choice of seating fabric can influence this microclimate.



Microclimate sensor equipment used in the study

Cushion set up, with MIC200 and PER200

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Method

Using temperature and humidity sensors, the microclimate of a seated volunteer was monitored to see how the use of seating fabrics with different moisture vapour permeability (MVP) levels affected the temperature and humidity experienced.

Sensors were placed underneath the thighs and buttocks of the volunteer, above and below the cover fabric. Data was collected using a Body View system supplied by Inside Climate. The test was run for 1 hour.

STUDY 1

In the first study, the volunteer was seated on a moulded seating cushion with a cover made from two fabrics; on the left hand side was **MIC200**, a fabric from Dartex® Microclimate range. On the right hand side was **PER200**, a fabric from Dartex® Performance range.

STUDY 2

In the second study, the volunteer was seated on a foam cushion. Three separate cushion covers were made from different Dartex® fabrics – **MIC861**, **MIC200** and **END457** – and results from each cover were measured.

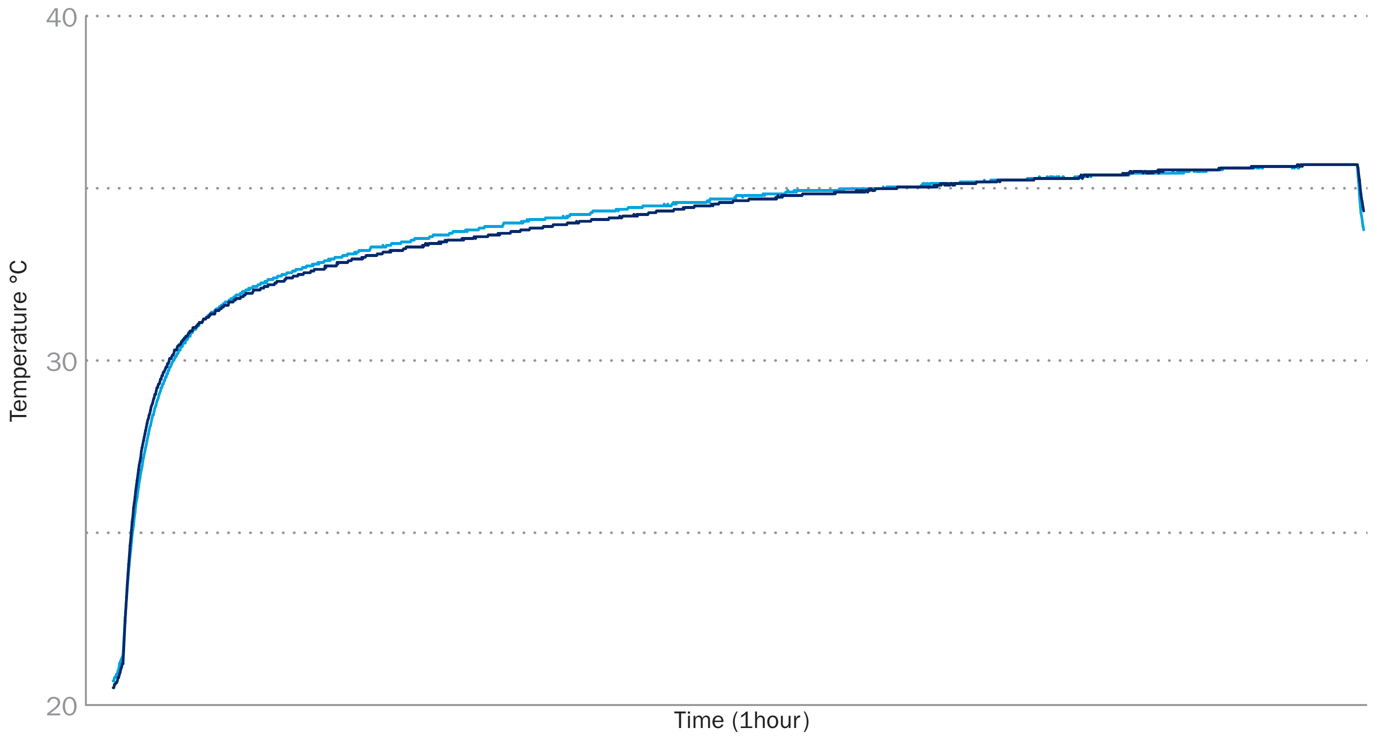
FABRIC		DARTEX® RANGE	FABRIC DESCRIPTION	MVP, ASTM D1653 (G/M2/24H)
dartex MicroClimate	**MIC861**	Microclimate	MIC861 – 4-way stretch polyester fabric with a Dartex® Microclimate coating	1500
dartex MicroClimate	**MIC200**	Microclimate	MIC200 – 2-way stretch polyamide fabric with a Dartex® Microclimate coating	1000
dartex Performance	**PER200**	Performance	PER200 – 2-way stretch polyamide fabric with a Dartex® Performance coating	500
dartex Endurance	**END457**	Endurance	END457 - 4-way stretch polyester fabric with a Dartex® Endurance coating	300

