

NOISE/NEWS

INTERNATIONAL

Volume 12, Number 4
2004 December

*A quarterly news magazine
with an Internet supplement published
by I-INCE and INCE/USA*

INTER-NOISE 05

Travel Planning

FEATURE:

First Annual Workshop on Global
Noise Policy

Measurement Uncertainty

An International INCE Symposium
Le Mans, France
June 2005



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Acoustical Society of China

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INTERNATIONAL

Volume 12, Number 4

2004 December

Features

<i>INTER-NOISE 2005: Travel Planning</i>	136
<i>First Annual Workshop on Global Noise Policy</i>	140
<i>Managing Uncertainty in Noise Measurement and Prediction—An International INCE Symposium</i>	162

Departments

<i>President's Column</i>	131
<i>Editor's View</i>	132
<i>Member Society Profile</i>	135
<i>International Representatives</i>	160
<i>Acknowledgements</i>	166
<i>Conference Calendar</i>	167
<i>Index to Volume 12</i>	168
<i>Directory of Noise Control Services</i>	CVR3

Cover Photos:

Sugar Loaf, so named because of its resemblance to the old mould used in the sugar refining process. At about 1,300 ft., Sugar Loaf offers breathtaking views of Rio. • Photo Credit: Erick Barros Pinto Courtesy of Rio Convention & Visitors Bureau

Le Mans

Courtesy of the International INCE Symposium Organizers

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NOISE/NEWS

I N T E R N A T I O N A L

The printed version of Noise/News International (NNI) and its Internet supplement are published jointly by the International Institute of Noise Control Engineering (I-INCE) and the Institute of Noise Control Engineering of the USA (INCE/USA).

I-INCE

The International Institute of Noise Control Engineering (I-INCE) is a worldwide consortium of societies concerned with noise control and acoustics. I-INCE, chartered in Zürich, Switzerland, is the sponsor of the INTER-NOISE Series of International Congresses on Noise Control Engineering, and, with the Institute of Noise Control Engineering of the USA, publishes this quarterly magazine and its Internet supplement. I-INCE has an active program of technical initiatives, which are described in the Internet supplement to NNI. I-INCE currently has 46 Member Societies in 39 countries.

INCE/USA

The Institute of Noise Control Engineering of the USA (INCE/USA) is a non-profit professional organization incorporated in Washington, D.C., USA. The primary purpose of the Institute is to promote engineering solutions to environmental noise problems. INCE/USA publishes the technical journal, *Noise Control Engineering Journal*, and, with I-INCE publishes this quarterly magazine and its Internet supplement. INCE/USA sponsors the NOISE-CON series of national conferences on noise control engineering and the INTER-NOISE Congress when it is held in North America. INCE/USA Members are professionals in the field of noise control engineering, and many offer consulting services in noise control. Any persons interested in noise control may become an Associate of INCE/USA and receive both this magazine and *Noise Control Engineering Journal*.

NNI Internet Supplement

www.noiseneewsinternational.net

- Links to the home pages of I-INCE and INCE/USA
- Abstracts of feature articles in the printed version
- Directory of the Member Societies of I-INCE with links, where available, to the Member Society Profiles and home pages
- Links to I-INCE Technical Initiatives
- Calendar of meetings related to noise—worldwide
- Links, where available, to NNI advertisers
- Links to news related to the development of standards
- Link to an article “Surf the ‘Net for News on Noise,” which contains links to noise-related sites—worldwide

Making Progress towards the INCE/USA Vision

NOISE-CON 2004 in Baltimore was another successful conference. This year's NOISE-CON 2004 was a joint meeting with Committee ADC 40—Transportation Related Noise and Vibration—of the Transportation Research Board, a Board of the National Research Council. This proved to be a great opportunity for interaction between INCE/USA members who attended NOISE-CON 2004 and the members of ADC 40. Attendance was good, the quality of the papers was high, the exposition was one of the largest for a NOISE-CON conference in recent years, and everyone enjoyed the crab feast aboard the harbor cruise.

A highlight of the meeting was the first annual workshop on US Noise Policy Development with a number of presentations that highlighted the state of the art and the way into the future (see full article in the September 2004 NNI). At the plenary session on Wednesday a number of awards were presented with Eric Ungar receiving the Distinguished Noise Control Engineering Award. Kudos to the organizers for putting together such a successful conference. ACTIVE 04 was held in Williamsburg in September and also was very successful. It was very well attended and interest has been rekindled to start planning for the next ACTIVE symposium. With more conferences like NOISE-CON 2004 and ACTIVE 04, the vision formed in 2003 to make INCE/USA sponsored conferences and specialty symposia the “must attend” conferences in noise control engineering in the USA is certainly to be achieved. Next year NOISE-CON 2005 is in Minneapolis and is joint with the Acoustical Society of America—with a number of joint sessions organized with the ASA Noise Technical Committee and the ASA Architectural Acoustics Technical Committee. This joint meeting will also have an exposition. We therefore are looking forward to another successful conference this time in partnership with our colleagues from the Acoustical Society of America.

NOISE-CON 2004 was preceded by a number of INCE business meetings, which included meetings

of the Finance Committee, the Publications Advisory Board, the Long Range Planning Committee, the Executive Committee, the Technical Advisory Board and last but not least the Board Of Directors and Officers meeting. This year the Board had to take the unpleasant step of increasing the membership dues. A letter justifying the increase has been sent out with the dues invoice. Among other items discussed, were discussions on an electronic substitute for the paper version of NCEJ, improving the INCE/USA Web presence, and revamping Board Certification. Also discussed was the establishment of an “Academy of Fellows” from nomination of members for contributions to noise control engineering, contributions to INCE/USA, and continued participation in the affairs of INCE/USA. An initiative by the VP of Technical Activities, Pat Davies, defining adjustments to TC structure was also discussed. Other changes include the appointment of Alan Marsh as Editor-in-Chief (interim) for NCEJ, and establishment of a Student Activities Committee to increase student participation in INCE/USA.

Two other elements of the INCE/USA vision are NCEJ and membership. David Holger has resigned as Editor in Chief (EiC) of NCEJ. On behalf of INCE/USA and the NCE community I want to thank Dave for his hard work and leadership as EiC of NCEJ for more than 9 years. We are now in the process of selecting an EiC (see solicitation in the September 2004 issue of NNI). It is anticipated that the ‘long term’ EiC will take over in June 2005. In the interim the EiC duties are being superbly handled by Alan Marsh who brings a wealth of experience to this position. Alan is already making his mark on NCEJ. INCE/USA is looking forward to a new era for its premier journal as it achieves the vision as the premier journal in NCE and the challenges of electronic publishing.

Membership is on the increase but we must not stop with the membership drive. We are doing a good job at recruiting new young members who are the future



Joseph Cuschieri
2004 INCE/USA
President

continued on page 133

The Language of Noise



Bernard Berry

European Editor
I-INCE VP Europe
and Africa

To misquote George Orwell, in his novel *Animal Farm*; “All Christmas presents are welcome—some are more welcome than others.”

Someone who knows my love of the English language—its history, development and evolving application—gave me the wonderful book *Lost for Words—The Mangling and Manipulation of the English Language* by John Humphrys¹. The author is well known in the UK as a journalist, BBC reporter, radio interviewer, and scourge of politicians of all persuasions.

In the book he exposes the depths to which he believes the language has sunk and offers many examples of what he calls “the most common atrocities.” His case is that the language is under attack from all sides. “Politicians dupe us with deliberately evasive language. Bosses worry about impacting the bottom line while they think out of the box. Academics talk obscure mumbo jumbo.” He dispenses sensible guidance on how to use simple, clear, and honest language.

Well, I hear you say, “What has this got to do with noise control engineering as a profession, or I-INCE?”

The simple answer is that we all have a need and a duty to communicate clearly with others, who may range from experts in our own field, through those less familiar with our particular area of expertise, and on to the “general public.” I am sure we all take great care in writing our scientific papers, technical reports etc., when we have a relatively clear idea of the target audience. But of course many of the key issues in noise control engineering, such as the environmental impact of airports and sound insulation of homes, impinge on the lives of the “general public”—whoever that might be. The situation is complicated by the fact that, even within the category of “general public,” we may face a large range of knowledge in our intended audience, from well-educated and technically aware pressure groups, to concerned private individuals.

The book *Lost for Words* serves as an entertaining and persuasive reminder of the care we should all take as the “providers” of information. But we should also bear in mind that we, as professionals, are often ourselves the audience. We should be ready to detect when politicians, and others, are, to use the eloquent words of a very senior British Civil Servant, “economical with la verité.”

We may also find ourselves in the “editorial chain” between the initial author and the intended audience, and have the chance to improve the clarity of language in that context. I was recently in that situation, reviewing a draft conference paper in the area of environmental noise assessment and management, intended for an international audience, for whom English might not be the mother tongue. Many of the publications with which we all deal are in that category. My eyes, but only part of my brain, took in the following words:

“Ambiguous assessment requirements may allow for significant interpretation as to the precise conditions that define the bounds of a representative data set.”

This could have come as an example straight from the book I have been discussing, but did not. My own suggested “translation” of the text is;

“We sometimes do not know what the client wants... and neither do they.”

A further group of examples on this theme might be our propensity to use acronyms—the shorthand we all find ourselves using as part of our special language. I myself may even be a serial offender, in the course of providing this magazine with European News. I could quote a range of recent cases – from ACARE (Advisory Council for Aeronautics Research in Europe—www.acare4europe.com/html/links.shtml) to the WHO [World Health Organization]. Such language could be regarded of

continued on page 167

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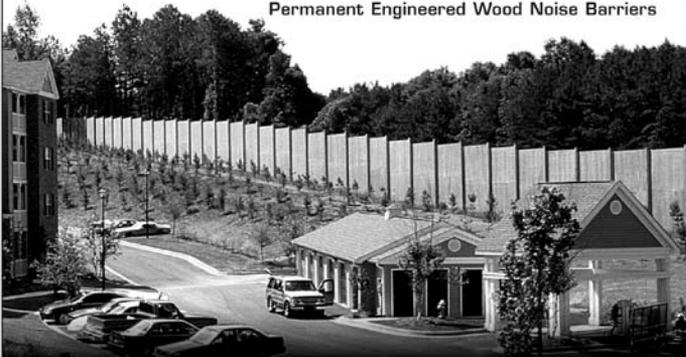
President's Column *continued from page 131*

of the Institute. However, we still need to find a way to attract the large number of engineers who are working on noise control issues in Industry we have not tapped this membership resource. As the membership base expands, this will help participation in our conferences and the number of published papers in our journal.

This is my second and last President's Column as my term expires at the end of 2004. It certainly was an eventful year from my perspective, and being president is more work than I anticipated. However I enjoyed it and certainly was a pleasant experience. I want to thank the BoD, the officers, the staff and all the members for the support and help and for making my year such a pleasant experience. ■



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Acoustical Society of China

The Acoustical Society of China (ASC) is the premier professional society in acoustics in China, dedicated to the development of science and technology in the field of acoustics, and to the promotion of diffusion and exchange of relevant knowledge.

In 1964, the Society of Acoustics was initiated as a branch of the Chinese Institute of Physics, which formed a platform for the communications of researchers working in the area of acoustics in China. In 1978, another organization of acoustics, the Applied Acoustical Society, was founded as a branch of the Chinese Institute of Electronics. In 1985, after the exploratory discussion of the peer acousticians of China, mainly Prof. Dezhao Wang, Dah-you Maa, Chongfu Ying, Rongjue Wei, and Mo'an Wei, the two branch societies were unified into the Acoustical Society of China (ASC). The Administrative Secretariat of ASC has been located in the Institute of Acoustics, Chinese Academy of Sciences, since then. ASC is also a Member Society of the Committee of Basic and Applied Physics allied in UNESCO and of the International Institute of Noise Control Engineering (I-INCE). Since its establishment, ASC successfully organized several international conferences, including the 16th International Congress on Noise Control Engineering (INTER-NOISE 87), the 14th International Congress on Acoustics (ICA 1992) and the 6th International Congress on Spoken Language Processing (ICSLP 2000), and many bilateral and domestic conferences on acoustics. Three professional journals on acoustics, Chinese Journal on Acoustics (both Chinese and English editions), Applied Acoustics and Noise and Vibration Control (in Chinese only), have been published by the society.

The membership of ASC is at present about 3500, with some institutions and companies as sustaining members. To assure adequate attention to the separate fields of acoustics, ASC has established some 9 technical committees charged with



keeping abreast of developments and needs of the membership in their specialized fields. Some such fields are physical acoustics, underwater acoustics, environmental acoustics, audio engineering, speech/hearing and music acoustics, biomedical ultrasonic engineering, detection ultrasonics, sono-electronics, and nonlinear acoustics. There are 6 working councils setup to response for different affairs of the Society, including the scientific communication council, scientific popularization council, organization council, international affair council, technical consultant council, and youth affair council. To facilitate the local activity of the Society, ASC also has 12 local committees situated in different provinces and cities around the country, which are Beijing, Shanghai, Tianjin, Xi'an, Kunming, Shandong, Jiangsu, Heilongjiang, Hubei, Sichuan, Zhejiang and Shanxi.

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This is the 48th in a series of articles on the Member Societies of International INCE.

The 2005 International Congress and Exposition on Noise Control Engineering

7-10 August 2005 • Rio de Janeiro • Brazil



INTER-NOISE 05, the 2005 International Congress and Exposition on Noise Control Engineering, will be held at the Sofitel Hotel on Copacabana Beach, Rio de Janeiro, Brazil on 2005 August 7-10. The Congress is sponsored by the International Institute of Noise Control Engineering (I-INCE), and is being organized by the Brazilian Acoustical Society (SOBRAC) together with the Iberoamerican Federation of Acoustics (FIA). Samir N. Y. Gerges, professor at the Federal University of Santa Catarina, is the Congress President.

Congress Schedule

On Sunday, August 7, three short courses will be held beginning at 08.00. The I-INCE Congress Selection Committee will meet from 09.00 to 12.00, and the I-INCE General Assembly will meet from 14.00 to 16.00. Congress registration begins at 14.00. The Opening Ceremony the first of five distinguished lectures, and a reception will be held in the Sofitel from 17.30 to 20.30.

On Monday, August 8 and Tuesday, August 9, distinguished lectures and technical sessions will be held. Over the lunch hour, the INCE Technical Divisions (formerly Technical Sections) will meet to plan for the next INTER-NOISE to be held in Honolulu, Hawaii, USA in 2006 December.

