

Environmental Systems
PARAMETRIC ANALYSIS FOR SOUND AUTONOMY

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May 2015

ABSTRACT

Based on the data listed will treatment a study hall at UP – will treatment all of problems and sound effects that suffer from noise problems and not arrived speech to the required distance where it will be processed audio. Through the program (**Ecotect**) for the treatment of vacuum thoughts its design, to provide a signal to the sound design of the hall to get to the desired intensity of the sound.

Analysis of sound and acoustics plays a role in such engineering tasks as product design, production test, machine performance, and process control. For instance, product design can require modification of sound level or noise for compliance with standards.

1. Sound analysis and the properties of the materials used in the space

1.1.Theory and Implementation

Absorption coefficients of thin layers of material over a range of flow-resistance values are also shown. Supplementary data provide a basis for estimating the flow-resistance of a material from its bulk density.

1.2. THE NATURE OF SOUND

A vibrating object will produce a sequence of compressions and rarefactions in the air surrounding it. These small fluctuations in air pressure travel away from the source at relatively high speed, gradually dying off as their energy is absorbed by the medium. What we call sound is simply the sensation produced by the ear when stimulated by these vibrations.

2 Methodology

2.1. Requirements

1. Hall study at UP
2. Software Program (**Eotect analysis**)
3. Materials used for the treatment of sound.

2.2. Keyword

1. Studio room volume
2. Speech Acoustic
3. Analysis sound absorption
4. Value Reverberation Time (RT)

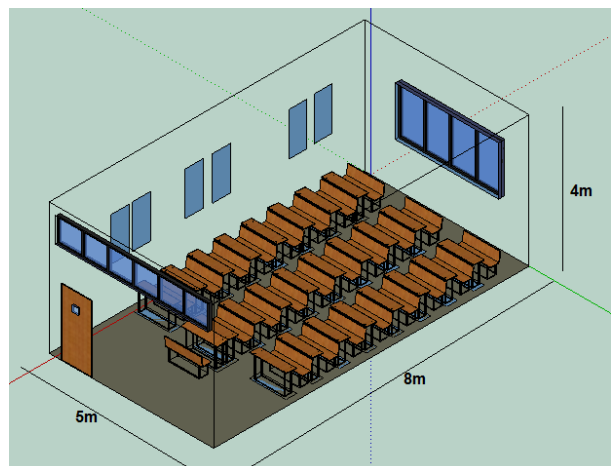
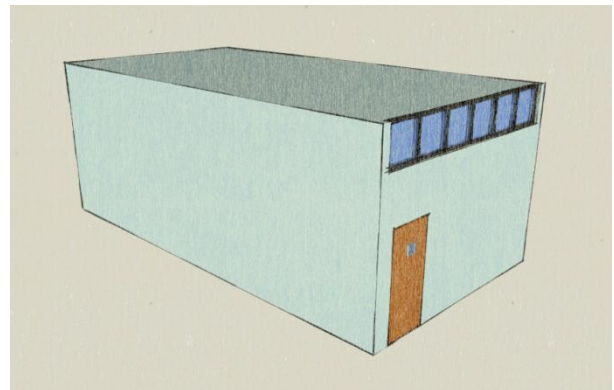
2.3. Input

Dimensions:

8*5*4

Volume:

204 m3



2.4. GOALS

1. Choose suitable material for interior construction and how to find out the amount of absorption and reverse sound on surfaces.
2. The main goal of treatment is dependent to get into the best time (Optimum) so that the increase of processing
3. To get rid of some audio problems such as noise, echo and noise which causes inconvenience to users of the vacuum.
4. Some processors such as the installation: absorbent materials that depend on high or low frequencies, such as porous membranes and absorbent materials

Address the balance by using reflective surfaces or absorbent different frequencies.

