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ASHRAE SINGAPORE CHAPTER NEWSLETTER – DECEMBER 2005 ISSUE

PRESIDENT'S MESSAGE



“Wishing ASHRAE members and friends

Merry Christmas

&

Happy New Year 2006”

This third issue newsletter has several interesting news on the Chapter, Region XIII and the Society.

Our Chapter welcomes joint activities with other associations and learning institutions; so as to reach out to wider audience and forge closer links with other organisations. Recently, we had joint meeting with NUS, School of Design and Environment on ASHRAE Distinguished Lecture Talk by visiting Professor Jan Sundell on 23 Aug 2005; and joint seminar with Singapore Polytechnic, School of Mechanical and Manufacturing Engineer on ‘SP 9th Cleanroom Seminar 2005’ on 17 Sep 2005. Both events were a success where there were much participation from the audience.

In Region XIII, we had attended the 8th Chapters Regional Conference (CRC) in Hong Kong, on 26-27 August 2005. ASHRAE Society officers, Region XIII officers and 6 Chapters’ Board of Council had fruitful meetings; such as Society updates, Regional reports, Chapter reports, and motions raised to Society on membership matters, as well as proposed research potentials. There was also a half day Technical Seminar held on 26 August, theme on “Green Design & Technology for Sustainable Buildings”.

2006 ASHRAE Technology Award has given an ‘Honorable Mention winner’ to Singapore Chapter submission by CPG Consultants Pte Ltd on the project “National Institute of Education, Nanyang Technological University in Singapore”. All Technology Award winners will be featured in the March 2006 issue of *ASHRAE Journal*. Congratulations!

Society (www.ashrae.org) has released several information for the benefits of members, such as (see newsletters for the articles) :

- ASHRAE Implements New Process to Update Code-Intended Standards
- Sustainability Topic of ASHRAE Satellite Broadcast
- ASHRAE Research Plan Provides Guide for a Sustainable Future
- User’s Manual Provides Better Understanding of ASHRAE 62.1

On behalf of Board of Council, I wish our members and friends “Happy Holidays Season”.

Albert Sin Yew Tek
President, 2005-2006
ASHRAE Singapore Chapter



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ASHRAE Distinguished Lecture Talk: INDOOR ENVIRONMENTS AND HEALTH

Speaker: Professor Jan Sundell, International Centre for Indoor Environment and Energy Technical University of Denmark, ASHRAE Distinguished Lecturer

Date: 23rd August 2005, Tuesday

Location: LR425, Level 4, SDE3, School of Design and Environment, National University of Singapore

An overview of the history of human health and indoor environmental exposures and the problems today regarding such exposures and health were discussed with a focus on allergies and Sick Building Syndrome symptoms.

During the last 7 years Nordic and European multidisciplinary scientific State-of-the-Art reviews have been conducted regarding issues of large public health concern. Results were presented on TVOC-Health, Pets-Allergies, Dampness-Health, Particles in indoor air – Health, Breastfeeding-Allergies, and Ventilation-Health.

As a result of the reviews a large epidemiological study on “Dampness in buildings and health”, DBH, was started.

- **Step 1** was a cross-sectional questionnaire study on all children 1-6 years of age in a county in Sweden, with questions on the home environment and health.
- **Step 2** is a case control study on 200 symptomatic children (eczema, rhinitis, asthma), and 200 healthy children. Extensive exposure measurements and clinical investigations were performed.

Results related to the role of indoor environmental exposures would be presented. Among the topics are the role of phthalates, building ventilation, and pet exposure for allergies among children.

Professor Jan Sundell is an environmental scientist, from Sweden, with a unique background in both engineering (M.Sc.Eng) and medicine (Dr.Med.Sc.). Before going into science he was responsible for building codes, and occupational health legislation in Sweden and the Nordic countries. He was the main author of a model building code for ventilation in homes for UN. He has conducted several large multi-disciplinary studies on associations between indoor environmental factors and health.

His efforts have focused on ventilation, the causes of sick building syndrome, and for the increase in allergies/asthma. He has led numerous European multi-disciplinary reviews of the total scientific literature with regard to indoor climate and health. He has served on the Board of Directors of The International Society of Indoor Air Quality and Climate (ISIAQ), is Vice President of The International Academy of Indoor Air Sciences, and is the Editor-in-Chief of the most prestigious scientific journal within the field of "Indoor Air."

