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Sustainable Transition

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Publisher's Letter

Growing Set of Needs Winging Out

Spotting an opportunity is a key to success. COVID-19 has changed the way we live and work. Coming November could have a scientific date for growing needs of people. At least, reopen transport and offices and to reopen schools in January 2021, seems to be a mathematical projection about pandemic, worked out by Tata Institute of Fundamental Research. However, I reiterate: my focus on the health and safety of employees will continue to be a priority in our publication house. Though, unexpected slowdown in industrial activity globally, mainly on account of COVID-19 pandemic, has severely impacted the HVAC&R industry, yet this presents an opportunity to develop the leadership skills and navigate through any channels of passivity into action.

Pandemic continues to disrupt world economy threatening lives and livelihood of people around the world. It raises a number of unique challenges for people, society, businesses and industry. Hence, patience, employees' safety and retention, managing with minimum resources; sustaining and redesigning strategies to tide over is what loyalty and leadership is meant to be in such long-term times.

At the outset, we thank all the authors for contributing articles to their own publication bringing knowledge of 'go green' refrigeration and HVAC industry for our readers. And we, at Chary Publications continue attending webinars, other networking sessions, providing the industry with latest content. This September 2020 issue presents its readers with coverage on concept of green buildings, energy efficient HVAC equipment and systems in changing environment.

Tracking changes in the markets, as well as the changing purchase behaviours of the consumer needs prime focus to validate new plan. Despite, warning signs of the killer pandemic, we are still finding ways and solutions to enable challenge its spreading menace. It presents a remote possibility in near future and if, I am given to believe my instinct, the broad killer wave will perch through 2020 end to provide any respite, as the counts of positive cases go haywire.

Please do write to me with your inputs to serve you in the best possible ways at pravita@charypublications.in

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ChemPoint to be ComStar's distributor

ChemPoint.com Inc., has been chosen by ComStar International Inc., for marketing, sales, and distribution of ComStar's performance refrigerant products in the United States.

The ComStar RS-Series of refrigerants offers a line of zero ozone depleting and low GWP solutions for a variety of industrial and commercial applications. The RS-refrigerants deliver enhanced chiller performance with a significantly lower environmental impact than older, harmful hydrochlorofluorocarbon (HCFC) and HFC chemistries with higher GWP, used in air conditioning, commercial, and industrial refrigeration, chillers, refrigerated transport, appliances, equipment with capillary and TXV expansion devices.

While ComStar will continue to develop and deliver innovative refrigerant solutions for the consumer and industrial end markets, ChemPoint will leverage its technical expertise and high service level to reach new markets and applications.

Rick Hoener, Global Managing Director, ChemPoint said, "We are excited about our new partnership with ComStar. As yesterday's harmful refrigerant technologies are phased out, it is important to select an eco-conscious, environmentally friendly refrigerant. ComStar's advanced refrigerants are recognized for their quality and low GWP. Their 45 years of experience in manufacturing environmentally friendly chemistries is a perfect match with ChemPoint's agile and innovative digital approach to providing superior customer service to the trade professional market."

Steven Mella, CEO, ComStar said, "ComStar manufactures a comprehensive product line of environmentally safe, industrial strength chemical products for the trade professional. ChemPoint's unique customer support platforms set them apart from chemical distribution companies of the past. We're confident that ChemPoint's outreach tools and customer-driven services will help extend the reach of ComStar's state-of-the-art low GWP retrofit refrigerants, ultimately helping to reduce the carbon footprint of refrigerants." ■

CSIR-CMERI Develops World's Largest Solar Tree



Solar Tree is a quantum leap towards making energy reliant and carbon negative India. Each solar tree has the potential to save 10-12 tons of CO₂ emissions being released into the atmosphere as GHG, when compared with fossil fuel fired energy generation. Besides, the surplus generated power can be fed into an Energy Grid.

CSIR-CMERI developed world's largest solar tree, is installed at its Residential Colony, Durgapur. **Prof. (Dr.) Harish Hirani, Director, CSIR-CMERI**, elaborating about the technology stated that, "The installed capacity of the solar tree is above 11.5 kWp. It has the annual capacity to generate 12,000-14,000 units of clean and green power."

