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IMAGINE

Improved Methods for the Assessment of the Generic Impact of Noise in the Environment

Description of the Source Database

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1 Introduction

In June 2002, the European Directive on the Assessment and Management of Environmental Noise or Environmental Noise Directive (2002/49/EC, further indicated by its abbreviation END) was accepted and has come into force. Under this directive, member states will be obliged to produce noise maps of the major roads, railways, airports and industrial activity sites as well as of large agglomerations by 30th June 2007. These noise maps shall express the environmental noise levels caused by the above sources, in terms of the harmonized noise indicators L_{den} and L_{night} . From these noise levels, other indicators such as the total number of seriously annoyed residents shall be derived. This information shall then be submitted to the European Commission and made public. The next step will be to draft Noise Action Plans, which will have to be produced by July 2008.

For the production of noise maps and noise action plans, a harmonized assessment method is required. To this extent, the END defines so-called interim methods, which are to be applied until a final and harmonized method is developed and implemented in order to line up the mapping and action planning operation from 2012.

In August 2001 the project HARMONOISE was started, of which the main objective is to develop harmonized, accurate and reliable methods for the assessment of environmental noise from roads and railways. Industrial noise, which will show as an element of the noise maps in agglomerations, was not touched at all in HARMONOISE.

The present IMAGINE project aims at bridging the gaps between the results of HARMONOISE on the one hand and the implementation of a complete and practicable method for noise mapping and action planning on the other.

In particular, Work Package 7 of IMAGINE will provide a method for the assessment of environmental noise levels from industrial sites and plants, which links well within the methods for noise propagation developed in HARMONOISE.

In Task 7.2 of Work Package 7 an extensive database with a large number of industrial noise sources and their characteristic noise emissions is produced. For each source or industry type a typical example for the sound power level is given for representative modes of operation, taking other aspects such as quality in terms of low noise emissions etc. into account.

The database will be a powerful and convenient tool for the potential end user who needs sound emission data for industrial noise sources for noise mapping purposes. However, the database will have to be used with caution because there are a number of problems, sources of errors and risks associated with its application to noise mapping that are not evident - especially to the inexperienced user.

During the Imagine project the database will be maintained and filled up with data that we may receive.

2 Industrial noise

The noise mapping approach developed in the HARMONOISE and IMAGINE projects clearly distinguishes noise production and noise propagation. It is based on a generic noise propagation model that is applicable to any type of noise source as long as it is described in appropriate terms as, for example, type, sound power level, spectrum, coordinates, operating conditions, etc.

Industrial noise is produced by companies, varying from small retail to large chemical plants. Making noise maps for the EU does not have to include recreational noise, for instance noise from bars, shooting ranges or stadiums. In this database little information about recreational noise is included, the sound power levels that are included were easily available.

If input data for sound propagation calculations and noise mapping is to be determined from measurements in situ of the noise emissions of industrial noise sources, harmonized methods are needed to obtain comparable and consistent results. At present, a comprehensive set of standards from ISO, DIN and other organizations exists, which can be used as a basis for standardized measurements. The report "Measurement Methods" of the IMAGINE project Work Package 7 addresses the end user who wants to take measurements on industrial noise sources to determine input data for noise mapping purposes. According to the primary objective of subtask 7.1, it provides a compilation of existing international and national standards that can be applied to such measurements.

If no measurements can be made (future developments, lack of money and time), one may use the noise data, for instance the CE-label, of the machinery.

In this report we describe the source database for industrial noise sources, the way to use this database and the general contents of the database. In addition we give some advice on the yearly averaged working hours.

3 Noise mapping - obtaining source input data

3.1 Requirements for input data

The following information, sound power data, constitutes a complete set of input data for sound propagation calculations with the methods developed in HARMONOISE and is to be used for noise mapping:

- Location (coordinates) and elevation of the noise source
 - Dimensions and orientation
 - Type of source (point-, line-, area-, volume-source)
 - Operating conditions of the source
 - Emitted sound power level spectrum
 - Directivity
 - Working hours (day, night, season)
- } for each relevant operating condition

Note that not all of the information above is equally important as the impact on the noise mapping results is different. This becomes important if only limited or no data for individual quantities is available. For example, while - obviously - to know the sound power level of the source is crucial, lacking knowledge of the directivity may still lead to an acceptable noise map as a result of many sources.

