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Indoor Factory Noise

SP Net info 25

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Indoor Factory Noise is now available in SoundPLAN 5.0. Earlier this year – with the March2000 version – Industry Building was implemented in the Industry Noise Propagation module. These two facilities – Industry Building and Indoor Factory Noise – complete the calculation "from inside to outside". The two facilities are closely linked together, once you have keyed in data for calculating the indoor sound pressure level this input is reused when calculating the noise radiated from the facades into the environment.

Input parameters in the Indoor Factory Noise module are
- building geometry
- density of scattering objects in the room and
- absorbing properties of the indoor surfaces of the building.

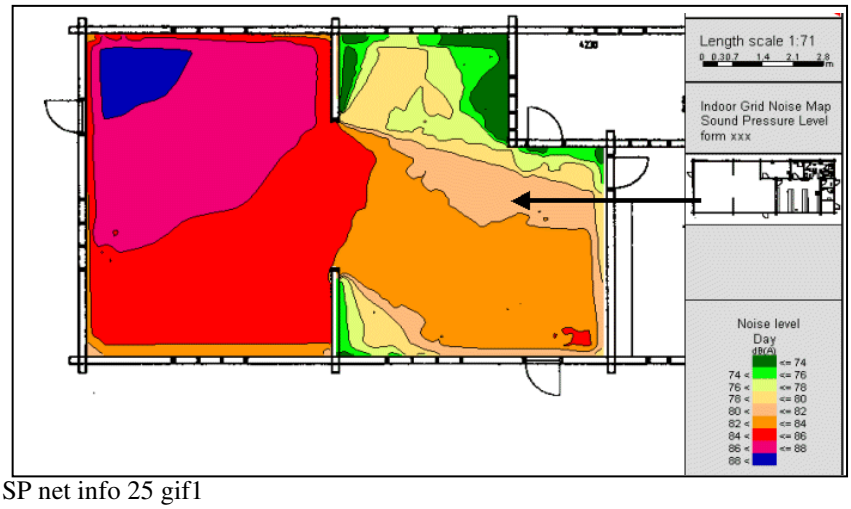
As for the building dimensions the modelling procedure is the same as when defining an Industry Building. You should state the corners of the building one by one and key in the building height. All facades must be vertical and of the same height, i. e. slanted roofs must be handled by stating the average height of the room. Facades can be divided into segments, and segments can be further divided into sub-segments, but segments must not intersect. Screens can be handled, but for the moment only screens reaching the roof can be modelled. In the future this restriction will be eliminated.

The density of scattering objects is defined using the parameter q = S/4V. In this formula S is the total surface area of scattering objects and V is the volume of the room. According to this definition the inverse of q (1/q) will be equal to the mean free path of the room. In most working environments q takes values in the interval between 0,1 and 0,01. As scattering objects counts machines, stocked goods, pillars, cabins and even wall and roof irregularities bigger than 1/3 of the wavelength. The unit of q is [1/m]. Please note that q must be set to a value bigger than 0 in order to make the calculation run.

As descriptor of the absorbing properties of the surfaces the well-known absorption coefficient Alfa is used. Calculations can be performed pr terts. However, since the calculation result most probably should be used for comparison against recommended values specified pr octave or for "inside-to-outside" calculations pr octave, the alfa-value should be keyed in per octave.

The calculation output could be either for single point receivers, a line receiver or in a grid just like outdoor calculations.

The single point sound and grid noise calculations are similar to the outdoor calculations. On the attached SP net info 25 gif1 an indoor grid noise map is shown.

