Introducing Acousta-fil TM a new revolutionary product in exhaust acoustics

Acousta-fil™

Acousta-fil is a recently developed and patented system designed for use as exhaust silencer infill

This unique concept of exhaust silencer infill has fired the imagination of some of the largest automotive manufacturers and is expected to become the standard format for narrow annulus applications in the future.

The Acousta-fil system is so simple to install that it provides enormous potential for reduced production costs. The special construction offers considerable advantages over existing methods of installation and should prove particularly effective in resonator applications.

Acousta-fil is a textile product with outstanding thermal and acoustic insulating properties. Acousta-fil has been designed for controlled expansion on initial contact with heat and is intended to fill complex voids with acoustic insulation media to a pre-determined density.

The product is manufactured from continuous filament E' Glass fibres as standard though it is possible to use other continuous filament fibres i.e. S' Glass and Silica to suit different temperature and chemical resistance requirements.

Although Acousta-fil has been developed specifically for the exhaust silencer infill, the concept also offers potential for use as a thermally insulating Catalyst Brick support media.

Advantages

- **User friendly format, easily handled, soft to touch and with no loose fibres.**
- **Unique construction allows accurate means of controlling finished insulation density.**
- **Easily installed in confined spaces, even with restricted access such as resonators offering huge labour savings.**
- **Continuous drawn filament fibres of between 9-14 micron diameter are outside the recognised limit for potential respirability i.e. below 3 microns**
- **No loss of particulate or short fibres through perf often associated with spun rock fibres or staple glass fibre wools.**
- **Can be supplied as roll material in any width from 10mm to 950mm, as pre-cut pieces or alternatively joined as layflat tubing.**
- **No cardboard mandrels to return and no obstructions from packaging in welded seams as often experienced with polybag pillows**
- **High initial density and flat pack-ability allows for considerable storage space savings compared with alternative materials**

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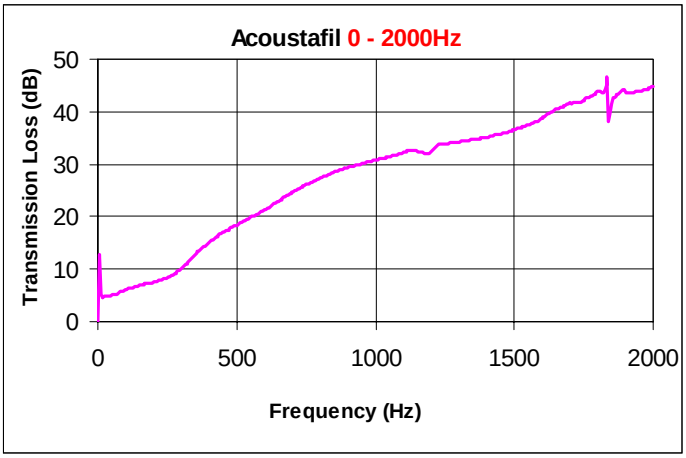
Acoustic Test Data

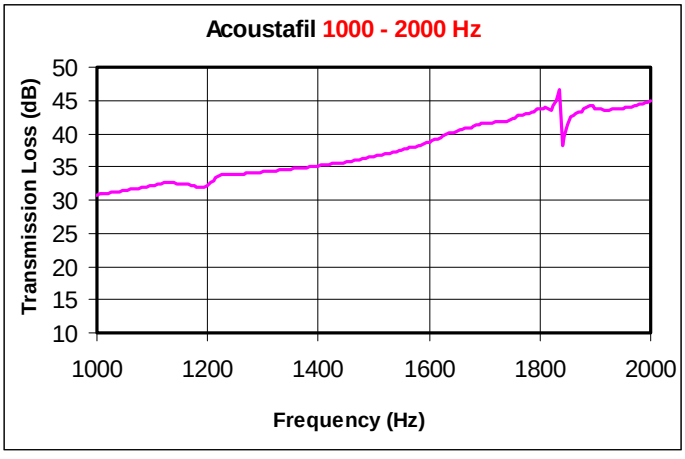
The following sound absorption data is supplied courtesy of Arvin-Meritor Ltd. and is a result of tests carried out in their UK Research Laboratories in Warton. Methods of optimising pack density for a given can were discussed with Arvin-Meritor. It was decided that Taguchi analysis would be one method of showing how attenuation at specific frequency levels could be achieved. The four-microphone technique (pioneered by Chung & Blaser) for determining acoustic transmission loss was used initially to determine attenuation levels achieved when using Acousta-fil fabric.

