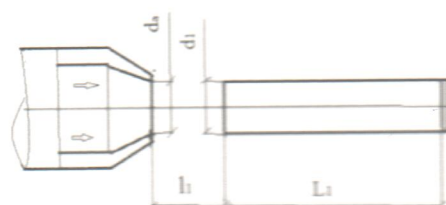
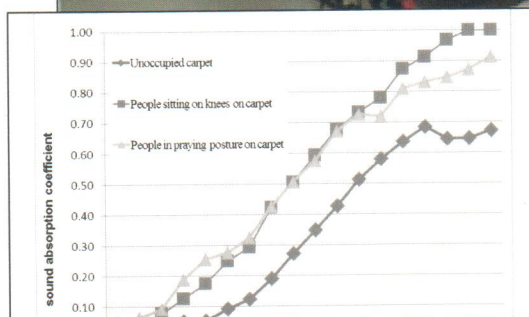


AKUSTIKA

odborný časopis o akustice a vibracích



SPECIAL VOLUME

7th All-Russian Research To Practice Conference With International Participation -
„Protection Against Increased Noise And Vibration“

from content:

- HIGH-INTENSITY LOW-FREQUENCY ACOUSTIC VIBRATIONS HAVE THE CRITICAL EFFECT ON THE LUNGS
- ON THE POROUS SOUND-ABSORBING PANELS WITH THE END LOW-FREQUENCY RESONANT CAVITIES
- ON THE RESULTS OF EXPERIMENTAL STUDIES OF THE PHYSICAL PROCESS OF GENERATING SOUND VIBRATIONS BEATS IN CLOSED AIR CAVITIES OF TECHNICAL ROOMS
- ON THE TECHNIQUE OF MISMATCHING THE RESONANT INTERACTIONS OF THE SOUND FIELDS CAUSED BY TECHNICAL OBJECTS WITH THEIR OWN ACOUSTIC MODES IN THE AIR VOLUME OF ROOMS
- COMPARATIVE ANALYSIS OF SOUND SUPPRESSING LIGHTWEIGHT STRUCTURED PANELS AND MODERN NOISE PROTECTION MEANS
- EFFECTIVENESS RESEARCH OF POLYMER FILM-BASED VIBRATION ABSORBERS
- MEDICAL AND BIOLOGICAL ASPECTS OF ACOUSTIC POLLUTION OF URBANIZED AREAS

CONTENT / OBSAH**HIGH-INTENSITY LOW-FREQUENCY ACOUSTIC VIBRATIONS HAVE THE CRITICAL EFFECT ON THE LUNGS**

Valery Zinkin, Irina Vasilyeva, Vladimir Bespalov, Aleksandr Osetrov

5

Paper No. 242/2019

ON THE POROUS SOUND-ABSORBING PANELS WITH THE END LOW-FREQUENCY RESONANT CAVITIES

Mikhail Fesina, Igor Deryabin, Gorina Larisa

10

Paper No. 243/2019

ON THE RESULTS OF EXPERIMENTAL STUDIES OF THE PHYSICAL PROCESS OF GENERATING SOUND VIBRATIONS BEATS IN CLOSED AIR CAVITIES OF TECHNICAL ROOMS

Mikhail Fesina, Igor Deryabin, Gorina Larisa

17

Paper No. 244/2019

ON THE TECHNIQUE OF MISMATCHING THE RESONANT INTERACTIONS OF THE SOUND FIELDS CAUSED BY TECHNICAL OBJECTS WITH THEIR OWN ACOUSTIC MODES IN THE AIR VOLUME OF ROOMS