Wednesday, August 10 will be devoted to one distinguished lecture, technical sessions, next congress planning, and a closing ceremony—to begin at 18.00.

Distinguished Lectures

The following Distinguished Lectures will be presented at INTER-NOISE 05:

Sunday, 7 August

Tor Kihlman (Sweden) Sustainable Development in an Urbanizing World: The Environmental Noise Issue

Monday, 8 August

Thais Morata (Brazil) Health Effects of Noise Interactions at Work, Leisure and Home

John Casali (USA) Advancements in Hearing Protection: Technology Applications and Challenges for Performance Testing and Product Labeling

Tuesday, 9 August

Michael Vörländer (Germany) .. Engineering Acoustics meets Annoyance Evaluation

Robin S. Langley (UK) Predicting the Response Statistics of Uncertain Structures Using Extended Versions of SEA

Wednesday, 10 August

J, Stuart Bolton (USA) Noise Control Materials

Rio de Janeiro

Everyone knows about Rio de Janeiro's striking scenery with the world-famous Copacabana and Ipanema beaches, lush tropical forests, tall granite peaks such as the famous Christ, Sugar Loaf and Corcovado mountains, warm year around weather, international cuisine, rich culture, beautiful architecture and vibrant nightlife, not to mention the unparalleled warmth of its fun-loving inhabitants. But it is important for you to know that Rio de Janeiro also offers some of the world's most sophisticated congress and tourism infrastructures it has a modern international airport (recently expanded), easy accessibility with most international airlines flying daily in and out of Rio from/to major world cities.

Rio de Janeiro is a cosmopolitan city, known worldwide for its scenic beauty and its natural resources. The city provides a harmonious and agreeable environment for its inhabitants and visitors, for both leisure and work which, combined with its infrastructure, makes Rio an important center for commerce and services, with the advantage of a modern and diversified industrial sector. The city of Rio de Janeiro recognizes that one of its main virtues is the kindness and hospitality with which its residents welcome all visitors.



General Information

Visa and Passport Requirements.

When coming to Brazil, you must be sure that your passport is valid for at least six months after the date of entry. Check with your local Brazilian embassy or consulate whether or not you require a visa to enter the country. If a visa is required, allow plenty of time for it to be issued.

Language. The official language of INTER-NOISE 05 is English. All papers are to be presented in English.

Money and Credit Cards. The official Brazilian currency is the Real (BRR). Approximate exchange rates (January 2005) are: U.S. dollars; 1 USD = 2.70 BRR, Euros; 1 EUR = 3.50 BRR, Japanese Yen: 1 JPY = 0.025 BRR, British pounds; 1 GBP = 4.99 BRR.

The Brazilian Real is divided into 100 centavos. Bank notes are 100, 50, 10, 5, and one Real. Coins are one Real or 50, 25, 10, 5 and 1 centavo. All banks and money exchange recognize traveler's checks and foreign currency. It is advisable to take U.S. dollars or Euro traveler's checks or currency as this is more readily exchanged than other currency. Banking hours from 10.00 to 16.00 hours Monday to Friday.

It is recommended that you change a small amount of money on arrival to pay the taxi, etc. Major credit cards—such as MasterCard, American Express, Dinner Club and VISA—are accepted in the majority of hotels, shops and restaurants.

Lunch/Coffee breaks. Coffee breaks and lunch boxes are included in the congress registration fee and will be served on Monday, Tuesday and Wednesday.

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Note to Smokers. Smoking is prohibited in all session rooms and all congress areas, and also in any indoor place in Brazil.

Climate and Clothing. Rio de Janeiro enjoys beautiful weather all year round, with an average daily temperature in August of 15 to 20°C. You will not normally need formal clothing, such as suit and necktie, but a short sleeved shirt, light trousers and a "pullover" or extra layer is usually used.

Tipping. In most restaurants and bars a 10% service fee is added to the bill. More sophisticated places may add on 15%. If service is not included it will be stated at the bottom of the bill (service não incluído). There is no VAT in Brazil. Taxis do not expect a tip, but it is normal to round up the final price. You should be aware that the amount given on the taximeter will not always be the amount you are due to pay. Look for a separate sheet taped to the window, which will tell you how much the amount on the meter equates to.

Contacts

Congress Hotel

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There are two professional congress organizers assisting with INTER-NOISE 05, one for general organization, and one for the organization of tours and hotel reservations.

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Contact the Congress Secretariat

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Short Courses

Three Short Courses will be offered on Sunday, August 07 from 08.00 to 17.00. These courses are not included in the conference registration fee, and must be booked separately at the congress web site.

COURSE I: Sound Quality

The instructor will be Patricia Davies, Professor, Ray W. Herrick Laboratories, School of Mechanical Engineering, Purdue University. USA.

This course will address aspects of: good practice in psycho-acoustical testing; analysis of test results; sound analysis and simulation; identification of perceptual attributes of sounds; sound analysis to predict perceptual attribute strengths and sound quality metrics; modeling the relationships between, perceptual attributes and perceived sound quality; global versus applications-oriented models of sound quality and annoyance; and connecting noise control approaches to sound quality evaluation.

The course will include examples of practical applications of the techniques described; discussion of the role that different types of sound attributes play in different applications; and the strengths and short-coming of existing models to predict those attributes. Examples of applications include transportation, diesel engines, tractors, HVAC systems, and refrigerators. Participants are encouraged to bring examples of sound quality case histories.

COURSE II: Noise Control Materials

The instructor will be J. Stuart Bolton, Professor, Ray W. Herrick laboratories, School of Mechanical Engineering, Purdue University. USA.

Porous material: background and definitions, acoustical characterization of porous materials and standing wave tube theory, simple theoretical models for porous materials, effective use of porous materials, demonstration of system modeling software and comments on the use of porous materials in the automotive industry, modeling of elastic porous media. Part 1 - fundamental theory and modeling of elastic porous media. Part 2 - demonstration of wave propagation in elastic porous media and comments on sound absorption, measurement of mechanical properties of foam, and special purpose measurements of interest to the automotive industry, modeling of elastic porous media. Part 3 - sound transmission measurement of transmission loss by a standing wave tube method, SEA in sound package design, introduction to finite element modeling of elastic porous materials, finite element modeling of noise control materials and software demonstration, wrap up, general discussion and question and answer period.

COURSE III: Successful Prevention of Hearing Loss in Work, Leisure and Home

(in the Portuguese Language). Thais Morata, Ph.D; NIOSH - USA.

Dr. Thais Morata is an audiologist who has been working in the area of hearing loss prevention since 1982. Her main area of interest is the prevention of auditory effects of combined exposure to noise and chemicals. Dr. Morata is a research fellow at the National Institute for Occupational Safety and Health, in Cincinnati, Ohio, USA. She collaborates with several international occupational health institutes in this area. She currently teaches graduate courses at the Universidade Tuiuti do Paraná in Curitiba, Brazil.

Análise da exposição à ruído ambiental e ocupacional e a necessidade de medidas preventivas. Apresentação e discussão de programas preventivos existentes a nível internacional. Atualização dos subsídios teóricos e práticos referentes a prevenção de perdas auditivas. Análise e desenvolvimento de estratégias de vigilância epidemiológica.



Global Noise Policy Workshop

The second annual workshop on global noise policy will be held on 2005 August 8. Co-chairmen for the workshop are William W. Lang and Tjeert ten Wolde. The purpose of the workshop is to discuss the latest developments in noise policy in the three principal areas of major interest: occupational noise, community noise, and consumer product noise. The discussions of community noise will include aviation/airport noise, surface transportation noise, industrial noise, and local citizens' concerns. Specialists from government and from the private sector will focus on recent actions related to noise policy. In those areas where actions have been taken since the first annual workshop in 2004 (*See the feature article in this issue.—Ed.*), the speakers will be asked to summarize the implementation of these policies in their areas of expertise. Following the presentations, there will be focused discussions among the presenters and members of the audience. The objective of the workshop is to bring the attendees up-to-date on the implementation of national noise policies that ultimately will lead to a global noise policy. The special focus for the 2005 workshop will be on the noise emissions of products and their impact on international trade.

Congress Registration

Congress registration is via the Internet. Go to <http://www.internoise2005.org.br> and follow the instructions. Registration fees are in Euros.

With the low INTER-NOISE 2005 registration fee and special offers for the hotel rates and airline fares, INTER-NOISE 2005 will turn out to be less expensive than any congress in Europe, Asia or the USA. Please take advantage of this opportunity and come to visit this very interesting tropical country, perhaps for the first time. We are sure you will enjoy it.

Congress Banquet

The congress banquet will take place on Tuesday, August 09, 2005 at the PORCAQ Rio Flamingo beach restaurant. Barbecue and grills of the best Brazilian meat are served on the table until you are satisfied (usually there are red and green signs which you show, Green means need more and Red means stop). Salads, hot and cold dishes are self service. Drinks include the famous Brazilian Capirinha, beer, fruit coquetal and soft drinks. Wine can be ordered, but is not included.

The restaurant is overlooking the beautiful tropical beach, the Christ statue and Sugar Loaf. Typical shows and dance music will be provided, including the Samba. Buses will depart from Sofitel just after the end of the last technical session. More information will be in the congress book.

Accommodations

The congress hotel is the Sofitel on Avenida Atlantica directly across from Copacabana Beach. Agreements have been reached with about 20 hotels located between 50 and 2500 meters from the Sofitel. Prices range from 140 USD for the five-star Sofitel to 20 USD for a three-star hotel (per person in a triple room, including breakfast). Go to the congress home page, click on "good news," and then click on "accommodations." You will find a hotel reservation form and links showing the locations of the hotels, the distances from the congress hotel, prices, and links to the home page of each hotel.

Travel Arrangements

VARIG. VARIG, the official carrier of INTER-NOISE 05, will be honored to take you to Brazil aboard its aircraft. The largest airline in Latin America, VARIG is a member of the Star Alliance making possible your access to a wide range of destinations in over 112 countries. The Alliance also provides benefits such as united check-in for passengers and luggage (for passengers using the services of more than one Star Alliance airline) in addition to a complete mileage program integration.

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You may arrive in Brazil at Rio International Airport (Galeão) which is about 40 km from the Sofitel, or at São Paulo International Airport (Guarulhos), which is about 400 km from Rio de Janeiro city.

To get to your hotel from Rio International Airport (Galeão), you have the following options:

1. Take a taxi direct from Galeão to your hotel.
2. Take the Airport Bus to Rio de Janeiro Central City Airport (Santos Dumont) and then you will be near the Sofitel. Then take a taxi to your hotel.
3. Take a bus from Galeão Airport which passes near most of the hotels on the main beach front avenue (Avenida Atlantica). However, the bus may stop some distance from your hotel, and you will have to walk with your luggage. This is therefore not recommended.

If your flight arrives at São Paulo International Airport (Guarulhos), which is about 400 km from Rio de Janeiro city, we do not recommend that you rent a car or take a bus. You have the following options to get to Rio de Janeiro:

1. Take a connecting flight from São Paulo International Airport (Guarulhos) to Rio de Janeiro International Airport (Galeão) and then follow the instructions above to get to your Hotel.
2. If you have to wait a long time for a connecting flight at Guarulhos, you can take the Airport Bus to the São Paulo Central City Airport (Congunhas). There are flights every 30 minutes (Ponta Aerea) to Rio de Janeiro Central City Airport (Santos Dumont). Then take a taxi to your hotel.

First Annual Workshop on Global Noise Policy

William W. Lang and Tjeert ten Wolde, Workshop Co-Chairmen and Co-Conveners of I-INCE Technical Study Group 5

Introduction

Workshop Co-chairman Bill Lang opened the First Annual Workshop on Global Noise Policy on Tuesday morning, 2004 August 24, at the Czech Technical University, Prague, Czech Republic. He introduced his Co-chairman, Dr. Tjeert ten Wolde, who presided during the second day of the two-day workshop. The workshop had four sessions during the mornings and afternoons of Tuesday and Wednesday. The topics covered in the four sessions corresponded to the four parts of the final report being prepared by I-INCE Technical Study Group 5 on "Noise as a Global Policy Issue:"

Part 1 - General policy considerations

Part 2 - Occupational noise

Part 3 - Environmental noise

Part 4 - Consumer product noise

Earlier workshops have been held on noise topics, but this was the first to focus on the development of a *global* noise policy. The format of the workshop was to have invited presentations by a panel of specialists in the topics covered in the four parts. At the end of each of the four sessions, there was an open meeting of I-INCE Technical Study Group 5 to discuss what the panelists had presented and to recommend changes to the TSG 5 draft report.

General Aspects of a Global Noise Policy International Standards on Noise

The first of the panelists to speak in the workshop was Leif Nielsen from Denmark, who is Secretary of Subcommittee SC1 on Noise of Technical Committee

43 (Acoustics) of the International Organization for Standardization (ISO). He spoke on *international cooperation and the development of international standards on noise*. International standardization is a key aspect of global noise policy. The primary focus of this presentation was on the Business Plan (BP) of SC1. The main objective of a Business Plan is to provide a concise and up-to-date overview for interested stakeholders of important business, technological, environmental and social trends in the field of the ISO subcommittee.

The major objectives of international noise standards are:

- To harmonize noise measurement methods in order to establish a good basis for noise reduction measures, and
- to harmonize measurement methods for the effects of noise especially on human hearing function in order to avoid, diagnose and give therapy for hearing damage.

Although international standards do not carry the weight of law, they profoundly influence the language, interpretation, and direct extent of the law and are often written into contracts to monitor acceptance and performance. They are essentially science-based building blocks for use by national governments or international organizations with authority to develop noise policy.

The noise control market is generated:

- By consumer demands (noise control in cars and for domestic equipment; this part is market driven),

- for the protection of workers (occupational noise; driven by law), and
- for the protection of people in their domestic environments against noise from external sources (environmental noise; driven by law).

The market related to both occupational and environmental noise has two complementary aspects:

- The financial damage due to noise, and
- business opportunities through the sale of products and services.

A number of the international noise standards help to remove technical barriers to trade and to improve social conditions.

Major factors that have an impact on the development of international markets are:

- The demands for noise control that grow with increasing wealth and with the increase of population density, and
- the fact that in the next decade the European Union and Japan will further strengthen their legislation on noise control; this will strongly influence the world wide market and the need for international noise standards.