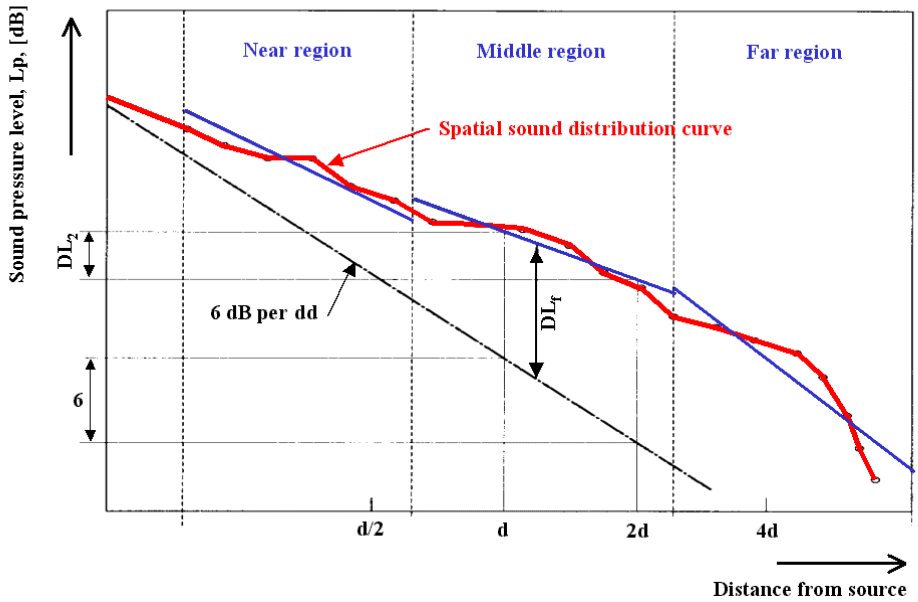


SP net info 25 gif1

The line receiver (Indoor SPC) differs somewhat from the line receiver in outdoor calculations (where a line receiver is used to define the cross section in a Grid Cross Section Map). In Indoor Factory Noise the line receiver is used to define the line along which the sound propagation curve SPC in the room is calculated. The SPC is the curve, which shows how the sound pressure level from a reference sound source decreases, when the distance to the source increases. The SoundPLAN output of this calculation is a graph showing the SPC curve as well as a table stating the rating values dLf and dL2. The reverberation time T60, the equivalent absorption area A and the mean absorption coefficient of the surfaces are also included in the calculation output.

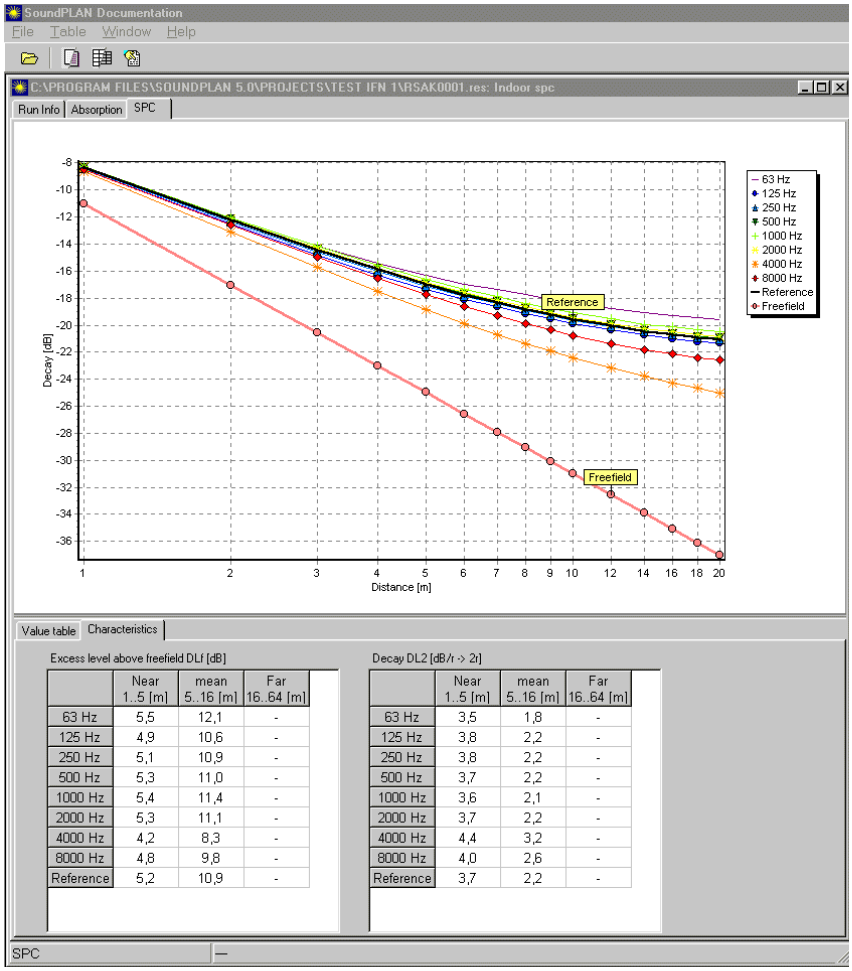
The two values dLf and dL2 were first defined in VDI 3760, but the basic idea of this document was adopted in an ISO/EN standard in1996 - 1997 (ISO 11690) and thus is implemented in Denmark, Finland, Iceland, Norway and Sweden. Today the two values dLf and dL2 are recognised as better descriptors of the acoustic properties of a room than the reverberation time or the equivalent absorption area. In VDI 3760 recommended values of dLf and dL2 are stated for various working environments.