Results

STUDY 1

In the first study, the temperature profile was consistent, but the humidity levels in between skin and fabric were significantly lower for the Microclimate fabric. When measuring absolute humidity below the fabric, a greater increase in humidity was recorded for the Microclimate fabric; demonstrating the increased movement of moisture vapour through this particular material.

Temperature (Above) **MIC200** / **PER200**



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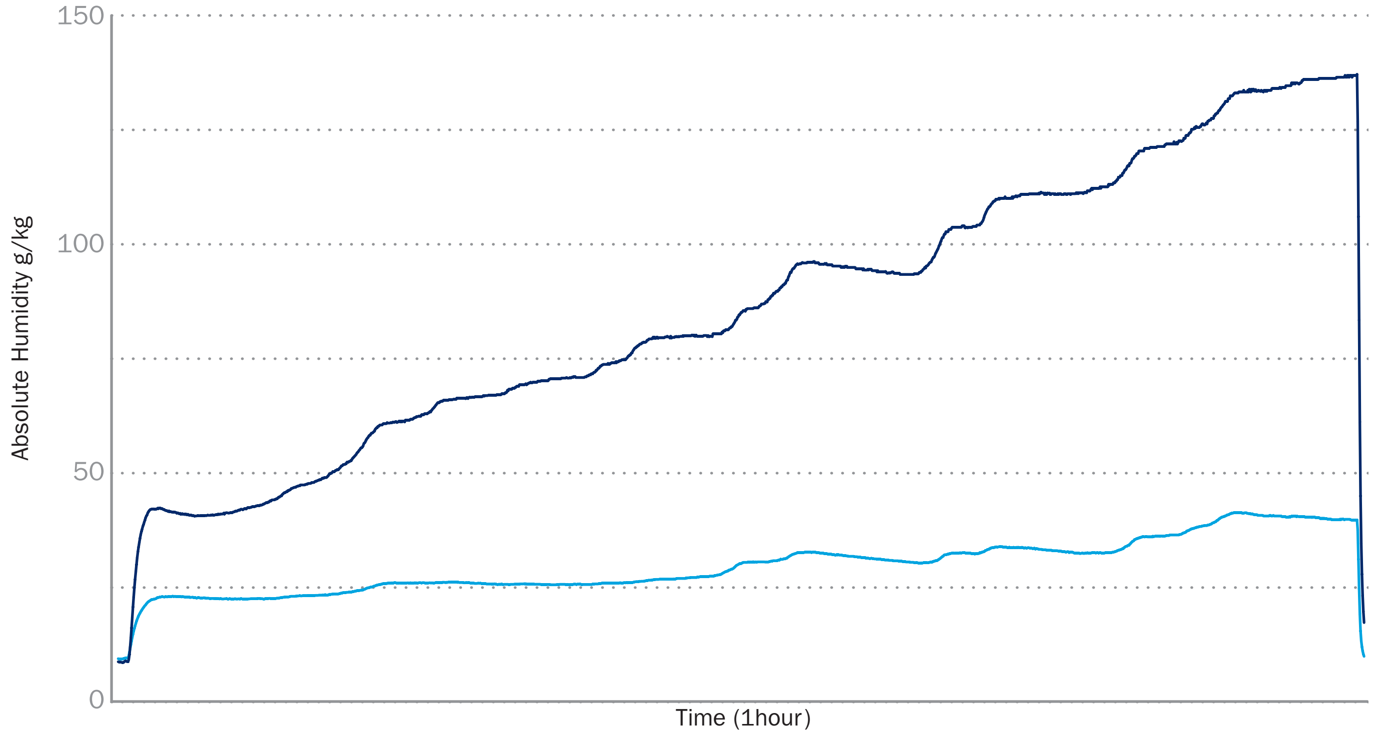
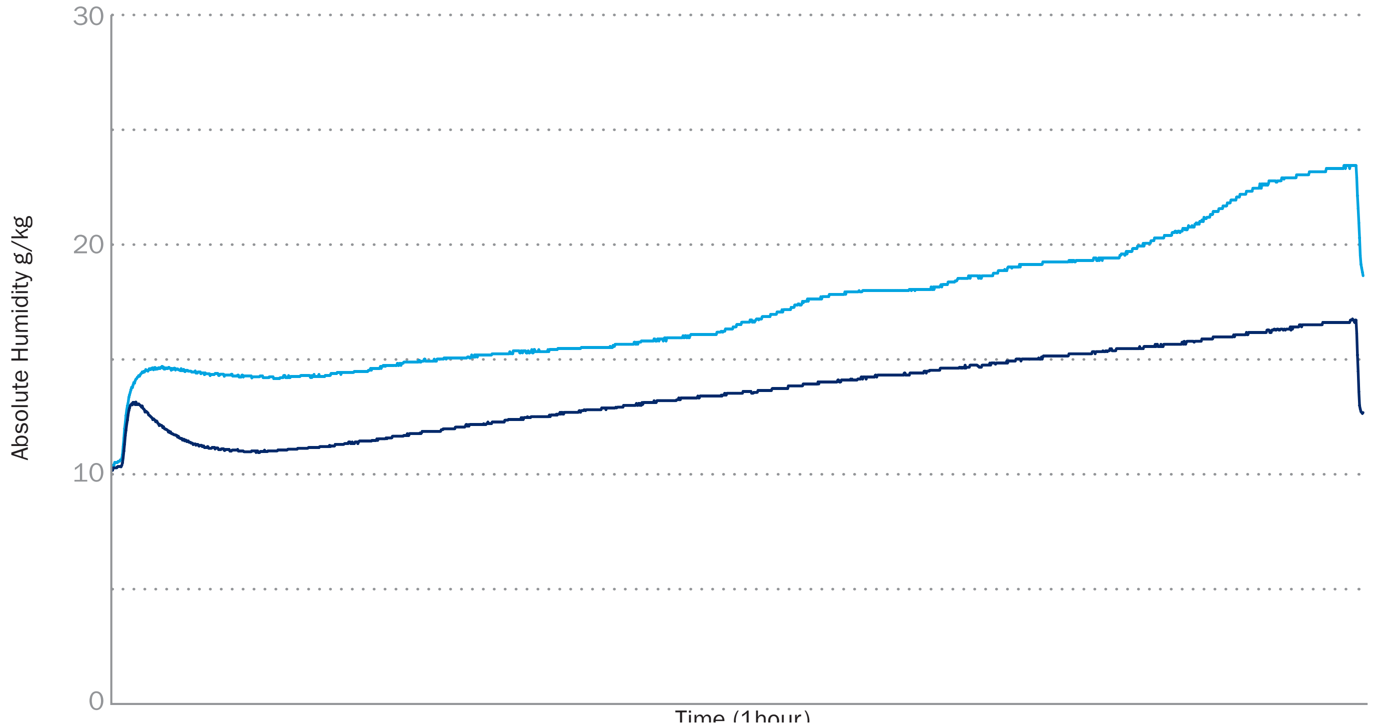
Absolute humidity (Above) **MIC200** / **PER200**