Within ASHRAE he is a member of SSPC 62.1, the Environmental Health Committee, and is the chair of EHC Subcommittee for Research. He is an excellent provocative lecturer, with outstanding knowledge on the need of ventilation, and the importance of indoor air factors for health.



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Technical Talk: Plate Heat Exchanger in HVAC

Speaker: **Mr. Kelvin Tam, Regional Manager, Alfa Laval Singapore Pte Ltd**

Date: 7th September 2005, Wednesday

Location: Hollandse Club

Versatility of The Plate Heat Exchanger in HVAC

by Janet Quah - Alfa Laval (M) Sdn Bhd

Introduction

Wherever people gather, at work, at home, or at recreation, air conditioning system have become the key to environmental comfort. When in a large office building or hotel, underground or mining tunnel, the function of an air conditioning system is a transferring heat from one medium to another. This operation often involves temperature differences that are so small that stringent requirements are place upon the heat exchanger equipment.

There is today, a clear trend in the market towards compact heat exchangers. Plate and frame heat exchanger, which falls into the compact category is being favored more and more over traditional shell and tube heat exchanger for its various features and benefits. Small footprint, low weight, fully counter-current design, high efficiency, high degree of heat recovery, ability to handle close temperature approach are some of the features which readily translate to lower capital and operating cost.

In this short article, we shall look at some of the background theory governing design of the plate heat exchanger and applications within the HVAC industry.

Heat transfer theory

To design a heat exchanger, firstly, the heat balance between both fluids has to be established.

In cases where there is no change of phase, i.e. no evaporation or condensation of the fluid, the following formula is used to determine the heat load:

$$Q = m_1 \times c_{p1} \times dT_1 = m_2 \times c_{p2} \times dT_2 \quad \text{where 1 and 2 denote primary and secondary sides}$$

The heat load is related to the heat exchanger by the formula below :

$$Q = k \times A \times \text{LMTD}$$



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In this second formula, we can deduce that a high k-value (overall heat transfer coefficient) will result in a lower heat transfer area requirement. A small LMTD will have the converse effect and increase the heat transfer area.

There are a number of parameters which can influence the k-value. Fluid properties, flow conditions, heat exchanger geometry, plate material - they all affect the k-value to varying degrees. The first three group of variables can be represented as dimensionless numbers in the mathematical derivation of the k-value. The academic discussion will not be dealt with in this article.

For HVAC cooling duties with close temperature approach (small LMTD) between both fluids, the parameter vital to getting an economical design is a value known as θ or NTU (number of transfer units), defined as the ratio of the temperature difference to LMTD.

$$\theta = \frac{dT}{LMTD}$$

Theta determines the degree of difficulty of a thermal duty.

If we equate the first two formulas above and re-arrange them, we get the following :

$$A = \frac{m \times cp}{k} \times \theta$$

For a fixed heat load where flow rate is kept constant, we can see that the heat transfer area is proportional to theta-value.

Theta is also related to heat recovery and it can easily be proven that to design high heat recovery duties, the heat transfer area is very sensitive to any slight change in theta value.

As a designer, it is imperative to understand the variables that one can control to optimize the heat exchanger selection for a cost-effective design. In addition, knowledge of commercially available plate and technical limitations of the design will result in better specifications for the industry.

Applications in HVAC

Plate heat exchanger (PHE) found its first application in HVAC cooling duty some 45 years ago. Cooling applications are typically used for air conditioning in hotels, office buildings, industrial buildings, hospitals, sports centres and community dwellings. There are two basic types of cooling application – district cooling serving a number of buildings and central cooling where the application serves a single building.

One of the more common HVAC applications in Singapore today is the use of PHEs in district cooling systems. Plate Heat Exchangers in a district cooling network act both as a means of transferring cooling effect to air handling units, and as pressure interceptors between the main network and the local system inside each building. The district cooling system offers operating flexibility, since each building can use as much or as little cooling as needed, without worrying about the chiller size or capacity.



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Central cooling systems are limited to a single building, for example a hotel, office blocks, commercial centre or hospital. In skyscrapers, the static head creates a pressure that may exceed what the chiller condenser or room air conditioners can handle. A Plate heat exchanger will then split the circuit in order to keep the pressure at an acceptable level, it is possible to put PHE on different levels throughout the building. Thus limiting the pressure and corresponding requirements on, for example, pumps, piping and valves, and also protect air handling units and other equipments from excessive pressure.

