ASHRAE India Chapter
CELEBRATING 125 YEARS
ASHRAE INDIA CHAPTER BULLETIN
For the HVAC&R Industry
Volume 21 Issue 4 | October 2021
Editor: **Mr. Kanagaraj Ganesan,** Associate Editor: **Mr. Suhaas Mathur, Ms. Shruti Gupta, Dr. Rajinder Singh**

Presidential Message

Dear Friends,

I am very delighted and pleased to address you all with this newsletter at the start of the ASHRAE new society year. ASHRAE India Chapter has successfully organized an Annual General Meeting and Installation Ceremony of the new AIC BOG (2020-2021) at Virtual platform with participation of a very enthusiastic new team which is ready to deliver the new mandates of the society year. With a successful completion of previous year of AIC with a wonderful performance in all fields, even though with many outdoor activities restrictions due to COVID. All the targets were met and achieved much beyond our expectations in this challenging time.

We are very positive and confident for this year too, to continue all our activities with more encouraged targets in all spheres. Our focus will be to add more new members and retain the existing ones to make AIC the leading chapter in India and Region-at-Large. We will enhance the research promotion contribution as compared to the previous years.

ASHRAE India Chapter has successfully conducted virtual meeting for Orientation program of Rajasthan Chapter, 5 technical webinars attended by more than 270 participants in total, ASHRAE India has also supported Associations in LIVE 2021 Summit & Expo – ''An Initiative for a Healthier Workspace Environment, organized the 1st N.C. Gupta Memorial Football Tournament and coming up with lots of Interesting new webinars and events, the updates of which will be available on our social media Channels, So stay tuned with us..!!

Our sustainable development activities will continue in villages, schools, and hospitals. We will involve more people and students in these activities for better results. We will increase the activities under the refrigeration committee. We will try to make more members from this field and carry out more webinars on refrigeration. We will promote the interest of engineers who are working in this field. We are planning to include more young engineers and architects in this society year. The target will be to get enthusiastic scholars from the industry and focus on converting student memberships to YEA after graduation.

With the improvement of the situation and things falling out in place in this post-pandemic situation, we look forward to conducting the events with grand success and with full capacity. I would like to thank and acknowledge all the BOG and chapter members for their unconditional support for the ASHRAE India Chapter activities, which has kept the ball rolling even in the tough times and transcend expecting more enthusiasm for the new society year.

Thanking you

ABID HUSAIN

President
ASHRAE INDIA CHAPTER

Sustainable Cooling for All

1. Nexus of space cooling with the built environment and climate change:

Space cooling is one of the major contributors to climate change due to its emissions attributes related to higher energy consumption and predominant use of high global warming potential refrigerants. Emerging economies such as India, Indonesia, China and Mexico exhibit high annual growth rate for room air-conditioners. Space cooling is also important from the perspective of access to cooling for vulnerable populations, water conservation and material circularity. Space cooling is responsible for significant energy use and emissions, contributing around 1 gigaton of CO_2 and nearly 5 per cent of total energy consumption worldwide in 2020. The floor area of buildings globally is expected to increase 75 per cent between 2020 and 2050, of which 80 per cent will be in emerging and developing economies (IEA 2021c). This provides an opportunity to put in place the right interventions to curtail cooling energy by applying bio-climatic architecture and passive building design principles.

If the efficiency gains of climate-responsive design and space cooling equipment remain unrealized, energy use for space cooling is expected to double again from current levels by 2040. It is essential for countries to develop and adopt targets and cooling policies in their Nationally Determined Contributions (NDCs) that emphasize climate-adapted building designs, construction and operations aligned to the concept of "Avoid-Improve-Shift-Protect" (see discussion below). Under a net zero energy scenario, energy use for space cooling can be reduced 50 per cent by 2050 compared to the current "state policies" scenario.

2. Approach to Sustainable Building Space Cooling: Avoid-Improve-Shift-Protect:

Environmental impact of space cooling can be reduced by following integrated design and delivery method aligned with the concept of 'Avoid-Improve-Shift-Protect' during the entire life cycle of the building projects.

Integrated Design and Delivery (IDD)

Integrated Design and Delivery (IDD) is central to the conceptualization and implementation of high-performance space cooling strategies. To implement IDD, all the stakeholders involved with a buildings project such as urban planners, architects, mechanical and electrical engineers, contractors, clients, operators, and end users should work collaboratively from the project inception stage to define the performance goals and objectives of high-performance space cooling. The process is complemented by using integrated design charrettes, state-of-the-art simulation tools, continuous commissioning practices and efficient management of space cooling systems. The stakeholders should take shared responsibility to iteratively synthesize the evaluation of weather parameters, building design, building function, and cooling equipment design. IDD will become more visually pronounced when one building component contributes to multiple functions, for example when a structural system such as a beam becomes a duct for cool air distribution or when a floor becomes a radiant cooling system.