- Floor Tiles

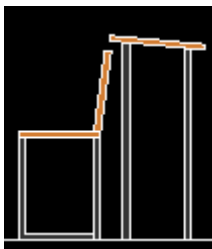


3 Materials:

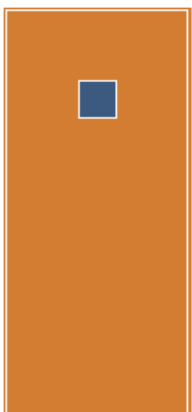
- Windows: (TOP OF THE BOARD)



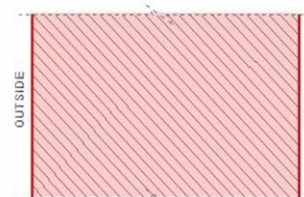
- Sitting Chairs:



- Door:



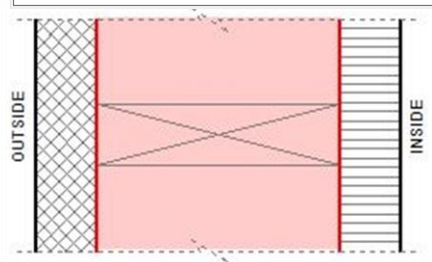
- Board:



Layer Name	Width	Density	Sp.Heat	Conduct.	Type
1. Fabric - Heavy Cloth	0.010	160.0	2000.000	0.045	65

- Walls

Layer Name	Width	Density	Sp.Heat	Conduct.	Type
1. Wood Pine (With Grain)	0.020	550.0	2301.000	0.343	95
2. Air Gap	0.080	1.3	1004.000	5.560	15
3. Plaster Board	0.020	1250.0	1088.000	0.431	85

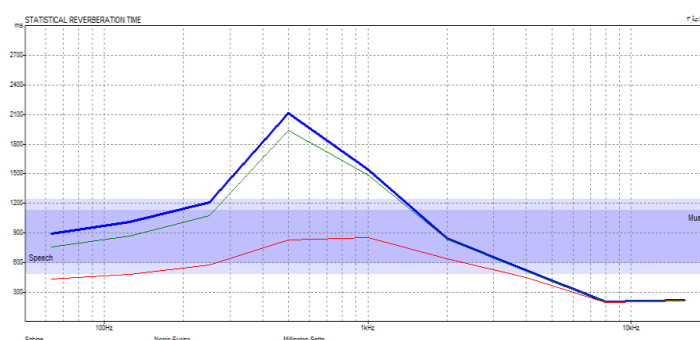


3.1. BY THIS CONDITION, **BEFORE:**

BEFORE THE TREATMENT STATISTICAL ACOUSTICS

- Volume: 204.000 m3
- Surface Area: 180.880 m2
- Occupancy: 4 (49 x 8%)
- Optimum RT (500Hz - Speech): 0.59 s
- Optimum RT (500Hz - Music): 1.13 s
- Volume per Seat: 4.163 m3
- Minimum (Speech): 4.396 m3
- Minimum (Music): 8.294 m3
- Most Suitable: Sabine (Uniformly distributed)
- Selected: Sabine (Uniformly distributed)

FREQ.	TOTAL ABSPT.	SABINE RT(60)	NOR-ER RT(60)	MIL-SE RT(60)
63 Hz:	36.231	0.89	0.43	0.76
125Hz:	31.479	1.01	0.48	0.87
250Hz:	24.978	1.21	0.57	1.08
500Hz:	12.221	2.11	0.83	1.94
1 kHz:	9.760	1.55	0.85	1.49
2 kHz:	8.362	0.85	0.64	0.83
4 kHz:	10.226	0.52	0.45	0.51
8 kHz:	8.640	0.20	0.20	0.20
16kHz:	9.993	0.22	0.21	0.22



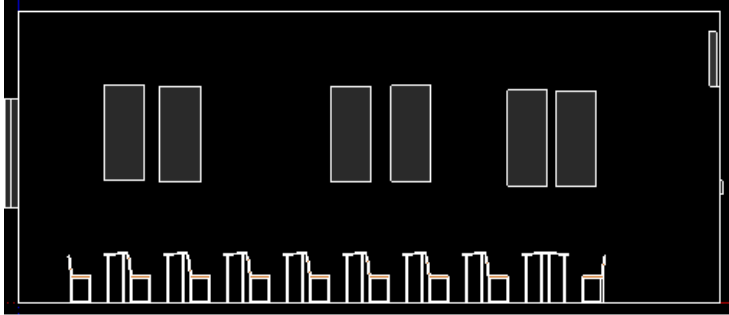
3.2. BY THIS CONDITION, AFTER

AFTER THE TREATMENT

STATISTICAL ACOUSTICS

Added Fabric Panels

Distance Between it and Wall: 0.04 cm



The Result is:

