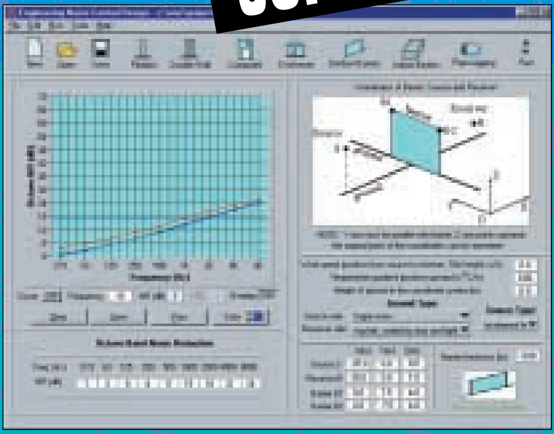
COMPREHENSIVE ENGINEERING NOISE CONTROL

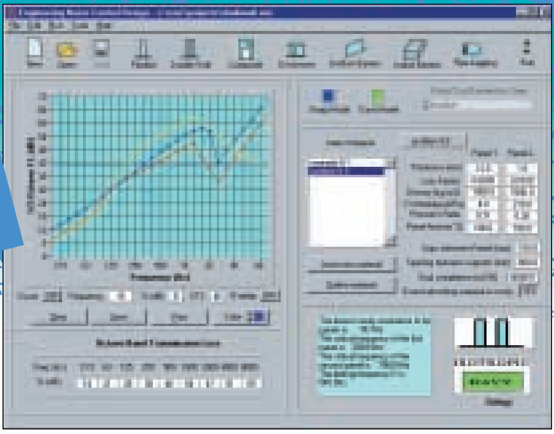
GRAPHICAL, WINDOWS BASED SOFTWARE



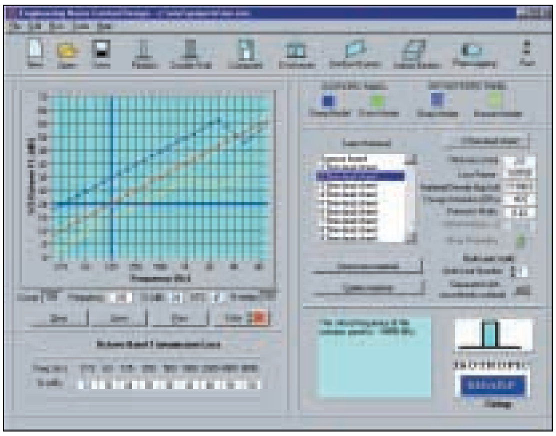
Special features

Common to all modules are:

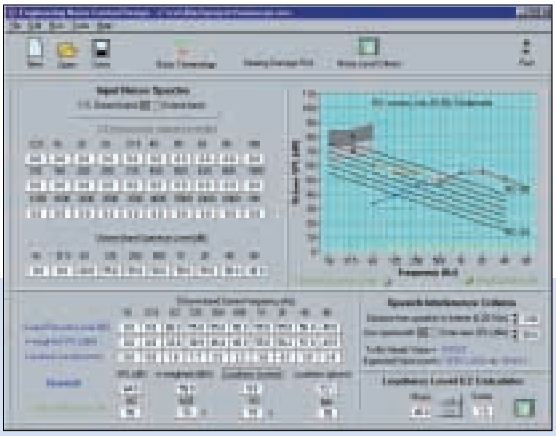
- ability to use your own material properties or use the in-built extensive data base
- multiple curves placed one at a time on the same axes to compare the effect of parameter changes
- Graphical windows interface with pop-up menus and data plots



No longer is it necessary to do tedious and risky hand calculations. All of the calculation procedures in the book, *Engineering Noise Control*, by **D.A. Bies and C.H. Hansen** have been verified and encapsulated in a windows graphical user interface which is extraordinarily simple to use and provides results in tabular and graphical form. The calculation procedures have been thoroughly tested and checked and are highly reliable.



A useful feature is the ability to run an analysis several times and plot the results for each run on the same axes to explore the effect of changing various input parameters and to allow a design goal to be achieved quickly. Targeted users are mechanical engineers, noise and vibration consultants and students undertaking noise control courses, although anyone interested in noise control or who has a noise problem would benefit. The software is divided into **seven modules**, corresponding to various sections of the text book.