AVOID

The "Avoid" approach to cooling action refers to reducing the demand for active cooling in buildings through passive cooling solutions, nature-based solutions, and reductions in internal heat gains from artificial lighting and indoor equipment. At the site level, the designer can deploy strategies such as the optimal orientation of buildings as well as spatial configuration with consideration of open spaces, vegetation, mutual shading, water bodies and compact building design. At the building level, implementing the three simple strategies of insulate well, shade well and ventilate well can lead to substantial reduction of cooling demand.

IMPROVE

The "Improve" approach to cooling action refers to improving the energy performance of individual cooling equipment, using overall centralized air-conditioning systems and applying low energy active cooling strategies. For room air conditioners, energy efficiency improvement can be attained primarily through right-sizing of the cooling equipment, choice of highly efficient compressors, use of inverter technology and use of water-cooled or ground-coupled condensers. For centralized air-conditioning systems, consideration of low-energy active cooling strategies such as radiant cooling systems, evaporative cooling, displacement ventilation, demand control ventilation, air-side and water-side economizers, and enthalpy recovery can further improve the energy performance.

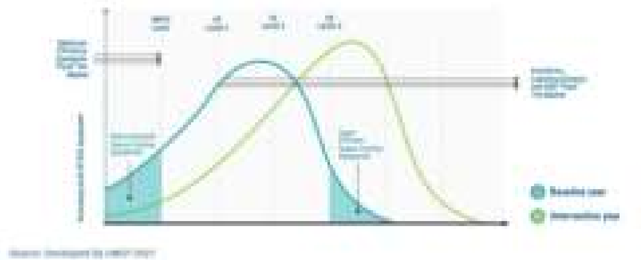

Figure 1 Role of regulatory and market-based mechanisms to improve the energy efficiency of space cooling

SHIFT

The "Shift" approach to cooling action refers to the use of renewable or waste resources for space cooling and the reduction of direct greenhouse gas emissions from the refrigerants used in the cooling equipment. The integration of renewable energy sources with space cooling requires careful planning, design, implementation, and operation. Commonly applied combinations include geothermal energy, solar heat or waste heat coupled with absorption- or adsorption-based chilling systems. These cooling systems consume much less electrical energy and use refrigerants and absorbents/adsorbents that do not emit greenhouse gases.

PROTECT

The "Protect" approach to cooling action refers to the need to shield vulnerable populations, who often live in poorly designed and maintained housing stock, from the adverse impacts of hot weather. Worldwide, around 1.09 billion people are at high risk of heat stress due to a lack of access to cooling (Sustainable Energy for All 2021). This population includes both rural and urban poor who have little means of affording refrigerant-based space cooling.

Although the urban poor have some access to reliable electricity, their condition is exacerbated due to the urban heat island effect. "Protect" cooling actions to reduce urban heat and improve the health of low-income populations include; well-ventilated urban planning, mutual or self-shading, cool roofs and walls (see box 17), pervious pavements, non-motorized or congestion-free transport, and the use of vegetation and local water bodies to improve the microclimate.

3. Enablers For Sustainable Space Cooling

The environmental impact of space cooling systems can be mitigated by reducing their energy use intensity and by using climate-friendly refrigerants. This will require coherent drivers such as international commitments and collaborations, regulatory and market-based policies, financial mechanisms, and awareness/capacity-building (UNEP and IEA 2020).

1. International commitments and collaborations

At a high level, countries can show commitment to sustainable space cooling by adopting or ratifying international commitments such as the Paris Agreement, the Kigali Amendment to the Montreal Protocol and the UN Sustainable Development Goals. Further, countries can foster international collaborations, which will provide national governments with the opportunity to work jointly with international experts and institutions on accelerating the uptake of sustainable space cooling.

2. Regulatory and market-based policies

The development and implementation of successful sustainable cooling policies requires clear "ownership" and effective collaboration among various stakeholders including government, manufacturers, designers, civil society, academia and end users (UNEP Cool Coalition 2021). Market-based mechanisms, such as bulk procurement of air conditioners and other cooling equipment, can bring economies of scale to reduce costs and lead to accelerated adoption of super-efficient air-conditioning equipment.

