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## **Acoustic Intensity Theory & Application Seminar**

**( February 23<sup>rd</sup> – 25<sup>th</sup>, 2010 & October 12<sup>th</sup> – 14<sup>th</sup>, 2010 )**

**Background Discussion & Abstract:** Navcon Engineering is a consulting firm specializing in noise and vibration measurement, analysis and control. We have been presenting the Acoustic Intensity Seminar since 1989. Our seminar is truly unique covering both the theoretical and experimental sides.

Attendees are encouraged to bring a laptop computer with them for use during the laboratory exercises.

**Intended Audience & Course Objective:** This *three* day course is intended for all engineers and technician that work on noise source characterization, product noise control or are interested in determining the sound power level. Lectures cover the fundamentals of acoustics, sound source characterization, and progresses through acoustic intensity conceptualization, theory, measurement techniques, and applications.

Laboratory exercises include sound power measurements, noise source identification, noise source ranking and spectral noise mapping.

### **Presenter:**

**Jim Steedman**, president of Navcon Engineering, has personally conducted more than 300 sound power tests. He received his bachelors and masters degrees from the University of Cincinnati where he concentrated on modal testing, structural dynamics modification and acoustics. He has consulted in the field of noise and vibration measurement, analysis and control since 1977. Jim has traveled worldwide consulting and presenting courses on acoustic intensity, environmental noise, modal testing and noise & vibration control.

**Hans Forschner**, Senior Acoustical Engineer with Navcon Engineering Network received his bachelors and masters degrees from the University of Stuttgart where he concentrated on indoor & outdoor noise modeling and acoustical modal analysis. He has consulted with numerous companies in Europe, South East Asia and the United States in the field of environmental noise and structurally radiated noise problems.

**Course Fee:** **\$1850** per attendee. The course fee includes participation, seminar manual, lunches and refreshments. A full refund will be made for all cancellations received 30 days before the start of the course. No refunds will be granted after the 30 day deadline. Substitute attendees will be accepted at any time. In the event that we have to cancel the course, the course fee will be refunded in full, but we disclaim any further liability.

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## **Acoustic Intensity Theory & Application Seminar – Course Outline**

(February 23<sup>rd</sup> – 25<sup>th</sup>, 2010 & October 12<sup>th</sup> – 14<sup>th</sup>, 2010 )

### **Digital Signal Processing Basics**

- Fourier Analysis & Digital Filtering
- The Sampling Process
- Time and frequency domain window
- Time/frequency domain measurements

### **Fundamentals of Acoustics**

- Basic physics: definition of motion and the wave equation
- Sound pressure, sound intensity and sound power
- The decibel scale (adding/subtracting/averaging sound levels)
- Noise descriptors  $L_p$ ,  $L_I$ ,  $L_W$ ,  $L_n$ ,  $L_{eq}$ ,  $L_m$
- Time weighting & frequency filtering
- Near, far, free and reverberant sound fields
- Time and frequency domain (octave and FFT) analysis
- Measurement considerations
- Wave propagation, sound spreading, reflection, diffraction

### **Acoustic Intensity Concepts**

- Definitions and levels
- Particle velocity
- Formulas
- Intensity fields
- Implementation
- Effects of standing waves
- Basic misconceptions

### **Acoustic Intensity Theory**

- Common analogies
- Conceptualizations
- Theoretical formulation of intensity

### **Acoustic Intensity Instrumentation**

- Microphones, intensity probes, RTA & FFT analyzers & post processors
- High/low frequency intensity measurement errors
- Phase mismatch - sound field reactivity
- Intensity system calibration

### **Sound Power Determination**

- ISO 9614-1, ISO 9614-2, ANSI S12.12 and others

### **Acoustic Intensity Applications**

- Sound power determination
- Source location - null microphone technique, mapping & ranking of noise sources, transmission loss, sound absorption & more

### **Hands on Laboratory Exercises**

- Sound pressure measurement
- Sound intensity calibration
- Residual intensity measurement
- Sound intensity mapping
- Noise source identification
- Sound power per ISO standards
- Data reduction & presentation

**Acoustic Intensity Theory & Application Seminar – Registration Form**

<b>Name</b>	.....
<b>Company</b>	.....
<b>Address</b>	.....
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<b>City, State, Zip</b>	.....
<b>E-Mail</b>	.....
<b>Phone</b>	..... <b>Fax</b> .....
<b>Date</b>	..... <b>Signature</b> .....
<b>Class Date</b>	<b>Feb 23 - 25, 2010</b> <input type="checkbox"/> <b>October 12 - 14, 2010</b> <input type="checkbox"/>
<b>Payment</b>	<b>P.O. No.</b> ..... <b>Company Check</b> <input type="checkbox"/> <b>Payment: US \$</b> _____ <b>Bank Transfer</b> <input type="checkbox"/> <b>Credit Card: Visa</b> <input type="checkbox"/> <b>MasterCard</b> <input type="checkbox"/> <b>Credit Card #:</b> _____ <b>Expiration Date:</b> ____ / ____ <b>Name on Credit Card:</b> _____ <b>Billing Address:</b> _____ <b>Billing Zip Code:</b> _____ <b>Card Verification Value CVV #:</b> _____ (3 digits on the back)

**Course Fee: \$1850** per attendee. We accept company purchase orders with terms of Net 15 days, company checks, money orders, bank transfers and credit card (Visa, MasterCard). The course fee includes participation, course notes, lunches and refreshments. A full refund will be made for all cancellations received 30 days before the start of the course. No refunds will be granted after the 30 day deadline. Substitute attendees will be accepted at any time. In the event that we have to cancel the course, the course fee will be refunded in full, but we disclaim any further liability. For administrative & technical questions phone +714-441-3488.

**To register, complete and Fax this form to +714-441-3487.**