The **cost of the software** for a singe user license is $1190 USD for all seven modules. A network version (up to 120 seats) is also available. The cost for the network version depends on the number of seats requested. There is a 10% discount for educational. institutions. A maintenance fee of 25% of the software cost entitles users to free upgrades for three years. The user manual and demo version of the software can be downloaded free-of-charge from www.causalsystems.com

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MODULE 1

Fundamentals, subjective response to sound and noise criteria (chapters 1, 2, 3 and 4)

- calculation of speed of sound in liquids, solids and gases
- sound power from sound power level and vice versa
- sound pressure from sound pressure level and vice versa
- sound intensity from sound intensity level and vice versa
- addition of coherent sound levels
- addition of incoherent sound levels
- subtraction of coherent sound levels
- subtraction of incoherent sound levels
- combining noise reductions where several paths from source to receiver are involved.
- Loudness in phons and sones given octave or 1/3 octave band levels
- calculation of NC, NR, NCB and RC (as well as spectral character) from octave band data
- A-weighted sound levels from octave or 1/3 octave band linear levels
- L_{eq}, L_{Aeq}, $L_{Aeq,8h}$,
- Allowed exposure time (European, USA criteria),
- Daily noise dose from dB(A) noise levels and time of exposure to each level
- Hearing damage risk calculations using ISO 1999 and Bies/Hansen methods
- Impact noise dose calculation
- Speech interference calculations

MODULE 2

Sound power of sources and outdoor sound propagation (chapters 5 & 6)

- Sound pressure at specified distance due to monopoles, dipoles, quadrupoles, line sources (coherent and incoherent) and plane sources, given the source sound power or source strength. Reverse calculations are also available.
- outdoor sound propagation - OCMA, CONCAWE and Aexact@ analysis
  meteorological effects (3 procedures)
  ground effects (including turbulence)
  air absorption
- radiation field of a source (indicates whether observer is in near field, geometric near field, far field or a transition region)
- sound power from reverberant room measurements
- sound power from field measurements
  semi-reverberant field (3 methods)
  near field measurements (3 methods)
  vibration measurements

MODULE 3

Room acoustics and sound absorption (chapter 7, Appendices 3, 4 and 5)

- Resonance frequency, modal density, modal overlap for rectangular room
- room absorption (and room constant) from reverberation time and vice versa (Sabine and Millington - Sette)
- room sound pressure levels from sound power of source in room and vice versa
  Sabine rooms
  flat rooms (specularly and diffusely reflecting walls)
  tunnels or long rooms (specularly and diffusely reflecting walls)
- calculation of statistical absorption coefficient averaged over room from data for individual room surfaces
- calculation of statistical absorption coefficient from material flow resistivity and thickness
  for porous material layer only
  for porous material layer with impervious skin
  for porous material layer with impervious skin and perforated sheet or just perforated facing
- design of panel sound absorbers given desired absorption coefficients
- empirical method
- analytical method
- calculation of effect on sound levels in a room of adding a specified amount of absorbing material
- determination of optimum reverberation times for specified space size and use

DETAILED SOFTWARE CONTENTS

(modules 1 to 7)

MODULE 4

Transmission loss, enclosure design, barriers (indoor and outdoor) and pipe wrappings (chapter 8)

- TL calculations for single partitions
  (both Sharpe and Davy/Hansen methods)
  critical frequencies
  STC calculation
  isotropic panels
  ribbed panels
- TL calculations for double partitions (Sharpe and Davy methods)
  STC calculation
  steel or wooden studs
- Calculation of overall TL for a wall with windows, doors, cracks etc.
- Enclosure noise reduction calculations
  includes cooling air flow requirements
  effect of cracks and openings
  effect of enclosure internal conditions
- Outdoor barrier noise reduction
  includes diffraction around sides and top and ground absorption
  barrier thickness included
  point or line sources
  wind and temperature gradient effects included
- Indoor barrier noise reduction
  barrier of arbitrary orientation in a rectangular room
- Pipe lagging noise reduction (2 calculation methods)

MODULE 5

Dissipative and reactive muffler design and duct breakout noise calculations (chapter 9)

- impedances of orifices, expansion chambers and ducts (resistive and reactive)
- Helmholtz resonator design and noise reduction
- Expansion chamber noise reduction
- Low pass filter (for reciprocating compressors etc) design and noise reduction
- small engine exhaust design
- pressure drop estimates for specified dissipative or reactive mufflers
- flow generated noise due to silencers and duct bends
- Dissipative muffler design
  lined duct attenuation calculations for sound absorptive liners with and without impervious and perforated facings
  noise reduction due to reflection at inlet and outlet
  correction due to effective expansion in lined section
- duct breakout and break-in noise calculations
- Lined plenum chamber noise reduction calculations
- Exhaust stack directivity and noise reduction vs height calculations

MODULE 6

Vibration isolation and damping (chapter 10)

- mass on spring isolator
  resonance frequency for damped and undamped systems
  frequency of maximum displacement, velocity and acceleration
  Force transmissibility as a function of excitation frequency, resonance frequency and damping
  effect of flexibility in the foundation or mounted mass on the transmitted force
- machine mounted on 4 isolators
  resonance frequencies calculations
- vibration absorber design
  optimum stiffness and damping for specified mass ratio
  vibration amplitude of absorber at resonance
- relation between different damping measures (critical damping ratio, loss factor, logarithmic decrement)

MODULE 7

Sound power estimates for specific source types (chapter 11)

- fans
- compressors
- cooling towers
- pumps fluid jets
- control valves
- fluid flow in pipes
- boilers
- turbines
- IC engines
- furnaces
- electric motors
- generators
- transformers
- gears