Mikhail Fesina, Igor Deryabin, Gorina Larisa

24

Paper No. 245/2019

COMPARATIVE ANALYSIS OF SOUND SUPPRESSING LIGHTWEIGHT STRUCTURED PANELS AND MODERN NOISE PROTECTION MEANS

Valery L. Murzinov, Pavel V. Murzinov, Irina A. Ivanovna

30

Paper No. 246/2019

EFFECTIVENESS RESEARCH OF POLYMER FILM-BASED VIBRATION ABSORBERS

Valery Kirpichnikov, Alexander Syatkovskiy

36

Paper No. 247/2019

MEDICAL AND BIOLOGICAL ASPECTS OF ACOUSTIC POLLUTION OF URBANIZED AREAS

Igor Lykov, Nadezhda Loboda, Alexey Streltsov

39

Paper No. 248/2019

SOCIAL SURVEY ON COMMUNITY RESPONSE TO ROAD TRAFFIC NOISE IN KINSHASA, DEMOCRATIC REPUBLIC OF THE CONGO

Junior Nzelengenge Tambiki

45

Paper No. 249/2019

DETERMINATION OF THE MAIN SOURCE OF EXTERNAL NOISE CAUSED BY THE ENTERPRISE ENGINEERING AND TECHNOLOGICAL EQUIPMENT IN THE RESIDENTIAL DEVELOPMENT AREA

V.V. Svetlov, V.A. Sannikov

50

Paper No. 250/2019

ANALYSIS OF THE VIBRATION SPECTRUM OF THE RAILWAY BED FOR ENERGY HARVESTING

Valery Tsaplev, Sergey Konovnikov, Roman Konovnikov, Ivan Pavlov

54

Paper No. 251/2019

NOISE PROTECTION DEVICE DEVELOPMENT FOR LOCAL NOISE CANCELLATION

Alexander Tyurin, Zavialov Pyotr, Alexander Zikov

59

Paper No. 252/2019

CALCULATION OF THE NOISE LEVEL FROM A LINEAR SOURCE WITH VARIABLE NOISE CHARACTERISTICS ALONG THE LENGTH

Vladimir Tupov

64

Paper No. 253/2019

DISSIPATION OF THE ACOUSTIC OSCILLATIONS IN TWO-PHASE MEDIUM OF GAS-SOLID PARTICLES TYPE

Kochergin Anatoly, Pavlov Grigory, Valeeva Kseniya

67

Paper No. 254/2019

REDUCING THE NOISE INTENSITY OF SUBSONIC TURBULENT JETS USING NOISE-ATTENUATING DEVICES

Oleg Sitnikov, Pavel Nakoryakov, Margarita Mironova, Kseniya Valeeva

73

Paper No. 255/2019

THE STUDY OF ACOUSTIC CHARACTERISTICS OF THE PERFORATED AND HOMOGENEOUS PLATES WITH SIMILAR GEOMETRICAL DIMENSIONS

V.Y.Kirpichnikov, L.F.Drozdova, A.P.Koscheev, E.L.Myshinsky

79

Paper No. 256/2019

THERMAL MODEL FOR SAW CALCULATIONS IN THE LAYERED SYSTEMS

A.V.Osetrov, L.F.Drozdova, E.L.Mzshinsky

83

Paper No. 257/2019

ACOUSTICS OF PROCESS AS A FACTOR OF FORMING IN THE COMBUSTION ZONE OF FORMATIONS WITH EXCESS CHARGE

Pinchuk V.A., Pinchuk A.V.

88

Paper No. 258/2019

THE EFFICIENCY OF THE NOISE REDUCTION LEVELS OF THE LOCOMOTIVES AND DIESEL LOCOMOTIVES

I. A. Yaitskov, A.N. Chukarin

92

Paper No. 259/2019

ABOUT THE APPROACHES TO MATHEMATICAL DESCRIPTION AND CALCULATION OF TIRE ROAD NOISE RADIATION

Andrey V. Vasilyev

97

Paper No. 260/2019

THE IMPACT OF NOISE POLLUTION ON THE ECOLOGICAL STATE OF THE TERRITORIES OF PRESCHOOL INSTITUTIONS OF THE RESORT CITY OF PYATIGORSK