3.2 Sound power levels

To assess the sound power levels for industrial noise sources, such as electric motors, pumps and compressors, fans, furnaces and boilers, coolers, piping and valves, stacks and flares, construction and building machinery, and many others, the following approaches can be used:

- Determination of the noise sound power level of the sources from measurements near the source or further away in the field.
- Noise data obtained from the manufacturer of the noise source in question.
- A database with default data for typical sound emission values for individual industrial noise sources. Since the large variety in industrial noise sources and particularly in their individual state of noise control, does not allow a database of generic validity to be set up, the data provided in such a database will inevitably need to be limited to a representative number of typical examples.
- Prediction/computation using parameter formulae, usually based on the principle of “acoustic efficiency”. Different classes of noise reduction, e.g. “good”, “average” and “poor” can be distinguished.
- Default values for the typical sound power level radiated by a specific industrial activity per unit area, taking into account classes of sound reduction applied. This is possible for many industrial activities, for example petrochemical plants, power plants, ship yards, timber plants, etc.

The best way to gather the relevant sound power data is done by taking noise measurements at each source. Apart from measuring the sound power, information can be gathered about location, dimensions, operating time and conditions. Performing these measurements for a large industrial area with all kinds of different sources is time consuming. For instance measuring and collecting the relevant sound power data for a petrochemical plant of 25000 m² will take about three man days whereas for the assessment of a small manufacturer of wooden stairs, half a day of measuring time may be sufficient.

If there is not enough time to measure the relevant sound power data, the sound power levels might be obtained from manufacturers of the equipment, for instance the CE-label. These sound power levels are of course for very strict operation conditions, probably described by the measurement method used. In addition to this data information such as the location and working hours must be obtained. If the manufacturers cannot supply these sound power levels, one can use data from a database.

The following industries will be described in the database:

Table 1
Industry types

Aircraft industries	Motor car industries
Aluminium production	Multi-purpose terminal
Asbestos production	Paper mills
Breweries	Petrochemical plants
Bulk terminals	Petrol stations
Car repair shops	Power plants
Carbon production (incineration, graphitization)	Quarries
Carcass disposal installations	Rearing installations (poultry, pigs)
Cement works	Roro terminals
Ceramics production (incl. porcelain)	Rotary kilns (clinker, lime production)
Chemical plants	Scrap terminals
Coal gasification and liquefaction plants	Shipyards
Coke ovens	Shunting yards
Combustion installations	Slaughterhouses
Concrete production	Smelting installations (non-ferrous metal processing)
Construction and building sites	Smitheries (ferrous metal processing)
Construction plants	Steel and pig iron production
Container repair	Stone mills
Container terminals	Stores (cooling, loading/unloading)
Contractor companies	Surface treatment installations (metal processing)
Copper production	Surface treatment installations (non-metal)
Dairies	Tanning plants (hides and skins)
Foundries (ferrous metal)	Textile industries
Furniture industries	Timber plants
Gas terminals	Transformer stations
Glass production	Warehousing, distribution
Hot-rolling mills (ferrous metal processing)	Waste disposal installations (hazardous)
Metal ore roasting and sintering installations	Waste disposal installations (non-hazardous)
Metallurgical, chemical or electrolytical installations (non-ferrous metal processing)	Waste incineration installations
Mineral melting installations	Waste landfills
Mineral oil and gas refineries	Weaving
Mining	Windmill parks

3.3 Operating conditions

The operating conditions may have great influence on the noise production. For instance, a handheld sanding machine may have little noise emission when held in the air, but put on a piece of wood the sound power will rise. If the machine is put on a large thin piece of metal, the sound power will rise again. This shows that the dependence on operating conditions is very large.

For every industrial noise source, the noise emissions depend on a number of parameters. These will be related to operation of the source itself - for example its design characteristics and operating conditions - but also to features added to the source – such as noise control measures, for example.

If the number of noise-relevant parameters for a specific source type is sufficiently small, a comprehensive set of data can be entered in the source database. This allows the end user to find sound power levels characterizing the noise emission with acceptable accuracy for all relevant situations. However, a "sufficiently small" number of parameters that have a significant impact on the noise emission characteristics of industrial noise sources, is an extreme exception: in many cases, the number of such parameters is very large.

