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To **DuroStick**

Subject : **Evaluation of a sample of the brushable product in the form of a paste in terms of sound insulation properties for airborne noises**

At the request of the DUROSTICK company to evaluate the soundproofing capacity of a brushable product in paste form with the brand name dB Block, measurements of the soundproofing capacity in airborne noises were carried out by the Nanoapplications laboratory of the Institute of Theoretical and Physical Chemistry of the National Research Foundation. The process, results, and conclusions follow

Procedure

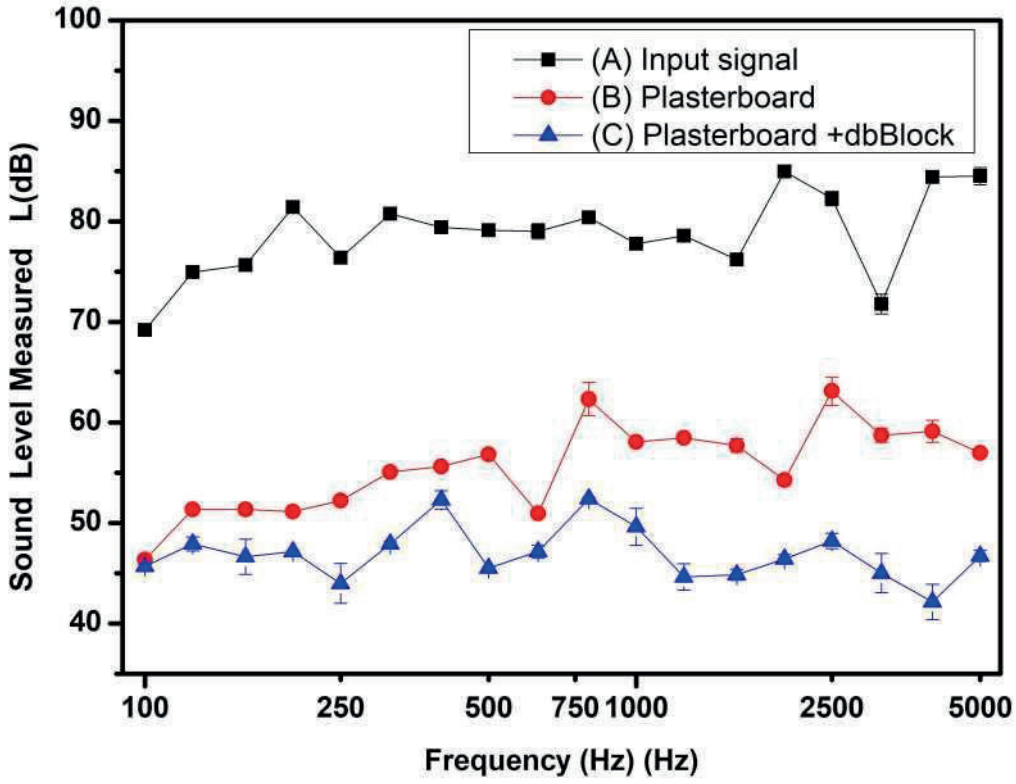
Initially, software was developed in a Labview environment, through which a calibrated sound signal source produced sound waves of a specific intensity and a specific frequency and simultaneously recorded the response of a sound signal sensor to the input signals.
An open source software in a Matlab environment was also modified, which implements temporal and spectral analysis of the recorded signals in terms of sound intensity using digital filters in a way that conforms to the ANSI S1.4-1983 standard.
Furthermore, sets of measurements were taken using the above software on two samples made of plasterboard with dimensions of 100x100x100cm. The first without the application of the soundproofing product, and the second after the application of it. Measurements were made by generating input signals in a frequency range from 100 to 5000Hz and using the maximum inflection point and average methods.