Also, there are ice accumulator / storage application. Where ice can be accumulated during one period, stored and then thawed and used during another. Energy can be purchased during the night or off-peak hours. In many countries this means that it can be obtained at a lower price.

Heating, in most cases, is a matter of providing a comfortable indoor environment, whether at home, at work or in a public facility. Heating can also involve heating tap water, swimming pools etc, heating system normally supply heat to a single building, with the heat source inside this building, the heat is normally provided by a boiler, but it can also come from a heat pump or solar panels.

There are many more applications within the industry where the plate concept has a technological edge over other type of heat exchanger. As it is not possible to describe every single application, the writer welcomes any query or feedback and can be contacted at janet.quah@alfalaval.com or siewkien.chua@alfalaval.com.



Plate heat exchanger



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SP 9th Cleanroom Seminar 2005: Definition of Cleanroom Technology Scope of Works, Maintenance, Performance Testing and Monitoring of Cleanrooms

Speakers: Mr. Josef Oswald, Daldrop + Dr. Ing. Huber,
Ms. Lynda Tan, Yargay MCI Pte Ltd
Mr. Ong Yam Chai, Cesstech (S) Pte Ltd
Mr. Raymond Thomas, Lighthouse Worldwide Solutions

Date : 17th September 2005
Time : 9.00 am to 12.30 pm
Location : Venus II & III Level 3, Furama Riverfront.

This event was jointly organised by Singapore Polytechnic, School of Mechanical and Manufacturing Engineering and ASHRAE Singapore Chapter. The event was a resounding success with 139 participants from the industry and polytechnic.

The speakers include Josef Oswald from Daldrop, Lynda Tan from Yargay MCI Pte Ltd, Ong Yam Chai from Cesstech (S) Pte Ltd and Raymond Thomas from Lighthouse Worldwide Solutions. The topics covered range from the cleanroom technology scope of works, cleanroom cleaning, performance testing and certification of semi-conductor and pharmaceutical cleanrooms to monitoring cleanrooms.

The seminar ended after a Q&A session with presentation of tokens of appreciation to all speakers. Participants then proceeded to lunch in the hotel.



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Leadership Interview: Mr. Jimmy Loon

Past President: 1997-1998



Mr. Jimmy Loon is currently with United Overseas Land Ltd, holding the appointment of General Manager (Development). Had graduated from the National University of Singapore with a Bachelor Degree in Mechanical Engineering, and later on obtaining a Masters Degree in Project Management. He is a Fellow of the Society of Project Managers.

Q1. What attracted you to engineering and/or the HVAC industry?

Majored in ACMV in the University. Was keen to try my hand in the design of ACMV for buildings upon graduation.

Q2. What was your first job in the HVAC industry and where did it lead?

Started work in a M&E Consultancy Firm. As a young design engineer, was initially involved in the airconditioning design of office buildings & factories. Went on later to work in another M&E Consultancy Firm – Monenco Asia Pte Ltd. Decided then to build up my career in the construction industry.

Q3. Describe the industry at that time. What were the challenges that you and your colleagues were facing?

The Construction Industry at that time was already well-known as a “Sunset Industry”, as it was lacking tremendously behind others like manufacturing and production, where IT and new technologies were being introduced. Software to assist in heat-load and OTTV calculations were not easily available, a very sad state of affairs when personal computers and the CADD systems were starting to flood the industry.

Q4. How and when did you get started in ASHRAE?

Being in an M&E Consultancy Firm, it was quite “natural” to be aware of ASHRAE’s role and activities in the HVAC Industry. Was encouraged to enrol in ASHRAE and the Chapter by Mr. P S Loh, Past President of the Local Chapter, back in 1986.

Q5. What was your ASHRAE chapter experience?

Allowed for interactions with various professionals in the HVAC industry, from lecturers to consultants, contractors and suppliers.

Q6. What were the major issues facing the industry at that time?

The construction industry then was facing a downturn, and at the same time, everybody were becoming aware of the importance of energy conservation and clean energy alternatives.



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Equipment suppliers were rushing to introduce new range of chillers operating on environment-friendly refrigerants.

Q7. How was SAAM (ASC) interacting with the public?