Absolute humidity (Below) **MIC200** / **PER200**

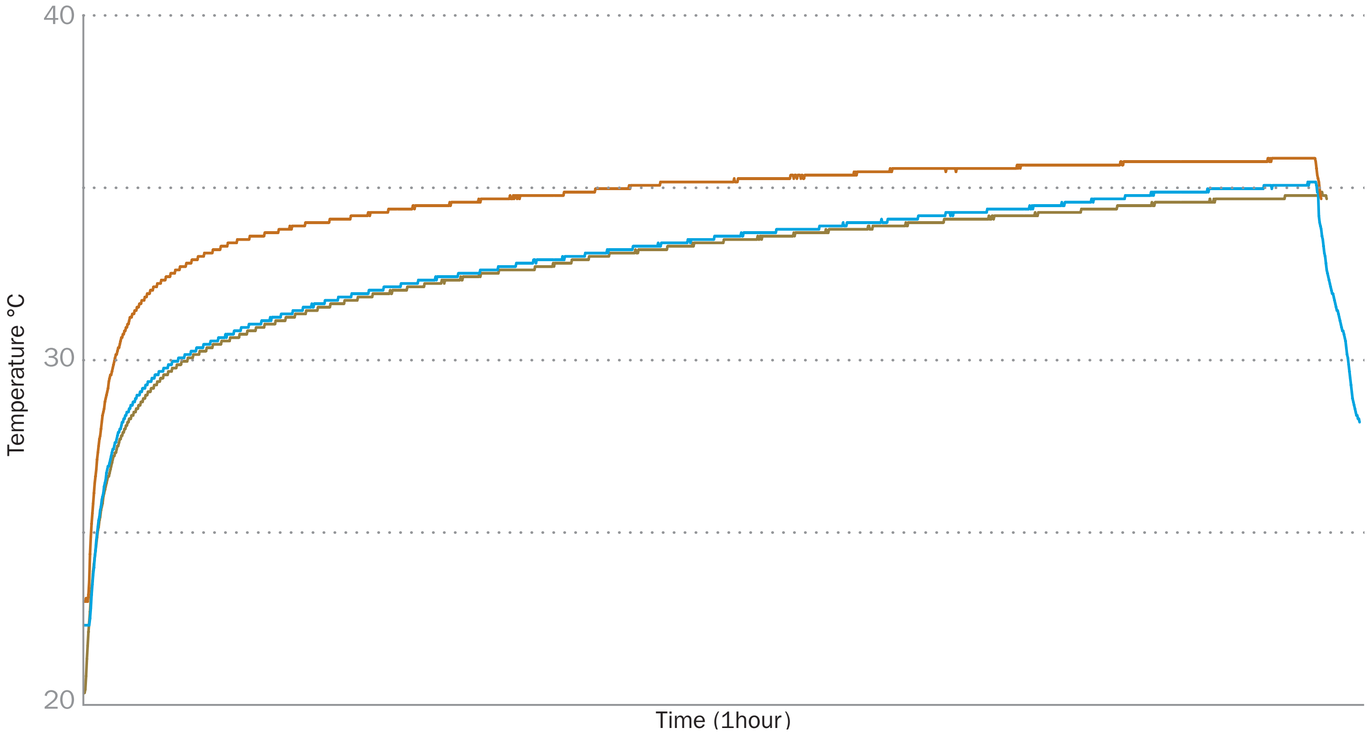


STUDY 2

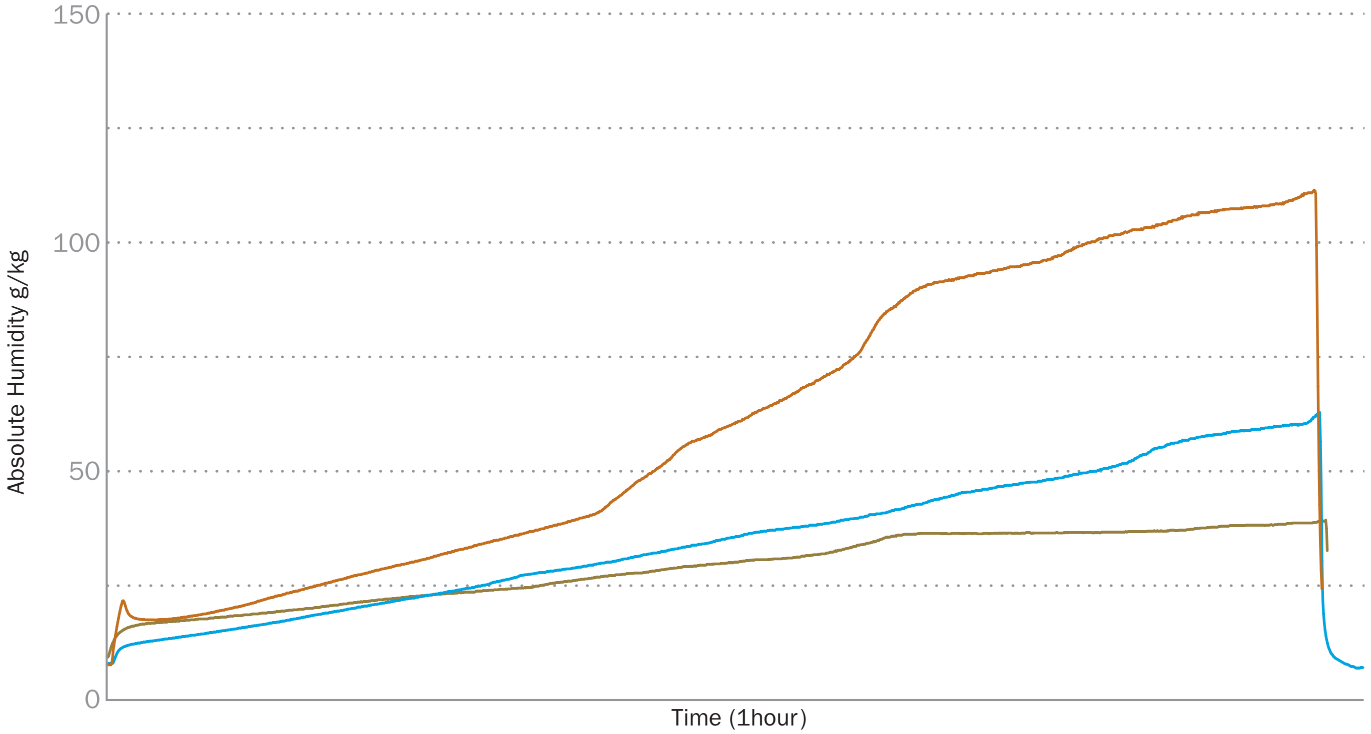
In the second study, the same pattern emerged; the higher the moisture vapour permeability of the fabric, the lower the absolute humidity measured between skin and fabric and the more moisture detected underneath the cover fabric.

Interestingly in this test, the more breathable the fabric, the more time it took for the temperature to equilibrate.