Volume: 204.000 m³

Surface Area: 197.258 m²

Occupancy: 4 (49 x 8%)

Optimum RT (500Hz - Speech): 0.59 s

Optimum RT (500Hz - Music): 1.13 s

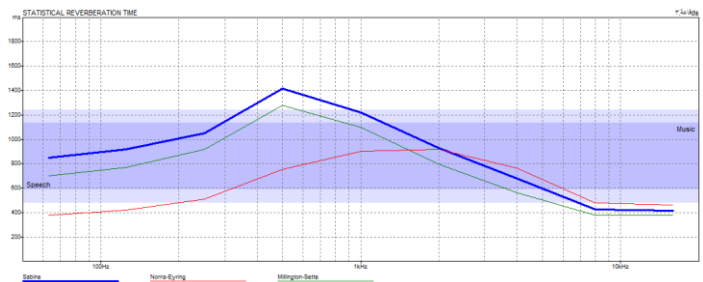
Volume per Seat: 4.163 m³

Minimum (Speech): 4.396 m³

Minimum (Music): 8.294 m³

Most Suitable: Millington-Sette (Widely varying)

Selected: Sabine (Uniformly distributed)

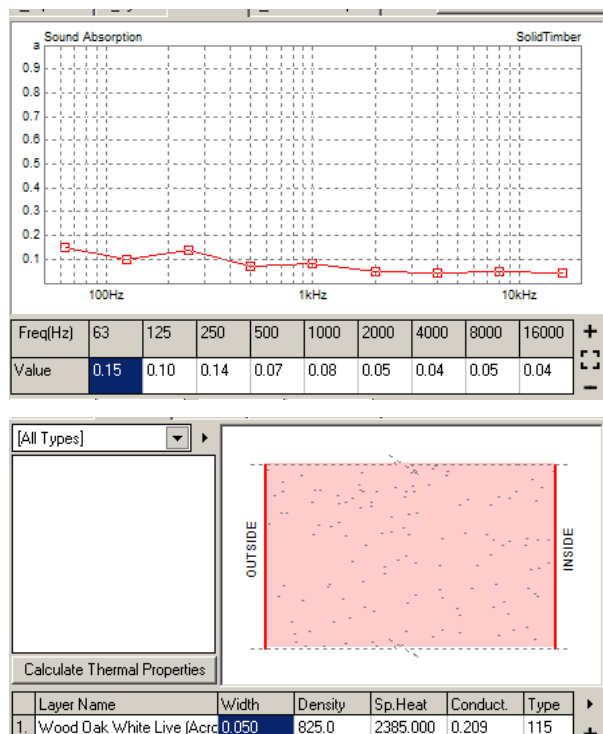


TOTAL FREQ.	SABINE ABSPT.		NOR-ER RT(60)	MIL-SE RT(60)
63Hz:	38.080	0.85	0.38	0.70
125Hz:	34.801	0.92	0.42	0.77
250Hz:	29.312	1.05	0.51	0.92
500Hz:	20.891	1.42	0.75	1.28
1kHz:	21.049	1.22	0.90	1.10
2kHz:	23.589	0.93	0.92	0.79
4kHz:	28.078	0.68	0.76	0.56
8kHz:	27.276	0.43	0.48	0.38
16kHz:	26.719	0.41	0.47	0.38