The Chapter were also kept busy organizing seminars and talks, educating the public on the new refrigerants and the types of chillers on their efficient energy consumption characteristics.

Q8. On what SAAM (ASC) committees did you serve?

Programme Committee

Q9. What people stand out as influences on you?

Past President Loh Peng Sum

Q10. What events changed SAAM (ASC)?

The encouragement and decision by ASHRAE to initiate the formation of Region XIII, the first outside of North America, of which our Chapter was instrumental in facilitating its formation. This allows our interaction with other regional chapters from Hong Kong, Malaysia, Taiwan and even Philippines and Thailand.

Q11. What events changed the industry?

The implementation of the Montreal Protocol in 1987.

Q12. What has ASHRAE meant to the industry's growth?

It has always been the leader in providing research, education and standards for the HVAC industry.

Q13. What advise would you give to a young person entering the HVAC field?

The satisfaction is unsurpassed when you see your contribution realized in a newly commissioned building. Hopefully, this will give you the strength to face the new challenges in the HVAC industry.

Q14. Did any humorous events take place during your association with ASHRAE?

Forgot to bring the ASHRAE banner to the Annual Dinner during my first year involvement in the Programme Committee. Had to beg our Indian "jaga" to open up my office on a Saturday evening to retrieve the banner; almost couldn't make it on time for the Dinner.

Q15. What other interests and/or hobbies do you have?

Reading, Golf.



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Addenda Availability Changes

ASHRAE Implements New Process to Update Code-Intended Standards

ATLANTA – As part of ongoing efforts to increase use of its standards, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) has announced a major change to availability of addenda to code-intended standards. The move puts ASHRAE in line with issuance of model building codes.

In the past, addenda for code-intended standards on continuous maintenance were posted individually on ASHRAE.org after being approved by the Board of Directors for publication. Now, Board-approved addenda to code-intended standards will be published in a supplement. The supplements for each standard will be published on a regular schedule halfway between the three year publication of each standard. The addenda also will be incorporated into each standard when it is reissued after its last publication. Richard Hermans, P.E., chair of ASHRAE's Standards Committee, acknowledges the change is significant.

“Our whole approach to how we relate to the building code industry is changing,” Hermans said. “We are seeking more involvement with the model code development community to assist us in our code proposals. We are responding to member concerns over the cost of keeping up with our code-intended standards. By cost, I am not referring to the dollars spent for obtaining the updated documents but rather the cost in time to train employees about the new requirements contained in addenda. And we are aligning our release of certain standards to coincide with the model code schedules for code change proposals.”

All of these actions point to a policy of releasing addenda on a predictable schedule spaced out over years, he said. “In this way, we will develop our code-intended standards in the same way that groups such as the International Code Council and the National Fire Protection Association, both of which incorporate ASHRAE standards, maintain their model codes,” he said.

The change applies only to code-intended standards that are on continuous maintenance. These are:

- Standard 15, Safety Standard for Refrigeration Systems;
- Standard 34, Designation and Safety Classification of Refrigerants;
- Standard 52.2, Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size;
- Standard 62.1, Ventilation and Acceptable Indoor Air Quality in Commercial, Institutional, Industrial and High-Rise Residential Buildings;
- Standard 62.2, Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings;
- Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings;
- Standard 90.2, Energy Efficient Design of Low-Rise Residential Buildings;
- Standard 140, Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs.



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The first supplements for standards published will be available in March 2006.

For more information on ASHRAE's work in standards, visit www.ashrae.org/standards.

ASHRAE, founded in 1894, is an international organization of 55,000 persons. Its sole objective is to advance through research, standards writing, publishing and continuing education the arts and sciences of heating, ventilation, air conditioning and refrigeration to serve the evolving needs of the public.

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Sustainability Topic of ASHRAE Satellite Broadcast

ATLANTA – A satellite broadcast is being offered by ASHRAE to fulfill its goal of promoting building sustainability as a means to provide a safe, healthy, comfortable environment while simultaneously limiting the impact on the Earth's natural resources.

Information about building sustainability principles, practices and emerging concepts will be presented in the free April 19, 2006, satellite broadcast and Webcast, Sustainability and the Building Environment. The program is sponsored by ASHRAE's Chapter Technology Transfer Committee (CTTC).

