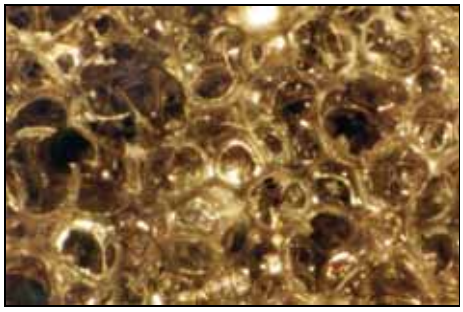
Reapor a Porous Absorber

Reapor is a new type of porous absorber using foamed glass beads, sinterted together to form a porous panel.

A porous absorber is any type of porous or fibrous material, such as polyurethane foams, fibreglass, textiles, carpets etc. They all absorb sound energy as they damp the oscillation of the air particles by viscous dissapation (friction), turning the acoustic energy to heat (this heat energy is too small to be perceived by a person).

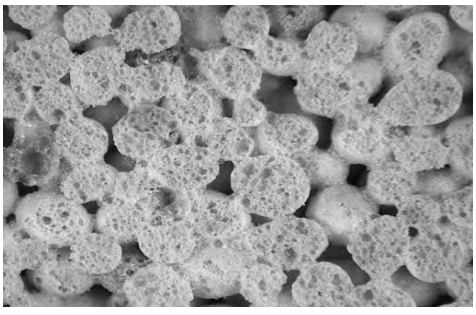
Pictured below is a microsopic view of polyurethane foam showing its cellular structure, the reflective patches are closed cell walls.



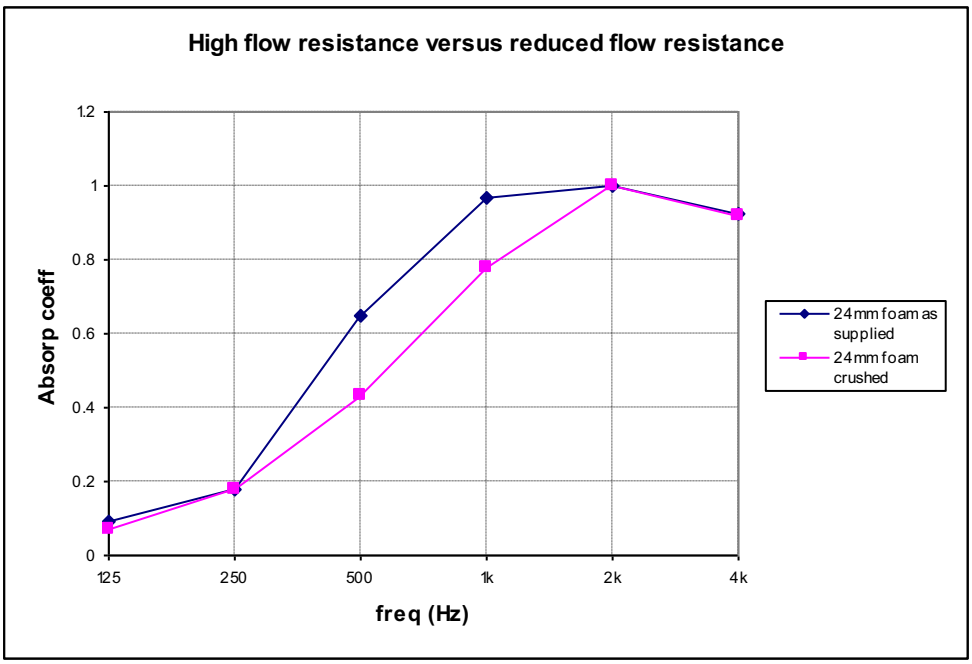
Acoustics foam cells as
seen under a microscope

The two important factors control the performance of a porous absorber are

1. **Airflow resistivity**, generally speaking the higher the air flow resistance within a given band the better a porous absorber works. If the absorber is too closed the sound waves particularly at high frequencies tend to bounce off, loosing little energy. If the absorber is too porous the sound waves pass easily through the material and reflect back off the backing surface. The graph 1 shows the same 24mm foam uncrushed and crushed. The crushing effectively opens the foam up, reducing its flow resistance.