While quantitative indicators of the costs of noise and its control are imprecise, a few examples related to the business environment are noteworthy:

- The social and economic cost of occupational deafness is very high, on the order of 100,000 USD for a single worker;
- the value of trade in machinery within Europe is several hundred billion USD; quieter machines improve working conditions and increase productivity;

- “a quieter product” has become a sales argument for the machinery for sale in the EU and for export as well;
- the yearly world wide damage due to noise consists of medical costs, costs of lost labor days, reduced housing prices, reduced land prices, reduced productivity, reduced safety and other factors; it has been estimated to be as much as 1000 billion USD; and
 - the yearly world wide expenditures related to noise control have been estimated to be as much as 100 billion USD.

To summarize Nielsen's presentation, the ISO noise standards involve the quality of life for all human beings. The work is deeply tied to the economies of all nations in the form of trade, jobs, manufacturing, national competitiveness, and GDP. Its economic impact is impossible to measure, but it involves governments, manufacturing sectors, consumers, labor forces, and the public at large. All have a major stake in the international noise standards.

Machinery Noise Emission Standards

The second panelist to speak was Hans Jonasson from Sweden. He presented a paper that was co-authored with Roger Higginson from the UK on the development of the basic machinery noise emission standards. These international standards are in three series.

- The ISO 3740 series that facilitates the computation of the sound power level of a noise source from the values of the sound pressure level measured in its vicinity.
- The ISO 11200 series that facilitates the measurement of emission sound pressure levels at a work station of a machine or piece of equipment.
- The ISO 9614 series that facilitates the determination of the sound power levels of noise sources using sound intensity.

Each series includes methods that yield three grades of accuracy—survey, engineering and precision. The standards in the three series are now more widely used than ever in response to broadening

... the yearly world wide damage due to noise... has been estimated to be as much as 1000 billion USD

regulatory demands for user safety and for reduced intrusion of machinery and other equipment. The standards are continuing to evolve to allow for improvements and the commercial implications of regulatory requirements. The original ISO 3740 series, dating from the 1970s, has been completely revised, culminating with the publication of the new ISO 3745 in 2003. The ISO 11200 series was completed with the publication of ISO 11205 in 2003. The ISO 9614 series was completed with the publication of Part 3 in 2002. A new round of revisions of these standards has now been initiated by Working Group 28 of Sub-committee 1 (“Noise”). In the case of the ISO 3740

series and the ISO 11200 series, two successive revisions are envisaged, one short term based on existing knowledge and one long term if the needed research can be carried out to provide substantial information not available at present. For the short-term revision, the present structure of the series of standards, by which the individual standards are identified with particular acoustic environments and grades of precision, will be retained.

The objectives of the short-term revisions of the ISO 3740 series are:

- To edit the standards so as to unify their structures, terminology and definitions, and treatment of common aspects;
- to add clauses to those standards which do not already have them, covering determination of the sound energy level for noise sources emitting bursts of sound;
- to unify the treatment of measurement uncertainties in all the standards and add guidance showing how the uncertainties can be expressed in a manner consistent with the *ISO Guide to the Expression of Uncertainties in Measurements*;
- to provide in the methods giving grade 2 and grade 3 precision the information necessary to allow determination of the sound power levels and sound energy levels under reference atmospheric conditions; and
- to extend the range of acoustic environments in which ISO 3744 may be applied.

The objectives of the short-term revisions of the 11200 series are:

- To edit the standards so as to unify their structures, terminology and definitions, whilst at the same time clarifying the distinctions between and different fields of application of the respective standards within the series;
- to change ISO 11201 from a grade 2 method into a method giving either grade 1 or grade 2, depending on the quality of the acoustic test environment;
- to change ISO 11202 from a grade 3 method into a method giving either grade 2 or grade 3, with distinctions made, for example, by classification of the noise source to environment relation and giving clear rules on how to proceed if the work station is shielded from the main source of noise emission;
- to add to ISO 11203 some guidance relating to the directivity of the noise source;
- to describe more clearly the field of application of ISO 11204 and to harmonize the methods of determining the environmental correction with those given in ISO 3744 and ISO 3746;
- to unify the treatment of measurement uncertainties in all the standards and add guidance showing how the uncertainties can be expressed in a manner consistent with the *ISO Guide to the Expression of Uncertainties in Measurements*.

The knowledge to make all of the above changes to the standards is already available and Working Group 28 has already begun the revision work with target dates for completion by 2006.

Status of Noise Policies Worldwide

The next panelists to speak were Bill Lang and Hideki Tachibana, co-conveners of I-INCE Technical Study Group 3, "Noise Policies and Regulations." They presented an overview of the work of TSG 3 to assess the *effectiveness* of noise control policies, guidelines, and

regulations worldwide. This is a large-scale, internationally-coordinated program. Two survey questionnaires were circulated to collect information on legislated regulations and standards regarding environmental noise emission and immission requirements in each of the countries of the I-INCE Member Societies that appointed specialists to serve on Technical Study Group 3.

The first questionnaire circulated in 2001 included the following points:

- Legislative and administrative structures for the enactment and enforcement of noise policies and regulations/standards,
- enumeration of the major laws and/or ordinances relevant to environmental noise problems,
- nature of these laws and ordinances,
- subjects to which these laws and ordinances apply,
- regulation/standard values specified in these laws and ordinances, and
- effectiveness of the noise laws and ordinances in reducing levels of environmental noise.

The second questionnaire circulated in 2002 asked for the following:

- Additional information on each regulation, standard, guideline, etc., with the request that each be characterized as an immission or emission document, and
- information on building codes, occupational noise regulations, and noise labeling of consumer products.

It is difficult to compare the laws, regulations, guidelines, and standards in each country, because important differences exist among them, including assessment and measurement methods, whether limits are mandatory or targets, and

whether compliance is being achieved by controlling emissions from noise sources or immissions at the receiver.

The complicating factors that need to be taken into account are:

- Differences in noise indicators and noise exposure metrics;
- differences in assessment methods: measurement or calculation;
 - if by calculation, what computation method should be used
- differences in duration of assessment times;
- character of each legislative document: "Law," "Act," "Regulation," "Guideline," or "Standard"
- control of emission from noise sources(s) or immission at receiver(s);
- intention of specified noise levels: mandatory limits or targets;
- requirements for existing situations or new installations, or both;
- differences in measurement methods;
- differences in location of measurement points:
 - outdoors or indoors
 - free-field (how to deal with façade reflection)
 - measurement height above ground and location relative to nearby structures

*The next step in
the long-term goal
of assessing the
effectiveness of noise
policies around the
world is to develop
estimates of national
noise exposure.*

A draft of the final TSG 3 report presents a comprehensive overview worldwide of current emission-oriented and immission-oriented policies in the environmental noise field.

Compilation of the noise policy background material for TSG 3 provides a database of international noise policy documents and exposure

criteria for additional uses in the future. Thus, the database, itself, is the primary product resulting from the TSG 3 effort. The next step in the long-term goal of

assessing the effectiveness of noise policies around the world is to develop estimates of national noise exposure. It is believed that the technical capabilities for performing such an effort have now developed to the point where this effort is warranted.

Review of U.S. Noise Policy

The next panelist in the workshop was George Maling from the U.S.A. He presented an overview of U.S. noise policy that was co-authored with Larry Finegold.

The United States has a long history with respect to the establishment of policies for control of both environmental and occupational noise. Two of the first policies were developed by the Occupational Safety and Health Administration for occupational noise and the Federal Aviation Administration for aircraft noise. The National Environmental Policy Act led to the establishment of the Office of Noise Abatement and Control in the U.S. Environmental Protection Agency and later to the passage of the Noise Control Act of 1972 (NCA 72). In the following decade, regulations were established for a number of noise sources, and assistance was given to State and local governments for control of noise. NCA 72 was effectively terminated in 1982 through loss of funding.

He then posed a question: "Does America have a noise policy today?" He answered by pointing out that every Federal agency concerned with noise has a noise policy. In addition to policies at the Federal level, there are hundreds of policies of the fifty states and ordinances of the local governments. The Federal agencies involved with noise are:

- U.S. Environmental Protection Agency
- Federal Aviation Administration (Dept. of Transportation)
- Federal Highway Administration (Dept. of Transportation)
- Federal Railroad Administration (Dept. of Transportation)
- Federal Energy Regulatory Commission
- Occupational Safety and Health

- Administration (Dept. of Labor)
- National Institute of Occupational Safety and Health (Department of Health and Human Services)
- Mine Safety and Health Administration (Department of Labor)
- General Services Administration (Public Buildings Service)
- National Park Service (Department of the Interior)
- Department of Housing and Urban Development
- Department of Defense
- U.S. Army (Department of Defense)
- U.S. Navy (Department of Defense)
- U.S. Air Force (Department of Defense)
- U.S. Coast Guard (Department of Homeland Security)

Because the U.S. does not have a single national noise policy, there are three actions that could be taken to make the current policies more effective:

- create new legislation to consolidate and supersede existing policies,
- reestablish the Office of Noise Abatement and Control within the U.S. Environmental Protection Agency and give it coordinating authority, and/or
- encourage interagency cooperation.

At the First Annual Workshop on U.S. Noise Policy Developments held in Baltimore, MD, U.S.A. on 2004 July 14, several possibilities were discussed that could influence America's noise policies in the future:

- the Federal Aviation Administration has established a Center of Excellence involving seven universities to study five aircraft noise problems in detail,
- supersonic flight over land by business jets will require a major change in current policies,

- the Import/Export Bank of the U.S. as well as the World Bank are prescribing noise limits on projects they are funding,
- the New Alliances Program of the Occupational Safety and Health Administration brings industry, government, labor and academia together to solve workplace noise problems,
- progress is being made in the voluntary noise labeling of products by manufacturers and industries,

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- quieter tires on passenger vehicles may generate levels as much as 5 dB below noisy tires; pilot projects on quiet pavements are underway in several states, and
- improvements are being made in the wording and implementation of State and local noise regulations.

General Aspects of a Global Noise Policy

The final panelist in the Tuesday morning session of the workshop was Bill Lang

who presented the general considerations that are involved in the preparation of a global noise policy. He reviewed the contents of *Part 1: General* of the report entitled: "A Global Approach to Noise Control Policies," being prepared by I-INCE Technical Study Group 5. This report is intended to inform the appropriate international and national authorities on the necessary constituents of a global noise policy document. Part 1 begins with definitions of general terms related to the development of noise control policies. It continues with a classification of the three areas requiring global policies: occupational noise, environmental noise, and consumer product noise. Brief consideration is given to the effects of noise on people. General descriptions are included of the authorities responsible for issuing noise policies, for the development

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of building blocks supporting such policies, and for declarations of the intent of these policies. Part 1 concludes with a detailed description of the elements of global noise policies that are intended to control noise by means of specifications on the emissions of noise sources and by setting noise limits at receiver locations (immission specifications). A draft of the TSG 5 report was in the final stage of preparation undergoing review by the members of TSG 5 prior to submission to the I-INCE Board of Directors for a decision by the Board to send the draft forward to the General Assembly for publication approval.

Discussion

A lively discussion followed the presentations by the panel members. This was an open meeting of Technical Study Group 5 and the final opportunity for members of TSG 5 to make comments on the draft of the TSG 5 report. Here are brief summaries of a part of the discussion in the question (Q) and answer (A) format with the answers as given by the co-chairmen.

Q. In the TSG 5 draft, where is an integrated approach presented, including land-use planning? I didn't see it. Where are the elements of risk assessment? I see a difference between what you are defining as noise control and my understanding of noise management as defined in the WHO guidelines for community noise.

A. *Part 1 covers the general items that are needed in a noise policy statement or document, in particular, the common language between the three kinds of noise – community noise, occupational noise and consumer product noise. Community noise will be covered in the last session of this workshop that deals with Part 3 of the TSG 5 draft.*

Q. The words *emission* and *immission* are used in the TSG 5 draft. In the railway world we have found that those words are confused and we have developed and use "noise creation" and "noise reception." Wouldn't it be a good idea

to include those words as well?

A. *Emission and immission have been used in the continental European languages for many years, and in the last decade or so have been adopted in English. They now appear to be firmly embedded in the technical language of acoustics and noise.*

Q. In your summary of the effects of noise from the TSG 5 draft, you equated environmental noise with consumer product noise. I think they should be separated. In the case of consumer product noise, there are issues of product sound quality that Dr. Lyon discussed in his plenary lecture. There are also signals, and this may also be true for environmental noise. For consumer products, signals about the correct function or even malfunction of a product are often present. Moreover, consumer product noise is something that, hopefully, can be labeled in the future. I think that you should separate those three items.

A. *Agreed.*

Q. In the TSG 5 draft, you have three bullets under environmental noise, why not put three bullets under consumer product noise as well?

A. *Agreed.*

Q. You need to put more bullets under occupational noise and hearing loss. Certainly, communication problems within a workplace. Interference with communication. You have three points for environmental noise. Shouldn't you have more for the others, too?

A. *Agreed.*

Q. With occupational noise you face possible hearing loss. Under environmental noise, shouldn't it also be possible annoyance?

A. *Agreed.*

Q. When you are dealing with the public and with the source path receiver model, the one thing that is missing

is a feedback path from the receiver to the source. This is not a technical feedback path, but in a general way the receiver must have some influence over the source and that can only be accomplished by adding a feedback path.

A. *Agreed.*

Q. We're talking about wording, which is very important. When talking about noise generation, noise is not generated, but sound is generated and sound is propagated. It doesn't become noise until it is perceived at the ear of the receiver as unwanted sound.

A. *You are, of course, correct and we will endeavor to be more precise in the TSG 5 draft.*

Q. Occupational noise not only involves hearing loss, but it may also cause accidents due to the fact that workers do not hear warning signals due to the noisy work environment. It is a fact that in China, fifty percent of all accidents are due to this situation. If you look at this as a global issue, one should consider this safety issue in the different countries.

A. *Agreed.*

Occupational Noise Policy

Workshop Co-chairman Bill Lang opened the second session of the Workshop on Tuesday afternoon. The afternoon session was devoted to the topics covered in the second part of the final report being prepared by I-INCE Technical Study Group 5 on "Noise as a Global Policy Issue," namely, occupational noise policy.

European Occupational Noise Control Directives

The first panelist to speak in the Tuesday afternoon session of the workshop was Gustav Sehrndt from Germany, who presented a paper co-authored with Patrick Kurtz on *The implementation of the European occupational noise control directives*.

