School of Engineering, Design and Technology

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Testing for the Air Flow Resistivity and acoustic absorption

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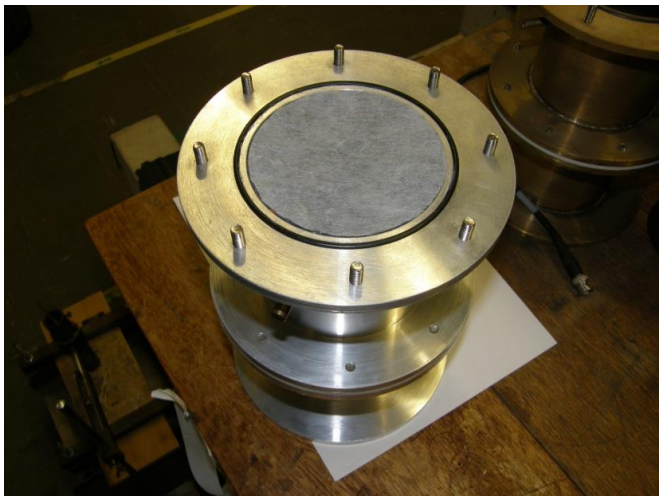
Introduction

This report presents the results of air flow resistivity and acoustic absorption test on fabric samples. The test was carried out according to the standard ISO 9053 [1] and BS EN ISO (2001) in the Acoustics Laboratory at the University of Bradford between 10th – 12th of March 2014.

Procedure for testing the sample

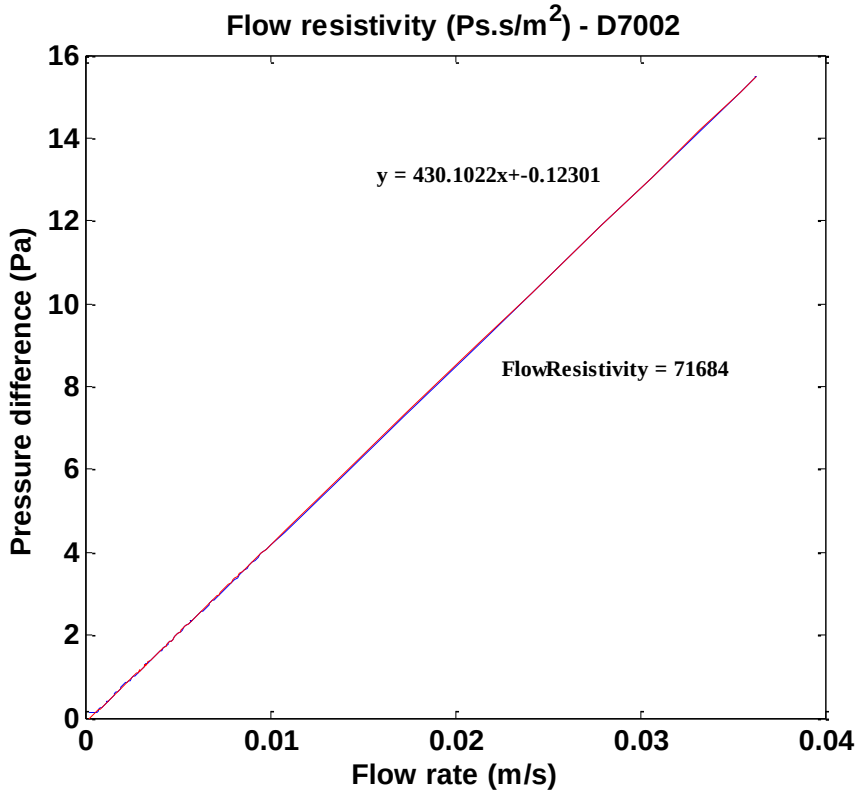
The tests were carried out using the flow resistivity rig which is shown in Figure 1 at room temperature in the range 19.6 to 19.8^{o}C. The material sample was placed in the sample holder as shown in Figure 2. The pressure transducers used were: (1) FCO34 pressure transmitter (ranges 0-30Pa, serial no: 9505145, certificate no: 05471), (2) FCO34 pressure transmitter (ranges 0-100Pa, serial no: 9603156, certificate no: 05472), (3) FCO34 Pressure transmitter coupled with a laminar flow element (ranges 0-30 l/min, serial no: 9505144 & 9505146, certificate no: 05473). The three pressure transducers were calibrated by Furness Controls Limited on the 20th April 2013. The electrical signals from the pressure transducers were acquire via a National Instrument data acquisition module (NI USB – 6008, 8 input, 12-bit, 10ks/s, multifunction I/O) and processed using a dedicated computer program written in LabView language. The value of the flow resistivity was determined from the slope of the linear function $\Delta p = f(V)$ using the least mean square method. Here Δp stands for the pressure drop across the material sample and V is the air flow velocity.