Pavel Sidyakina, Catherine Belaya, Dmitry Shchitov

100

Paper No. 261/2019

RUSSIAN EXPERIENCE OF TRANSPORT NOISE ESTIMATION AND MAPPING

Andrey V. Vasilyev

105

Paper No. 262/2019

STUDY OF THE EFFECTIVENESS OF VIBRATION ISOLATION OF UNCONVENTIONAL TOROIDAL ROPE VIBRATION ISOLATORS IN DIESEL UNITS VIBRATION ISOLATION SYSTEM	110	ENERGY-EFFICIENT SILENCERS OF GAS-AIR PATH	163
Minas A. Minasyan, Armen M. Minasyan, Aung Myo Thant		Andrey Taratorin, Vladimir Tupov	
Paper No. 263/2019		Paper No. 274/2019	
MODELING OF DISTRIBUTION OF SOUND WAVES IN THE CLOSED AREA BY FINITE DIFFERENCE METHOD	115	ANALYTICAL MODEL OF ENGINE FAN NOISE	168
Vladimir Mondrus, Dmitrii Sizov		Valery Samokhin, Petr Moshkov, Alexey Yakovlev	
Paper No. 264/2019		Paper No. 275/2019	
GENERATION REGULARITIES OF VIBRATION AND NOISE SPECTRA OF THE GEARBOXES OF OVERHEAD TRAVELING CRANES	120	ANALYSIS OF THE EXISTING WORKPLACE NOISE LEVELS IN THE INDUSTRIAL PREMISES AND OVERVIEW OF THE OPTIONS FOR REDUCING THEM	174
V.A. Bondarenko, A.N. Choukarin		Alisa Andryushchenko, Vadim Vasilyev, Sofia Grishina, Oleg Rusak	
Paper No. 265/2019		Paper No. 276/2019	
DESIGNING PLANAR MICROPHONE ARRAY FOR SOUND SOURCE LOCALIZATION	123	DETERMINATION OF ACOUSTIC CHARACTERISTICS OF FULL-SCALE SAMPLE OF SINGLE-LAYERED HONEYCOMB LINER BASED ON NUMERICAL SIMULATION	182
V.V. Ershov, V.V. Palchikovskiy		Khramtsov I.V., Kustov O.Yu., Palchikovskiy V.V.	
Paper No. 266/2019		Paper No. 277/2019	
ON EFFICIENCY OF SOME METHODS FOR DETERMINING THE AZIMUTHAL STRUCTURE OF NOISE IN CYLINDRICAL DUCT	130	EXPERIMENTAL STUDY OF INFLUENCE OF THE CHEVRONS ON JET-FLAP INTERACTION NOISE	189
Palchikovskiy V.V., Bersenev Yu.V., Korin I.A.		Sorokin E.V., Khramtsov I.V., Cherenkova E.S.	
Paper No. 267/2019		Paper No. 278/2019	
RESEARCH OF THE PROCESS OF FORMATION OF NOISE IN HOUSEHOLD REFRIGERATORS	135	RESULTS OF A SERIES OF ACOUSTIC MEASUREMENTS OF NOISE PENETRATING THROUGH THE PARTITION BETWEEN TWO CINEMAS	195
Alexey Demenev, Anatoly Naberezhnykh		Ilya Tsukernikov, Alexandr Fadeev	
Paper No. 268/2019		Paper No. 279/2019	
REDUCING NOISE FROM ROUND WOODWORKING MACHINES BY APPLYING VIBRATION DAMPING FRICTION PADS BETWEEN THE SAW BLADE AND THE CLAMPING FLANGE	138	ASSESSMENT OF THE ACOUSTIC SCREEN ABSORBING PROPERTIES BASED ON THE HELMHOLTZ RESONATOR	201
Denis Osmolovsky, Victor Asminin, Elena Druzhinina		Bulkin V.V., Sereda S.N., Kalinichenko M.V.	
Paper No. 269/2019		Paper No. 280/2019	
STUDY ON SILENCER ACOUSTIC EFFICIENCY IN GAS-AIR FLOW DUCT BENDS	141	IMPACT OF NOISE, GAMMA RADIATION AND OTHER GEOPHYSICAL FACTORS ON POPULATION HEALTH	206
Dmitry Chugunkov, Galina Seyfelmlyukova, Evgeniy Zhuravlev		Tamaz Zaks, Olga Burdzieva, Vladislav Zaalishvili	
Paper No. 270/2019		Paper No. 281/2019	
MECHANISMS OF GENERATION AND SOURCES OF NOISE IN SUPERSONIC JETS	144	TECHNOLOGY FOR THE MAINTENANCE OF ACOUSTIC COMFORT ON THE TRANSCAUCASIAN HIGHWAY IN THE ZONE OF THE RESIDENTIAL AREAS ADJUSTING THE MOTOR ROAD	211
Vladislav Emelyanov, Aleksey Tsvetkov, Konstantin Volkov		Ivan Alborov, Olga Burdzieva, Vladislav Zaalishvili	
Paper No. 271/2019		Paper No. 282/2019	
VIBRATION MODULATION CAUSES AT ROTATION FREQUENCY IN ROTARY MACHINES	151	EVALUATION OF NOISE OF THE MOSCOW METRO	216
Rykov S.A., Kudryavtseva I.V., Rykov S.V.		Lagutina N. V., Novikov A. V., Sumarukova O. V.	
Paper No. 272/2019		Paper No. 283/2019	
NOISE REDUCTION OF ROOF FANS ON THE CENTRAL HEATING STATION	158	PRINCIPLES OF ENSURING ENVIRONMENTAL WELFARE OF THE POPULATION UNDER THE EXPOSURE OF THE NOISE OF MOVING MOTOR TRANSPORT	222
Dmitry Chugunkov, Galina Seyfelmlyukova		Ivan Alborov, Olga Burdzieva, Fatima Tedeleva	
Paper No. 273/2019		Paper No. 284/2019	
ESTIMATING SOUND ABSORPTION COEFFICIENT OF PRAYERS IN MOSQUES	227		
Vasily Aleshkin, Christofor Schirjetsky, Anton Subbotkin			
Paper No. 285/2019			