European noise control policy regarding occupational health and safety is largely based on two Directives that govern the noise exposure at workplaces and product safety, including the noise emissions of machines used at workplaces. The minimum requirements to protect workers against risk to their hearing and to their health and safety are stated in Council Directive 86/188/EEC which will shortly be replaced by a new Physical Agents Noise Directive 2003/10/EC. The new directive lowers the existing action values from an A-weighted sound level of 85-90dB to 80-85dB, and introduces for the first time an exposure limit of 87dB that takes into consideration the presence of hearing protectors. Action values and a limiting value for C-weighted peak sound pressure levels are also given. The action values lead to concrete actions such as the requirement to inform the workers about potential risks, the provision and wearing of hearing protectors, the checking of workers' hearing and the drawing up of a noise abatement program including a requirement to provide adequate information for choosing quiet machines.

To comply with the latter requirement, the Machinery Directive 98/37/EEC, dealing with general machinery safety requirements, states that machines shall be designed so as to reach the lowest noise source levels, and that a noise emission declaration must be given in the instruction manual and in the technical documentation for the machine. The presentation described the new requirements in detail and the consequences for European standardization and the implementation into European national regulations.

Occupational Noise in the U.S.A.

The second panelist to speak was Eric Wood from the U.S.A. who presented a

paper on occupational noise in the U.S.A. that was co-authored with R.D. Bruce and A.S. Bommer.

Industrial workers around the world continue to be exposed to hazardous levels of occupational noise. This is true in the USA, where manufacturers continue to manufacture products that produce A-weighted sound levels of more than 85 dB at 1 meter and where employees' primary

*...employees' primary
defense against hearing*

*loss is a hearing
conservation program,*

*the effectiveness of
which is unknown until*

*they get noise-induced
hearing loss.*

conservation program, the effectiveness of which is unknown until they get noise-induced hearing loss.

With the exception of the Department of Defense, which uses an A-weighted L_{eq} of 85 for an 8-hour exposure limit (3-dB exchange rate), all of the other regulations covering worker noise exposures in the USA use a 5-dB exchange rate and an A-frequency-weighted, time-weighted average (TWA) of 90 dB as an allowable 8-hour exposure. The multitude of regulations leads to some confusion.

In 1983, the Occupational Safety and Health Administration (OSHA) developed an enforcement guideline by which the engineering-control requirements would not be enforced unless the noise exposures (A-weighted) exceeded 100 dB. Essentially, this communiqué told employers that they would be able to violate the intent of the regulation without penalty as long as they provided hearing protection. This policy is still in effect. The impact of this decision is that workers have now been exposed to A-weighted sound levels up to 100 dB for over 20 years. Their primary protection from noise-induced hearing loss has been the companies' hearing conservation programs, which often lack adequate provisions for audiometric testing, availability of hearing protection devices, education of

workers, and record keeping. In addition, the noise control technology that has been implemented by manufacturers in other countries has not found its way into USA-made products as frequently as it would have if engineering controls were required at A-weighted levels of 90 dB instead of 100 dB.

The USA is making some progress in saving the hearing of American workers. The confusion about differences between the various regulations and who is and isn't covered is a minor problem. Improving the reliability of the rating of hearing protection devices will be a significant contribution to improving the hearing of workers, since it will demonstrate that there is very little margin of safety available to the average worker exposed to hazardous levels of noise. The new recordable-losses definition will highlight the fact that many workers are incurring noise-induced hearing loss, but some additional metric is needed for early detection and prevention.

However, as long as hearing-protection devices are the only noise-control treatment used, there will continue to be individuals who will experience noise-induced hearing loss as a result of their employment—an unnecessary loss to our society. The compliance program decision that OSHA will not enforce the engineering controls section of the noise standard should be rescinded in order to help workers keep their hearing.

At some point in the future, hopefully sooner than later, the USA will:

- adopt an A-weighted L_{eq} of 85 dB sound level limit for an 8-hour exposure,

- require engineering controls to reduce A-weighted sound levels to 90 dB, and
- require hearing protection for exposures to A-weighted levels over 80 dB.

Upper Limits on Noise in the Workplace

The third speaker in the Tuesday afternoon session of the Workshop was Gilles Daigle from Canada. He and co-author Tony Embleton prepared a summary of an International INCE report of an I-INCE Working Party that Tony Embleton served as chairman. The report was originally published as I-INCE Publication 97-1,

“Final Report – Technical Assessment of upper limits on noise in the workplace,” *Noise/News International* 5, 203-216 (1997).

In the 1990s it became widely recognized that the economic and social costs of high levels of noise in the workplace required significant action to reduce the exposure of workers to noise. Such costs include not only the financial compensation or damages that must be paid and the reduced enjoyment of everyday life for those with a hearing loss, but also less quantifiable factors such as reduced productivity, increased stress, disturbed speech communication, and risk of accidents for a large number of workers. In 1997, International INCE published

a report that briefly reviews the extensive scientific and epidemiological evidence relating to noise, including impulsive noise, and risk of hearing damage, and discusses the factors that are relevant to legislation. The basic features of existing legislation from many jurisdictions are tabulated. The setting of specific limits on exposure to noise is a political decision, with results

that vary between jurisdictions depending on economic and sociological factors. It is, however, also important that regulations be harmonized internationally. The report, therefore, makes specific recommendations for legislation in the following areas:

- daily exposure levels normalized to 8 hours,
- limitations of peak sound pressure levels for short-durations (impulsive) noises,
- acceptable sound pressure levels changes for longer or shorter daily exposure periods,
- sound absorption in working areas,
- the inclusion of sound output requirements in purchase specification for new machinery,
- the use of personal hearing protection, and
- audiometric testing.

Specific recommendations from the report are the following:

1. It is desirable for jurisdictions without regulations, or with currently higher limits, to set a limit on the level of exposure over a workshift, A-weighted and normalized to 8 hours of 85 dB as soon as may be possible given the particular economic and sociological factors that are pertinent;
2. This exposure level should include the contributions from all sounds that are present including short-term, high-intensity sounds. If such sounds are further limited in regulations to a maximum sound pressure level, the regulations should set a limit of 140 dB for C-Weighted peak sound pressure level;
3. An exchange rate of 3 dB per doubling or halving of exposure time should be used. This exchange rate is implicit when the exposure level is stated in terms of 8-hour-average sound pressure level;
4. Efforts should be made to reduce levels of noise in the workplace to the lowest economically and technologically reasonable values, even when there may be no risk of long-term damage

... as long as hearing-protection devices are the only noise-control treatment used, there will continue to be individuals who will experience noise-induced hearing loss as a result of their employment—an unnecessary loss to our society.

- to hearing. Such action can reduce other negative effects of noise such as reduced productivity, stress and disturbed speech communication;
5. At the design stage of any new installation, consideration should be given to sound and vibration isolation between noisier and quieter areas of activity. Rooms normally occupied by people should have a significant amount of acoustical absorption in order to reduce the spatial distributions of sound;
 6. The purchase specifications for all new and replacement machinery should contain clauses specifying the maximum emission sound power level and emission sound pressure level at the operator's position when the machinery is operating;
 7. A long-term noise control program should be established and implemented at each workplace where the level of the daily exposure, normalized to 8 hours, exceeds 85 dB. This program should be reassessed periodically in order to exploit advances in noise-control technology;
 8. The use of personal hearing protection, either earplugs or other hearing protection devices, should be encouraged when engineering and other noise control measures are unable to reduce the daily, normalized-to-8-hours, A-weighted exposure level of workers to 85 dB. The use of hearing protection devices should be mandatory when the exposure level is over 90 dB; and
 9. All employers should conduct audiometric testing of workers exposed to more than 85 dB at least every three years, or at shorter intervals depending on current exposure levels and past history of the individual worker. Records of the results of the audiometric test should be preserved in the employee's permanent file.

Toward a Global Policy for Occupational Noise

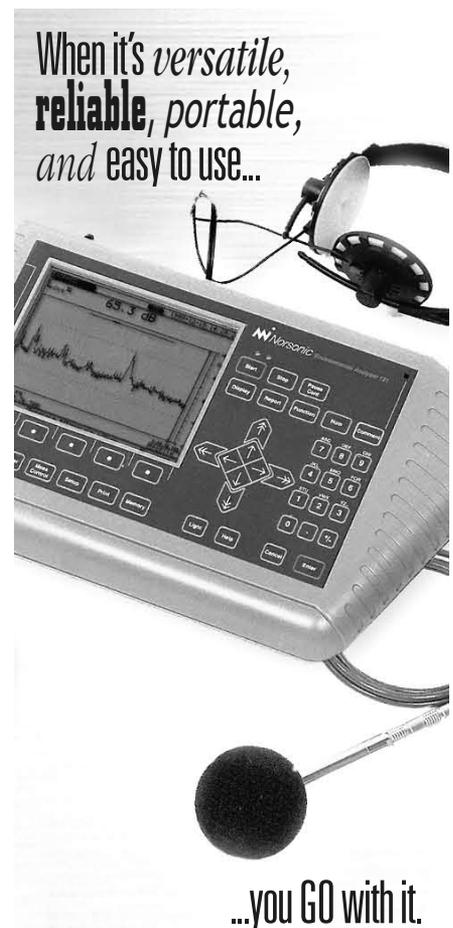
The final panelist in the Tuesday afternoon session of the workshop was Bill Lang whose presentation was based on Part 2:

Occupational Noise of the report entitled: "A Global Approach to Noise Control Policies," being prepared by I-INCE Technical Study Group 5 for consideration by appropriate international and national authorities.

The sections of Part 2 follow the outline presented in Part 1, and are focused on the control of hazardous noise at a place of work. A key objective of Part 2 is to promote international uniformity of requirements that limit occupational noise. Part 2 includes a number of specific recommendations for a worldwide policy on occupational noise.

Summary of I-INCE recommendations:

- The most important element for a worldwide policy on occupational noise is the harmonization of quantities for the description of noise immissions and noise emissions, and their use in prescribing uniform limits that are accepted internationally. This can be achieved by international agreements negotiated by the United Nations (UN) or one of its agencies.
- Engineering control of noise should be the primary consideration, and the single most important element, in any international or national program for protection of hearing in occupational situations.
- Within a jurisdiction, the same upper limits on exposure to noise in the working environment as well as hearing conservation measures should be applied to all industries, all workers, and all employers. The jurisdiction should coincide with the geographical boundaries of a country.
- A statement of international or national noise policy should include a prefatory clause, such as: *"The policy of the 'issuing authority' is to reduce the risk and magnitude of permanent hearing damage to a minimum for those individuals habitually exposed to high levels of noise in their working environments."*



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- This I-INCE report recommends, in consonance with the earlier I-INCE report, the following for international or national noise policies:
 - The 8-hour limit for the A-weighted exposure to noise in a workplace should be 1 Pa²h and hence the corresponding limit for the 8-hour-average, A-weighted sound level should be 85 dB; the recommended limit on peak C-weighted sound-pressure level should be 135 dB for impulsive sounds that occur within a work period of any duration, and
 - Engineering noise control measures should be applied to all relevant sources of noise to ensure there is no exceedance of the limit of 1 Pa²h for an 8-hour-exposure to noise and no exceedance of the limit of 135 dB for peak C-weighted sound pressure level.
 - An exchange rate of 3 decibels should be used to evaluate exposure to noise.
 - Limits on exposure to noise in a working environment should *not* be linked to the use or non-use of hearing protection devices.
 - For some widely-used mobile equipment, the introduction of legal emission limits should be in terms of A-weighted sound-power levels.
 - Also for work locations inside the cabins of trucks, tower cranes, ground moving machinery, etc., legal noise “emission” limits in terms of the A-weighted sound pressure level at the operator’s position should be implemented.
 - When the recommended I-INCE limits of 85 dB/135 dB cannot be achieved by engineering means, the use of hearing protective devices as part of an effective hearing conservation program should be implemented as a secondary measure.

Discussion

An interesting discussion followed the presentations by the panel members. This was an open meeting of Technical Study

Group 5, and the final opportunity for members of TSG 5 to make comments on the draft of the TSG 5 report. Here are brief summaries of a part of the discussion in the question (Q) and answer (A) format with the answers as given by the co-chairmen.

Q. You should be aware of the activities of the International Labor Office (ILO). This is a very important organization that is part of the UN. In 1977, the ILO issued a so-called “Code of Practice” with the title *Protection of Workers Against Noise and Vibration in the Working Environment*. In this paper, there are not only limit values, but also values for certain activities in the working environment. This documentation is very important because it is transmitted by the UN to all UN member states, and then it becomes the foundation for legislation in the different countries.

A. *Your points are well taken and will be included in the TSG 5 report.*

Q. The draft of the TSG 5 report has a number of very strong recommendations. Can you make it somewhat clearer in the conclusions which recommendations are for the global level and which are for the national level?

A. *We are aiming at the national level for most of the recommendations. On the international level, industrial machines are basically the same worldwide, so we hope to encourage the selection and purchase of the quietest ones.*

Q. Regarding the *immission* side, I think it is important that the same descriptors be used all over the world, but it may not be necessary to recommend the same limits. Are you recommending the same limits worldwide? To propose harmonized legislation all over the world with the same limits will be very difficult to achieve.

A. *People are people all over the world, and we don’t want to encourage a*

situation similar to that in the U.S. today where there are different limits depending upon whether the worker is in a mine, a steel mill, or the military. At the very least, we want to work for the same limit throughout a jurisdiction (i.e., a country). Look at the limit issue from an objective viewpoint. The technology for solving the occupational noise problem in the world is far advanced over the technology to solve the environmental noise problem. Because adaptation by the individual is absent in the former case, and plays a major role in the latter case, there is no worldwide consensus on environmental noise limit values. For occupational noise, there is consensus on the limit values, and the technology is available, in most cases, to implement them.

Q. I think you also have to consider conditions in a country. If an enterprise purchased a printing press 20 years ago, it may still have a life of 30 years. On the other hand, an enterprise that is designing and building a completely new factory may have an easy time meeting the lower limit values. Shouldn’t these situations be taken into account?

A. *Yes, some form of “grandfathering” is obviously needed.*

Q. We all know that 80 dB and 85 dB limits are based on jobs with exposures of 8 hours a day. Could we have some kind of opening to say that sometimes we should be allowed to have higher limit values, for example, for musicians in a classical orchestra?

Q. There are job categories where an individual will work in a noisy environment one day, maybe two days a week. Perhaps he will do noisy work on Thursdays and Fridays, but not on Monday, Tuesday, and Wednesday. It’s tricky and many employers worry about this kind of situation. The question is should the same limits apply if it’s only one day or two days a week?

A. Both are good questions. In completing the TSG 5 report, we should give them careful consideration.

Q. You said that hearing protectors are path control devices. I believe you were talking about the section of the TSG 5 report dealing with engineering controls on the transmission path. I certainly don't want to see hearing protectors mentioned as part of engineering noise control.