3. Financial mechanisms and innovative business models

Domestic funds and public finance can be used to leverage international funds and private investments, respectively, for sustainable space cooling. This will help in initiating related programmes and raise investor confidence. Countries where public investment is a challenge can explore mobilizing finance through multilateral funds, bilateral funds, philanthropies and private sector participation.

4. Awareness and training programmes

Extensive awareness- and capacity-building efforts by designers, contractors, commissioning professionals, service technicians, air-conditioning operators and building users are needed to reduce energy consumption and refrigerant leakages during the service life of space cooling equipment.

This is an excerpt from the chapter from 2021 Global Status Report for Buildings and Construction, published in 19.10.2021. The full report can be read by downloading the book with this link: **https://globalabc.org/sites/default/files/2021-10/GABC_Buildings-GSR-2021_BOOK.pdf**

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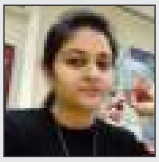


Ar. Anubha Ashtikar
President, ISHRAE, Raipur Sub-Chapter
Sr. Sustainability Expert -
Integrative Design Solution Pvt. Ltd

ASHRAE India chapter Felicitated ASHRAE Life Members

Mr Nihal S Hukmani

Mr Virendra K Wadhwa

Mr Ashok K Virmani

Mr Sumat P Jain

Mr Nand K Mehra

Mr Yashodhar Kumar Jain

Mr Syed Saleem Raza Zaidi

Refrigeration and Vapour Compression Refrigeration System (Cycle) for Refrigeration and Air-Conditioning Engineers

1.1 REFRIGERATION

Refrigeration means production of cold and coldness is produced by abstraction (removal) of heat. Refrigeration is a process of moving heat from one location to another in controlled conditions. The work of heat transport is traditionally driven by mechanical work, but can also be driven by heat, magnetism, electricity, or other means.

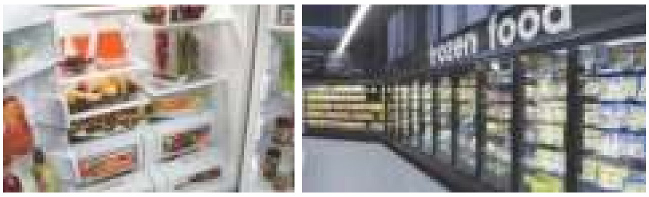


Fig.1.1 Refrigeration

1.2 VAPOUR COMPRESSION REFRIGERATION SYSTEM (VAPOUR COMPRESSION CYCLE)

Vapor compression refrigeration system is the most widely used method for refrigeration used in domestic and commercial refrigerators, water coolers, large-scale warehouses for chilled or frozen storage of foods, ice plants, refrigerated trucks and refrigeration in oil refineries, petrochemical and chemical processing plants, natural gas processing plants etc. This system is used for air-conditioning of buildings like shopping malls, offices, hospitals, schools and colleges etc. This system is used for air-conditioning of cars, buses and rail etc.

1.3 DESCRIPTION OF VAPOUR COMPRESSION REFRIGERATION SYSTEM (VAPOUR COMPRESSION CYCLE)

The vapor-compression refrigeration system has four major components: evaporator, compressor, condenser, and expansion (or throttle) device. The most widely used refrigeration cycle is the vapor-compression refrigeration cycle. In an ideal vapor-compression refrigeration cycle, the refrigerant enters the compressor as a saturated vapor and is cooled to the saturated liquid state in the condenser. It is then throttled to the evaporator pressure and vaporizes as it absorbs heat from the refrigerated space.

The ideal vapor-compression refrigeration cycle consists of four processes.

Process	Description
1-2	Isentropic compression
2-3	Constant temperature heat rejection in the condenser
3-4	Throttling in a throttle device (expansion device)
4-1	Constant temperature heat abstraction (addition) in the evaporator

The ideal vapor-compression refrigeration cycle is shown on the Pressure-Enthalpy (P-h) diagram (Fig. 1.3).