"This broadcast will benefit all of the team members involved in the design, construction, start-up, and operation phases of a facility," said Jon Christopher Larry, chair of CTTC. "Viewers will be given information and sources to assist them when they are faced with the situation where a green design must be done. The green building industry will also benefit from the engineering input from ASHRAE."

The speakers for the broadcast will provide guidance on how to practice green building design. They are: Joe Van Belleghem, president, BuildGreen Developments, Victoria, Canada; Hal Levin, Fellow ASHRAE, research architect, Building Ecology Research Group, Santa Cruz, Calif.; Jean Lupinacci, director, ENERGY STAR commercial and industrial branch, Climate Protection Partnerships Division, U.S. Environmental Protection Agency;

Kevin Hydes, P.E., P.Eng., president and CEO, Keen Engineering, Montreal, Canada; and Malcolm Lewis, Ph.D., P.E., president, CTG Energetics, Irvine, Calif.

The broadcast will be similar to the April 2005 Mold in the Building Environment Broadcast/Webcast viewed by some 16,000 viewers at 1,700 locations.

Visit www.ashrae.org/greenbuildingsbroadcast for the latest information regarding the broadcast/Webcast and ASHRAE's work on sustainability.

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ASHRAE Research Plan Provides Guide for a Sustainable Future

ATLANTA – Providing navigation for a sustainable future is the goal of a new research strategic plan developed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

The plan outlines ASHRAE’s research goals for the next five years. It centers on sustainability, which is defined as “the concept of maximizing the effectiveness of resource use while minimizing the impact of that use on the environment.”

“Research and technology are the foundation of ASHRAE on which everything else is built,” said John Mitchell, Ph.D., P.E., chair of the Research Advisory Panel that developed the plan. “With issues related to energy conservation, refrigeration and indoor air quality facing our industry, our foundation must remain strong.”

The plan contains goals in five targeted areas. These include:

Energy and Resources

- Provide guidance on techniques to working toward achieving net zero-energy use by 2015, meaning buildings that consume equal or less energy than they produce on an annual basis.
- Produce by 2015 new residential and light commercial buildings that have 70 percent less energy use than buildings built at the turn of the millennium according to ASHRAE Standard 90.2, Energy-Efficient Design of Low-Rise Residential Buildings.
- Optimize and make consistent ASHRAE Standards 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings, 62.1, Ventilation for Acceptable Indoor Air Quality, and 55, Thermal Environmental Conditions for Human Occupancy, to achieve measured and verified high system energy efficiency with high indoor environmental quality (IEQ) for indoor built environments.

Indoor Environmental Quality

- Make improvements in occupant health and comfort that can yield a 20 percent increase in productivity by 2015.
- Provide an optimal indoor environment for buildings, vehicles and facilities with respect to comfort, productivity, health and safety.
- Provide better understanding of how contagious viruses are transmitted in an indoor environment and develop remediation techniques and equipment to minimize exposure.



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Tools and Applications

- Develop more effective tools that will improve the productivity of the design process by 25 percent by 2015.
- Develop dual path standards where paths are prescriptive based and performance based.
- Develop a measurement-based rating system to establish the environmental performance of a building and its system.
- Provide design guidance for buildings and systems to address the past and expected change in climatic conditions.

Equipment, Components and Materials

- Establish techniques to improve the energy efficiency and reliability of heating, ventilating, cooling and refrigeration system components.
- Improve performance and reliability and minimize the environmental impacts of working fluids and materials.
- Advance ASHRAE's role in the safety and security of food distribution.
- Develop techniques that reduce the installed energy use of HVAC&R system auxiliary equipment by 50 percent by 2015.

Education and Outreach

- Make the results of ASHRAE sponsored and cooperative research available to the technical community.
- Ensure that ASHRAE research has an international impact.

To view the plan or for more information on ASHRAE's research program, visit www.ashrae.org/research.

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User's Manual Provides Better Understanding of ASHRAE 62.1

ATLANTA – A new user's manual provides users with a better understanding of the design, installation and operation requirements in ASHRAE's ventilation standard.

The Standard 62.1 User's Manual explains the requirements of ANSI/ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality, and contains numerous examples of their application in an easy-to-follow question and answer format.

“Because the standard is written in code-intended language, such material could not be included in the standard itself, so the manual helps users better understand the intent and apply it to their work,” Dennis Stanke, chair of the Standard 62.1 committee, said. “It helps users understand what Standard 62.1 requires and how those requirements can be met. It's a document that designers have needed for many years and will find useful for many years to come.”