Results

Sound intensity measurements

	m	11 (V)	C1(yEr±)	B{Y}	E1[yEr±)	D(Y>	G1(yEr±)
Long Name	Frequency (Hz)	[A) Input signal	Std A	(B) Plasterboard	Std B	[C) Plasterboard -•-dbBlock	Std C
Units	Hz	dB	dB	dB	dB	dB	dB
Comments							
1	100	69.17	0.21	46.34	0.1	45.69	0.21
2	125	74.96	0.07	51.36	0.12	47.93	0.7
3	160	75.65	0	51.35	0.53	46.65	1.74
4	200	81.41	0.14	51.15	0.12	47.15	0.12
5	250	76.33	0.2:1	5224	0.21	43.99	1.99
6	315	80.76	0.21	55.03	0.23	47.93	0.23
7	400	79.42	0.21	55.64	0.4	52.31	0.9
3	500	79.12	0.14	56.35	0.06	45.52	0.1
9	630	79	0.73	50.96	0.06	47.16	0.67
10	300	80.38	0.21	62.33	1.61	52.41	0.17
11	1000	77.77	0.49	53.09	0.15	49.63	1.34
12	1250	73.55	0.07	53.49	0.4	44.64	1.31
13	1600	76.18	0.07	57.73	0.67	44.35	0.55
14	2000	84.94	0.2:3	54.27	0.53	46.42	0.44
15	2500	82.23	0.71	63.1	1.37	43.22	0.75
16	3150	71.78	0.99	53.75	0.7	45.02	1.95
17	4000	84.41	0.07	59.14	1.11	42.16	1.75
13	5000	34.5	0.35	57	0.3	46.74	0.55

Table 1 Average and standard deviation of 6 sets of measurements for: A) input signal B) 9mm plasterboard sample and ^9mm plasterboard sample and 3mm dB Block coating for the frequency range between 100-5000Hz



Graph 1 Average and standard deviation of 6 sets of measurements for: A) input signal B) 9mm plasterboard sample and ^9mm plasterboard sample and 3mm dB Block coating for the frequency range between 100-5000Hz

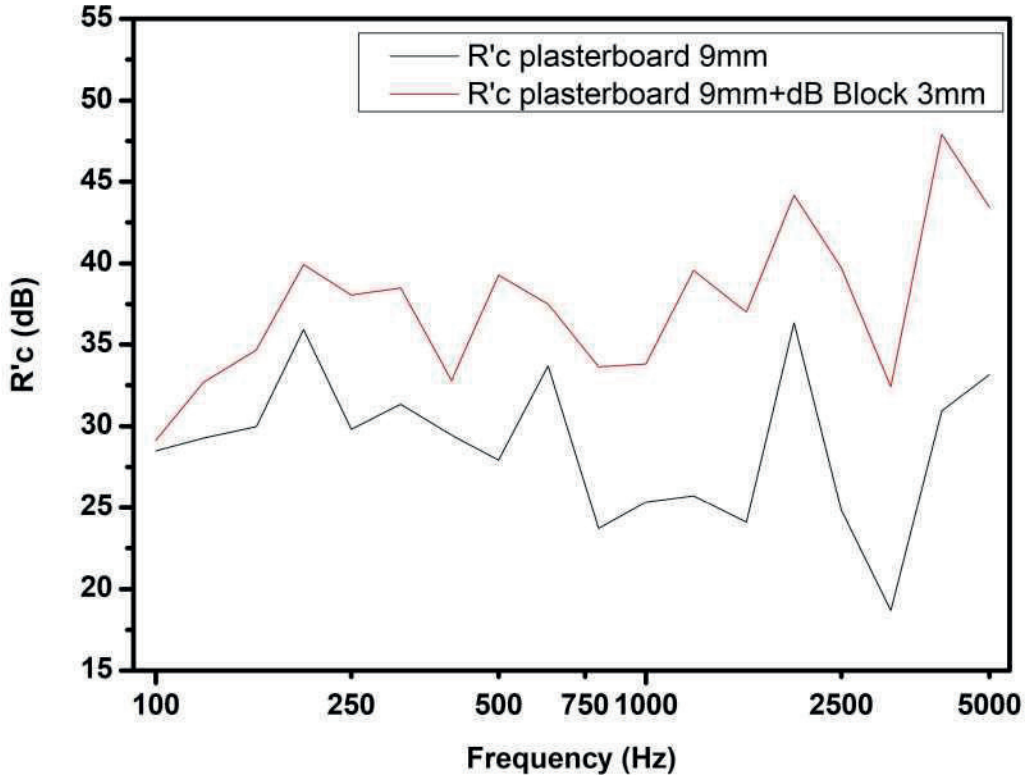
Calculation of Apparent Sound Reduction Index

where L_{Input} the intensity level of the input signal as measured in the sound production area, $L_{measured}$ the intensity level of the recorded signal inside the test, S the sound incident surface,

the equivalent sound-absorbing surface area of the specimen.