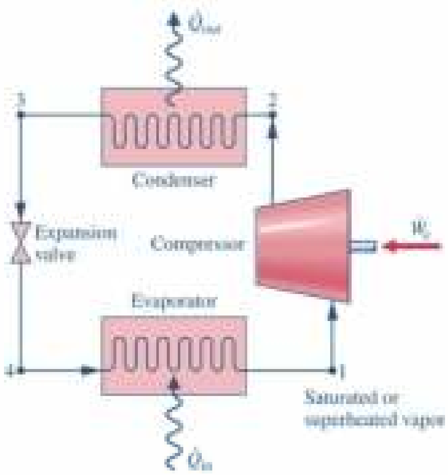


Fig.1.2 Ideal vapor-compression cycle

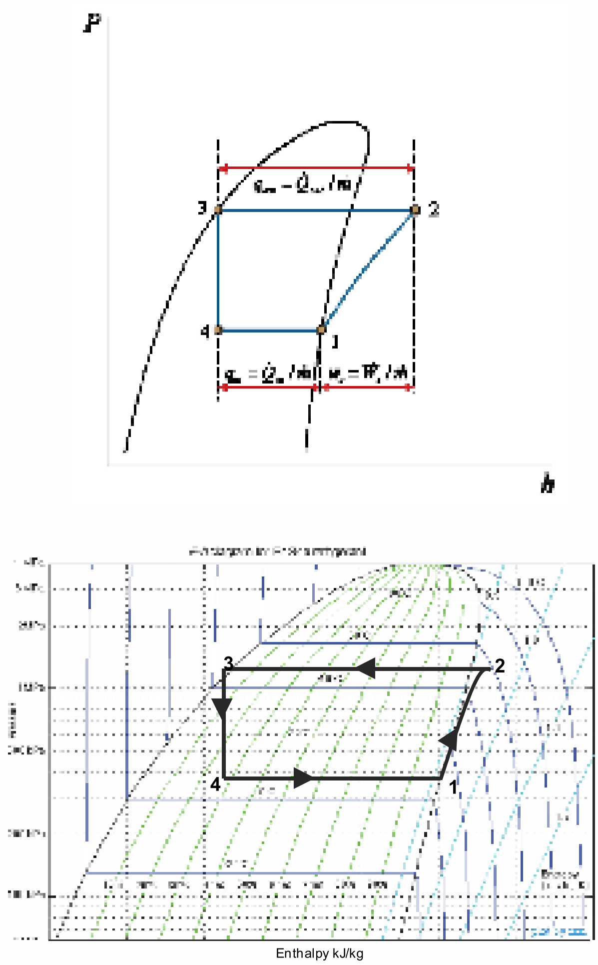


Fig.1.3 Ideal vapor-compression cycle on the Pressure-Enthalpy (P-h) diagram

Thus the refrigeration cycle comprises of:

(1) Absorption of heat from the substance to be cooled by the evaporation of a liquid refrigerant in the evaporator at a controlled lower pressure.

(2) Raising the pressure (to raise the condensing temperature) of the low pressure vapour coming from the evaporator, by the use of the compressor.

(3) Removal /rejection of heat from the high-pressure vapour in the condenser so as to liquefy or condense the vapour.

(4) By the use of the throttling device, reducing the pressure of the high-pressure liquid (from the condenser) to the level of pres¬sure needed in the evaporator.

These components are inter-connected by pipes-such a, evaporator to compressor by the suction line, compressor to condenser by the discharge or hot gas line and from condenser to throttling device by the liquid line. In addition to raising the pressure of the vapour, the compressor also creates the pressure difference between the evaporator and condenser and thus maintain a continuous flow of the refrigerant through the system.

1.4 WORKING OF VAPOUR COMPRESSION REFRIGERATION SYSTEM

Vapor-compression refrigeration system is a closed thermodynamic system and the working fluid used in this closed system is known as refrigerant. In this system compressor sucks low temperature low pressure refrigerant vapors from the evaporator and compresses to high temperature high pressure refrigerant vapors by application of work, after compression the refrigerant vapors are superheated. These high temperature high pressure superheated refrigerant vapors goes to the condenser, firstly these refrigerant vapors are desuperheated and then condensed to liquid refrigerant by rejecting latent heat to the atmosphere in case of air cooled condensers and rejecting the heat to cooling water in case of water cooled condensers, using cooling towers.