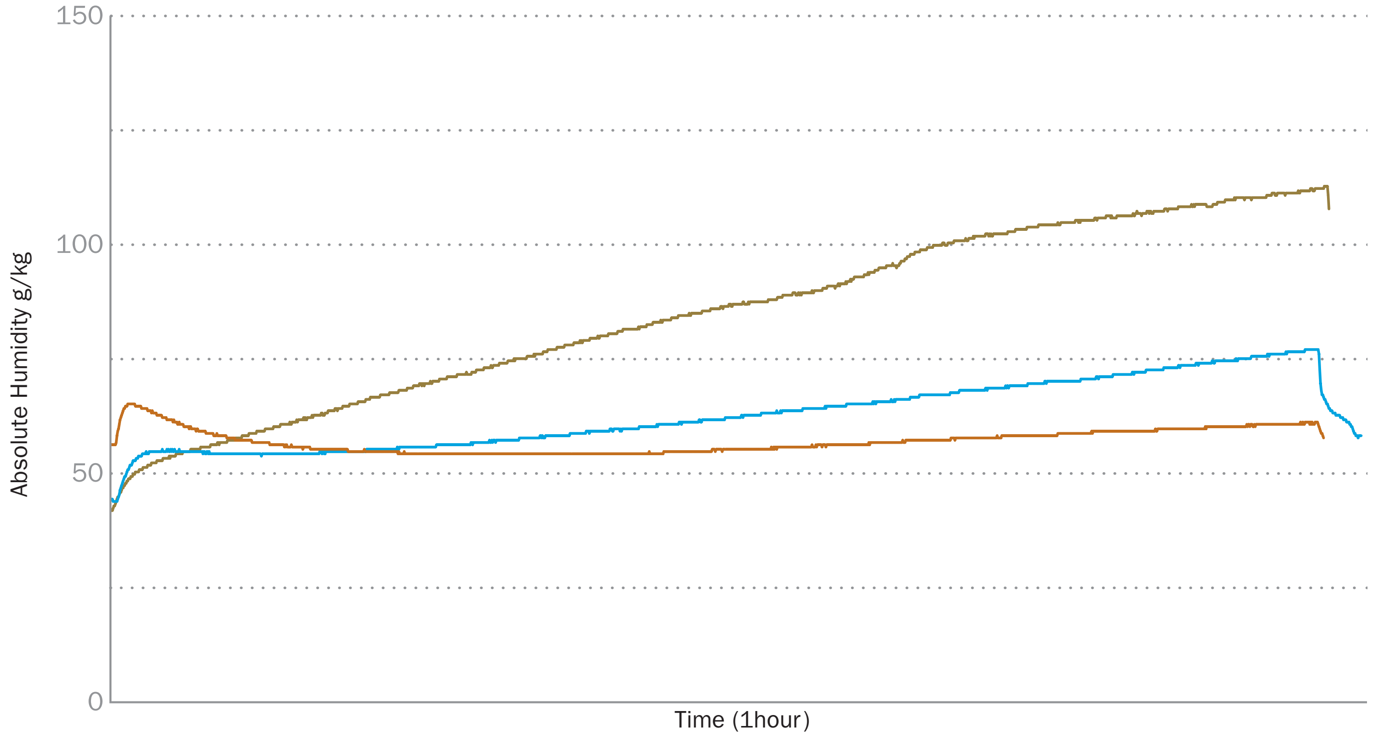
Temperature (Above) **MIC200** / **MIC861** / **END457**



Absolute humidity (Above) **MIC200** / **MIC861** / **END457**



Absolute humidity (Below) **MIC200** / **MIC861** / **END457**



Conclusion

This initial study shows that the absolute humidity results measured were different for each cushion, which demonstrates that it is not just the properties of the fabric that can influence the microclimate.

For best results, the moisture handling properties of the fabric should be matched to the moisture handling properties of the other seat components. Choosing a fabric with high MVP can slow the temperature and humidity rise over time, to keep the person feeling cooler and drier for longer.

It is suggested that this study is repeated using a wider variety of fabrics for a longer period of time to see if this has any differing impacts on the microclimate.