The enclosed SP net info 25 gif2 gives an idea of the definition of the two values. dLf is named "the excess of sound pressure level" since it states the difference between the SPC curve of the room and the SPC curve for a free field. In general, the smaller the values of dLf the more comfortable the acoustics of the workplace. dL2 is named "the spatial decay of sound pressure level per distance doubling" and is equal the amount by which the sound pressure level decreases, when the distance from the source is doubled. Under free field conditions dL2 = 6 dB. Increasing dL2 will in general improve the acoustics.



SP net info 25 gif2

dLf and dL2 are functions of frequency as well as the distance from the source. An overall value ("Reference") is calculated using an A-weighted pink noise spectrum. This overall value as well as the values per octave are calculated in the "near" region (from 1 m to 5 m form the source), in the "middle" region (from 5 m to 16 m from the source) and in the "far" region (from 16 m to 64 m from the source). The enclosed SP net info 25 gif3 shows an example of the calculation output in the SoundPLAN Result Table.



	Near 1..5 [m]	mean 5..16 [m]	Far 16..64 [m]
63 Hz	5,5	12,1	-
125 Hz	4,9	10,6	-
250 Hz	5,1	10,9	-
500 Hz	5,3	11,0	-
1000 Hz	5,4	11,4	-
2000 Hz	5,3	11,1	-
4000 Hz	4,2	8,3	-
8000 Hz	4,8	9,8	-
Reference	5,2	10,9	-

	Near 1..5 [m]	mean 5..16 [m]	Far 16..64 [m]
63 Hz	3,5	1,8	-
125 Hz	3,8	2,2	-
250 Hz	3,8	2,2	-
500 Hz	3,7	2,2	-
1000 Hz	3,6	2,1	-
2000 Hz	3,7	2,2	-
4000 Hz	4,4	3,2	-
8000 Hz	4,0	2,6	-
Reference	3,7	2,2	-

SP net info 25 gif3

The algorithm used in Indoor Factory Noise to calculate the distribution of sound pressure in a room is a two dimensional ray tracing method, which doesn't require a lot of detailed information about shape and absorbing properties of the surfaces and therefore gives a quick answer as how to choose the acoustic treatment of the workplace. For further information about the method please refer to VDI 3760 or ISO 11690 or the two documents stated below.

The price for Indoor Factory Noise is 1800 EURO.

References:

- Jovicic, S.: Vergleiche gemessener und nach mehreren Verfahren berechneter Schallpegelabnahmen in einem Werkhallenmodell. Fortschritte der Akustik DAGA 90 (1990)

- Probst, W., Neugebauer, G., Kurze, U. J., Jovicic, S., Stephenson, U.:Schallausbreitung in Arbeitsräumen, Forschungsbericht Nr. 621 der BAU, Wirtschaftsverlag NW, Bremerhaven (1990).