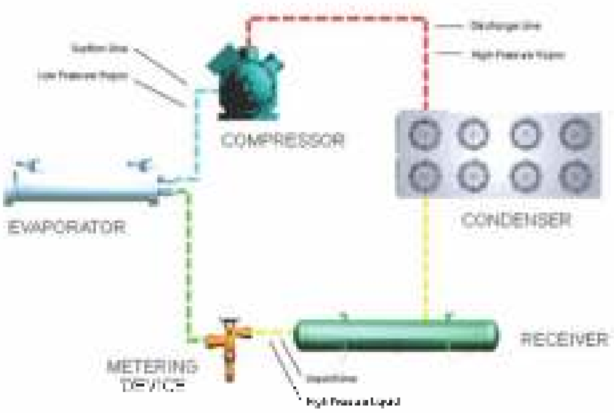


Fig.1.4 Working of vapor-compression refrigeration system

In rare cases the liquid refrigerant is sub-cooled in the condenser if the cooling water inlet temperature to condenser is lower or the flow rate of cooling water is higher. Sub-cooling is always advantageous. From condenser, the high-pressure liquid refrigerant enters the throttle device (expansion device or metering device) having narrow opening, expansion of refrigerant will takes place; pressure of the refrigerant is reduced. We get the cooling effect, after throttling the low temperature refrigerant is a mixture of liquid and the vapour part depend upon the pressure drop in throttling device, if pressure drop in more, more friction, more vapour formation. This low temperature refrigerant enters the evaporator and abstracting the heat from the food stuffs preserved in case of refrigeration or abstracting the heat from the space to be air-conditioned, evaporation of refrigerant will takes places, then again these low temperature low pressure refrigerant vapors sucked by the compressor. This cycle repeats again and again. This is known as vapour compression refrigeration cycle (system).

1.5 COEFFICIENT OF PERFORMANCE (COP) OF VAPOUR COMPRESSION REFRIGERATION SYSTEM

Coefficient of Performance of vapor-compression refrigeration system is defined as the ratio of net refrigerating effect to the compressor work.

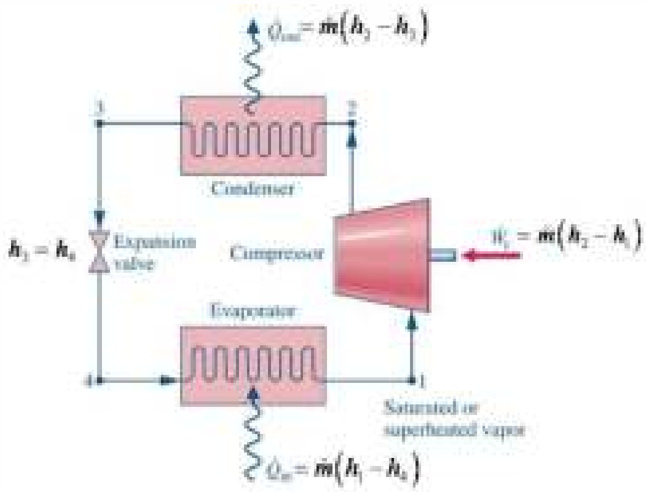


Fig.1.5 Coefficient of performance of vapor-compression refrigeration system

Coefficient of performance (COP) = Net refrigerating effect / Compressor work

= N / W

Net refrigerating effect (N) $= m\,(h_1 - h_4)$

Compressor Work (W) $= m\,(h_2 - h_1)$

Where (m) = mass flow rate of refrigerant

h_1 = specific enthalpy at compressor suction

h_2 = specific enthalpy at compressor discharge

h_3 = specific enthalpy at condenser outlet

h_4 = specific enthalpy after expansion

1.6 ACTUAL VAPOUR COMPRESSION REFRIGERATION SYSTEM (CYCLE)

An actual vapor-compression refrigeration cycle involves irreversibilities in various components - mainly due to fluid friction (causes pressure drops) and heat transfer to or from the surroundings. As a result, the COP decreases.

Differences

- Non-isentropic compression;
- Superheated vapor at evaporator exit;
- Sub-cooled liquid at condenser exit;
- Pressure drops in condenser and evaporator.

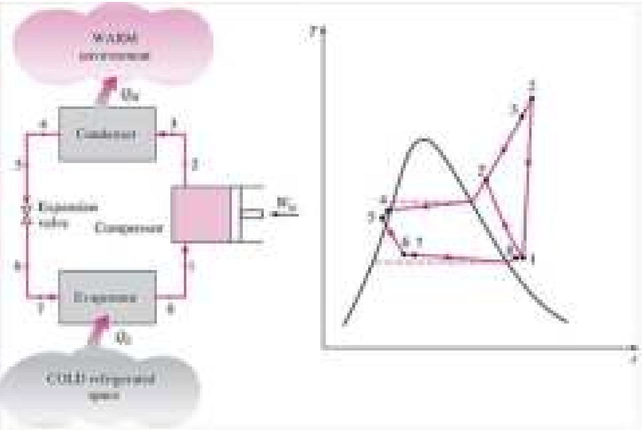


Fig.1.6 Actual vapor-compression refrigeration system

In actual vapor-compression refrigeration cycle there is pressure drop in suction vapour in flowing through the suction line from evaporator to compressor inlet. Refrigerant vapours from evaporator flowing through suction valve, suction valve offers resistance, bulk volume of vapours is drawn through narrow opening of suction valve, there is wire drawing effect, its effect is pressure drop.