The Solar Tree is designed to ensure maximum exposure of each solar PV panel to sunlight and also creation of the least amount of shadow area beneath. There are a total of 35 solar PV panels in each tree. Prof.(Dr.) Harish explained, that solar tree also has certain customizable features for application at diverse sites. The solar trees were designed to ensure minimum shadow area, thus potentially making them available for widespread usage in agricultural activities such as high capacity pumps, e-Tractors and e-Power Tillers. These trees can be aligned with agriculture for substituting price-volatile fossil fuels. Solar tree has the capability to incorporate IoT based features, i.e., round-the-clock CCTV surveillance in agricultural fields, real-time humidity, wind speed, rainfall prediction and soil analytics sensors. ■

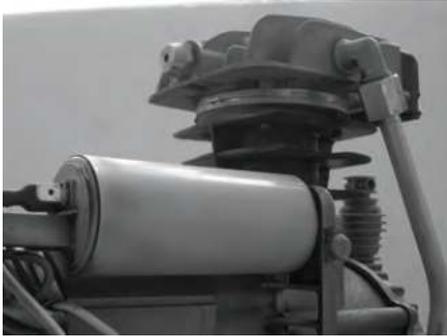
Gold Certification by IGBC for ABB India's Nashik Factory Certified as Green Building

IGBC 'Green Factory Buildings' is the first rating program developed in India, exclusively for the industrial sector. This is based on globally accepted energy and environmental principles and strikes a balance between known established practices and emerging concepts.

ABB India's commitment towards sustainability and eco-efficiency is recognized with a gold certification by the Indian Green Building Council (IGBC) for its environmentally friendly Nashik smart factory in India. With this recognition, ABB India's site becomes the first factory to be certified as a Green Building within the Nashik Industrial Area, which houses approximately 10,000 factories across various industries. ABB India has taken various initiatives at its facility to reduce their carbon footprint through in-house solar panel installation, energy efficiency improvement projects, and tree plantation drives. In addition, the company has also taken up various waste management initiatives to eliminate the usage of stretch film and reduce use of single-use plastic for packing purposes.

The factory has scored high on multiple parameters including rainwater harvesting which helped save 565 m³ of rainwater per day, and reduction of indoor water usage by 47.8%. The facility has achieved overall energy savings of 95.03% and mitigated CO₂ emission by up to 345 tons per year. Apart from this, the natural topography & landscape, sensitivity for differently-abled, usage of natural light and efficient ventilation system, heat island effect on the roof, wastewater treatment through sewage treatment plant, employee collaboration areas, and gym and recreational facilities were some of the important factors that added to the factory's overall rating. ■

Danfoss introduces 450-ton Turbocor VTX oil-free compressor



Representative Image by Cagper from Pixabay

Danfoss launched highest-capacity oil-free compressor, yet bringing the benefits of Danfoss Turbocor magnetic bearing technology to larger water-cooled chillers.

With a nominal capacity rating of 450 tons/1 600 kW, the Danfoss Turbocor VTX1600 can bring efficiency and long-lasting performance to larger applications like hospitals, data centers and university campuses. Also, multiple configurations, delivering capacities over 3600 tons / 12600 kW, are possible.

The VTX1600 is built around the same Turbocor technology, that's proven effective in more than 80,000 chillers worldwide, over the compressor's life. It is built in the USA and China to ISO 9001:2015 and ISO 14001:2015 standards, with support from the world's leading supplier of oil-free compressor technology. The permanent magnet synchronous motor and integrated variable speed drive provide high efficiency and enable compact design. The compressor that delivers world-class efficiency under all load conditions, is designed for use with R134a using most trusted oil-free technology and a large operating map to suit wide range of application conditions.

Eddie Rodriguez, Aftermarket Product and Service Manager, Danfoss Turbocor said, "VTX1600 represents five years of refinement and innovation at the high-capacity end of the Danfoss Turbocor range. Chiller OEMs have wanted this for some time. Now, they're able to use the Turbocor technology they know and trust to deliver efficiency and long-lasting performance in larger applications. Compared to screw non-inverter compressors, that means they can do away with oil management maintenance, cut noise, and improve part-load efficiency by up to 30%." ■

HVAC systems disabling Not a Measure to Reduce Virus Transmission

William P. Bahnfleth, professor of architectural engineering at the Pennsylvania State University and US chair for the ASHRAE epidemic taskforce, in his published research paper, 'Fundamentals of Covid-19 Risk Management' concludes that HVAC systems primarily reduce risk of aerosol and airborne transmission by reducing airborne concentration. And, during COVID-19 pandemic, concerning transmission of SARS-CoV-2 and the operation of HVAC systems, ASHRAE leadership approved the following two statements.