Example 1 - Ventilators and fans

The noise emissions of ventilators and fans do not only depend on the ventilator type, the flow rate and the shaft power but also on the impeller speed and diameter, the number of impeller blades and their design, the medium and its temperature, the pressure increase, the efficiency, and a number of other parameters. In addition, an adequate description of the noise characteristics of industrial sources for noise mapping must take into account the spectrum which - in case of ventilators and fans - can be quite sensitive to parameter variations even if they do not affect the overall noise level. Further influence comes from possible noise control measures that may range from sand fillings for console cavities to acoustic insulation of the casing and ordinary silencers for air intakes or exhausts. In addition, an estimation of the octave band spectra of the sound power level of a ventilator is a very difficult task as it is, even for an experienced and specialized expert, as the physical noise generating mechanisms are very complicated and often not completely covered by the formulae available.

Example 2 - Valves

Parameters that influence valve noise are the valve type, the throttling mechanism and principle, pressure drop and pressure staging, medium properties and state, the flow rate, the dimensions of valve and connected piping, piping layout and, of course, any thermal and/or acoustic insulation applied to valve and piping. Often the noise emissions are very sensitive even to small variations of some of these parameters.

Many more examples could be given.

To describe noise sources in the WP7 source database, two principal kinds of entries are planned to be included:

- Parameter formulae to calculate the noise emissions from the relevant parameters
- Emission sound power level spectra for different parameter sets and situations

3.4 Working hours

The working hours are an essential input for the calculation of noise levels. If a machine is operating one or twelve hours during the daytime this will result in about 11 dB difference in the received noise level for this machine.

The working hours should be given for the day, evening and night period. This must be based on a yearly average. In the next table an example is given.

Table 2
Estimating the yearly averaged working hours and the correction in dB for a lift truck

period	Days working for a percentage of hours of the period				aver. hours	correction [dB]
	full-time	50%	25%	0%		
day	43	81	100	141	3,6	5,2
evening	2	5	30	328	0,1	16,0
night	0	0	60	305	0,3	14,3

For the more dominant sources, the yearly average working hours correction should be estimated at least within 0,5 dB tolerance in order to achieve an accuracy of 1 dB at 100 meters. The yearly average working hours correction should be subtracted from the sound power level.

Dominant sources are the sources that contribute most at the nearby houses. These dominant sources may range from sources with a low sound power level but located very close to this receiver to high sound power levels corrected for the working hours at larger distances. Also screening of noise will play an important role for the distinction of a dominant source. So after the first calculation and defining the areas with a high contribution for industrial noise, some extra care could be taken in estimating the yearly averaged working hours.

As a rule of thumb, the most dominant sources are the top ten of most contributing sources at a certain receiver.

If no source data is available, an estimate of the overall working hours must be obtained through contact with the factory. This will relate to working hours in the weekend, holidays as well as the working hours during normal days and working in overtime. A company that only works for eight hours during the daytime and which does not work during weekends and holidays (a total of 20 days) will result in a total of yearly averaged working hours of about 5,3 hours.

A petrochemical plant will be working almost 100% of the time. Only critical or planned stops will vary the noise levels.

In the next table, indications are given, based on experience in the Netherlands, for the effects of the yearly operating hours for general plants, in steps of 2 dB. The highest correction is 20 dB, which in general will reduce the contribution below noticeable levels.

Table 3

Yearly general deviation of daytime noise production in dB

Type of industry	Evening	Night
Aluminium production	0	0
Breweries	0	0
Bulk terminals	2	4
Car repair shops	8	20
Chemical plants	0	0
Coal gasification and liquefaction plants	0	0
Coke ovens	0	0
Construction and building sites	20	20
Construction plants	20	20
Container repair	5	20
Container terminals	0	2
Contractor companies	5	20
Dairies	2	0
Foundries (ferrous metal)	0	0
Furniture industries	5	10
Gas terminals	0	0
Glass production	2	4
Hot-rolling mills (ferrous metal processing)	0	0
Metal ore roasting and sintering installations	0	0
Motor sports (car, motor, land, water, snow, air)	2	10
Multi-purpose terminal	2	4
Paper mills	0	0
Petrochemical plants	0	0
Petrol stations	3	6
Power plants	0	0
Roro terminals	0	2
Scrap terminals	4	20
Shooting ranges (outside)	0	20
Shunting yards	0	0
Smitheries (ferrous metal processing)	4	20
Stadiums	0	20
Steel and pig iron production	0	0
Stores (cooling, loading/unloading)	4	10
Transformer stations	0	0
Warehousing, distribution	2	4
Waste disposal installations (hazardous)	4	10
Waste disposal installations (non-hazardous)	4	10
Windmill parks	0	0

4 Making the database practical for the end user

A compromise needs to be found between the desired accuracy on the one hand and the need for keeping the database handy, reliable and practical in use on the other. This will involve measures on the data side as well as on the end user side.

