AKUSTIKA
Müraallikate helivõimsuse taseme määramine mitme
müraallikaga tööstustehastes seoses helirõhu taseme
hindamisega keskkonnas
Tehniline meetod

Acoustics
Determination of sound power levels of multisource
industrial plants for evaluation of sound pressure levels in
the environment
Engineering method

EESTI STANDARDIKESKUS EVS
EESTONIAN CENTRE FOR STANDARDISATION

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-ISO 8297:2006 "Akustika. Müraallikate helivõimsuse taseme määramine mitme müraallikaga tööstustehastes seoses helirõhu taseme hindamisega keskkonnas. Tehniline meetod" sisaldab rahvusvahelise standardi ISO 8297:1994 "Acoustics — Determination of sound power levels of multisource industrial plants for evaluation of sound pressure levels in the environment - Engineering method" identset ingliskeelset teksti.	This Estonian Standard EVS-ISO 8297:2006 consists of the identical English text of the International Standard ISO 8297:1994 "Acoustics — Determination of sound power levels of multisource industrial plants for evaluation of sound pressure levels in the environment - Engineering method".
Standard EVS-ISO 8297:2006 on kinnitatud Eesti Standardikeskuse 10.04.2006 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.	This standard is ratified with the order of Estonian Centre for Standardisation dated 10.04.2006 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from Estonian Centre for Standardisation.

Käsitlusala

1.1 Üldine

See rahvusvaheline standard täpsustab tehnilist meetodit (2. klass, defineeritud ISO 2204 standardis) müraallikate helivõimsuse taseme määramiseks suurtes mitme müraallikaga tööstustehastes seoses helirõhu taseme hindamisega keskkonnas. Need müraallikate helivõimsuse tasemed on kasutatavad sellise hindamise vastavas prognoosimudelis.

See meetod on rakendatav ainult suurte mitme müraallikaga tööstustehaste puhul (määratlemata arv erinevaid müraallikaid), mille peamised mõõtmed on horisontaaltasandil ja mille müra levib peamiselt ühtlasel määral kõigis horisontaalsuundades.

Korrigeerimata helirõhu tasemeid mõõdetakse oktaaviribades.

Saadud tulemused väljendatakse nii oktaaviribade helivõimsuse taseme kui ka vajadusel A-filtriga korrigeeritud helivõimsuse taseme kujul.

1.2 Müraallika tüüp ja suurus

See meetod on rakendatav tööstuslikel aladel, kus suurem osa seadmetest töötab välitingimustes, mitte siseruumides; välitingimuste näited on kütusekeemia kompleksid, kivikarjäärid, purustustehased ja kaevanduste sissepääsualad. Kui on tagatud mõõtmiste seostatavas vähemalt ühe tegevustsükliga, siis meetod on rakendatav ka liikuvatel allikatel, mis liiguvad tsükliliselt või pidevalt (näiteks transpordiliinid või kaablivedukid).

Scope

1.1 General

This International Standard specifies an engineering method (grade 2, as defined in IS0 2204) for determining the sound power levels of large multisource industrial plants relevant to the evaluation of sound pressure levels in the environment. These sound power levels may be used in an appropriate prediction model for such an evaluation.

The method is limited to large industrial plants with multiple noise sources (a combination of an unspecified number of individual sources) having their main dimensions in the horizontal plane, and which radiate sound substantially uniformly in all horizontal directions.

Unweighted sound pressure levels are measured in octave bands.

The results obtained are expressed both in octave-band sound power levels and, if required, in A-weighted sound power levels.

1.2 Type and size of noise source

The method is applicable to industrial areas where most of the equipment operates outdoors, not enclosed by a building, e.g. petrochemical complexes, factories, stone quarries, crushing plants and pithead installations. The method is also applicable when there are moving sources performing cyclic or continuous operations, such as drag lines or cable conveyors, provided that the measurements can be related to at least one cycle of operation.

