SCS euroAcoustic

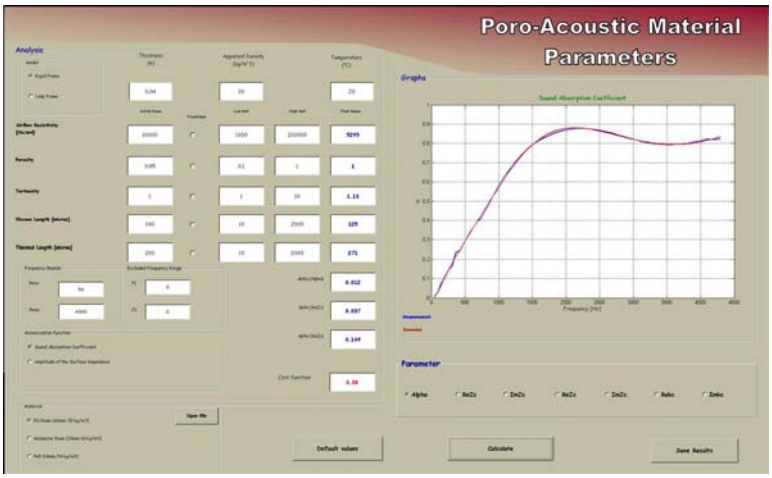
SCS902A PAM-P*rediction*

Sound & Vibration

Acoustic characteristics of Porous Materials

Theoretical determination of Poro-Acoustic Parameters

Determination of acoustic parameters for Porous Materials, Multi-layers, etc. in the fields of:
Automotive, Aeronautics, Railway, Ships, Construction, machines, Building construction



Theoretical Determination of:

- Normal Incidence Sound Absorption coefficient $\alpha_{\perp}$
- Normalized surface impedance Z_S Real & Imaginary Parts
- Normalized characteristic impedance Z_C Real & Imaginary Parts
- Complex wave number K_C Real & Imaginary Parts

5 parameters based model:

- Airflow resistivity
- Open Porosity
- Tortuosity
- Viscous and Thermal characteristic lengths

Key features and Usage

PAM-P can be used as a stand alone software or as a powerfull pre-processor to determine quantities to be used in Vibro-Acoustic Model simulation: from Sandwich & Multilayers to complex structures with the need of data for Sound Prediction.

PAM-P input of data are linked to SCS902A material testing suite of devices for Poro-Acoustic and Poro-Elastic properties experimental determination

The inverse matrix approach

PAM-P is s software using Inverse Matrix approach to predict Poro-Acoustic parameters of Porous Materials; physical properties of rigid and limp frame porous materials are considered from acoustical measurements and to calculate some quantities from others experimentally known.
In literature there are basically two different approaches: *analytical* and *minimization*. The analytical approach is based on the limit behaviour of the bulk properties (effective density and effective bulk modulus), while the minimization approach make use of non linear best-fit algorithms, genetic algorithms, iterative or neural network schemes to determine the best solution that *minimizes* a cost function (bulk property or equivalently surface parameter) calculated by means of a prediction model.
PAM-P use the five-parameter model developed by Johnson, Champoux and Allard considering: airflow resistivity, open porosity, tortuosity, viscous and thermal characteristic lengths.
Additionally it is also possible to use a hybrid procedure that requires:
a) the measurement of the complex density of the material for estimating the airflow resistivity;
b) the measurement of the normalized surface impedance for the estimation of open porosity, tortuosity and characteristic lengths by means of function minimization using genetic algorithms.
The procedure described in b) could be used to determine all the physical parameters at once .
Moreover the software will allow to perform partial inversion once some of the physical parameters are already known. For example by fixing some of the parameters to values determined by tests.
However it has to be remarked that the use of he hybrid procedure assures a reliable estimation of both physical parameters and acoustical quantities.
PAM-P gas been developed by Universiity of Ferrara – Italy and is marketed through SCS distribution channels

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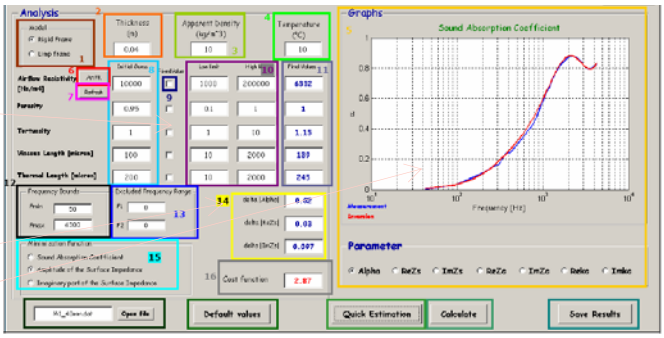
PAM-P Software Main Input Parameters

- Input temperature of the experimental tests.
- Input thickness and density (limp model) of the sample.
- Choice of rigid frame or limp frame model.
- Determination of airflow resistivity by analytical method.
- Set bounds of the initial guessed value
- Show Residuals for normal incidence sound absorption coefficient and normalized surface impedance between experimental and theoretical values.
- Input the cost function.
- Residuals for cost function between experimental and theoretical values.
- Graphical comparison between experimental and calculated data upon calculation of the 5 parameters
- Data file Open
- First estimation of the parameters.
- Calculation using genetic algorithm



Testing of Poro-acoustic & Poro-elastic properties

SCS-902A is Software system driving several testing devices allows easy and reliable measurement of all poro-acoustic and elastic properties.
Two versions are available: **LabView SCS810x software for NI board** or **SCS80FA for 01dB platforms** running dBFA software suite.
SCS-902A features a user friendly software interface leading up to completion of the measurement and can be used for typical application in Laboratory but it is also portable and battery operable

Supported Hardware Platforms

SCS-902A devices:

- **Standing wave tube ISO-ASTM standards**
- **Flow Resistance ISO 29053**
- **Tortuosity Electric Impedance method**
- **Reverberant room for α_{ST} coefficient**
- **Damping Loss Factor SAE method**
- **Damping Loss Factor and Elastic Modulus Oberst method**
- **Bulk Modulus**

SCS9020B: alpha normal incidence Kundt

SCS9020B/TL: Sound Transmission Loss normal incidence

SCS9020B/FM: Fitler, Muffler, etc Sound Transmission Loss

SCS9026: Bulk Modulus

SCS9021: Damping Oberst method

SCS9023: Flow Resistivity

SCS9022: Damping SAE Plate

SCS9031: Alpha Random Incidence

SCS9025: Tortuosity