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Determination of sound absorption coefficient in impedance tubes according to ISO 10534-2

(2 appendices)

Client

SP Wood Technology

Test object

The test object, Feelingwood, for both impedance tube sizes of 100 mm and 30 mm. Some parameters of the test object are given in Table 1.

Table 1. The test objects

Test object	Thickness (mm)	Weight (g) (100 mm diameter)	Density (kg/m^3) (estimated)
Feelingwood	45	15,5	43,9

Photo of the test object is given in Appendix 1.

Measurement date

5 April

Result

At right incoming angle, the material's absorption coefficients in third octave bands between 100 – 1600 Hz were determined by 100mm diameter impedance tube; the material's absorption coefficients in third octave bands between 800 – 5000 Hz were determined by 30mm diameter impedance tube. For those overlapped third octave bands the results by 100mm diameter impedance tube should be used.

The frequency resolution for the narrow band measurements is 1,5625 Hz. The whole frequency range for the measurements (using the 100mm diameter tube together with the 30mm diameter tube) is 81,25 – 5700 Hz, aiming to cover one third octave bands of 100 – 5000 Hz.

Seven quantities have been determined for the test material:

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Alpha	The normal incidence sound absorption coefficient
abs(r)	The amplitude of the normal incidence reflection factor
angle (r)	The angle of the normal incidence reflection factor
real (r)	The real part of the normal incidence reflection factor
imag (r)	The imaginary part of the normal incidence reflection factor
real (Z)	The real part of the specific acoustic impedance
imag (Z)	The imaginary part of the specific acoustic impedance

The absorption coefficient data in one third octave bands between 100 - 5000 Hz is given in Table 2 for the test object. The relevant narrow band result is given in graph in Appendix 2. The digital narrow band data for the seven quantities for the test object is given in the Excel data files "tube100_result" and "tube30_result".

Table 2. Absorption coefficient in third octave bands.

Frequency [Hz]	Feelingwood 45 mm	
	100mm tube	30mm tube
100	0,05	
125	0,07	
160	0,08	
200	0,10	
250	0,21	
315	0,31	
400	0,40	
500	0,55	
630	0,69	
800	0,81	0,77
1000	0,91	0,88
1250	0,97	0,95
1600	0,99	0,98
2000		0,97
2500		0,94
3150		0,92
4000		0,95
5000		0,97

The results are valid for the tested samples only.

Measurement conditions

Temperature	22 ±1 ℃
Humidity	45 ±5 % RH
Air pressure	991 ±5 hPa

Measurement method

The measurements were carried out according to ISO 10534-2 "Acoustics - Determination of sound absorption coefficient and impedance in impedance tubes - Part 2: Transfer function method".

Uncertainty

The measurement uncertainty is estimated to be 0,02 absorption coefficient units. The uncertainty is given with a coverage factor k = 2, which for a normal distribution gives a probability of about 95 %.

Equipment

Impedance tube	Brüel & Kjaer	4002	ser.no. 168423
Microphone	Brüel & Kjaer	4939	ser.no. 2389604
Microphone	Brüel & Kjaer	4939	ser.no. 2420329
Mic. preamplifier	Brüel & Kjaer	2633	ser.no. 1205782
Mic. preamplifier	Brüel & Kjaer	2633	ser.no. 1444661
Mic. power supply	Brüel & Kjaer	2804	ser.no. 1854132
Power amplifier	LAB.GRUPPEN AB	SS 1300	ser.no. 910-905
Sound Analyser	01dB	Harmonie	ser.no. 04227
Calibrator	Brüel & Kjaer	4228	ser.no. 1404336

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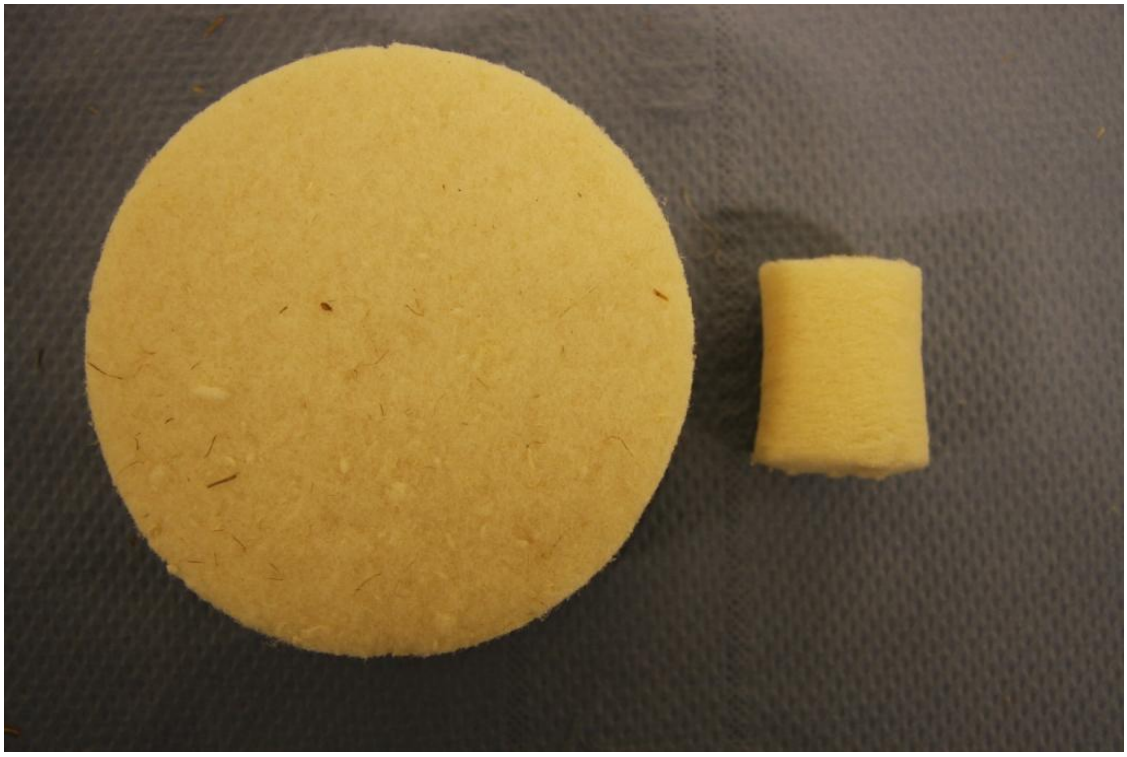
Appendices

Photo of the test object

Feelingwood



The narrow band sound absorption coefficient

(for reference)

Feelingwood