Three parameters were considered as being variables that could detract from or improve acoustic attenuation. These may be considered as 'factors' for inclusion in a 4 x 3 Taguchi array.

1. Ends per course (fabric)
2. Fill density
3. Fabric Density

The results when analysed demonstrate the effects of an increase or decrease in the variables and therefore allow us to predict an optimum pack configuration for maximum performance at a given frequency range.
The test results also revealed an exceptional performance in the frequency range 1500 – 2000 Hz with a can fill density of 160 kg/m^3.





The graphs show the performance across the frequency range of 0 – 2000 and also in more detail the range 1000 – 2000 Hz.
Any further data can be provided on request.

The tests were carried out using an existing 2 part silencer from Arvin so that the resulting data can be compared to an existing data-base. The silencer was cylindrical 95 mm diameter and 336 mm long and consisted of two chambers, one at 215 mm long and the other at 107 mm long. Inner perforated tube diameter was 45 mm

Taguchi analysis

Prof. Taguchi, the mathematician, devised a series of mathematical arrays to enable multiple measurable factors to be used in a way to cause interdependency. High and low values can be chosen, and by considering other 'rules' to ensure the results of the trials remain practical and useable, it is an invaluable method of obtaining data that causes measurable changes, in our case to attenuation over a range of frequencies.
In our trials each factor had a 'high' and 'low' quantitative figure that could affect acoustic attenuation.

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Product Datasheet

Acousta-fil

Acousta-fil Exhaust Silencer Infill

Introduction:

Acousta-fil is a recently developed and patented system designed for use as exhaust silencer infill. Consisting of continuous filament bulked E'glass yarns that are tightly woven and restrained by sacrificial catch threads that melt at low temperatures. Heat from the exhaust gas releases the bulked yarns to fill the silencer cavity. The system is particularly useful for narrow annulus applications such as resonators and clam shell designs where blown in roving is impractical.

Construction:

Acousta-fil is manufactured from high performance E' Glass voluminised filament yarns of 9 to 14 micron diameter. The glass filaments are assembled and passed over high pressure air jets to produce a lofted yarn with outstanding thermal and acoustic insulation properties. The yarns are then further processed by weaving or crochet knitting to produce a flexible tape or fabric in a variety of weights and densities. It is also possible to use other filament materials such as S2 glass or silica to increase the temperature resistance offering some potential as catalyst brick support or sealing media.

Physical Properties

E glass Acousta-fil is suitable for use at temperatures up to 600^{O}C in silencer applications.
E' Glass fibres have a minimal amount of surface dressing to assist in processing, this is usually organic ie. starch or silane and will disappear at temperatures above 200^{O}C without affecting the properties of the glass fibres.

E' Glass fibres: -are resistant to oils, solvents and most chemicals although contact with hydrofluoric acids, strong alkalis and live steam should be avoided.
-are non combustible.

The Standard low melt synthetic binder in Acousta-fil softens above 110 C with a melt point of between 127-132C. However we are currently developing binder with melt temperatures as low as 65C for cooler applications such as Diesel Exhausts.

Chemical Properties

E' Glass	SiO_2	54.1%
	Al_2O_3	15.3%
	CaO	17.3%
	MgO	4.7%
	Na_2O	0.6%
	B_2O_3	8.0%
Synthetic binder		<2%

Availability

Acousta-fil can be manufactured in a range of different widths, thickness' and densities to suit individual applications. It is possible to produce any width from 15mm up to 950mm in increments of 5mm. The number of catch threads (warp) per 10 cm wide can be varied from 1 to 20 (a pitch of 5 mm

The available weight ranges are from 0.6Kg to 2.8Kg per metre square, Acousta-Fil can be supplied as roll material, as pre-cut shapes or joined as a layflat tubing.