ISSN 1801-9064 (Print)
ISSN 2570-8775 (Online)
REGISTRACE MK ČR E 18950

ANALYSIS OF THE EXISTING WORKPLACE NOISE LEVELS IN THE INDUSTRIAL PREMISES AND OVERVIEW OF THE OPTIONS FOR REDUCING THEM

^{a)} Alisa Andryushchenko, ^{b)} Vadim Vasilyev, ^{c)} Sofia Grishina, ^{d)} Oleg Rusak

^{a)} BALTIC STATE TECHNICAL UNIVERSITY «VOENMEH» named after D.F. Ustinov
Graduate student of O1 department - Ecology and health and safety, lvasishina@gmail.com

^{b)} BALTIC STATE TECHNICAL UNIVERSITY «VOENMEH» named after D.F. Ustinov
Master student of O1 department - Ecology and health and safety, vadim_r4@list.ru

^{c)} BALTIC STATE TECHNICAL UNIVERSITY «VOENMEH» named after D.F. Ustinov
Graduate student of O1 department - Occupational safety, gsy62@mail.ru

^{d)} Forestry and wood technology University
Doctor of technical Sciences, Professor of the Department «Biotechnosfernoj public security»

Abstract: The paper deals with the problem of excessive workplace noise levels of the production facilities. The noise levels of the typical production facilities are assessed on the basis of the statistical data obtained as a result of measurements. Typical technical measures which do not require technical re-equipment of the production facilities are considered.

Keywords: workplaces, noise level, noise mitigation measures

1. INTRODUCTION

Public health requirements for physical factors at workplaces came into effect [1] on the territory of the Russian Federation starting from 1st January, 2017, which cancelled the assessment of the sound pressure level at workplaces of the industrial premises and established the following normalized noise indicators:

- A. The sound level is 80 dBA, equivalent sound level A with allowance for the tension and difficulty of the work flow during the working shift is 50-80 dBA;
- B. The maximum sound levels A are 110 dBA, for impulse noise - 125 dBA.
- C. Peak sound level S is 137 dBC.

The document also notes that for certain industries (sub-sectors) of the economy the equivalent workplace noise level is allowed from 80 to 85 dBA, provided that the acceptable health risk of the workers is confirmed by the results of the workers' occupational health risk assessment and a set of measures aimed at minimizing the health risks for workers [1] is implemented.