Suction is at low temperature and discharge of refrigerant is at high temperature, due to that cylinder walls are at high temperature. Hence there is heat transfer is from cylinder walls to suction, due to that there is increase in enthalpy.

During compression, the temperature and pressure of the vapour refrigerant is increased. There is heat transfer from refrigerant to cylinder walls; hence there is increase in enthalpy. There is wire drawing effect during the passage of vapour refrigerant through discharge valve, its effect is pressure drop.

There is pressure drop in discharge line because of frictional resistance to flow of refrigerant due to roughness of pipe. There is also pressure drop in condenser due to frictional resistance to flow of refrigerant. In liquid line there is also pressure drop due to frictional resistance to flow of refrigerant.

In evaporator, there is pressure drop due to frictional resistance to flow of refrigerant. On changing from liquid to vapour, velocity of refrigerant is increased; its effect is pressure drop.

Dr. Rajinder Singh's Classroom Series

Dr. Rajinder Singh
Past President (2015-16) & Chair Student Activities - ASHRAE India Chapter)
DL ASHRAE USA
Professor - Pusa Institute of Technology

This classroom is started in view to strengthen the theoretical knowledge of Engineers from Industries in Refrigeration & Air- Conditioning field. This will also be helpful for the students interested in this field. This will be continuing in our quarterly Newsletter issue. In the second class we are covering 'Refrigeration and Vapor Compression Refrigeration System (Cycle)'.

ASHRAE Celebrates Grand Opening of New Global Headquarters Building

Focus on the economic viability of transforming existing buildings into sustainable, resilient & healthy operations

Front Left to Right (with scissors): Jeff Littleton, ASHRAE Executive Vice President; Ginger Scoggins, ASHRAE Treasurer; Klas Dahlberg, Head of Business Area, NIBE Climate Solutions, Mick Schwedler, 2021-22 ASHRAE President, Jeremy Witikko, Office of the Chief Technology Officer, Cisco, Farooq Mehboob, ASHRAE President-Elect, Mike Mason, Mayor of Peachtree Corners; **Back Left to Right:** Tim McGinn, ASHRAE Building Ad Hoc Committee Member, ASHRAE Presidential Member, Chuck Gulledge, Darryl Boyce, ASHRAE Presidential Member, Sheila Hayter, ASHRAE Presidential Member, Blake Ellis, ASHRAE Building Ad Hoc Committee Member, Don Brandt, ASHRAE Building Ad Hoc Committee, Michael Cooper, ASHRAE Building Ad Hoc Committee Member.

ATLANTA (November 18, 2021) – ASHRAE today formally opened its new global headquarters building, following a ribbon cutting ceremony, attended by its board of directors, top building campaign donors, elected officials and local guests. The Society completed a $20 million building renovation project intended to prove the economic viability of a fully net-zero-energy (NZE) operation.

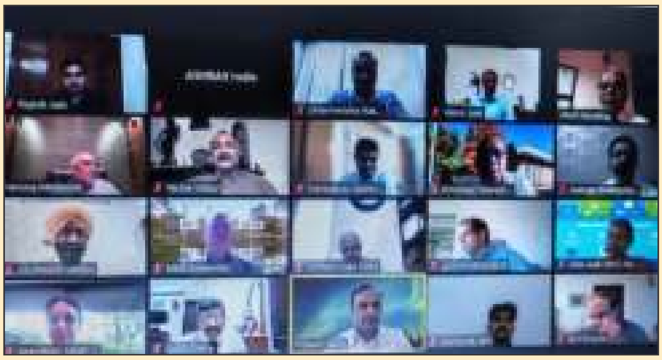
"The completion of this project is an important milestone for ASHRAE as a professional society and for the built environment worldwide," said 2021-22 ASHRAE President Mick Schwedler, P.E., Fellow ASHRAE, LEED AP. "Our investments in energy efficiency and sustainability will boost innovation within the built environment and inspire others to replicate our headquarters' project model. Our Society reimagined a pathway forward for existing building stock and is pleased to provide an example of the future of high performance buildings."

The renovated, 66,700 ft2 building, situated on 11 acres of land at 180 Technology Parkway in Peachtree Corners, Georgia, is the culmination of a 10-month project, completed in October 2020, during the height of the COVID-19 pandemic.