A. There is an argument as to whether hearing protectors are part of the receiver.

Q. I think this document should make it clear that hearing protectors are not to be regarded as an engineering control and therefore shouldn't be mentioned in this section at all.

A. The TSG 5 report emphasizes that hearing protective devices are only to be used when engineering controls are insufficient to meet the upper limit values.

Q. I'm from Denmark, and I have to emphasize that we have more than one value that we must observe. There's a limit value of 87 dB that must never be exceeded, meaning that if exceeded the work must be stopped immediately or hearing protection placed on the worker. And then there is the upper action value (85 dB in Denmark for some years) which, if exceeded, requires the enterprise to undertake a program to reduce the noise to below the upper action value.

A. You made a distinction between the limit value and the upper action value. There's another question on the same point.

Q. I have been studying in the Far East so I have been out of the picture for some time, and was surprised to learn about this directive. Why was this legislation introduced? Why is it a good thing to include hearing protection in the limit value?

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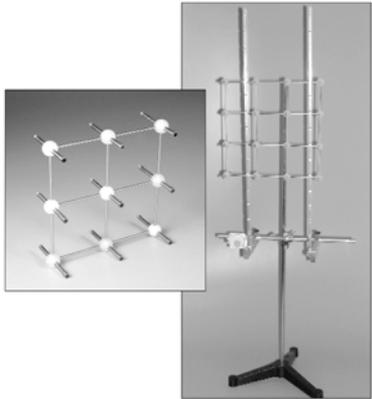
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A. The TSG 5 report states: "Limits on exposure to noise in the workplace should not be linked to the use or non-use of hearing protective devices."

Q. My opinion is that there should be included more than noise-induced hearing loss in some cases. A problem discussed in Europe is whether the limit value for pregnant women should be

lower than that for other workers.

A. No information has been furnished by TSG 5 members on this question.

Q. As far as the peak level is concerned, don't you have to define the rise time of the meter circuitry? Shouldn't it be between 30 and 50 microseconds? And what about the number of impulses per second?

A. When peak C-weighting is measured using an instrument that complies with the new IEC sound level meter standard (IEC 61672 -1: 2002), the hold circuitry gives the highest peak sound pressure level detected whether it is a single impulse or a string of impulses. You don't have to consider the rise time with the new IEC international standard.

Consumer Product Noise Policy

Workshop Co-Chairman Tjeert ten Wolde opened the third session of the Workshop on Wednesday morning. The morning session was devoted to the topics covered in the fourth part of the final report being prepared by I-INCE Technical Study Group 5 on "Noise as a Global Policy Issue," namely, consumer product noise policy.

Noise in the Interior of Aircraft

The first panelist to speak in the Wednesday morning session of the workshop was Alan Marsh from the U.S.A. who presented a paper on *ISO 5129 - the international standard for the measurement of noise inside aircraft*.

The level of the noise in the interior of passenger-carrying civil aircraft has been a concern to passengers, flight crew, cabin crew, aircraft manufacturers, and aircraft operators since the 1930s. For manufacturers to provide fair and meaningful guarantees that the level of sound will not exceed a specified limit requires agreement on flight-test conditions, measurement locations, test procedures, and the acoustical quantity to be determined.

As the passenger-carrying capacity of aircraft increases and as the competition for market share intensifies, the need increases for a uniform standard procedure to measure the level of the sound in the interior of aircraft. ISO 5129:2001, *Acoustics — Measurement of sound pressure levels in the interior of aircraft*

during flight was published by ISO on 2001 October 01. This standard specifies requirements for instruments and test procedures for the measurement and reporting of sound pressure levels at crew and passenger locations in the interior of aircraft under steady flight conditions. The types of aircraft within the scope of the standard include helicopters, single-engine or multiple-engine propeller-driven airplanes, turboprop-powered airplanes, and jet-powered airplanes. The principal objective of the standard is to obtain measurements of one-third octave band sound pressure levels at standardized positions and under flight conditions that should yield reproducible results. Various acoustical quantities, such as A-weighted sound level, speech interference level, or wideband sound pressure level, may then be calculated from the one-third-octave-band sound pressure levels.

Noise Labels

The second speaker on the Wednesday morning panel was Bernard Berry from the U.K. His subject was *I-INCE Technical Study Group 2, noise labels for consumer and industrial products*.

In 1999, a new I-INCE Technical Study Group TSG 2 was formed on "Noise labels for consumer and industrial products." This was intended to survey current methods for labeling and otherwise characterizing the noise emissions of consumer and industrial products. Note that labeling can mean more than just a physical label – it might be details in a Technical Manual. The measurement methods used by testing authorities were to be included in the survey. The methodologies were to be compared, and an assessment made of their relative effectiveness. The study of noise labeling is part of an educational program to advise on how, and in what form such labeling should be implemented. There has been active participation in the TSG from UK, USA, Japan, Norway, Turkey, Belgium and Brazil, with email exchange of information and 3 meetings,

at INTER-NOISE 2000 in Nice, 2001 in Den Haag, and 2002 in Dearborn, USA. The survey questionnaire has been sent to all the 46 Member Societies of I-INCE. Work is in progress to extend the survey to direct personal contacts of members of the TSG. We are also attempting to involve consumer organizations in as many countries as possible. The following were briefly explained: the overall role of I-INCE, the context of the TSG, a description of the survey, a summary of the results, and an outline of future plans.

Requirements for Information Technology Equipment

The third of the panelists to speak in the Wednesday morning session was Robert Hellweg from the U.S.A. The co-authors of his presentation were Terrance Baird and Egons Dunens. He spoke on the *International acoustical requirements for information technology equipment: a case for achieving greater harmonization*.

International standards for the uniform measurement and declaration of information technology equipment (ITE) noise emissions have existed for many years—e.g., ISO 7779, ISO 9296, ECMA-74, and ECMA-109. Many governments have adopted them. These standards resulted from worldwide cooperation of many individuals and companies over several years, and continue to evolve with new measurement technologies and the addition of new ITE categories. National and international acoustical criteria and limits have developed as part of eco-label certification programs (e.g., Germany: Blue Angel) or national procurement technical standards (such as, Sweden: Statskontoret Technical Standard TN 26:5). These criteria have contributed to the improvement of ITE acoustical performance. And to some extent, they reflect the underlying industry standards and technical inputs provided by industry experts during their development. However, the proliferation and independent development of these different noise

emission criteria have resulted in variations between the requirements and deviations from the international testing standards. This tends to reduce their value to users or consumers of ITE, and greatly increases the effort and costs incurred by manufacturers in attempting to meet numerous unique requirements.

Much progress has been made in the development of acoustic measurement methods for ITE since the 1970s. The infrastructure is currently in place to continue that work in the standards community. The last decade has brought an ever-increasing number of performance criteria calling out reporting requirements and in some cases acceptable upper limits for acoustic emissions. These criteria and manufacturers' interests in producing products that are acceptable have resulted in improving acoustic performance over the years. As ITE users have become more aware of acoustics as an important product attribute, this improvement in performance has certainly been a positive outcome.

However, due to some variations and unique requirements between sound level criteria and measurement procedures, manufacturers have incurred significant additional design and test process requirements that have resulted in higher costs to the user and not necessarily improved benefits. It is believed and proposed that the future development of acoustic criteria and the attainment of the goals therein, and concurrently achieving optimization of test process requirements to satisfy the criteria, will best be met by an increased level of participation and collaboration of the technical committees with the criteria-creating agencies.

Ultimately, this deliberate cooperation will provide the greatest benefit to the end user, whom we are all trying to satisfy through acceptable product acoustics.

Sound Quality Testing and Labeling of Appliances

The fourth panelist in the Consumer Products session was Sophie Maluski from the U.K. whose presentation was co-authored with Claire Churchill and Trevor Cox. She spoke on *Sound quality testing*

and labeling of domestic appliances in the U.K.

The last decade has brought an ever-increasing number of performance criteria calling out reporting requirements and in some cases acceptable upper limits for acoustic emissions.

Interviews highlighted that labeling is often misunderstood by customers, starting from a lack of understanding of the decibel scale used on some current labels. This has led the research to find out more about labeling across Europe and further afield, and to discuss future possibilities for practical sound labeling of domestic products useable by manufacturers and customers.

Labeling is considered a powerful tool and gives an identification of the product.

However, sound labeling is not mandatory except for the European noise directives for outdoor products. U.K. manufacturers have not considered Ecolabel schemes because they are expensive to set up and run, and they take time to make their mark. The other problem is the understanding of the sound labeling and how much information the sound labeling provides. The sound power level is often the criteria required by the sound labeling, but manufacturers can be confused between sound pressure level and sound power level. Manufacturers and consumers often do not understand the dB scale.

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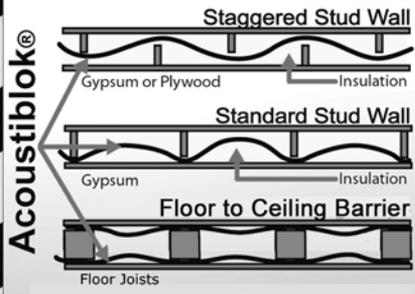
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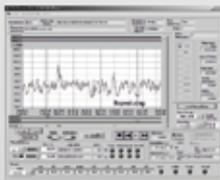
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the consumer to access. In retail shops, the sound labeling can be found by the consumers by looking at the Energy EU label. There are other products such as vacuum cleaners, which give information on noise level, but this information is only accessible to the consumer after purchase because the noise level is mentioned only in internal documents. Customers often show dissatisfaction with the noise level of vacuum cleaners as being too noisy. The label does not help the consumer to select a quiet vacuum cleaner.

The noise directive limits apply to products as manufactured. Once the equipment is purchased, the product noise level can change if the silencing equipment is dirty, displaced accidentally, or removed. The same applies to sound labels for white goods. Furthermore, the sound level is likely to change when the product is installed, for example when a washing machine is placed on a suspended wood floor. The present sound labeling does not inform the consumer of the nature of the sound. Two machines could display the same noise label, but sound differently. One sound could be perceived louder than the other because of its low frequency spectrum. Such difference is caused by the use of A-weighting filters. The noise level could comply with the sound labeling but the nature of the sound could be very unpleasant. For example, a frost-free freezer can be tonal which can be very unpleasant to hear, as in the case of vacuum cleaners. These different situations show that sound quality becomes more important than noise level, as confirmed by the manufacturers interviewed during the survey. The noise label in dB therefore is not of great help in terms of improving the products, but only brings products to a similar noise level as the competitor's products. To overcome this problem the sound label has to give both the sound power level and sound quality of the product. That would mean dB for sound power level and sones/phon for loudness, but these are units that require

a knowledge of acoustics. Instead, a scale like the efficiency on the EU energy label showing the sound power level and the sound quality could help the consumer to understand better the noise performance of the product without the problem of understanding the unit.

Toward a Global Policy for Consumer Product Noise

The final panelist in the Wednesday morning session of the workshop was Tjeert ten Wolde whose presentation was based on Part 4: Consumer Product Noise of the report entitled, *A Global Approach to Noise Control Policies*. This is now being prepared by I-INCE Technical Study Group 5 for consideration by appropriate international and national authorities. His presentation was entitled *On the possibilities for a global policy on consumer product noise*.

I-INCE Technical Study Group 5 has prepared a draft report on the global aspects of noise control policies. The report has four parts. In this paper, the contents of Part 4 on consumer product noise are presented. It is concluded that market forces play a major role in this area. These forces can be made more effective by better standardization and, for widely used equipment, by noise labelling. Noise emission requirements are only necessary for a few types of equipment.

Consumer product noise is unwanted sound emitted by products over which the affected person or persons has/have complete or partial control. Examples are dishwashers, vacuum cleaners, lawnmowers, air conditioning units, and means of private transport. Public transport is also included because the user usually has the freedom to select another means of transport.

The key question is: Are market forces sufficient for control? Because the user is the primary person who suffers from the noise, it should be expected that market

forces will govern the problem, i.e., that consumers will ask for quieter products and that manufacturers will develop and market such products. If that is the case, the role of governments, nationally and globally, can be limited.

For household equipment, for powered garden equipment, and for powered tools, market forces are definitely present. A significant fraction of the users looks for relatively quiet equipment and manufacturers make such equipment available. Low noise is a quality item for these products. For some products and in some countries the market mechanism more or less fails. Examples are lawnmowers (worldwide) and air conditioners (USA). This is probably due to a defensive posture of the related industry and a passive role of the consumer organizations. In those cases, a more proactive role of the authorities to generate the market forces, for example, by legislation on labeling, could be effective. It would be logical, however, for consumer organizations to take the initiative.

For the noise inside vehicles intended for private use, the market situation is similar to that for household appliances. The market mechanism works reasonably well. Usually, the more expensive types are quieter than the cheaper ones. But also the noise in many inexpensive vehicles is acceptably low these days, which is also a result of market forces.

For public transport vehicles the situation is somewhat different. Transport companies buy the vehicles, and these companies may or may not specify maximum allowable noise levels in the

passenger compartments. When they do, the transport company may offer more comfort for its passengers, which is an important competitive aspect. It is common practice that transport companies in rich countries specify immission limits for the passenger compartments, while that is forgotten or skipped by their colleagues in poorer countries. All together, one could say that the market mechanism works reasonably well in this area, although in

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most cases the citizens of poor countries are more exposed to noise inside public transport vehicles noise than are citizens of rich countries. It can be concluded that market forces are reasonably effective in controlling the problem of consumer product noise.

Discussion

An interesting discussion followed the presentations by the panel members. This was an open meeting of Technical Study Group 5 and the final opportunity for members of TSG 5 to make comments on the draft of the TSG 5 report. Here are brief summaries of a part of the discussion in the question (Q) and answer (A) format with the answers as given by the co-chairmen.

Q. We need to be clear on the scope of TSG 5 and what we mean by consumer product noise. In this category, do we include non-domestic equipment, such as fans in hotel bathrooms and ventilation systems in schools? Are these consumer products? Do we include industrial products for which an operator is present? A lawnmower is both a consumer product and an industrial product, as are several machines in the EU Outdoor Equipment Directive. Consumers, private individuals, operate some of them; others are operated by professional

workers. What is a consumer product, and what is an industrial product? Are industrial products included in our scope?