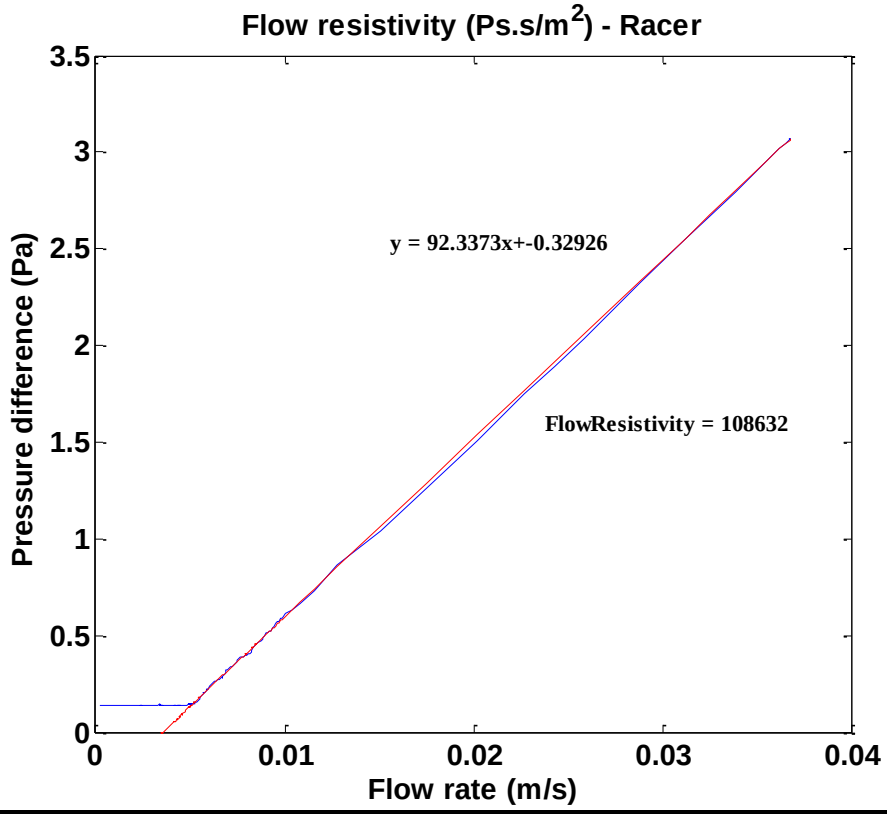
Figures 1. Air flow resistivity setup.

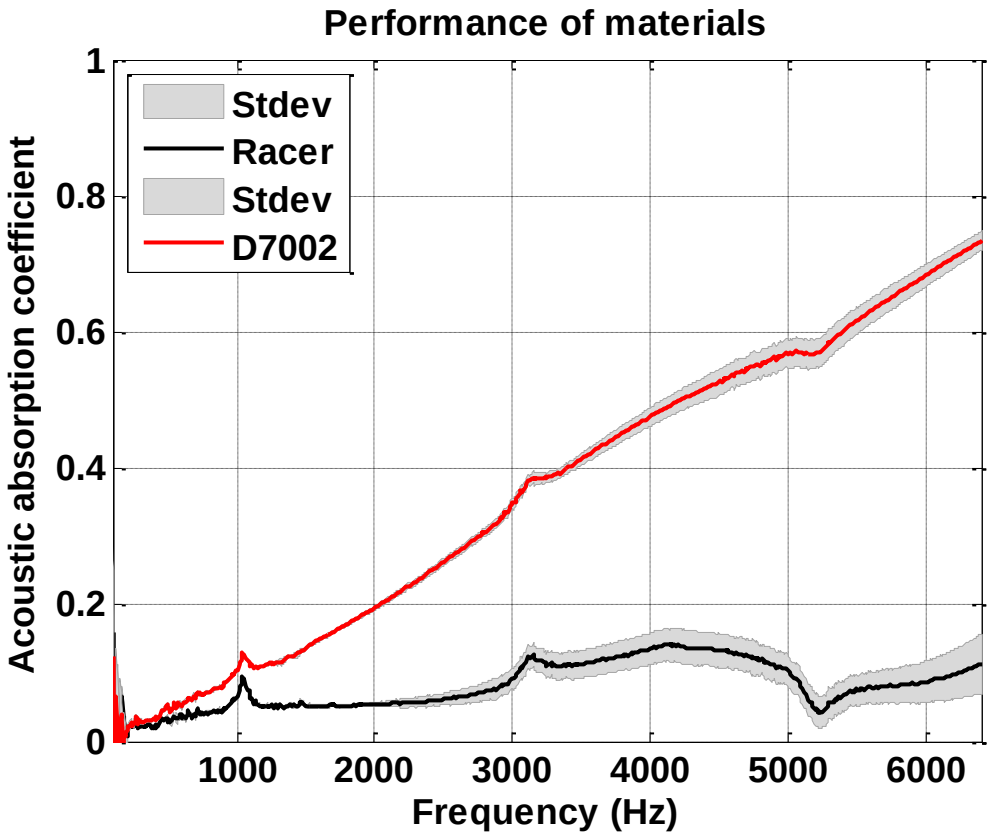


Figures 2. Sample inside the sample holder.

Results


Flow resistivity (Ps.s/m2) - D7002
y = 430.1022x+-0.12301
FlowResistivity = 71684
Pressure difference (Pa)
Flow rate (m/s)
0
2
4
6
8
10
12
14
16
0.01
0.02
0.03
0.04


Flow resistivity (Ps.s/m2) - Racer
y = 92.3373x+-0.32926
FlowResistivity = 108632
Pressure difference (Pa)
Flow rate (m/s)
0
0.5
1
1.5
2
2.5
3
3.5
0.01
0.02
0.03
0.04



Sample	Flow Resistivity (Pa s/m^2)	Thickness (mm)
Racer	108,632	0.85
D7002	71,684	6

Table 1. Flow resistivity.

Conclusions

It has been found that the materials supplied by Camira fabrics exhibit good acoustic absorption coefficient across a broad range of audio frequencies for the given thickness.

References

1. BS EN 29053: 1993, Acoustics – Materials for acoustical applications – Determination of airflow resistance, British standards Institution London.
2. British Standard BS EN ISO 10534, (2001). Determination of sound absorption coefficient and impedance in impedance tubes. Part 2: Transfer function method.