ASHRAE India Chapter ACTIVITIES

7th July, 2021

ASHRAE India Chapter is successful Annual General Meeting and Installation Ceremony of the new AIC BOG (2020-2021) held on Friday, 7th July, 2021 from 06.30 pm onwards at Virtual. Congratulations to the new team and Thanks to ASHRAE President Mick Schwedler, President Elect. Mr. Farooq Mehboob, Richie Mittal, Krishnan Vishwanathan, Ashish Rakheja for their motivational speech and support.



Date, 2021

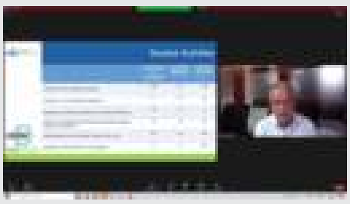
ASHRAE India Chapter's 1st Hybrid & Virtual BOG Meeting for the Society year 2021-2022. Lots of Interesting New Webinars and Events Coming up, do keep a lookout for them by following us on our social media Channels:

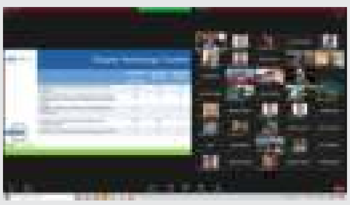
26th-28th July, 2021

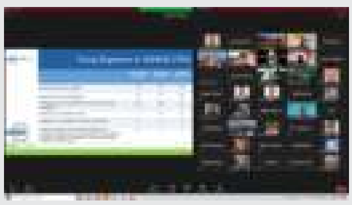
Sub Regional Virtual Meeting: held on 26th - 28th July 2021.

ASHRAE Rajasthan Chapter has successfully conducted the Orientation program for Chapter Officers and Chairs. This program was inaugured by Richie Mittal.

Krishnan Viswanath, Aakash Patel, Nitin Naik and Yashkumar Shukla talked about Chapter operation, Nomination process, Membership promotion, CTTC and Commercialism policy.







ASHRAE India Chapter ACTIVITIES

31st July, 2021

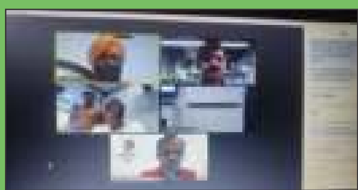
Webinar on RAL Progamme was held on 31st July-2021, The Programme was attended by 80 Students participants. Mr. Shrey Mahajan Presented lecture on' Air-Conditioning Overview and Related Industry Practices'. The event was appreciated by the participants and well attended.

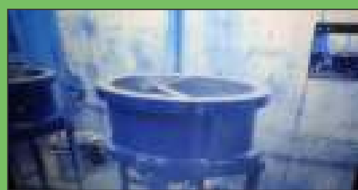
14th August, 2021

Webinar on RAL Progamme was held on 14th August, 2021. The Programme was attended by 40 participants. Mr. K. K. Mitra (RRL) Presented lecture on 'Modern energy efficient cold storage construction & Insulation System'. The event was appreciated by the participants and well attended.

21st August, 2021

Webinar progamme was held on 21st August, 2021. The progamme was attended by 80 student participants. Mr. Ravinder Khanna (Lead DPCV & BV), Mr. Sahil Sharma (Lead BFV) & Mr. Manoj Verma (IT Support)presented on "Live Virtual Industrial visit (Advance Valves: Briefing of Conventional Operations).





1st - 7th September, 2021

ASHRAE India Supporting Associations in LIVE 2021 Summit & Expo – ''An Initiative for a Healthier Workspace Environment held on 01 September - 07 September, 2021