A. *The answer is mixed. Those products, such as powered lawnmowers and vacuum cleaners that are operated by both consumers and professional workers, have different models, one for home use by consumers and an industrial model for professional workers. The latter are not consumer products. On the other hand, fans in hotel bathrooms and ventilation systems in schools are consumer products.*

Q. I don't disagree with that, but I want to make a comment on air conditioning equipment and systems. In the USA, noise emissions have become a competitive performance feature, especially for residential air conditioners. In other words, it is market driven.

A. *Agreed.*

Q. I believe in Dr. Lyon's talk yesterday, he identified three different types of noisy products. The first emits sounds you want to hear, for example, a toy doll. That's outside our scope. But the other two types are consumer products, and market forces will work for one of them. The consumer uses one type, but only the consumer hears its noise, such as a personal computer. The other type is a product the consumer uses, but it creates noise that affects other people, such as a power lawnmower. With respect to the noise received by the consumer operator, market forces are at play. But with respect to the neighbor's noise, market forces have no influence. The same thing is true for automobiles. The quality of the interior of the automobile has been market driven because consumers want quiet inside the vehicle. The quality of the vehicle as it passes by has not been market driven. It is a regulatory issue because it's affecting another party. I

think this needs to be considered in the TSG 5 report.

A. *Agreed. In fact it is already covered in the present draft report: the noise emitted to other than the user is called "environmental noise" and is discussed in Part 3 of the report. Market forces are considered to be ineffective for the reduction of noise emitted to the environment.*

Q. Where does the statement come from that market forces are adequate?

A. *Let us first define what we mean by market forces. Let us consider two groups of players: on the one hand the consumers, and on the other hand the manufacturers. If the game between these two is sufficient to lower the noise level of the product to an acceptable value, we say that market forces are effective. The authorities can stay completely outside the game. That's what we mean when we say that consumer product noise is market*

driven and that market forces are effective. For environmental noise (which may be emitted by the same product!), the situation is entirely different. When the government does nothing, very little can be accomplished in the field of noise abatement. So that is the big difference.

Q. I am not in complete agreement. What if the industry tells consumers that the noise level of the product can't be reduced? I have many examples where industry has the know-how to lower the sound power level of their machines, but they don't do it. And they tell the consumer that it can't be done. The consumer doesn't tell industry, "yes, you can," because consumers don't know anything about noise control techniques, and they don't know anything about noise. If the authorities don't tell industry to reduce the sound power level or improve the sound quality, or whatever, industry will never do it.

A. *I believe that you are talking about the environmental noise emitted by products and for that part I agree. And I also agree with you, in a very broad sense, about the noise emitted by lawnmowers, where the manufacturers have played a very defensive game.*

Q. Why have market forces worked for some consumer products, but not for others?

A. *Ten years ago, quiet dishwashers were not available in America. Today domestic dishwashers sold on the U.S. market are much quieter than they were. Why? The word has been passed to the manufacturers that some American consumers care about noise, and noise has become a market factor. For the products for which market forces have not worked, either the local consumers don't care about noise or the manufacturers have resisted the need to design quiet products, or a combination of the two.*

Q. There is very definitely a market force with respect to lower noise levels for the products of our industry. I can only speak from my personal experience with the company I've been with for over twenty years. We've had design goals for our products that are fairly stringent and there have been no external criteria. We learn from our customers what's acceptable, and we're constantly fine-tuning our products so that they are acceptable to our customers. We believe that market force works. And there are other manufacturers in our industry who strive to make lower-noise products, and the competitive market place has us looking at what our competitors are doing.

A. *A very interesting comment.*

Q. We've talked about automobiles. What about interior noise in other kinds of vehicles?

A. *In your own personal vehicle market forces work, and that's linked to*

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the power of advertising. Once the advertising starts, then quiet becomes an expectation. Similar forces work for other vehicles.

Q. What about trams, and trains, and subway cars?

A. *Market forces are also at play. Public transportation vehicles are put out for bid to manufacturers. The public authorities who solicit the bids must take into account the passengers, and they are obligated to insert noise requirements into the invitation to bid. To do otherwise, they would be derelict in their duty, as it will usually be the lowest bidder who gets the contract.*

Q. Should noise labels be made compulsory?

A. *At least for some special kinds of products; for example, toys that make noise should have noise limits. Other products are fireworks, and the ubiquitous Walkman.*

Environmental Noise Policy

Workshop Co-chairman Tjeert ten Wolde opened the fourth session of the Workshop. The session was devoted to the topics covered in the third part of the final report being prepared by I-INCE Technical Study Group 5 on "Noise as a Global Policy Issue," namely, environmental noise policy.

The co-chairman noted that environmental noise is the most extensive of the three noise subjects covered by the I-INCE report. Consequently many persons were invited for a contribution, but at the end only one was able to accept.

The Railway's Contribution to the Reduction of Environmental Noise

The first panelist to speak in the Wednesday afternoon session of the workshop was Peter Hübner from Switzerland, who presented a paper on *The railway's contribution to a sustainable reduction of environmental noise.*

The railways are the most environmentally friendly means of transport when it comes to transporting people and goods quickly and over long distances. However, the railways must concede that their good credentials of eco-friendliness are impaired by the noise disturbance caused by railway traffic. The good environmental performance of the railways constitutes the strategic success factor of the railways for playing a substantial role in a sustainable transport policy. But politically this role is only entrusted to the railways if they improve their environmental performance in relation to the competitors, or if they can at least maintain their lead. In the EU, this competitive situation is further stimulated by the Directive 2002/49/EG, which requires noise maps and action plans for agglomerations, major roads, railroads, and airports.

The technical prerequisites for noise reduction already exist. For passenger stock, the most important measure that has already been taken is the introduction of disk brakes instead of cast iron block brakes, and further action is not urgent. The situation in freight traffic is different. Here, up to now, there was no technical/commercial incentive to replace the braking system that relies on cast-iron brake blocks. In addition, an alternative, which at comparable prices could produce the braking power necessary in freight traffic, was not available. Some time ago UIC, CER, and UIP started the project "Action Programme Noise Reduction Freight Traffic." Its aim is to make sure that new freight cars are equipped with synthetic brake shoes, and that existing stock is refitted with this type of brake shoe if this is feasible at no extra cost. In October 2003, the responsible technical research committee of the UIC could "homologize" two types of so-called

K blocks for international traffic. These fulfill all technical requirements, and their use in new freight cars does not cost more than the traditional cast-iron brake blocks. In principle, these K blocks can also be used to retrofit existing freight cars. However, because of their higher braking power, they require that the whole braking equipment of the freight cars be altered. This of course means higher costs. To solve this problem, development is in progress. Noise reduction of K blocks as compared to the cast-iron blocks is about 10 dB.

The railways developed a system for cost-benefit analysis. Applying this system to the situation in European countries showed clearly that noise reduction at the source is much more effective than noise control over the transmission path and that the retrofitting of freight stock should get priority. The speaker suggested that funds for noise barriers be redirected to the improvement of rolling stock.

On the Possibilities for a Global Policy on Environmental Noise

The second speaker in the Wednesday afternoon session of the Workshop was Tjeert ten Wolde whose presentation

was based on Part 3: "Environmental Noise" of the draft report entitled "A Global Approach to Noise Control Policies," being prepared by I-INCE Technical Study Group 5.

The sections of Part 3 follow the outline presented in Part 1. At the end of Part 3, TSG 5 formulated the following recommendations concerning the political aspects of environmental noise:

- I-INCE is in favor of a worldwide agreement on the abatement of environmental noise, preferably in the form of a UN Convention. The

I-INCE is in favor of a worldwide agreement on the abatement of environmental noise, preferably in the form of a UN Convention.

basis of such an agreement should be a declaration of intent with content as provided in this report.

- As a first step in that direction, closer contacts and agreements between the European Union, Japan, and the United States should be established because a worldwide agreement is very much dependent on the support of these parties. I-INCE could stimulate the development of such contacts.
- There is already worldwide cooperation regarding the control of noise from aviation (ICAO) and there are movements in the same direction for road traffic noise, railway noise, and noise from outdoor machinery. I-INCE welcomes these initiatives but also concludes that these initiatives are almost completely uncoordinated and do not always serve the interest of noise reduction in the environment. Consequently, I-INCE is in favor of a more coherent approach, driven by national governments, cooperating through the UN.

On the technical and legal aspects I-INCE recommends that the following issues become subjects of worldwide action:

- Market-access legislation for noisy machinery and equipment, requiring either emission-noise data in the product documentation, some form of noise labeling, satisfying noise emission limits, or combinations of these.
- Further development of standards on quantities, measurement methods, measuring instruments, computation methods uncertainty, related to noise emission, noise transmission, and noise immission, and the effects of noise on humans. Some of these standards are lacking, and many of the already existing standards are unsatisfactory. The ongoing actions of ISO, IEC and other standardization organizations are not sufficiently powerful and need more international political and economic support.

- Harmonization of quantities, instruments and measurement methods, and/or computation methods for noise emission, properties of noise reducing elements (for example noise barriers), effects of noise on humans, and noise immission.

Discussion

Q. The World Trade Organization (WTO) is trying to remove non-tariff barriers. Presumably legislation to restrict market access on account of noise emission is conflicting.

A. *On the contrary. When all countries have the same harmonized legislation on this issue, there are no trade barriers. For aircraft it is already a fact. The large international companies are very much in favour of such a harmonization. Resistance is coming from the smaller companies.*

Q. The WTO asked for the removal of all non-tariff barriers by the year 2000, but the EU is seeking to include social and environmental concerns.

A. *For breaking down trade barriers you can either get rid of rules or harmonize the rules. It is not realistic to ask for the removal of all present rules related to health, safety and environment. That will certainly not happen. So only the second option is realistic.*

Q. But we need to convince the WTO.

A. *Yes.*

Q. I could give an example that supports what you say. In the United States, our federal government regulates noise for railroads and prevents states from adopting different regulations. So that is what you are talking about in Europe.

A. *Thank you. As I explained in my presentation, the car industry is already working on global harmonization on noise emission rules and such harmonization is already a fact for civil aircraft.*

Q. The report does not recommend a global immission limit for environmental noise. Maybe we should recommend an immission goal?

A. *At the moment it is impossible to have a proper discussion on this issue because we do not have a common quantity (or quantities). It will take a long time before there will be agreement on such a quantity. Politicians often discuss limit values before the quantity is properly defined. I-INCE should not approve that.*

Q. There is a lot of good material in the report, but I have some comments. My first remark concerns the noise indicators. It is very difficult to agree on indicators that govern noise in the right way. The EU has been not completely successful in that respect. Another aspect concerns the noise reduction of sources. In general they should be reduced by 20 to 30 dB to get a reasonable environment. That is perhaps too much, and I think that very much has to be solved with the aid of land-use planning and the construction of the building.

A. *I agree with your last remark but I do not understand your remark on the EU noise indicators.*

Q. It concerns for example the measuring height of 4m above ground. This is irrelevant for certain cases.

A. *You have misunderstood the EU Directive. The 4m is meant for "strategic planning" to make an estimate of the number of annoyed people in a certain area and to send data for comparison to the Commission. For detailed design, however, one should take the most appropriate assessment position (for example in front of the façade of an apartment at 20m height). Furthermore the Directive allows Member States to apply additional noise indicators for detailed design and special situations.*

Q. In many standardization working groups and in committees dealing with noise policy there is often a poor balance between the representation of different interest groups.

A. *Agreed. That is the reason that the subject should be taken up by the UN and organized in such a way that all different parties are well represented.*

Q. The report gives the recommendation to achieve harmonization, but it does not tell how. Would it be a good idea and feasible to give concrete suggestions for which indicators to choose and which measurement methods and computation methods so as to go a step further?

A. *We have on purpose not done that because we can almost certainly not reach agreement on those issues. ISO and WHO are presently unable to do so, and it is very unlikely that I-INCE can do a better job. The process of reaching agreement works much better when there is first a political commitment that, within a certain time frame, agreement on these issues must be reached. Working groups can be assigned the task to prepare proposals.*

Q. Speaking from my experience in the railways, I think that global limits can be set for *emission*, but not for *immission*.

A. *Agreed.*

Q. I think that at the very end we have to balance what money we spend for noise control and what money we spend for air pollution.

A. *Maybe. It is certainly a subject for further consideration.*

Q. As far as I understand you, you are suggesting a top-down approach which has been done at the European level. So do you suggest that we could do worldwide what we have done in Europe?

A. *Of course the proposals in the report have been very much influenced by what we have witnessed within the European Union. In the 15 (now 25) Member States, it was the same chaotic situation as it still is globally. The European policy is now harmonizing a lot of the elements which play a role. The global process should be similar.*

Q. I disagree to some extent with your statements on global emission regulations because there

are countries that have no legislation for new vehicles coming into their markets and do not require the vehicle to have met its emission requirements in the country of origin.

A. *That is true, but the model works nevertheless because most manufacturers of cars and aircraft sell the same products in countries with and without regulations. Another aspect of a worldwide agreement should be that "certificates" approved by one country should be accepted worldwide.*

Q. But what about all those underdeveloped countries?

A. *Initially a limited number of developed nations will sign the agreement. As I have said above, this will also have a significant effect on the products being sold in other countries. Furthermore, gradually, more nations will sign.*

Q. When a country does not accept the rules and exports products, that is a problem.

A. *Not for the nations that have signed the agreement, because they will not accept the products.*

Q. Part 3 of the report is very qualitative. It talks about quantities but there are no quantities defined in it.

A. *That is done on purpose. Proposing quantities, particularly the ones related to perception, would be counterproductive because it would immediately generate resistance from certain scientists and nations, whatever the proposal! Proposals should be made by UN committees under the mandate of a UN agreement (as explained in the report and in the paper).*

Q. There is a UN agency for the environment. Shouldn't it be mentioned in the report?

A. *Yes.*

Q. We must also consider the position of underdeveloped countries.

A. *Agreed.*

Q. Many countries only have noise regulations for new situations.

A. *You are referring to immission requirements. For the moment, TSG 5 is not proposing such requirements. Emission requirements have a general effect.*

Q. Things are different in countries with a low population density like Finland.

A. *Yes, particularly regarding immission requirements. But noise control is primarily important for the densely populated areas. Furthermore emission requirements, which form the core of the proposed global policy, are useful for all situations.*

Q. A comment on uncertainties. I think that we could develop principles to reduce uncertainties and to take care of the remaining uncertainties for *emission* as well as for *immission*.

In many standardization working groups and in committees dealing with noise policy there is often a poor balance between the representation of different interest groups.