See on rakendatav tööstustehastes, kus tehase pindala suurim horisontaalne mõõde on vahemikus 16 m ja umbes 320 m.

1.3 Müra tüübid

See rahvusvaheline standard kehtib allikatele, mis eraldavad lairibamüra, kitsasribamüra, diskreetseid toone, korduvat impulssmüra ja nende komponentide kombinatsioone. See menetlus on rakendatav ühtlase ja ebaühtlase heli korral, kui see on statistiliselt püsiva asukohaga. See ei sobi helienergia isoleeritud löökide mõõtmiseks. Meetod sobib kõige paremini laiaribalise püsiva müra puhul.

1.4 Mõõtmise ebatäpsus

Meetodiga kaasnev ebatäpsus tehase paigutuse tõttu sõltub peamiselt keskmisest vahemaast $\overline{d}$ mõõte-kontuuri ja tehase piiri vahel, seotuna tehase pindala ruutjuurega S_p, ja on antud tabelis 1.

Tabel 1 – Mõõtmisega kaasnev ebatäpsus

Väärtus $\overline{d}/\sqrt{S_p}$	Ebatäpsus [1] dB
0,05	+3,0 / -3,5
0,1	±2,5
0,2	+2,0 / -2,5
0,5	+1,5 / -2,0
1) Väljendatuna 95 % usaldusvahemikuna ühe mõõtmise kohta.	

Need ebatäpsused tekivad erinevate asendite puhul helirõhutasemete ruumiliste variatsioonide tõttu (keskmine aja jooksul), tulenevalt müraallikate eba-ühtlasest jaotusest tehase territooriumil. Need ei sisalda ebatäpsusi, mis on põhjustatud variatsiooni-dest müraallikate töös teatud aja jooksul.

MÄRKUS 1 Juhul, kui taustamürakorrektsioone ei saa rakendada vastavuses jaotisega 9.5.4, võivad ebatäpsused olla suuremad, kui need, mis on esitatud tabelis 1.

It is applicable to industrial plants in which the largest horizontal dimension of the plant area lies between 16 m and approximately 320 m.

1.3 Types of noise

This International Standard applies to sources which radiate broad-band noise, narrow-band noise, discrete tones, repetitive impulsive noise and combinations of such components. The procedure given is applicable to steady noise and to non-steady noise provided that it is statistically stationary. It is not suitable for measuring isolated bursts of sound energy. The method is best suited for broad-band steady noise.

1.4 Measurement uncertainty

The uncertainty inherent in the method due to the layout of the plant depends mainly on the average distance, $\overline{d}$ between the measurement contour and the boundary of the plant, in relation to the square root of the plant area, S_p, and is given in table 1.

Table 1 – Uncertainty inherent in the method

Value of $\overline{d}/\sqrt{S_p}$	Uncertainty [1] dB
0,05	+3,0 / -3,5
0,1	±2,5
0,2	+2,0 / -2,5
0,5	+1,5 / -2,0
1) Expressed as a 95 % confidence interval for one determination.	

These uncertainties arise from spatial variations in the sound pressure levels (averaged over time) at the different measurement positions, owing to the inhomogeneous distribution of sound sources within the plant. They do not include uncertainties due to variations in the noise emissions of the sources over a period of time.

NOTE 1 In cases where background noise corrections in accordance with 9.5.4 cannot be applied, the uncertainties may be greater than those given in table 1.

EVS-ISO 8297:2006

ICS 17.140.20 Masinate ja seadmete müra

Võtmesõnad: akustika, helirõhk, masinad, müra, müra (heli), seadmed

Contents

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 8297 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

Annex A of this International Standard is for information only.

Introduction

0.1   This International Standard specifies an engineering method for determining the sound power level of multisource industrial plants which is relevant to the assessment of the noise they contribute to points in the environment around the plant. It is based on measuring the sound pressure level on a closed path (measurement contour) surrounding the plant and determining an appropriate measurement surface.