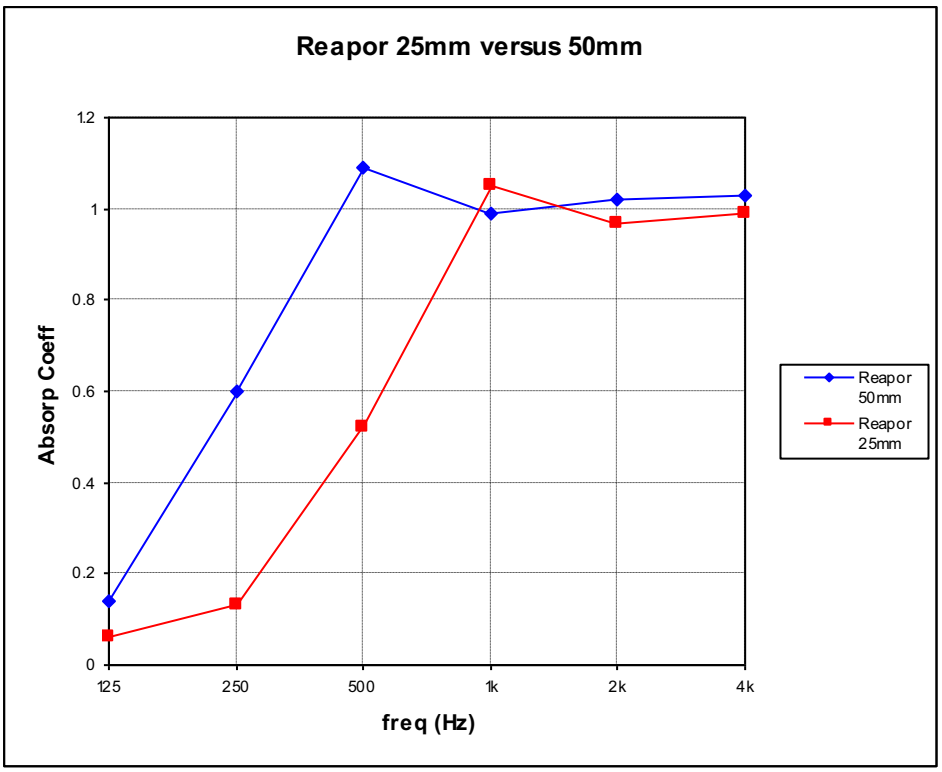
Reapor has stable cells as
seen under a microscope



Graph 1

Reapor has an ideal cell structure, giving it excellent sound absorption properties. Because Reapor will not degrade over time, unlike many other porous absorbers, the acoustic integrity is maintained.

2. **Thickness:** generally speaking the thicker the absorber the better it will perfom acoustically. As the absorber increases in thickness, say from 25mm to 50mm, the low frequency performance starts to improve, as per graph 2 below.