Frequency(Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000
$L_A(dB)$	69.17	74.9	75.65	81.4	76.38	80.7	79.42	79.1	79	80.3	77.77	78.5	76.18	84.9	82.28	71.7	84.41	84.5
$L_B(dB)$	46.34	51.3	51.35	51.1	52.24	55.0	55.64	56.8	50.96	62.3	58.09	58.4	57.73	54.2	63.1	58.7	59.14	57
$L_c(dB)$	45.69	47.9	46.65	47.1	43.99	47.9	52.31	45.5	47.16	52.4	49.63	44.6	44.85	46.4	48.22	45.0	42.16	46.74
L_A-$L_B(dB)$	22.83	23.6	24.3	30.2	24.14	25.6	23.78	22.2	28.04	18.0	19.68	20.0	18.45	30.6	19.18	13.0	25.27	27.5
L_A-$L_c(dB)$	23.48	27.0	29	34.2	32.39	32.8	27.11	33.6	31.84	27.9	28.14	33.9	31.33	38.5	34.06	26.7	42.25	37.76
10Log(S/A)	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66	5.66
$R'_{C(A-B)}$ (dB)	28.49	29.26	29.96	35.92	29.80	31.34	29.44	27.93	33.70	23.71	25.34	25.72	24.11	36.33	24.84	18.69	30.93	33.16
$R'_{C(A-C)}$ (dB)	29.14	32.69	34.66	39.92	38.05	38.49	32.77	39.26	37.50	33.63	33.80	39.57	36.99	44.18	39.72	32.42	47.91	43.42

Table 2 Calculation table of apparent sound reduction index



Graph 2 Apparent sound reduction index for 9mm drywall specimen and for 9mm plasterboard specimen coated with dB Block 3mm coating for the frequency range between 100-5000Hz

Frequency^ ^)	100	125	160	200	250	315	400	500	630
$R'_{C(A-B)} - R'_{C(A-C)}$ (dB)	0.65	3.43	4.7	4	8.25	7.15	3.33	11.33	3.8
Frequency^ ^)	800	1000	1250	1600	2000	2500	3150	4000	5000
$R'_{C(A-B)} - R'_{C(A-C)}$ (dB)	9.92	8.46	13.85	12.88	7.85	14.88	13.73	16.98	10.26

Table 3 Differences in apparent airborne noise sound reduction index by frequency between the 9mm plasterboard specimen and the 9mm drywall specimen coated with 3mm dB Block coating.

Calculation of weighted effective sound reduction index Γ for the

$$R'w(A\text{-}B) = \Sigma/\Delta\_B) = \mathbf{28.81}\ dB$$

For the test with 9mm plasterboard and 3mm dB Block overcoat

$$R'\ \mathbf{w}(A\text{-}C) — \frac{\Sigma fRc(A\text{-}c)}{\mathbf{18}} = \mathbf{37.45}\ dB$$

sample with 9mm plasterboard

So the measured difference in the apparent weighted sound reduction index due to the application of 3mm thick dB Block is 8.64dB

Theoretical calculation of a weighted effective sound reduction index for a 9mm plasterboard sample coated with 9mm of dB Block.

The difference in sound reduction due to an increase in the thickness of the dB Block was calculated according to the theoretical approximation formula

$$TL = \mathbf{20}LOG(m * f) - \mathbf{48}\ (dB)$$

where m is the mass per unit area and f is the frequency of the sound signal. For m=3.30kg/m/3mm an additional sound reduction occurs for a thickness of 9mm 9.53dB

Conclusion

	RL
Plasterboard 9mm	28.81dB
Plasterboard 9mm+dB Block 3mm	37.45dB
Plasterboard 9mm+dB Block 9mm*	46.98dB

*Theoretical calculation

The measured difference in the effective weighted sound reduction index of airborne noise due to the application of 3mm thick dB Block is 8.64dB.

With honor

Γαβριήλ Βασίλειος