The manual includes a CD containing a spreadsheet to assist in the standard's new ventilation rate procedure calculations.

The manual was developed through ASHRAE research and partially funded by the National Institute of Standards and Technology, the Air-Conditioning and Refrigeration Institute and the U.S. Green Building Council.

The cost of the Standard 62.1 User's Manual is \$55 (\$44, ASHRAE members).

To order, contact ASHRAE Customer Service at 1-800-527-4723 (United States and Canada) or 404-636-8400 (worldwide), fax 404-321-5478, by mail at 1791 Tullie Circle NE, Atlanta, GA 30329, or visit the ASHRAE.org Bookstore at www.ashrae.org.

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Coming Activities

<u>Date</u>	<u>Description</u>	<u>Organised by</u>
15 Nov 2005 7 to 10 pm	Members Nite, ASHRAE Stds 62.1 and 55 Updates & Extraordinary General Meeting Venue : Civil Service Club (Tessensohn Clubhouse)	BOG
22 Nov 2005 7 to 10 pm	<u>ASHRAE Distinguished Lecture Talk</u> Professor William Stoecker, "The World of Industrial Refrigeration" Venue: Furama Waterfront Hotel (former Apollo Hotel)	CTTC/ Membership
25 Nov 2005 1 –2 pm	<u>Engineering Fiesta 2005 @ National Library</u> Mr Sivakumar will present "Can we do without Air-conditioning and Refrigeration" Venue: Event Plaza, Level 1, National Library @ Bras Basah	Institute Engineers, Singapore (IES)
25 Nov 2005 12 pm	<u>Social Golf Tournament</u> Venue : Raffles Country Club	Research Promotion
25-26 Nov 2005	<u>Asia Pacific Conference, Manila</u> A/P Chandra Sekhar will be presenting paper "A review of air-conditioning and air distribution technologies for energy efficient healthy building" Venue: Manila Hotel, Manila, Philippines	Philippines Chapter
29 – 30 Nov 2005	<u>Sustainable Energy Asia 2005, Singapore</u> (Supported by ASHRAE Singapore Chapter) A/P Chandra Sekhar will be presenting paper "An energy efficient air-conditioning system for enhanced indoor air quality" Venue : Suntec Singapore	Singapore Association for Environmental Occupational Health (SAFEco)
3 Dec 2005 8:30am to 2:30pm	<u>ASC Family Day</u> Members to bring along families to : • Goat Farm Tour • Bollywood Vegetable Farm Tour (lunch provided)	Membership
17 Dec 2005	Bilateral Meeting for ASHRAE Singapore Chapter and Malaysia Chapter Annual meeting for ASC and MASHRAE BOGs Venue : Malacca	MASHRAE/ ASC



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YEAR 2006 Coming Activities

<u>Date</u>	<u>Description</u>	<u>Organised by</u>
6 January 2006	<u>Technical Talk</u> Professor David Wyon, “Productivity research in theory and in practice. Current status and future challenges”.	NUS, School of Design & Environment
February 2006	<u>Members Nite & Chapter Presentation</u> A/P Chandra Sekhar will be presenting “Status of TC 5.12(Ventilation requirement and infiltration)” (as a voting member)	Details will be advised.
March 2006	<u>ASHRAE Distinguished Lecture Talk</u> Professor Bjarne Olesen will be coming to Singapore.	Details will be advised.
April 2006	<u>ASHRAE Distinguished Lecture Talk</u> Professor Branko Todorovic will be coming to Singapore.	Details will be advised.
April 2006	<u>Annual General Meeting</u>	Details will be advised.
April 2006	<u>Annual ASC Trophy Golf Tournament</u>	Details will be advised.
May 2006	<u>Technical site visit to local development/facilities</u> National Library Board @ Bras Basah Road	Tentative
May 2006	<u>25th Annual Dinner & Dance</u>	Details will be advised.
June 2006	<u>Technical Talk</u>	Details will be advised.
4 –7 July 2006	<u>HVAC Asia 2006</u> South East Asia’s International Exhibition on Heating, Ventilation, Air-conditioning, Refrigeration, Air Filtration & Purification and Building Automation & Controls Venue: Hall 4, Singapore Expo	ASC HQ Link Pte Ltd