4.1 The data side

As discussed in several of the WP 7 meetings, the number of parameters taken into account and also the number of parameter combinations for a specific type of noise source, needs to be limited to keep the database usable. For this purpose, the following was decided upon:

- Source types will be grouped into the most important categories only (e.g. process furnaces will be categorized into furnaces with floor and with sidewall burners only, although many other special designs exist).
- Quality of the source in terms of noise emissions and extent of applied noise control will be categorized into "poor", "average" and "good" only.
- Only the most important parameters will be varied from dataset to dataset.
- Parameter variations will be made in steps that lead to differences in the overall noise level of about at least 2 dB.

The terms poor, average and good have the following interpretation:

- Poor: no noise mitigation measures have been taken and the machine/source is either old or badly maintained. The sound power levels are not always based on detailed measurements, but some examples have been found.
- Average: some noise mitigation measures have been taken and the machine/source is adequately maintained. If no other information of a specific machine/source is available, the source is called average.
- Good: the sound power levels of these machines/sources are among the lowest you can buy or manufacture. No research has been done whether these sources may be called Best Available Techniques.

Using an extensive set of parameters and many small variation steps would increase the number of entries in the database dramatically but would at the same time bring about only a minor improvement in accuracy: even for a technically "comprehensive" set of input parameters, the sound power level of many source types will still vary within a considerable range. This is due to various reasons, such as the influence of minor construction details or the noise generating process itself.

In contrast to this, a limited parameter set and a coarser variation step will limit the number of entries in the database, making it easier to use while still maintaining a level of accuracy that is only insignificantly lower than for the approach described above. This is especially true for situations where more than a few noise sources are present, i.e. especially for typical industrial plants with a high number of different sound sources.

4.2 The end user side

To avoid excessive inaccuracies and errors in the data, the (potentially inexperienced) end user will extract from the database, a "database user guide" with hints, advice and warnings. The main purpose of this information is to:

- Clearly address limitations in the use of the given data.
- Point out potential error sources and "traps".
- Give references to related standards or other sources where more detailed information on the source's acoustic characteristics can be obtained.
- If necessary, clearly discourage use of data by inexperienced users and strongly suggest to consult an expert to obtain reliable emission levels
- Point out that the database can never be more than the "second best" solution to obtain noise data for noise mapping - compared to consulting the expert and letting him take measurements.

5 Source database

The source database will give the user sound power levels, including a mean third octave band spectrum, for individual sources and whole plants based on measurements and formulas with a small number of parameters. This information is based on the knowledge of noise experts throughout Europe.

The data is entered in an Access database. This is widely used and distributed software that runs on Microsoft Windows. This will enable software developers to have easy access to the data. The description of the Access database is given in annex 1.

For purposes of convenience, DGMR has developed a software tool, called Source dB, for easy access and filtering of data. Source dB will be distributed free of charge. If Source dB is used, Access doesn't have to be installed on the computer.

This software tool has no means of input.

In the next paragraphs Source dB is described.

5.1 General look of Source dB

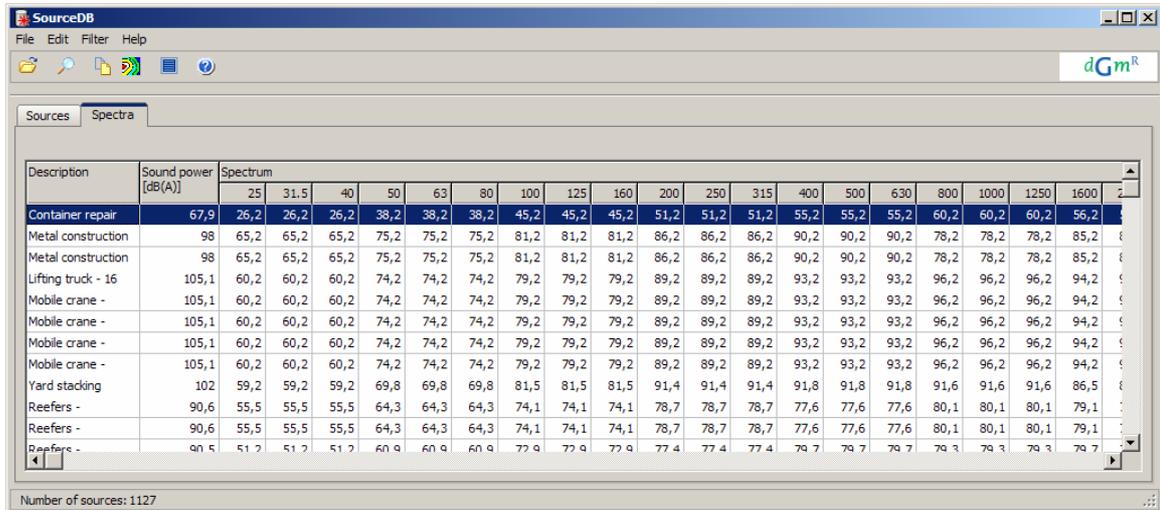
Source dB consists of seven screens, which can be accessed easily. The opening screen will look like this:

The screenshot shows the SourcedB software window with a menu bar (File, Edit, Filter, Help) and a toolbar. The main area displays a table with columns for Description, Sound power [dB(A)], Drive type, Industry type, Source type, Quality, Data input, Operating conditions, Height [m], Height variation [m], Deviation, Date, Date valid through, and Notes. The table contains 12 rows of data representing various noise sources like container repair, metal construction, lifting trucks, mobile cranes, yard stacking, and reefers.

Description	Sound power [dB(A)]	Drive type	Industry type	Source type	Quality	Data input	Operating conditions	Height [m]	Height variation [m]	Deviation	Date	Date valid through	Notes
Container repair	67,9	other	container repair	area	average	Standard		5	2	2	17-10-1996	17-10-2006	DGMR-repor
Metal construction	98	other	container repair	point (dBA)	average	Standard	5% -	1,5	1	1	3-10-2005	3-10-2005	I.C.G.-public
Metal construction	98	other	ship yards	point (dBA)	average	Standard	5% -	1,5	1	1	3-10-2005	3-10-2005	I.C.G.-public
Lifting truck - 16	105,1	internal combustion	container repair	point (dBA)	average	Standard		1	0,5	1	20-6-1996	20-6-2006	DGMR-repor
Mobile crane -	105,1	internal combustion	container repair	point (dBA)	average	Standard		1,5	0,5	3	1-1-2000	1-1-2010	soundpower
Mobile crane -	105,1	internal combustion	ship yards	point (dBA)	average	Standard		1,5	0,5	3	1-1-2000	1-1-2010	soundpower
Mobile crane -	105,1	internal combustion	construction and	point (dBA)	average	Standard		1,5	0,5	3	1-1-2000	1-1-2010	soundpower
Mobile crane -	105,1	internal combustion	contractor	point (dBA)	average	Standard		1,5	0,5	3	1-1-2000	1-1-2010	soundpower
Yard stacking	102	electric	container repair	point (dBA)	average	Standard		15	5	4	1-1-2000	1-1-2010	DGMR-stand
Reefers -	90,6	internal combustion	container repair	point (dBA)	average	Standard		2	0,5	2	1-1-2000	1-1-2010	DGMR-stand
Reefers -	90,6	internal combustion	container terminals	point (dBA)	average	Standard		2	0,5	2	1-1-2000	1-1-2010	DGMR-stand
Reefers -	90,6	electric	container repair	point (dBA)	average	Standard		2	0,5	2	1-1-2000	1-1-2010	DGMR-stand

Number of sources: 1127

Clicking on the tab called “Spectra” will give the third octave spectral information. See the following figure:



The width of the columns can be changed as done in a spreadsheet.

If the source type is “Formula”, the spectrum consists of “-200” entries.

Double clicking on a selected source or clicking on the “View” button, opens the “view” mode of a selected source. This will give access to two or three tabs that may differ depending on the type of data. An overview of the tabs is given below.

Input type	Tab 1	Tab 2	Tab 3
Standard	Source	Picture	
Formula	Source	Formula	Picture
Directivity	Source	Directivity	Picture

The first tab is always called “Source”, which shows all the input data, including the table showing in which industry types the source may be found.