The method is intended to be applied to large industrial plants having multiple noise sources under any specified operating conditions and to other large sources provided that they can be assumed to radiate substantially uniformly in all horizontal directions.

The method described in this International Standard complies with the general recommendations given in ISO 2204.

0.2   Data obtained using this International Standard are suitable for the following purposes.

a) To calculate the sound pressure level at given points around a plant under specified weather conditions provided that the distance of such points from the geometrical centre of the plant area is at least 1,5 times the greatest dimension of the plant area (see figure 1). All individual sources within the plant area are thereby treated as a single point source at the geometrical centre of the plant.

b) To identify industrial areas or particular parts of such areas in terms of their contribution to the sound pressure levels at given points in the environment.

c) To compare different sources (complete plants or component installations) in terms of their sound power level.

d) To monitor the noise emission of a plant.

Acoustics — Determination of sound power levels of multisource industrial plants for evaluation of sound pressure levels in the environment — Engineering method

1 Scope

1.1 General

This International Standard specifies an engineering method (grade 2, as defined in ISO 2204) for determining the sound power levels of large multisource industrial plants relevant to the evaluation of sound pressure levels in the environment. These sound power levels may be used in an appropriate prediction model for such an evaluation.

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The results obtained are expressed both in octave-band sound power levels and, if required, in A-weighted sound power levels.

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It is applicable to industrial plants in which the largest horizontal dimension of the plant area lies between 16 m and approximately 320 m.

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1) Expressed as a 95 % confidence interval for one determination.

These uncertainties arise from spatial variations in the sound pressure levels (averaged over time) at the different measurement positions, owing to the inhomogeneous distribution of sound sources within the plant. They do not include uncertainties due to variations in the noise emissions of the sources over a period of time.

NOTE 1   In cases where background noise corrections in accordance with 9.5.4 cannot be applied, the uncertainties may be greater than those given in table 1.

2   Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 266:1975, *Acoustics — Preferred frequencies for measurements.*

ISO 1996-1:1982, *Acoustics — Description and measurement of environmental noise — Part 1: Basic quantities and procedures.*

ISO 2204:1979, *Acoustics — Guide to International Standards on the measurement of airborne acoustical noise and evaluation of its effects on human beings.*

ISO 3744:1994, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane.*

IEC 225:1966, *Octave, half-octave and third-octave band filters intended for the analysis of sound and vibrations.*

IEC 651:1979, *Sound level meters.*

IEC 804:1985, *Integrating-averaging sound level meters.*

IEC 942:1988, *Sound calibrators.*

3   Definitions

For the purposes of this International Standard, the following definitions apply. (See also figure 1.)

3.1   sound power level: The sound power level of the plant which is relevant to the calculation of the sound pressure level in the environment at a position remote from the plant. It is expressed in decibels.

It is ten times the logarithm to the base 10 of the ratio of a given sound power to the reference sound power. The reference sound power is 1 pW (10^{-12} W).

The width of a restricted frequency band shall be indicated: for example octave-band sound power level, one-third octave-band sound power level, etc.

Sound power level is denoted by the following symbols according to context:

L_W (for frequency bands);

L_{WA} (for A-weighted sound power level).

NOTE 2   The sound power level of the plant, as determined by this International Standard, may differ from the sum of the sound power levels of the individual sources in the plant.

3.2   sound pressure level, L_p: Ten times the logarithm to the base 10 of the ratio of the mean-square sound pressure of a sound to the square of the reference sound pressure. It is expressed in decibels. The reference sound pressure is 20 µPa.

The width of a restricted frequency band shall be indicated, for example, octave-band sound pressure level, one-third octave-band sound pressure level, etc.

3.3   plant area, S_p: The area in which all the sources of the plant are contained. It is expressed in square metres.

3.4   measurement area, S_m: The total area enclosed by the measurement contour. It is expressed in square metres.