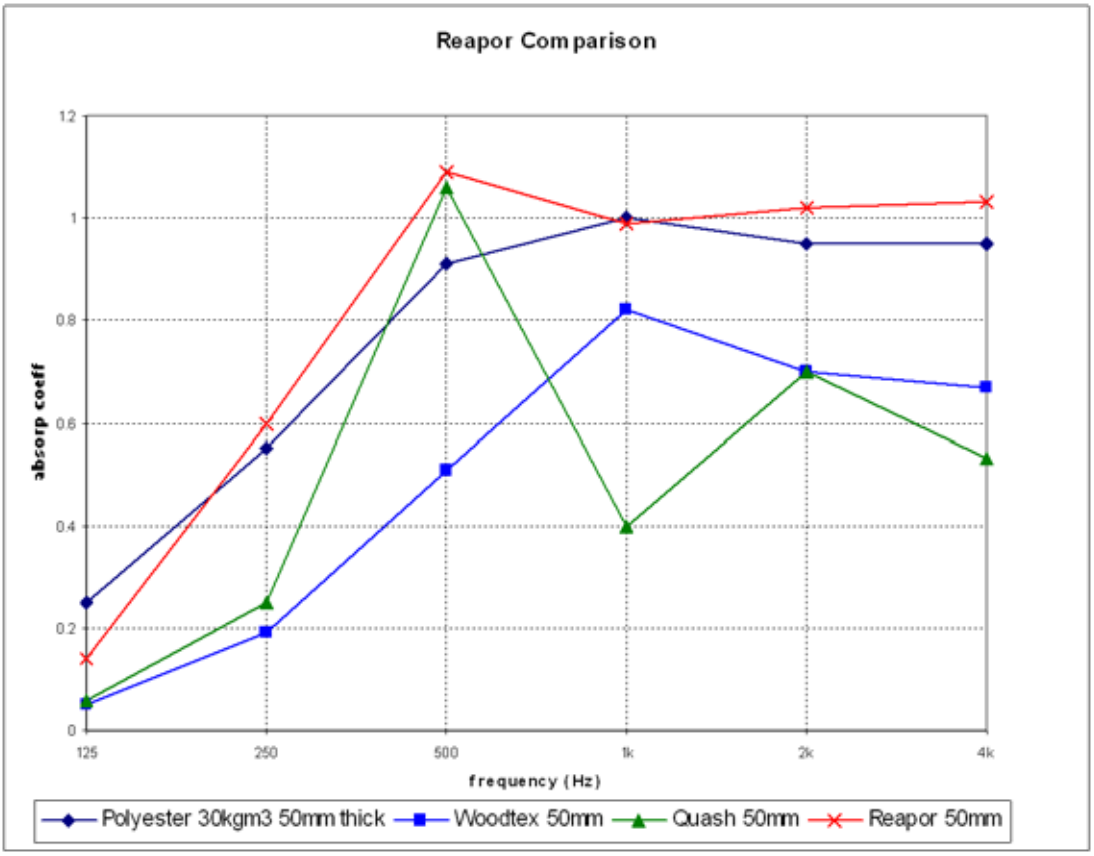
Graph 2

Environmental Issues

If fitted outside or inside in harsh environments, Reapor does not need to be protected from the elements; all other products usually, must be protected with impervious films to keep out adverse environmental conditions such as wind, rain, UV and in particular water, which in some cases will completely destroy the product.

By covering a porous absorber with an impervious film, the acoustic performance is immediately reduced; this is usually overlooked by material suppliers because of the drop in performance.

Some comparisons have been made in graph 3 with other products that have been used in the past as exterior absorbers.



Graph 3

Water

Reapor will take in water doubling its own weight and increasing its bulk density from 270 kg/m^2 to around 540 kg/m^2. The product is however free draining.
Water will drain out as the product reaches its saturation level and ultimately dry out, with no adverse effects to the product.

Fire

Reapor is made from 100% recycled glass, it contains no binders; therefore it has no combustible products to ignite. Reapor has been tested to DIN 4102 Part 1, Fire behaviour of building materials and building components Building materials; concepts, requirements and tests: and achieved Class A1, non combustible.
Excerpt from fire test (*The test samples did not burn. Combustible gasses did not occur above the oven opening. The temperature of the oven, which had fallen through the insertion of the test samples, increased steadily and came throughout the duration of the test close to the end temperature.*) This excerpt is only given, as an explanation as to how Reapor performed under test conditions; the full test is available on request.

Acoustic testing

Reapor was been tested in accordance with DIN EN ISO 354: 2003, Sound absorption coefficient of a sound absorber in a reverberation room.

Frequency (Hz)	Reapor 50mm	Reapor 25mm
100	0.09	0.04
125	0.18	0.06
160	0.3	0.08
200	0.14	0.13
250	0.56	0.13
315	0.74	0.23
400	0.91	0.35
500	1.03	0.52
630	1.08	0.67
800	1.02	0.9
1k	0.93	1.05
125k	0.85	1.13
16k	0.86	1.05
2k	0.9	0.97
25k	0.94	0.93
315k	0.92	0.98
4k	0.88	0.99
5k	0.9	0.94