- A.** *Agreed. For the emission side initial steps have already been taken in the form of stated/guaranteed values. For the immission side that is not really the case, and it will be very difficult to introduce those in immission regulations.*
- Q.** We could at least have it in all standards and regulations on *emission*.
- A.** *Agreed. Large, globally-active manufacturers support the principles. Smaller companies tend to oppose.*
- Q.** You are talking about products. What about installed products where the installation also plays a role?
- A.** *Yes, the installation is also important for the actual noise emission, but it helps to have rules for the bare products.*
- Q.** Additionally, there is the problem of maintenance.
- A.** *Agreed, but I doubt whether we should include that in a global policy.*
- Q.** For cars you are going the wrong way because spectrum and maintenance are also important.
- A.** *The major thing that may make a car noisier is a damaged exhaust silencer. There are nations having legislation on this issue. But I do not think that this should be globally harmonized. The UN could, however, provide recommendations for this issue.*
- Q.** Who is responsible for the noise emission of a product after it is sold, the user or the manufacturer?
- A.** *Primarily the user. The responsibility of the manufacturer depends on his guarantee.*
- Q.** In the EU periodic checks of cars, including the exhaust, provide an important contribution to noise control.
- A.** *Agreed.*

Closing

Workshop Co-chairman Bill Lang commented on what's going to happen next. The modified report will go forward for publication. We don't know what the vehicle of publication will be yet. It may be posted on the web, it may be in *Noise/News International*, or it may be in *Noise Control Engineering Journal*. But the point is that we, as a technical study group, will submit the report suitably edited from the discussions here in Prague, and all the comments we have received since it was circulated to the individual members of TSG 5 on July 10 of this year.

We will ask the Board for permission to publish it as a draft, not as a final report. And that draft will be circulated to the 40+ Member Societies of International INCE for their comments and criticism. During the next INTER-NOISE, at the General Assembly, it will be an item on the agenda to approve the report as an International INCE publication. So we have hopes that, with some final editing, it will become a publication of International INCE. That's the plan. If anybody has any questions on the plan, let me know. And many, many thanks for your participation over these past two days.

More Information

For background information on national and international noise policy, readers may refer to a collection of papers on the CD-ROM produced for NOISE-CON 04. In addition to the papers presented at the conference and the proceedings of all NOISE-CON conferences beginning in 1996, noise policy papers have been collected from a number of sources and included on the CD-ROM. These are:

- A short paper on U.S. noise policy by Maling and Finegold prepared for INTER-NOISE 04.
- The papers in the special issue on national noise policy of *Noise Control Engineering Journal*, **51**(3), 2003 May-June.
- The papers in the special issue on national and international noise policy of *Noise Control Engineering Journal*, **49**(4), 2001 July August.
- The portion of the table of contents of the NOISE-CON 01 Proceedings that deals with noise policy, with further links to the individual papers.
- The paper, "An Overview of U.S. Noise Policy" by Finegold, Finegold, and Maling that was published in *Noise/News International*, **10**(2), 51-63, 2002 June.
- The table of contents for the panel session papers and abstracts presented at INTER-NOISE 2002 with further links to the papers and abstracts. Most of the panel sessions dealt with noise policy issues.
- An explanation of the database of noise policy documents prepared by Finegold and Finegold. The database itself is on the CD-ROM in Microsoft Excel.

Information on the availability of this CD-ROM can be found on the INCE/USA page at the Atlas Bookstore, www.atlasbooks.com/marktplc/00726.htm.

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info@tech5.nl
(also Belgium, Luxembourg)

New Zealand: Machinery Monitoring System Ltd
649623-3147 • 349623-3248
mamos@clear.net.nz

Russia: Oktava+
7095-799-90-92 • 7095-799-90-93
info@octava.ru

Singapore: Spectra Instruments Pte Ltd
65-6747-8857 • 65-6747-5873
spectrainst@pacific.net.sg

South Africa: Environmental Instruments
27-21-910-3403 • 27-21-919-7883
env.inst@iafrica.com

Spain: Vertex Technics S.L.
3493-223-3333 • 3493-223-2220
carlos.suarez@vertex.es

Sweden: PCB Europe
46 8 444 3870 • 46 8 444 3875
pcb@pcb.com
(also Denmark, Norway)

Switzerland: Ing Bureau Dollenmeier
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sales@idbol.ch

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getzner
WERKSTOFFE

Managing Uncertainty in Noise Measurement and Prediction — An International INCE Symposium

Symposium Information

Managing Uncertainty in Noise Measurement and Prediction will be held on 2005 June 27-29 in Le Mans, France, the home of the famous 24-hour automobile race. The Board of Directors of International INCE has designated this event as an International INCE Symposium.

The symposium is being organized by INCE/Europe and The Centre d'Information et de Documentation sur le Bruit (CIDB) in collaboration with the Ecole Nationale Supérieure d'Ingénieurs du Mans (ENSIM). Organizations supporting the symposium include International INCE, the European Acoustics Association (EAA), the Centre Technique des Industries Aerauliques et Thermiques (CETIAT), and the Université du Maine. Sponsors of the symposium include Saint-Gobain Glass and 01 dB.

Symposium Venue

The meeting will take place in Le Mans one of the major French centers for acoustics in the joint buildings of Ecole Nationale Supérieure d'Ingénieurs du Mans (ENSIM), and of the Institut Supérieur des Matériaux du Mans (ISMANS) on the campus of the Université du Maine.

Le Mans has a very attractive medieval city center with its beautiful St Julien Roman cathedral. It is one of the birthplaces of the French automotive industry and it is famous worldwide for its 24 hours sports car race. It is situated 200 km southwest of Paris and directly connected by TGV (High Speed Train) to:

- Paris (55 minutes)
- Roissy-Charles de Gaulle Airport (90 minutes)



Participants will have the opportunity to visit the renowned Automobile Museum and a gala dinner will be organized. A wide range of hotels is available at reasonable prices, as well as some student accommodations.

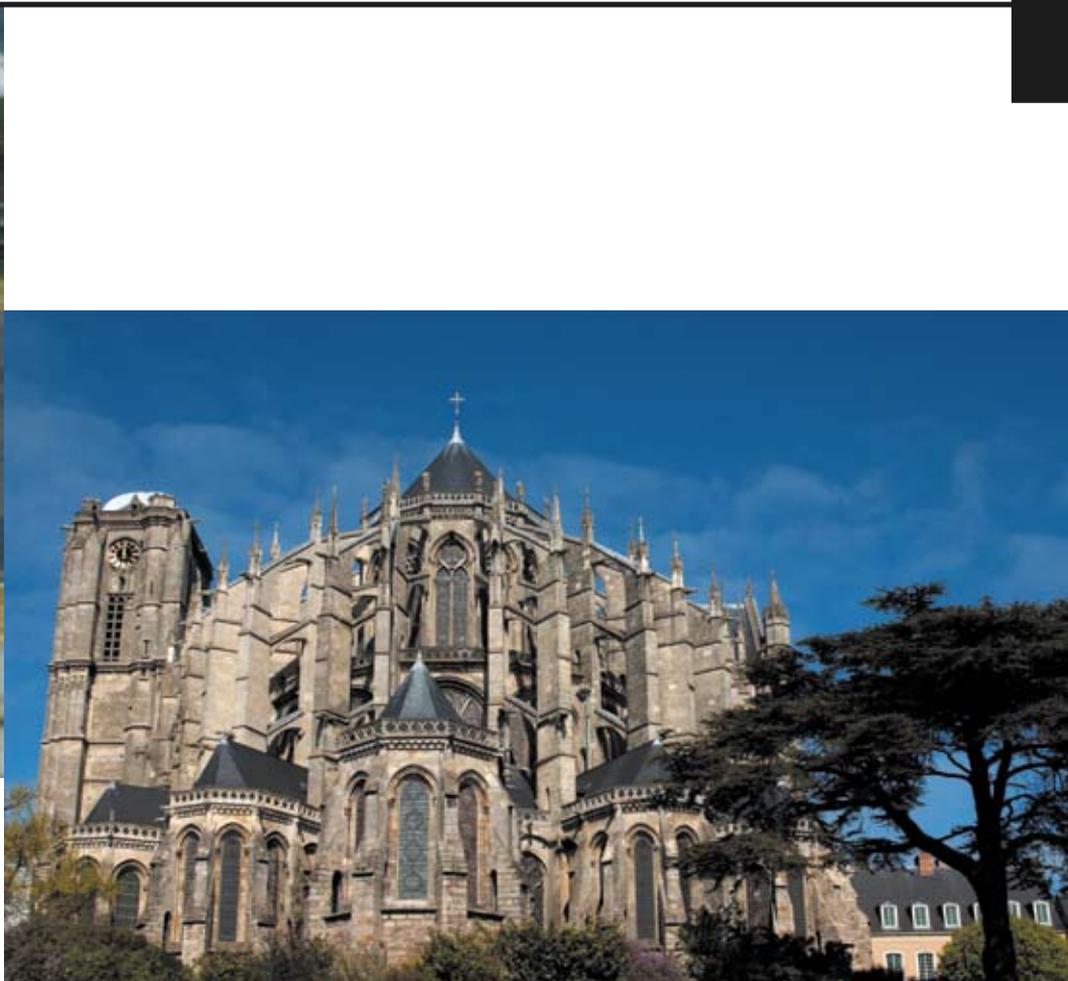
Symposium Objectives

In the domain of applied acoustics and noise and vibration control, most results are provided without confidence intervals. This situation applies to data obtained from all types of measurements as well as to the prediction of results obtained from computation, whether coming from purely numerical models or from combinations of empirical models and experimental data. It is not uncommon to find results quoted in decibels with decimal places without having any indication of the margin of intrinsic error (which sometimes exceeds five decibels!). Uncertainties may arise from many sources: precision of the instrumentation, requirements of

procedures, environmental conditions, variability of noise emission, performance of the laboratory, human factors, validity of a numerical model, meshgrid resolution etc., and could (and should !) be given considerably more attention in many situations.

Confidence in the accuracy of quoted data is becoming more and more sensitive for commercial issues (e.g., when publishing the sound level of a machine or a vehicle) as well as for political and legal matters (e.g., when predicting the noise impact of a new motorway). It is likely that, in many future situations, values will have to be provided with confidence intervals as is currently the case for several European Directives on emissions of transport means, machines and appliances and on environmental noise.

The objective of this International INCE Symposium is to remind acousticians and



noise and vibration control engineers why they should provide confidence intervals when delivering noise data and to discuss how it should be done. Provision of confidence intervals may prevent future problems of noncompliance (for example, if a value is given at ± 3 dB, you cannot then be accused subsequently of underestimating by 3 dB). It is also necessary for users to be able to make reasonable estimates of what can be required and achieved in terms of accuracy. The intention is to highlight the current practice within the various domains of applications, to show the gaps in our knowledge and procedures, to disseminate results of current European research projects and to pave the way for future research and development.

Symposium Topics

Four main topics associated with uncertainties will be treated during this meeting:

- General aspects of uncertainties in physics and mechanics,
- instrumentation accuracy for acoustics, vibration, and signal processing,
- uncertainties in sound and vibration

- measurements (vehicles, machines, buildings, materials, sound maps, etc.), and
- uncertainties in prediction models and software (vibro-acoustics, aero-acoustics, environmental acoustics, etc.).

Presentations will cover all topics related to uncertainties and accuracy:

Practical issues:

- Use of different grades of accuracy in acoustic instrumentation, uncertainties in vibration measurements,
- proper use of calibration in sound and vibration instruments,
- determination of uncertainties in new standards based on the GUM,
- accuracy in test codes for sound power determination of machines,
- accuracy in test codes for performance of building elements,
- accuracy of field measurements in buildings,
- uncertainties in the assessment of

noise from vehicles and all means of transport,

- uncertainties in the management of declared values,
- labeling the acoustical properties of products and uncertainties,
- variability in the results of test laboratories,
- the reliability of sampled acoustic measurements when applied to a manufacturing run,
- uncertainties in sound mapping and environmental noise prediction,
- dealing with measurement uncertainties in complaints from the public,
- compliance with the requirements of regulations and EU directives,
- legal and commercial aspects linked with uncertainties,
- sensibility and robustness of software for vibroacoustics prediction, and
- effects of material and geometrical variations in vibroacoustics modeling.

Industrial, test laboratories and R&D approaches such as:

- Sources of uncertainties in acoustic and vibration instrumentation,
- uncertainties in sound intensity measurements,
- uncertainties in low frequency, tonal and impulsive noise measurements,
- uncertainties and sound quality indicators,
- round robin tests as a way to check the robustness of a test code,
- uncertainties in propagation models,
- variability in noise and vibration of products due to the manufacturing process,
- dealing with uncertainties in modal analysis,
- dealing with uncertainties in SEA and in numerical FEM, BEM and CAA modeling.

Applications to various areas and fields of interest:

- Appliances,
- machines,
- road vehicles,
- aircraft,
- trains,
- ships,
- buildings and room acoustics
- materials and noise control systems for building
- environmental and community noise,
- manufacturers,
- public bodies
- consumers, and
- European directives.

Technical Sessions

The papers in the technical sessions will be presented in the English language; selected papers may have simultaneous translation into French. The various aspects of uncertainties in noise measurements and prediction will be addressed through 4 types of sessions:

Plenary lectures: Four plenary lectures will cover subjects of common interest for most participants:

- “The European Guide for calculating uncertainties in measurements (GUM) and its consequences for acoustic standards” by Marc Priel, LNE (France)
- “Uncertainties in modeling and simulation” by Jean-Pierre Coyette, FFT (Belgium)
- “Uncertainties in environmental noise measurements and prediction” by Wolfgang Probst, ACCON (Germany)
- “Human response - the ultimate uncertainty” by Brigitte Schulte-Fortkamp, T.U. Berlin (Germany)

Technical parallel sessions: These sessions will cover more focused subjects and will be run in parallel. They will be based on a blend of introductory lectures presenting the state of the art in the domain, followed by invited and contributed papers and incorporating ample time for discussion at the end of the session. Some of them, covering the topic for the first time, may be run in the way of open workshop. The conclusions of the sessions will be reported and discussed in plenary sessions.

Plenary discussion sessions: Those plenary sessions will provide presentations and open discussion on key subjects such as:

- The responsibilities of the manufacturer, test laboratory, and consultant in providing accurate results to a client,
- where the responsibility lies to declare the accuracy of the results of computation, and
- the variability in noise and vibration emission of products due to the manufacturing process.

There will also be an opportunity to present a synthesis of the technical sessions in view of the cross experiences from different domains and to orient future work.