View - Container repair - Standard

Source Picture

Description: Container repair

Date: 17-10-1996 Drive: other

Date valid through: 17-10-2006 Source type: area (dBA/m2)

Height [m]: 5,0 Quality: average

Height variation [m]: 2,0

Deviation [dB]: 2,0

Industry (Multiple select):

- aircraft industries
- aluminium production
- asbestos production
- bars
- breweries
- bulk terminals
- car repair shops
- carbon production (incineration, graphitiz.
- carcass disposal installations
- cement works
- ceramix production (inc. porcelain)
- chemical plants

Operating conditions:

Notes: DGMR-report; W.95.0708.A d.d. 17 oktober 1996; Onderzoek kentallen geluidemissie in de Rijnmond

Sound Power (A-weighted)

Total dB(A)	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800
67,9	26,2	26,2	26,2	38,2	38,2	38,2	45,2	45,2	45,2	51,2	51,2	51,2	55,2	55,2	55,2	60,2

The tab "Picture" may include a picture of the source, so the user can identify the source.

View - Container repair - Standard

Source Picture



Sound Power (A-weighted)

Total dB(A)	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800
67,9	26,2	26,2	26,2	38,2	38,2	38,2	45,2	45,2	45,2	51,2	51,2	51,2	55,2	55,2	55,2	60,2

The tab "Formula" gives access to a mathematical expression. Some values like power consumption or pressure drop have to be filled in. If no values are given, the spectrum consists of -200 entries. When the "Calculate" button is pressed, the sound power is given together with an "educated guess" third octave spectrum.

The screenshot shows a software window titled "View - Centrifugal pump with less than 30 kW power - Formula". The "Formula" tab is active, displaying the equation $L_{wA} \approx 74 + 10 \log P$. Below the formula, a "Variables" table is shown with one entry: P [kW] with a value of 100,00. At the bottom, a table titled "Sound Power (A-weighted)" provides data for various power levels.

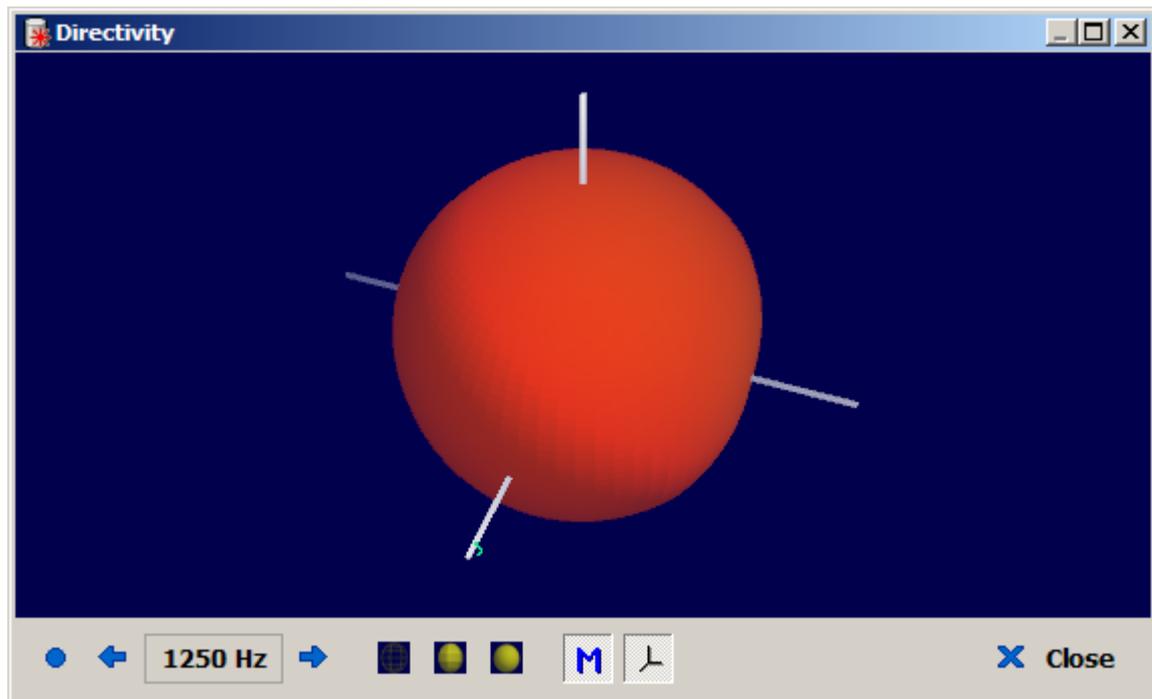
Total dB(A)	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000
	94,0	50,2	50,2	67,2	67,2	67,2	75,2	75,2	82,2	82,2	82,2	85,2	85,2	85,2	83,2	83,2

The tab "Directivity" gives you sound power levels in different directions. The results may be viewed selecting the "View" button.