Product Datasheet

Perma-fil Needlemat

Perma-fil E'Glass Needlemat

Construction:

Saveguard Perma-fil E'glass needlemat has been specifically developed for use in vehicle exhaust silencer applications. Manufactured from 9 micron filament E'glass fibres that are specially carded to produce a high volume batt. This is then mechanically needled to bond the fibres, which results in a dimensionally stable matt or felt, possessing excellent thermal and acoustic insulating properties without any chemical binder.

The mechanical bonding system secures the individual fibres thus eliminating fibre loss via the perforated tubes. Perma-fil needlemat can be supplied pre rolled as packs on cardboard mandrels. Perma-fil packs are wrapped in Polythene sleeves for ease of handling and to reduce any irritation from the glass fibre. We also offer a complete cutting and die cutting service for more complex shapes.

Properties:

E'Glass fibres have a minimal amount of surface dressing that is required to assist in processing, this is usually organic i.e. starch or silane and will disappear at temperatures above 200^{O} C. E'Glass Needlemats are suitable for continuous use at temperatures up to 550^{O} C higher in exhaust applications, however tensile strength continues to reduce noticeably as temperatures increase above 400^{O} C.

Technical:

E'Glass Fibres: are resistant to oils, solvents and most chemicals although contact with hydrofluoric acids, strong alkalis and live steam should be avoided.

are non combustible.

have a low thermal conductivity.

Colour White

Thermal conductivity: .078 w/mK 300C mean

Loss on Ignition: < 1.2%

Chemical:

E'Glass:

SiO2	54.1%	Al2O3	15.3%
CaO	17.3%	MgO	4.7%
Na2O	0.6%	B2O3	8.0%

Availability

Thickness	4mm	6mm	9mm	12mm	18mm	25mm
Weight per m^2 150 Kg/m^3	600	900	1350	1800	2700	3600
Weight per m^2 130 Kg/m^3	520	780	1171	1560	2340	3125
Roll Length	50	50	30	20	15	10

Density: **available in a range of densities from 100 -160Kg/m^3**
Width: **100cm standard (others available on request)**

Typical Applications:

Acoustic insulation media for exhaust silencers
Heatshields

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Product Datasheet

Perma-fil Bulk Wool

E'Glass Bulk Wool

Construction:

Saveguard Perma-fil E'Glass Wool is manufactured from drawn continuous filament E'Glass yarns, that are cut to the required staple length. The staple fibres are then processed using traditional textile machinery to open the fibres and produce a high volume blown wool. Perma-fil Glass Wool's possesses outstanding thermal and acoustic insulation properties and are used primarily in automotive exhaust silencer applications.

Glass Yarns have a minimal amount of surface dressing to assist in processing, this is usually organic i.e. starch or silane and will disappear at temperatures above 200C. Without effecting the performance of the Glass Fibre.
Untreated E'Glass Fibres are suitable for continuous use at temperatures of up to 600C in exhaust applications however tensile strength continues to reduce noticeably as temperatures increase above 400C .

Properties:

Glass Fibres: are resistant to oils, solvents and most chemicals although contact with hydrofluoric acids, strong alkalis and live steam should be avoided.

are non combustible.

have a low thermal conductivity.

Colour White

Technical:

Perma-fil E'Glass Wool meets BSAU193a: 1990

The tests prescribed by BSAU193a: 1990 require that the material withstands temperatures of 650C without reduction of fibre length, diameter or bulk density.
The loss of material mass shall not exceed 10.5% after immersion in a synthetic exhaust condensate of the following composition
10ml hydrobromic acid
10ml sulphuric acid
distilled water to make up to 1litre

Chemical:

E'Glass	SiO_2	54.1%	Al_2O_3	15.3%
	CaO	17.3%	MgO	4.7%
	Na_2O	0.6%	B_2O_3	8.0%

Availability

Woven Polypropylene Bales of 150 kilo nominal
Polythene Bags of 20kg
Can also be supplied as made up acoustic pillows enclosed in a variety of high temperature fabrics.
Also available in other glass grades for higher temperatures

Typical Applications:

Loose fill for Exhaust Silencer cans
Infill for acoustic pillows in gas turbine exhaust silencer applications

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