Workplaces in the enterprise production facilities (especially in the engineering industry) are often characterized by high noise levels, significantly exceeding the maximum permissible (up to 23 dBA). In this regard, development of the noise mitigation measures is a mandatory part of compliance with the regulatory and legal framework of the Russian Federation.

2. WORKPLACE NOISE LEVELS IN THE INDUSTRIAL PREMISES

Design and calculation of the noise mitigation measures in the production facilities cannot be performed without a preliminary assessment of the noise sources acoustic characteristics, their location and characteristics of the production environment. However, due to the complexity of the production process, the equipment used (its parameters and characteristics) and performed working processes, the noise reference and passport data are often different from the real ones.

Tab. 1 represents the equivalent noise levels in the existing production facilities of various types. It provides an understanding of the current noise levels in the production facilities, systematized by the type of production (and as a consequence, by the main representatives). Measurements were carried out in the period from 2015 to 2018, which indicates the relevance of the issue.

Workplace (operations performed)	Sound levels/ Equivalent sound levels per shift, dBA	Equipment involved	Exceeding MPL of the equivalent SL, dBA
Light industry (household appliances production)			
Conveyor line operators (water heaters manufacturing)	80-82	Belt and roller conveyors	Up to 2
Manual welding operators (water heaters manufacturing)	85	Manual welding machine	5
Semi-automatic welding operating personnel (water heaters manufacturing)	82	Semi-automatic welding machine	2
Conveyor line operators (washing machines manufacturing)	80-87	Belt conveyors, hand-held pneumatic tools, auxiliary installations	Up to 7
Conveyor line operators (refrigerators manufacturing)	80-85	Belt conveyors, hand-held pneumatic tools, auxiliary installations	Up to 5
Mechanical engineering and metalworking (elevators manufacturing, pipe rolling)			
Stamping operators (elevators manufacturing)	81-82	Punching presses (metal sheets up to 3 mm thick)	Up to 2
Stamping operators (elevators manufacturing)	85-91	Punching presses (metal sheets over 4 mm thick)	Up to 11
Metal riveting operator (Elevators manufacturing)	83	Clinching	Up to 3
Metal cutting operator (Elevators manufacturing)	86	Guillotines	Up to 6
Sheet bending operator (Elevators manufacturing)	81	Bending presses	Up to 1
Welder (Elevators manufacturing)	86	Welding semi-automatic machine	Up to 6
Packers (Elevators manufacturing)	81-84	Manual pneumatic tools	Up to 4
Unwinding, steel sheet cutting operator (pipe rolling)	89	Unwinding installations, guillotines	Up to 9
Welding operator (pipe rolling)	93-95	Industrial welding machine	Up to 15
Welding operator (pipe rolling)	93	High-frequency welding machine	Up to 13
Pipe-straightening machine operator (pipe rolling)	102	Pipe-straightening machine	Up to 22
Inner bead checking operator (pipe rolling)	92	Water head under pressure inside the pipe	Up to 12
Induction heating installation operator (pipe rolling)	93	Pipe weld induction heating installation	Up to 13
Pipe cutter (pipe rolling)	97	Pipe trimming installation	Up to 17
AUT operator (pipe rolling)	93	Automatic ultrasonic testing Installation	Up to 13
Pipe cutting machine operator (pipe rolling)	92	Pipe cutting machines	Up to 12
Hydraulic pipe testing operator (pipe rolling)	95	Hydraulic pipe testing press	Up to 15
Defectors (pipe rolling)	92-97	-	Up to 17
Pipe socket tensioner operator (pipe rolling)	94	Pipe socket tensioner	Up to 14
Power industry (thermal power plants)			
Steam turbine operator (boiler-and-turbine production facilities)	84-102	Brush-contact devices, generators, steam turbine rotors	Up to 22
Boiler operator (boiler-and-turbine production facilities)	87-103	Boiler shells, gas burners, pipelines	Up to 23
Ancillary equipment mechanics	85-100	Motors, pumps, generators	Up to 20