The screenshot shows a software window titled "View - Helicopter - Dauphin 365N3 - rear take-off - Directivity". The "Directivity" tab is active, displaying a table with 4 rows of directional data and 16 columns of sound power levels. A "View" button is visible on the right side of the interface.

Nr.	X	Y	Z	25	31.5	40	50	63	80	100	125	160	200	250
1	0	1,0	0	94,6	94,6	94,6	105,4	105,4	105,4	115,4	115,4	115,4	117,9	117,9
2	1,0	0	0	85,9	85,9	85,9	98,5	98,5	98,5	110,5	110,5	110,5	115,7	115,7
3	0	-1,0	0	91,2	91,2	91,2	101,8	101,8	101,8	113,6	113,6	113,6	120,5	120,5
4	-1,0	0	0	90,9	90,9	90,9	101,6	101,6	101,6	113,6	113,6	113,6	118,5	118,5

Total dB(A)	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000
	133,2	102,5	102,5	113,6	113,6	118,5	118,5	118,5	120,5	120,5	120,5	124,1	124,1	124,1	121,8	121,8



5.2 Description of input fields

The input fields which are used, are described for the different tabs.

For the Source tab the following data fields are used:

- Source description: Clear description including limitations (e.g. on total power consumption).
- Sound power: The A-weighted sound power of the source. If the source consist of a formula, no data is entered. This field is calculated from the third octave spectrum.
- Drive type: The power that runs the source (internal combustion, electricity, steam, water, solar power, nuclear, steam, or other).
- Industry type: Distinguished are 70 industry types. One source may occur in many different industry types.
- Source type: Distinguished are point sources, line sources, emitting buildings and emitting area's.
- Quality: Denotes the quality of the source in respect to the noise emission. Distinguished are good, average and poor.
- Data input: Distinguishes between three different input data: Standard (means no directivity or formulas are involved), Formula (calculation of the sound power based on a certain parameter) or Directivity (input is based on many spectra with direction given).
- Operating conditions: Information about the circumstances in which the source is used.
- Source height: Height to be used for calculating excess attenuation. This is only an indication. The source may be placed on the ground or on a roof!
- Height variation: Differentiation in height for calculating excess attenuation.
- Deviation: Indication of spread in the sound power level, mostly based on few samples.
- Date: Date at which the source has been measured or the source data has been published.

Date valid through: After this date the source data should be re-checked for validity.

Notes: In these field data can be entered to clarify the origin of the source, the capacity, etc.

For the Spectrum tab, the following input fields are used:

Source description: Clear description including limitations (e.g. on total power consumption) (the same as in the source screen).

Sound power: The A-weighted sound power of the source. If the source consists of a formula, no data is entered. This field is calculated from the third octave spectrum.

Spectrum: The third octave bands, in A-weighted levels, are given.

The Source tab displays all the information of a particular source mentioned in the sources and the Spectrum screen. Also a list is given, which displays the industry types in which the source will probably be used.

The Formula tab gives a mathematical expression with one or more fields to enter parameters. Clicking on the calculate button results in a third octave spectrum with the total sound power level.

The Picture tab displays a picture of the source if one is given, together with the sound power level and the spectrum.

The Directivity tab displays the sound power levels measured in different directions. The directions are entered as coordinates with the centre of the source as 0,0,0 (x,y,z). The averaged sound power levels over all the data entered is shown as the sound power level on the bottom of the screen.

5.3 How to filter data

In this paragraph, processes for filtering and selecting the source data are described. When using SourceDB it is possible to select and copy data from the source database in a user friendly way. SourceDB provides a view of the database from which detailed information can be loaded and taken from the source database.

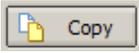
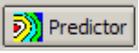
When starting SourceDB a spreadsheet called “Sources” with source data appears with the first line already selected. Above the spreadsheet a filter bar is placed to filter the loaded data. Every column of the spreadsheet can be filtered. When filtering, a selection of the data is displayed in the spreadsheet. Filters per column consist of a selection list in case of predefined data (i.e. Column Quality with predefined data good, average, poor) or an input field in which a text to filter can be entered. Filter lists are indicated with “<select>”, filter text is indicated with “<type>”. When filtering more than one column, only the sources which suffice the filter combination are displayed.