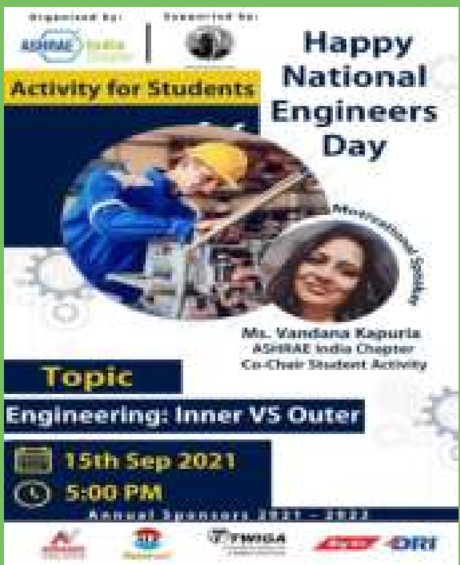
ASHRAE India Chapter

CELEBRATING 125 YEARS

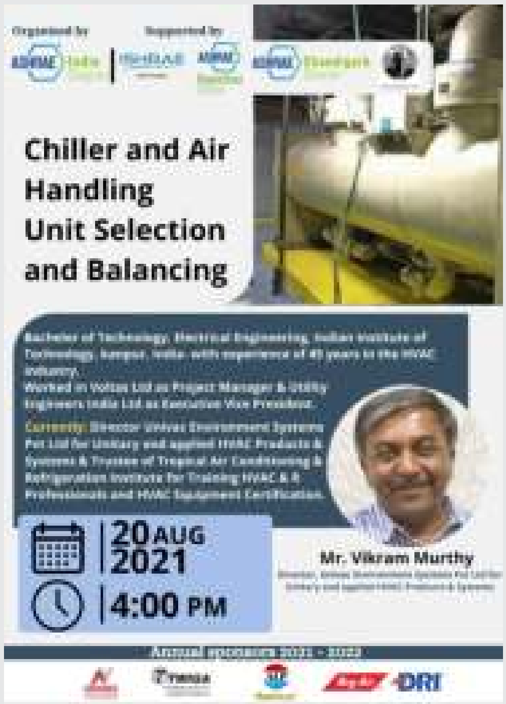
ACTIVITIES

15th September, 2021

A webinar was organized on 15th September, 2021 where Ms. Vandana Kapuria presented motivational speech on “Engineering : Inner VS Outer'. The programme was attended by 40 Students participants.



Webinar on RAL Progamme was held on 20th August, 2021. The Programme was attended by 40 participants. Mr. Vikram Murthy (RRL) Presented lecture on' Chiller and Air Handling Unit Selection and Balancing. The event was appreciated by the participants and well attended.



ASHRAE India Chapter ACTIVITIES

15th September, 2021

Ashrae India Chapter organized the 1st N.C.Gupta Memorial Football Tournament on 25th September, 2021 at Jamia Millia Islamia, Sport Complex, Okhla, New Delhi,

AIC Senior members Mr. Sunil Gupta, Mr. Abid Husain & BOG members Mr. Rajinder Singh, Mr. Abhishek Jain, Mr. Ashwani Jain, Dr. Varun Jain,Mr. Shrey Mahajan ,Mr. Rajesh Jain, Mr. Kanagaraj Ganesan , Ms. Vandana Kapuria all sponsers were present. Mr. Sunil Gupta grace the occasion. He was the initiator of this event. Mr. Gaurav Mathur – AVP – Sales Development (BS), Grundfos Pumps India Pvt. Ltd. inaugurated the tournament by playing first Match between AIC BOG Members & Coorporate members . Other members present from Gripple were Mr. Kapil Kapuria, The tournament was attended by 4 nos. Ashrae student chapters. The finalist were Delhi Technological University and YMCA - Faridabad. The tournament was won by Delhi Technological University. Prizes were distributed to the Winner, Runners up, 2nd Runners Up, The Golden Boot , The Man – of the Match, and Fighter of the match. A medal was provided to all participating players. Match commentary was provided by Ms. Indrani Rawat.

Big Thanks to our sponsors : Gold - Grundfos Pumps India Pvt.Ltd., **Team Name -** ALP Aeroflex India Pvt. Ltd., **Prize Money -** Anilesh Enterprises Pvt. Ltd., **Refreshment -** Gripple Hanger & Joiner Systems (India) Pvt Ltd, **Ground Sponsor:** Unifeb Insulation


फुटबॉल टूर्नामेंट में विश्वविद्यालय टीम का शानदार प्रदर्शन

फरीदाबाद। जेसी बोस विज्ञान एवं प्रौद्योगिकी विश्वविद्यालय, वाईएमसीए, फरीदाबाद के मैकेनिकल इंजीनियरिंग के छात्रों ने अमेरिकन सोसाइटी ऑफ हीटिंग, रेफ्रिजरेटिंग एंड एयर-कंडीशनिंग इंजीनियर्स के इंडियन चैप्टर द्वारा आयोजित एक

Date, 2021

Thanks to team of Turkish chapter for organising amazing first ever RAL Hybrid CRC at Istanbul which went flawless and no one missed out on any meeting.

Also thanks to each one of those who could attend physically and those virtually.

Congratulations to all for well deserved awards.

Thanks again for all you do for ASHRAE!