ENGINEERING NOISE CONTROL SOFTWARE

User Guide for 2nd edition textbook (Revision 1.1) Errata & Additions

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Causal Systems

A companion to the textbook, "Engineering Noise Control", 2nd Edn., by DA Bies and CH Hansen

Page 4, Replace the 2 lines above the heading, “Software Modules” with the following:
The “help” menu is not operational but help can be obtained by clicking in an area which contains no typing. The help menu at right contains information about various general topics, some of which are also covered in this manual. Topics that are not included in the manual are discussed below. The first topic of interest is the “Select Help version”. This allows you to select whether you would like the help information that appears when you click on a grey area of screen to reference the second or third edition of the textbook. The “New Release Notes” item displays all of the improvements made to ENC since the first commercial release (Version 1.183). The “Windows Display Mode” item explains how to set up windows to get the best out of ENC. Finally, the “About ENC Design” tells you what version of ENC you have.

Page 39, 2 lines down, after “with:” add the following equation:

$$Z_{NB} = Z_N + j2\pi f\sigma'$$

Page 58, At the end of the last paragraph but one, add:
“Negative values of *z* are not allowed for any parameter.”

Page 58, Add the following after the first sentence in the last paragraph:
“The procedure calculates an effective source height based on the sound ray curvature calculated from the wind and temperature gradients. If the effective source height is less than zero, it is set equal to zero. Interestingly, the effect on the overall attenuation of the barrier is not great in most cases. You need to enter the wind speed at 10m and the temperature gradient in degrees C per 1000m.”

Page 69, Add the following at the end of the sentence beginning 3 lines above the bottom of the page. “in the muffler calculation. For a 1/4-wave tube attached to a duct wall, the maximum allowed end correction is the radius of the duct to which it is attached (or half the duct depth). Note that all end corrections calculated for no flow using the equations in the text are multiplied by $(1\text{-}M)^2$ in ENC to account for flow.”

Page 69, 5 lines from the bottom of the page, change “9.16" to “9.15"

Page 72, Line 8, remove "less than or".

Page 72, Line 12, change “9.16" to “915"

Page 74, 5^{th} line above the figure, replace "above" with "figure below".

Page 75, after the first line insert the following.
"For side branch mufflers such as 1/4-wave tubes and Helmholtz resonators, the baffle or outside tube diameter should be set equal to the duct diameter on which the resonator is mounted for 'source end, end 2' and for 'outlet end, end 1'. No end correction is calculated for the duct ends nearest the side branch resonator as the upstream and downstream ducts effectively join together at the side branch.

Note that for all muffler types, if the duct end is not in a baffle or a tube, select "B" and set the baffle diameter equal to the duct diameter (or the equivalent diameter if the duct is non-circular).

End corrections are calculated using Equations 9.15 and 9.17 in the text multiplied by $(1\text{-}M^2)$ to account for the effects of flow (whether through or grazing flow)."

Page 75, third line, replace "10 mm" with "0.01m"

Page 75, 4^{th} line, delete "or downstream"

Page 76, 6^{th} line below the figure, replace "10 mm" with "0.01m"

Page 76, line 2, after "10mm." add the following:
"Then you need to enter the effective diameter of the resonator chamber where the neck is attached and in the same plane as the neck cross-section, so that the end correction for the neck at the resonator end can be calculated using Equation 9.15 in the text multiplied by $(1\text{-}M^2)$ to account for the effects of grazing flow.

Next, you must enter the diameter of the part of the duct to which the resonator is attached. This is usually the same as the diameter of the inlet and outlet ducts entered in the "Duct Properties" section of the panel. This information is used to calculate the effective length of the neck at the duct end as described on page 69 of this manual."

Page 77, after the sentence ending on the 4^{th} line, add the following:
"The quality factor is calculated using Equation 9.28 in the text."

Page77, after the sentence ending on the 7^{th} line add the following:
"Sometimes ENC calculates quality factors that seem too high, so"

Page 77, immediately above the figure add the following:
"ENC then calculates the acoustic resistance at the resonance frequency of the resonator using Equation 9.28 in the text. The resistance values at other frequencies are then calculated by multiplying the resistance at the resonance frequency by the ratio of the frequency of interest to the resonance frequency."

Page 79, replace this equation (which is only valid for 1/4 wave tubes) with Equation 9.28 in the text, where ***l*** is the discharge pipe length, *A* is the pipe cross-sectional area and V is the volume of the expansion chamber.

Page 86, For lined duct attenuation, please note that attenuations calculated for long, lined ducts may be an over estimate if they are more than about 50 dB due to other sources of noise such as flow noise.

Page 115, Add the following to the bottom of the page.

Outputs	Overall TL From IEC	50.6	From Baumann	47.3
Jet diameter (m)	0.0118		Freq. of max. internal SPL, fp (Hz)	7618
Pipe ring freq., fr (Hz)	7836.3		Overall internal PWL (dB)	125.3
Power coefficient, η	6.13E-5		Overall ext. PWL (dBA)	119.9
Stream Mach number	1.0		Overall internal SPL (dB)	146.8
Int. Coinci. freq., f0 (Hz)	2742.3		Overall SPL 1m (dBA)	91.4

In addition to the outputs illustrated above, ENC provides 1/3 octave band plots and tables of octave band values for the following quantities (see table below):

Freq. (Hz)	31.5	63	125	250	500	1000	2000	4000	8000	
Internal PWL (dB)	96.1	99.1	102.1	105.1	108.1	111.1	114.4	119.3	123.2	☑
External PWL (dB)	38.4	50.4	62.4	74.3	86.3	98.3	110.3	115.9	116.2	☐
Internal SPL (dB)	117.6	120.6	123.6	126.6	129.6	132.6	135.9	140.8	144.7	☐
SPL @ 1m (dB)	9.9	22.0	34.0	45.8	57.9	69.8	81.9	87.4	87.7	☐
Pipe wall TL (dB)	103.3	94.3	85.3	76.4	67.4	58.4	49.7	48.3	52.0	☐

- Internal sound power level (downstream piping only - upstream not important))
- external sound power level
- external sound pressure level at 1m from the pipe wall (downstream piping only)
- pipe wall transmission loss

The pipe wall transmission Loss is calculated using the following procedure:

- Calculate the spectrum of internal sound pressure level using the procedure described on pages 538 and 539 of the third edition of the text book.
- Calculate the 1/3 octave band sound pressure levels at 1m using Eqs. 11.47, 11.60, 11.63, 11.65 and 11.67 to 11.69 in the third edition of the textbook.

- Calculate the 1/3 octave band sound pressure levels immediately outside the pipe by adding to the levels at 1 m, the second term on the right of Eq. 11.65 in the third edition
- Calculate the 1/3 octave band TL values by subtracting the sound pressure level immediately outside the pipe from the sound pressure level inside the pipe for each 1/3 octave band and add the correction term, L_g to account for the internal fluid velocity.

The spectrum of radiated sound power is assumed to have the same shape as the radiated sound pressure.