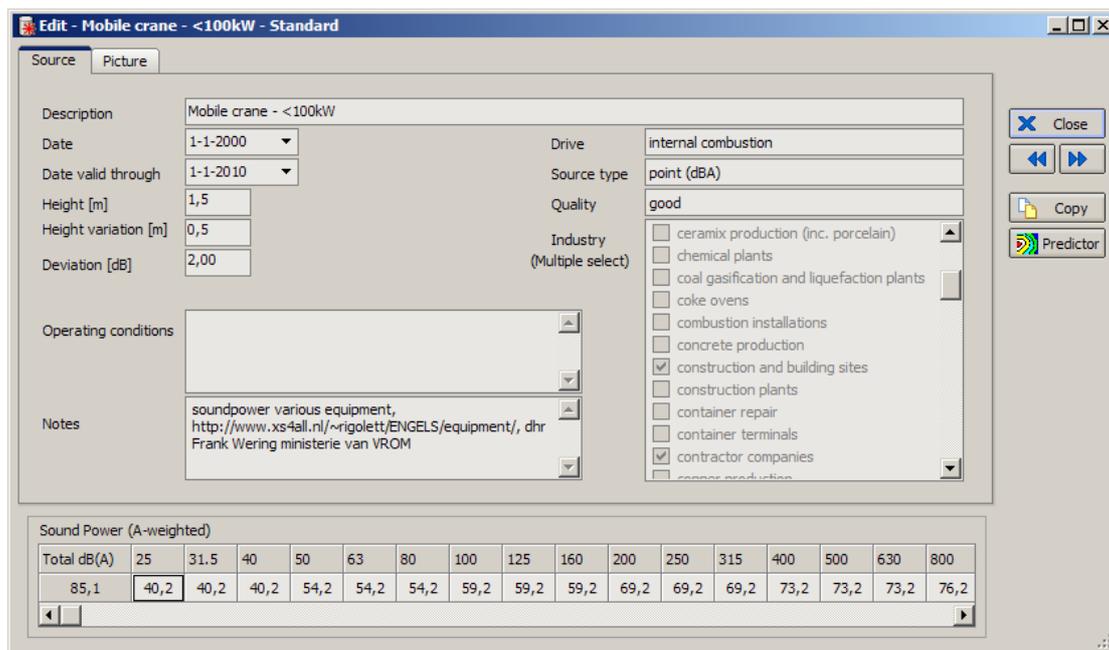
<type>	<type>	<select>	<select>	<select>	<select>	<select>	<type>	<type>
Description	Sound power [dB(A)]	Drive type	Industry type	Source type	Data input	Operating conditions	Height [m]	
Centrifugal pump	--	internal combustion	aluminium	point (dBA)	Formula			
Centrifugal pump	--	internal combustion	breweries	point (dBA)	Formula			
Centrifugal pump	--	internal combustion	cement works	point (dBA)	Formula			
Centrifugal pump	--	internal combustion	chemical plants	point (dBA)	Formula			

Only one source from the spreadsheet can be selected at a time. To navigate through the spreadsheet the mouse can be used or the cursor keys on the keyboard. To view a source in more detail, a selected source can be viewed. To view a source, use the menu-item “View” in the Edit menu or use the tool button  from the toolbar. It is also possible to use the shortcut CTRL-S, double click the mouse or press “ENTER” on the keyboard.

When viewing sources, a window with detailed information is opened. All information on the selected source from the database is shown in this tabbed form, including its picture (if available), and depending on the kind of source its directivity and formula.

5.4 How to copy data

Every selected source can be copied. This can be done both in the spreadsheet and in the detailed information form. Data from the source can be copied to text format, which can be pasted into every text processor (i.e. Microsoft Office Word) and other spreadsheet programs (i.e. Microsoft Office Excel). Using menu-item “Copy” in the Edit menu, tool button  or the shortcut CTRL-C in the main form and the speed button  in the detailed form. Sources can also be copied to Environmental noise mapping and calculation application Predictor using menu-item “Copy” in the Edit menu, tool button  or the shortcut CTRL-P in the main form and the speed button  in the detailed form.



5.5 Minimum requirements

To use SourceDB the following minimum requirements are defined:

128 MB internal memory

1 GHz CPU

Screen resolution 1024 x 768

Windows 98, 2000, XP

Acknowledgement

We would like to thank all the colleagues in the IMAGINE project who provided valuable input on sound power levels and prepared fact sheets for these standards. Without their support preparing the source database would not have been impossible in its present form.

Annex 1

Structure of database

