Course Title: Demand Control Ventilation in Critical Environment (Cleanroom, Laboratory and Healthcare)

1. Overview:	The main aims of this module are to provide an understanding of: • Demand Ventilation Control • Critical Airflow Management • Financial evaluation of energy saving technology
2. Objectives:	**On successful completion of this module, the participants will be able to:** 1. Develop an energy management system 2. Understand of demand ventilation control 3. Set up (or develop) energy policy, energy planning, procedure for evaluating performance of energy systems and energy performance review, documentation and communication processes. 4. Integrate energy management system into business practice 5. Understand critical environment safety before implementation of energy saving management and technology. 6. Evaluate financial attractiveness of energy retrofit projects 7. Understand the various energy savings performance models
3. Outline:	**Demand ventilation control in critical environment (6 hrs)** • Introduction to low energy lab and cleanroom design • Importance and impact of lab ventilation on first costs & energy usage • Typical lab energy costs & metrics • A holistic summary of the technologies and strategies used in low energy lab design • Overview of Variable Air Volume (VAV) lab air flow controls as an enabling technology • Temperature and minimum dilution ventilation control • The goal of reducing lab air flow rates to 2 ACH and how to safely achieve this • Overview of the three lab airflow drivers and how they can be reduced • Reducing the fume hood exhaust air flow rates • Reducing the cooling load requirements for lab airflow • Reducing the dilution ventilation requirements • Occ/Unocc control • Demand Based Control • Applicable lab standards and guidelines • Detailed discussion of Demand Based Control: • Basic concept and requirements • Practical technology: Multiplexed sensing • Published study on Lab IEQ conditions and energy savings implications • First cost savings • Case study examples of energy and first cost savings • Variable exit velocity exhaust fan control approaches • Basic concepts • Wind responsive approach • Demand based control approach • Sample example of energy savings • Hydronic cooling approaches and chilled beams • Basic concepts and benefits of hydronic cooling in labs • Various hydronic cooling approaches for labs

- Constant volume approaches to chilled beams
- Benefits of combining chilled beams and demand based control using VAV
- Case studies of chilled beam projects
- Low pressure drop design for labs
- Basic concepts
- Duct and coil design considerations
- Static pressure reset strategies
- Airflow control synergies and impacts
- Heat recovery systems for labs
- Sensible and latent recovery technologies
- Secondary heat recovery strategies for use with hydronic room cooling systems
- Relevant US standards & guidelines
- Energy and first cost analysis of the various energy savings approaches
- Description of a detailed lab energy and capital cost analysis tool
- Comparison of savings and first costs using a sample lab example
- Comparison of individual energy savings approaches
- Comparison of multiple combinations of the individual approaches
- Low flow and pressure drop design for Cleanrooms
- Similarities and contrasts to lab design
- Demand based control for cleanrooms
- Current status of this concept
- ASHRAE research project on this concept
- Summary and review of major conclusions.

Energy savings in Laboratory and fumehoods (2 hrs)

- VAV fume hood technologies
- VAV flow device for critical area
- Room pressurization and supply airflow tracking approaches
- Volumetric offset control

Motor Efficiency (1 hrs)

- Power factor In motor
- Improving motor efficiency

Trainers

Mr. Sharp is the chairman of Aircuity, Inc. and has over 25 years of wide-ranging entrepreneurial experience and more than 25 U.S. patents in the fields of energy efficiency and laboratory controls. As founder, former president and CEO of Phoenix Controls, he led the development of this world leader in laboratory airflow controls that was acquired by Honeywell in 1998. In 2000, Mr. Sharp founded Aircuity, which was spun out of Honeywell and is a smart airside energy efficiency company. He is a graduate of MIT with bachelors and masters degrees in electrical engineering. He is a member of the board of directors of I2SL, the nonprofit foundation that operates the Labs21 conference, as well as a member of the board of advisors of the MIT-Fraunhofer Center for Sustainable Energy Systems. Mr. Sharp is also a member of the ANSI AIHA Z9.5 Laboratory Ventilation Committee, a voting member of the ASHRAE TC9.11 committee (Clean Spaces/ Cleanrooms), a member of ASHRAE TC9.10 (lab systems), and has testified before the US Congress on the topics of climate change and energy efficiency.

Mr. Sunnee Ng is the General Manager for Joule Air Pte Ltd and Maszeca Sdn Bhd in Malaysia prior setting up his own company he is the Head of department and Operation Manager for a Singapore listed company specialize in critical airflow and corrosive fume exhaust system for cleanrooms. He has over 10 years' experience in the fields of energy efficiency and laboratory controls. He had completed project as engineer and project manager in Biopolis one north, Khoo Teck Phuat Hospital, Novena Hospital, Singapore General Hospital Ward 68, National University T-Laboratory, Lonza, MSD, Chevron, Shell Seraya ,SGH Pathology Building and the latest SGH Pathology BSL3.

APPLICATION FORM

Course Date 4 – 5 March 2014
Venue SEAS Training Centre at Park Mall, #08-02
Course Fee Normal Fee: $642
*SEAS member and SEAS SCEM candidates: $513.60

PERSONAL PARTICULARS

Full Name:
*(*Mr/Ms/Mrs/Dr)* *(Name as in NRIC)*
NRIC no: Date of Birth:

Designation:

Contact No: (Hp) (Tel) (Fax)

Email:

Address:

Postal Code:

+Sponsor: ☐Self-Sponsored ☐Company-Sponsored

COMPANY PARTICULARS

Company Name:
(Full Name)
Address:

Postal Code:

CONTACT PERSON PARTICULARS

Contact Person:
*(*Mr/Ms/Mrs/Dr/Prof)*
Designation:

Contact No: (Hp) (Tel) (Fax)

Email:

- I hereby declare that the particulars given in the Application Form are true and correct in every respect. I understand that the application will be disqualified if any information given is found to be untrue and the fees paid will be forfeited.
- I accept that SEAS reserves the right to change course venue, cancel or reschedule the course if necessary or warranted by circumstances beyond our control.
- SEAS reserves the right to accept or reject the application for whatever reason and no refund of fees will be made for withdrawal on or after the commencement of the course where the applicant has been accepted.

Payment Mode
- Crossed cheque is made payable to: **'Sustainable Energy Association of Singapore'**
- NETS (payable only via our training centre at Park Mall)

*All payments required are inclusive of GST.

Send completed application form and documents to:

Sustainable Energy Association of Singapore (SEAS)
9 Penang Road
#08-02 Park Mall
Singapore 238459

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