Case studies sessions: These will offer an opportunity for noise and/or vibration practitioners to present detailed examples from their professional lives where a more

studied treatment of measurement and prediction uncertainties may have led to a different outcome. This also includes examples of uncertainties about the appropriateness of a particular procedure for its intended purpose, particularly where a national or international standard is involved. Depending on the subject, these sessions may be organized as a follow up to technical sessions run on the same topic or independently.

Exhibition

An important exhibition will be organized adjacent to the session rooms. *Exhibitors coming from the following fields will be particularly welcome:*

- Instrumentation and software manufacturers, and
- control and test laboratories.

For further information, please contact: exhibition@uncertainty-noise.org

Accommodations and Registration

Accommodations in Le Mans and symposium registration information will be posted on the congress web site, www.uncertainty-noise.org

Symposium Committees & Sponsors

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Sponsoring Organizations CIDB

The Centre d'Information et de
Documentation sur le Bruit (CIDB) is
a non-profit organization established in
1978 by the Ministry of the Environment
which brings together 2000 members from
public and private sectors working in noise
reduction. The CIDB provides information
and documentation for both sectors through
a library, a website, journals, a directory,
booklets, exhibitions, conferences, training
courses. Internet: www.bruit.fr

INCE Europe

INCE/Europe is an organization formed in
1999 and registered in the United Kingdom
to assist individuals across Europe
working in noise and vibration control
and the effects of noise, particularly those
persons from a non-acoustic background.
The organization is a Member Society of
International INCE, and is a Sustaining



Member of the European Acoustics
Association. www.inceurope.org.uk

More Le Mans Information

You can connect to the following websites :

City of Le Mans

www.ville-lemans.fr
www.nissan.co.jp/Lemans/environ/guide.html
www.francebalade.com/maine/lemans.htm
www.tourisme.fr/office-de-tourisme/LE-MANS.htm
www.sarthe.com

Epau Abbey

www.coeurvaillant.net/structures/abbayeepau.html
architecture.reli2.free.fr/epau.htm

24 hours of Le Mans

www.nissan.co.jp/Lemans/index.html
www.lemans.org/univers_accueil/index_gb.html
www.maisonblanche.co.uk/technoparc-24hlemans.sarthe.com/site/gb/assets.asp

Automobile Museum

www.sarthe.com/sport/museeauto.htm

Contacts

- To obtain further information, please fill the form on the home page: www.uncertainty-noise.org
- To ask specific question related to organization or papers: info@uncertainty-noise.org
- To contact the exhibition manager: exhibition@uncertainty-noise.org

Acknowledgements

INCE/USA Liaison Program

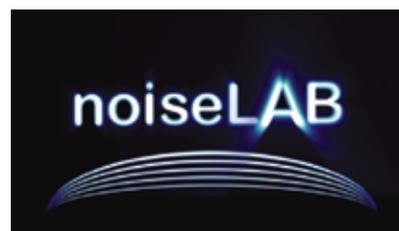
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USA.....	Graduate Program in Acoustics, The Pennsylvania State University, State College, Pennsylvania



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■ Advanced: (€1995) 4 channels

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- Noise prediction, Nord2000

■ Professional: (€2995) 8 channels

- 1/N octave, 100,000 line FFT
- Advanced noise prediction

■ Internet Sales and Support



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Conference Calendar

Below is a list of congresses and conferences sponsored by International INCE and INCE/USA. A list of all known conferences related to noise can be found by going to the International INCE page on the Internet, www.i-ince.org.

2005 June 27-29

International INCE Symposium

Managing Uncertainty in Noise Measurement and Prediction

Le Mans, France. For further information, fill in the form on the home page, www.uncertainty-noise.org. To ask a specific question, address an e-mail message to info@uncertainty-noise.org.

2005 August 06-10

INTER-NOISE 2005

The 2005 International Congress and Exposition on Noise Control Engineering

Rio De Janeiro, Brazil. Contact: Prof. Samir N.Y. Gerges, Mechanical Engineering Department, Acoustics and Vibration Laboratory, University Campus - Trindade, Florianopolis, SC - CEP 88040-900, BRAZIL. Tel. +55 48 2344074; Fax: +55 48 2320826; e-mail: samir@emc.ufsc.br.

2005 October 17-19

NOISE-CON 2005

The 2005 National Conference and Exposition on Noise Control Engineering

Minneapolis, MN, USA. Contact: Institute of Noise Control Engineering, INCE/USA Business Office, 210 Marston, Iowa State University, Ames, IA 50011-2153. Tel. +1 515 294 6142; Fax: +1 515 294 3528; e-mail: IBO@inceusa.org. Internet: <http://www.inceusa.org>.

2006 December 03-06

INTER-NOISE 2006

The 2006 International Congress and Exposition on Noise Control Engineering

Honolulu, Hawaii, USA. Contact: Institute of Noise Control Engineering, INCE/USA Business Office, 210 Marston, Iowa State University, Ames, IA 50011-2153. Tel. +1 515 294 6142; Fax: +1 515 294 3528; e-mail: IBO@inceusa.org. Internet: <http://www.inceusa.org>.

2007

INTER-NOISE 2007

The 2007 International Congress and Exposition on Noise Control Engineering

This congress will be held in Istanbul, Turkey. For further information on the dates, please contact the I-INCE General Secretary, Robert J. Bernhard, Ray W. Herrick Laboratories, Purdue University, West Lafayette, IN 47907, USA. Tel. +1 765 494 2141; FAX: +1 765 494 0787; e-mail: bernhard@ecn.purdue.edu.

2005 Student Awards from INCE/USA

Student Paper Prize Competition. INCE/USA will award up to five prizes of \$1000 each to students who are judged to have produced the best papers for the NOISE-CON 2005 Proceedings. The winning students also receive a complimentary registration for the conference. To be eligible for one of these awards, a student must obtain an entry form from the address below. Abstracts are due on May 01, and six-page papers are due on June 17. The abstract must be clearly marked as an entry in the competition.

Martin Hirschorn IAC Prize. In odd-numbered years, \$5000 the Martin Hirschorn IAC Prize is given...as a contribution to the education of a graduate student studying noise control engineering in the United States who proposes a project related to an application of noise control engineering and/or acoustical conditioning of architectural spaces.

The deadline for submission of proposals for this award is 2005 July 15. Entry forms for both of these awards may be obtained from INCE USA Business Office, 212 Marston, Iowa State University, Ames, IA 50011-2153, Telephone: (515) 294-6142, Fax: (515) 294-3528, E-mail: IBO@inceusa.org

Editor's View *continued from page 132*

course as a necessary evil of our profession, but, again, we need to ensure our audience knows the "code." Ironically, I have even had problems with the abbreviation of the name of this magazine. If I use the term NNI with colleagues of a certain vintage, in the UK, some think I am talking about Noise and Number Index, a metric for describing noise around airports with a long history—now replaced.

To summarize my message, I can do no better than quote the 2000-year-old words of the Roman rhetorician and orator Marcus Fabius Quintilianus:

"One should not aim at being possible to understand – but at being impossible to misunderstand."

—Bernard Berry
bernard@bel-acoustics.co.uk

¹ Published 2004 by Hodder and Stoughton, London: ISBN 0-340-83658-X 

Asia-Pacific News

- Australia: AAS Education Grant, **12: 30**
Australia: Academy of Science Policy, **12: 62**
Australia: Environmental Noise Health Report, **12: 114**
Australia: ICA 2010, **12: 62**
Australia: Music Entertainment Noise, **12: 30**
Australia: Register of Members, **12: 62**
Australia: Virtual City Sounds, **12: 114**
Australia: Westpac8, **12: 30**
Australia: Acoustics 2004, **12: 30**
Japan: ASJ-RTN Model 2003, **12: 30**
Japan: Contracted Research Project in INCE/Japan, **12: 114**
Japan: ICA 2004 in Kyoto is a Success, **12: 62**
Japan: INCE/Japan Free-Style Meeting, **12: 62**
New Zealand: Port Noise, **12: 68**
New Zealand: Road Traffic Barrier Demolished, **12: 68**

Books

- Hearing Conservation Manual, Fourth Edition, **12: 27**
The Science of Sound, Third Edition, **12: 27**

Conference Calendar

- Conference Calendar, **12: 38, 53, 120**

Directory of Noise Control Services

- 12: 40, 80, 128, CVR3**

Editor's View

- European Union Enlargement: 15 + 10 = 450 million, **12: 4**
International Cooperation on Environmental Noise, **12: 84**
Now and Then, **12: 44**
The Language of Noise, **12: 132**

European News

- Europe: Good Practice Guide for Strategic Noise Mapping and the
Production of Associated Data on Noise Exposure, **12: 64**
Europe: HYENA is an EU Project, **12: 115**
United Kingdom, Merseyside Noise Study, **12: 67**
United Kingdom: **12: 29**
United Kingdom: Stansted Expansion Being Reviewed, **12: 117**

Features

- ACTIVE 04, **12: 49**
First Annual Workshop on Global Noise Policy, **12: 140**
INTER-NOISE 2004, The 22rd International Congress and Exposition on
Noise Control Engineering, **12: 12**
INTER-NOISE 2005: Second Announcement and Call for Papers, **12: 98**
INTER-NOISE 2005 Travel Planning, **12: 136**

- Measurement Uncertainty in Noise Measurement and Prediction — An
International INCE Symposium, **12: 162**
NOISE-CON 04 Report, **12: 102**
NOISE-CON 2004: Conference Information, **12: 9**
NOISE-CON 2005 Announcement and Call for Papers, **12: 108**
Overview of I-INCE Technical Activities, **12: 16**
Overview of INCE/USA Technical Activities, **12: 23**
Report: The Second International Symposium on Fan Noise, **12: 22**
Sound Design of Machines From a Musical Perspective, **12: 54**

INCE Update

- Donavan is Named NNI Pan American Editor, **12: 116**
Eric Ungar Receives the INCE/USA Distinguished Noise Control Engineer
Award, **12: 116**
INCE/USA Elects 2004 Officers and Directors, **12: 28**
International INCE Elects New Officers and Directors, **12: 28**
Three Student Papers are Awarded Prizes at NOISE-CON 04, **12: 116**

International Advertising Representatives

- 12: 39, 70, 118, 160**

Member Society Profiles

- Acoustical Society of China, **12: 135**
Danish Acoustical Society, **12: 87**
INCE/Europe, **12: 47**
The Norwegian Acoustical Society, **12: 7**

Obituaries

- Vale Suzanne Thwaites, **12: 30**

Pan American News

- USA: ASA 75 to be Held in New York, **12: 31**
USA: First Annual Workshop on U.S. Noise Policy Developments, **12: 88**
USA: Joint Venture Provides Rail Noise and Vibration Test Services for
Railroad Equipment, **12: 31**
USA: MIT-led Team Cuts Noise From Landing Planes, **12: 112**
USA: Ralph K. Hillquist is Named SAE Fellow, **12: 31**
USA: The History of Acoustical Standards in the Past Eighty Years, **12: 63**

President's Column

- A Vision for INCE/USA, **12: 43**
Future Directions for Noise Control Engineering, **12: 3**
Making Progress towards the INCE/USA Vision, **12: 131**
Monitoring and Prediction of Environmental Noise, **12: 83**

Product News

- 12: 33, 74, 121**

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ACO Pacific, Inc.	159
Acoustiblok	144, 151
BSWA	159
CESVA	154
Delta/NoiseLAB	166
G.R.A.S. Sound & Vibration	133
Hoover—Plywall	133
NGC Testing Services	159
Norsonic	CVR2
PCB Piezotronics, Inc.	149
RION, Co., Ltd.	152
Scantek	147
SoundPLAN	134
Soundown Corp./Getzner	161

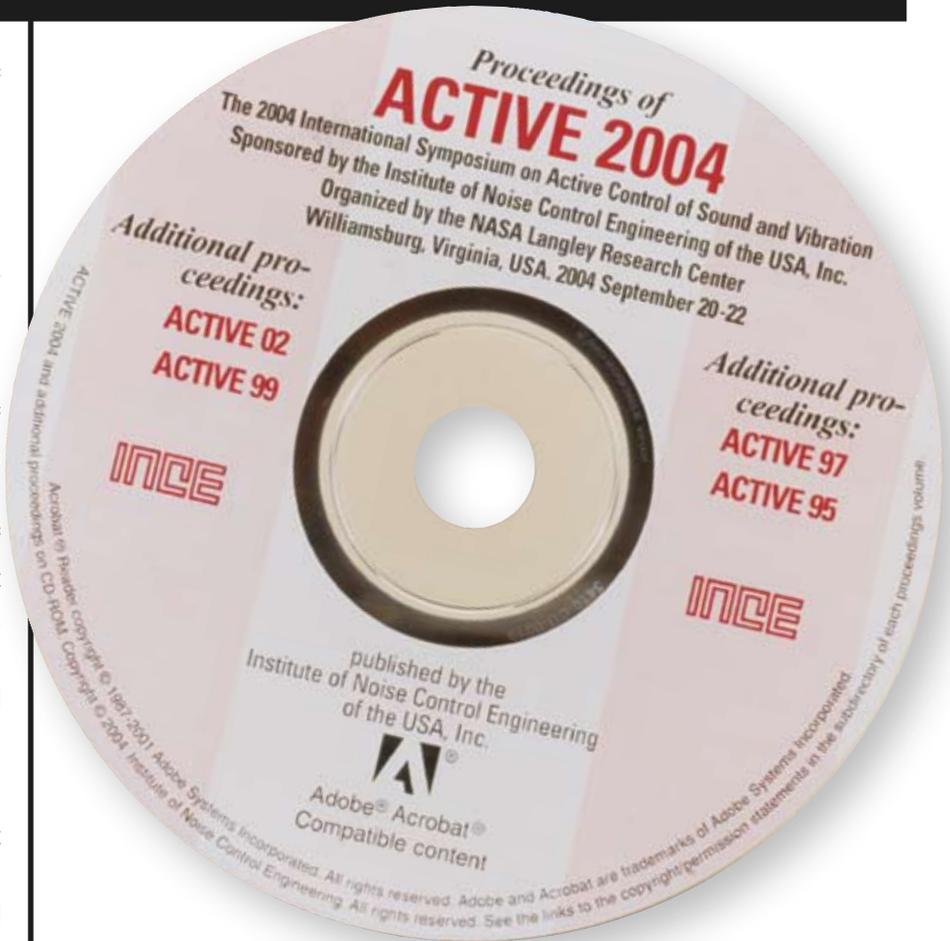
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