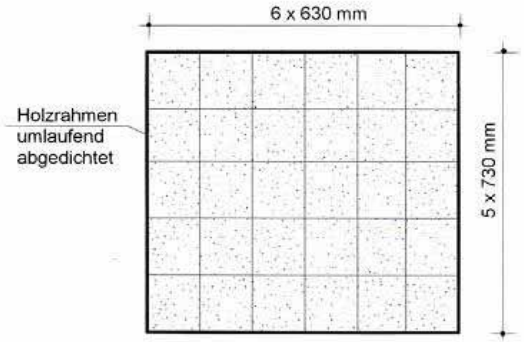
Messung der Schallabsorption im Hallraum nach DIN EN 20354

Antragsteller: Liapor GmbH & Co. KG, 91352 Hallerndorf-Pautzfeld

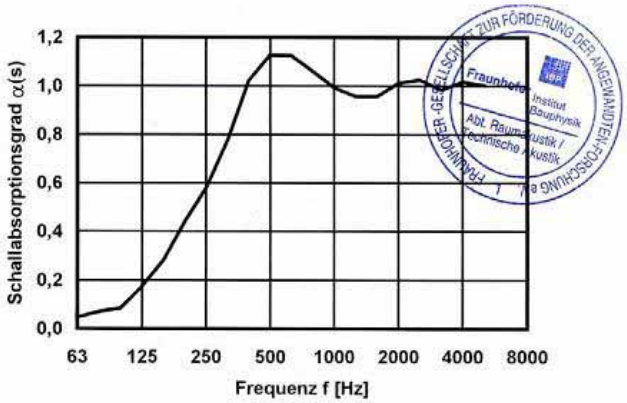
Messort: Technikum Fraunhofer-Institut für Bauphysik, Stuttgart

FhG - IBP
P-TA 17/2002

Hallraum: Volumen V = 392 m³; Oberfläche S = 322,30 m²; T = 19°C
Bodenfläche ca. 60 m²; Anzahl der Diffusoren: 15; r.F. = 46 %



Prüfaufbau: Darstellung der Prüfanordnung auf dem Hallraumboden



Proben: Reaporplatten (d = 50 mm, ρ = 267 kg/m³, Ξ = 13,4...15,8 kPa·s/m²)
Ausgangsmaterial Liaver Einkorn Ø 1 - 2 mm

Fraunhofer Institut Bauphysik

Datum: 25.07.2002 Unterschrift:

Reapor 50mm

Schallabsorptionsgrad nach ISO 354:2003

Messung der Schallabsorption im Hallraum

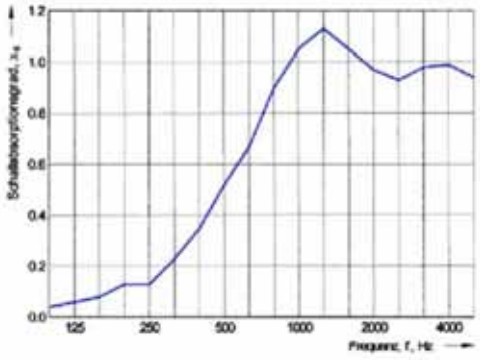
Auftraggeber: Liever GmbH & Co KG, Gewerbepark "Am Wald" 17, D-98693 Ilmenau
Prüfdatum: 27. August 2007

Aufbau: Akustikplatten aus Blähglas:
Reapor-Platten, 600 mm x 600 mm x 24,5 mm,
Rohdichte: 269,6 kg/m³

Objekt:

			Hallraum leer:			Hallraum mit Prüfobjekt:		
Fläche des Prüfmaterials:	12,00	m²	Relative Luftfeuchtigkeit:	61,4	%	Relative Luftfeuchtigkeit:	61,5	%
Volumen des Hallraums:	196,1	m³	Temperatur:	25,5	°C	Temperatur:	25,5	°C

Frequenz f [Hz]	α_s
100	0,04
125	0,06
160	0,08
200	0,13
250	0,13
315	0,23
400	0,35
500	0,52
630	0,67
800	0,90
1.000	1,05
1.250	1,13
1.600	1,05
2.000	0,97
2.500	0,93
3.150	0,98
4.000	0,99
5.000	0,94



Nr. des Prüfberichtes: MA 30- VFA 2007-1277.01

Datum: 27.09.2007 Unterschrift:

Reapor 25mm