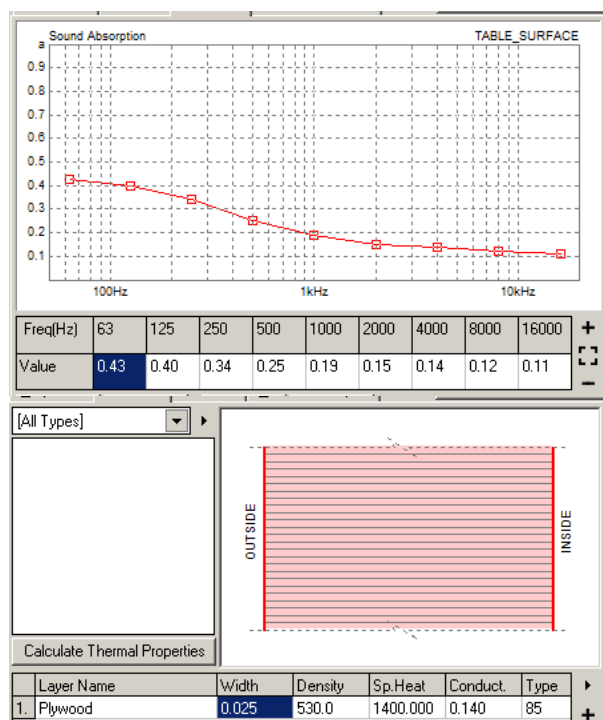
3.3. Preferring Materials

3.3.1. Wall-wood Panels

- *First Material*

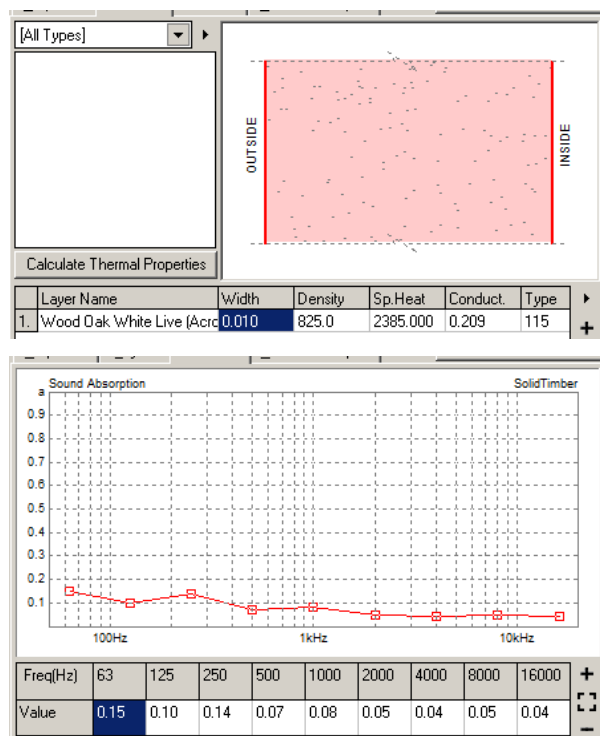


- *Second Material*



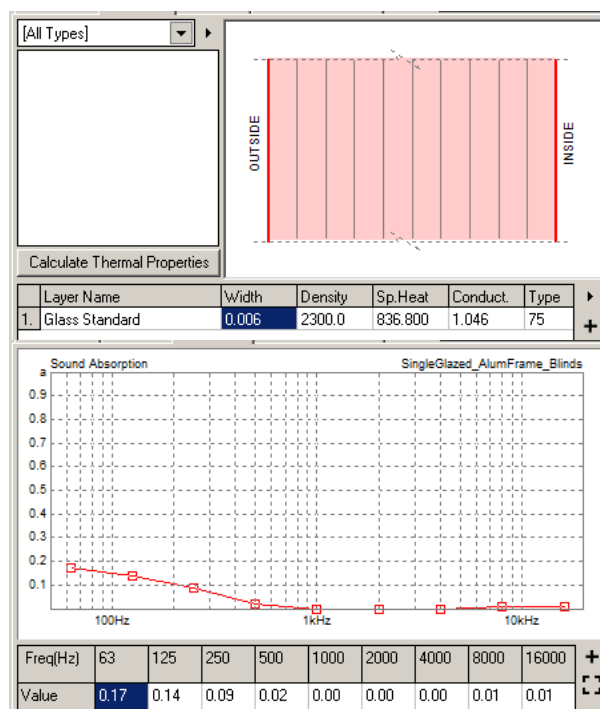
3.3.2. Table Surface

Last (BEST) Material

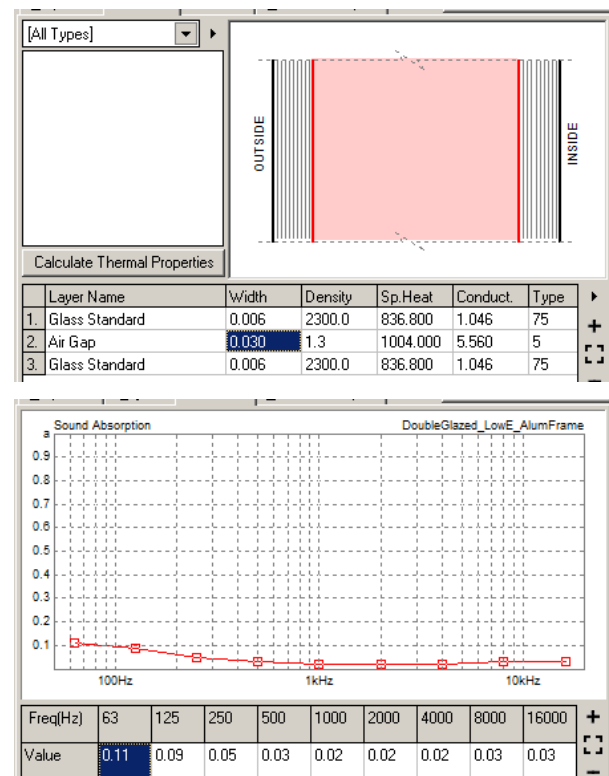


3.3.3. Window single glazed

First Material

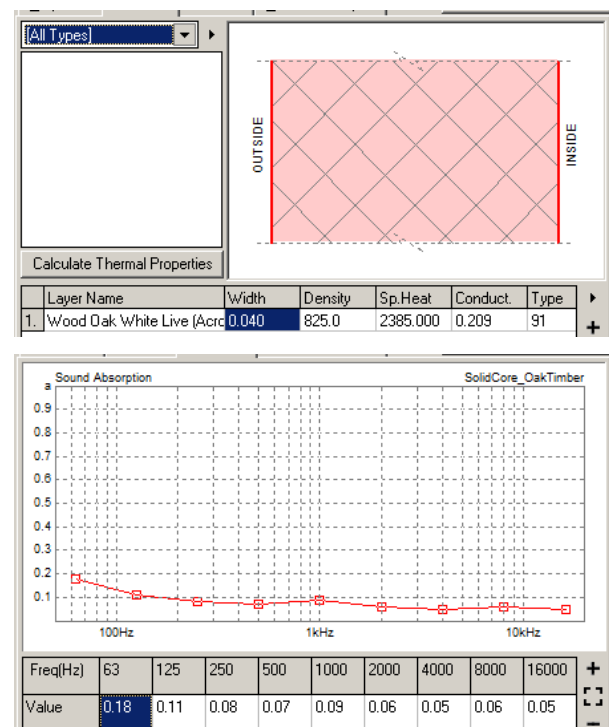


Second Material



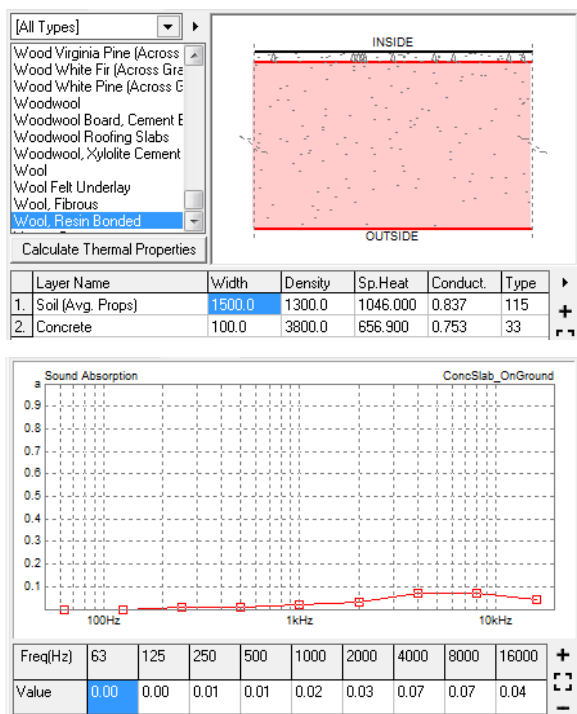
3.3.4. Door

First Material

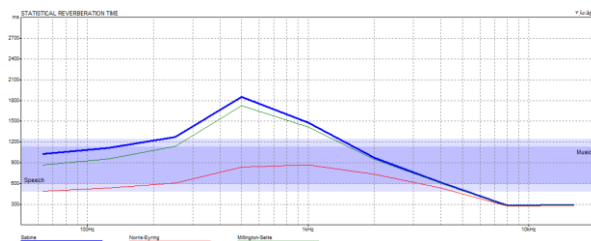


3.3.5. Floor (Tiles)

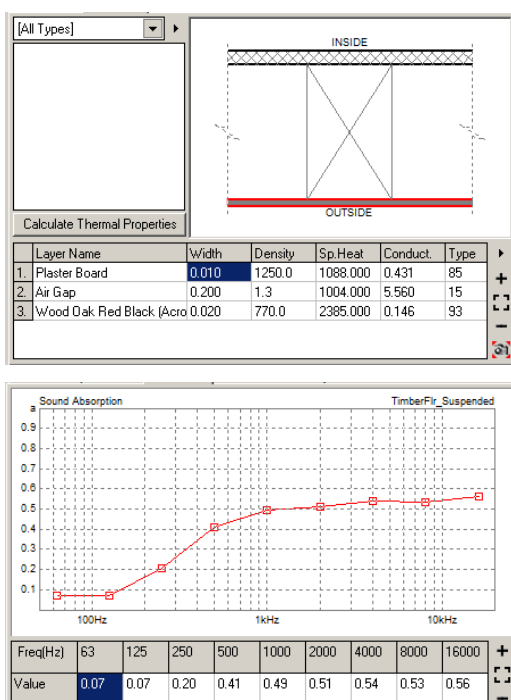
Last (BEST) Material



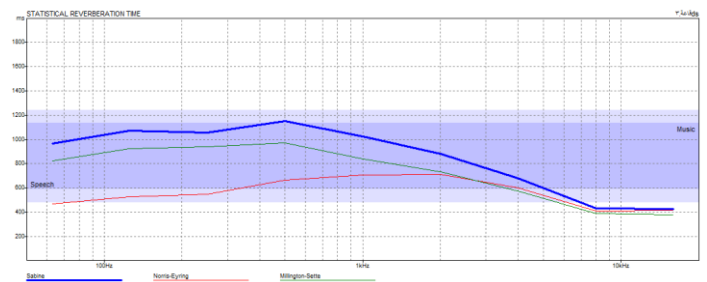
3.3.6. Analysis Before additive Absorptions Material:



3.3.7. Plaster Board (Wood Oak)



3.3.8. Analysis after additive Absorptions Material:



Last Result

Volume: 204.000 m³

Surface Area: 197.258 m²

Occupancy: 4 (49 x 8%)

Optimum RT (500Hz - Speech): 0.59 s

Optimum RT (500Hz - Music): 1.13 s

Volume per Seat: 4.163 m³

Minimum (Speech): 4.396 m³

Minimum (Music): 8.294 m³

Most Suitable: Millington-Sette (Widely varying)

Selected: Sabine (Uniformly distributed)

FREQ.	ABSPT.	TOTAL MIL-SE	SABINE			NOR-ER		
			RT(60)	RT(60)	RT(60)	RT(60)	RT(60)	RT(60)
63Hz:	33.314	0.97	0.47	0.82				
125Hz:	29.735	1.07	0.53	0.92				
250Hz:	29.142	1.06	0.55	0.94				
500Hz:	26.606	1.15	0.67	0.97				
1kHz:	27.471	1.02	0.70	0.84				
2kHz:	26.572	0.88	0.71	0.73				
4kHz:	28.640	0.68	0.60	0.58				
8kHz:	28.346	0.43	0.41	0.39				
16kHz:	29.752	0.43	0.42	0.38				

5 CONCLUSIONS

Several novel applications of the use of ultrasonic sound beams have been presented, as well as an open system used for their development. Many other applications of this system are currently under development, always keeping focus on sound/body interaction. We are also exploring the use of ultrasonic sound beams in combination with other sound projection systems such as ambisonics, and wavefield synthesis. Some future research directions include the extension of the system to the fields of mechatronics and robotics to create autonomous sound beam steering and focusing devices.

6. REFERENCES

- [1] GOOGLE, H. L. F. Helmholtz, *On The Sensations of Tone*. Dover Publications, New York, 1954.
- [2] L. J. Black, "A Physical Analysis of Distortion Produced by the Non-Linearity of the Medium", *The Journal of the Acoustical Society of*