Transmission of SARS-CoV-2 through the air is sufficiently likely that airborne exposure to the virus should be controlled. Changes to building operations, including the operation of heating, ventilating, and air-conditioning systems, can reduce airborne exposures.

Ventilation and filtration provided by heating, ventilating, and air-conditioning systems can reduce the airborne concentration of SARS-CoV-2 and thus the risk of transmission through the air. Unconditioned spaces can cause thermal stress to people that may be directly life threatening and that may also lower resistance to infection. In general, disabling of HVAC systems is not a recommended measure to reduce the transmission of the virus. ■

Future-ready Data Center Designed for Agility

Data centers areas host critical applications which consume a huge amount of energy and have evolving requirements. Legrand India launched Legrand Data Center Solutions (LDCS) bringing together a portfolio of global brands including Legrand, Numeric, Raritan & Server Technology under one team. LDCS is designed for agility, to give maximum flexibility for growth, allowing companies to cost-effectively expand, modify or replace technology and applications.

LDCS is one-stop customized data center infrastructure solution with user-centric design and flexible infrastructure, aiming to address a market size of INR 3000 crores and to address the needs of all kinds of data centers. It offers a wide range of server, network racks, high-performance cooling solutions. LDCS also includes all-in-one micro data center solution offering compact server room equipment.

Speaking on Legrand India's forward integration of its business and brands portfolio, **Tony Berland, MD & CEO**, said, "Datacenters in India is growing at a very fast pace. We are witnessing a growth of about 8.5%. Companies across sectors are accelerating their digital adoption. With our global presence, experience, offering and current portfolio of brands in India, we felt it is time to demonstrate our focus and support the data center market in India and make it future-ready."

Sanjay Motwani, Business Head, LDCS, remarked, we are bringing multiple brands under one umbrella in India. We can mould the latest technologies to the customer's requirement. We intend to support companies to stay ahead of the curve. Our solution is designed for agility, which essentially means that it is a solution which can deliver what the customer wants, in a way that is flexible, fast and scalable. With the government sharing the cause for data center infrastructure development, there is more and more reason to believe that Legrand Data Center Solutions will have a compelling growth story unfolding for itself. ■

Ingersoll-Rand (India) announces Mission Critical Products Across Industries in 2020-2021

Ingersoll Rand announced the launch of new rotary screw compressor and small reciprocating in India as a part of company's larger plans of launching an extensive product portfolio in the year 2020-21 in India, over the coming months. These products will bring the best of Ingersoll Rand and Gardner Denver technologies. Two new products launched includes small air-cooled reciprocating in 3HP-25HP and new rotary screw in 7.5-11kw. CompAir reciprocating compressor is designed for heavy industrial applications to provide quality and performance. While 7.5-11kw rotary screw compressors ensures maximum uptime through its rugged design, better efficiency through integrated compression module and compact footprint to save floor space.

Amar Kaul, CMD, Ingersoll-Rand (India) Limited said, "Ingersoll Rand over the years has been known for introducing reliable and energy efficient products with applications across critical industries, helping them enhance productivity. The merger of Ingersoll Rand with Garden Denver will help offer our customers with a more robust and holistic product and services portfolio." He added, past few months have been critical for businesses, and we at Ingersoll Rand have ensured a continuous support to our customers even during lockdown to enable them in their efforts to contain the spread of Covid-19. We used this period (lockdown phase due to Covid-19) to increase our investments and resources on new products innovation and accelerate the launches.

During Covid-19 outbreak, Ingersoll Rand continued servicing mission-critical products that support essential sectors on the front lines of minimizing the spread and fighting the impact of COVID-19, including the healthcare, food, transportation and logistics, critical manufacturing, energy and defense industrial sectors. ■

Trane's New Technology: Clean Air in Shopping Malls Draws Higher Footfalls



Climate controls company, Trane Technologies announced, it was the first in Singapore to launch a new suite of air cleaning systems. The company's technology uses both photocatalytic oxidation (PCO) and ultraviolet germicidal irradiation (UVGI), along with electrostatic filter technology that when combined, kills or inactivates microorganisms including viruses that passed through the filters.

Wisma Atria is one of the first commercial developments in Singapore to adopt air cleaning system. In Singapore, one of the first to adopt Trane's latest air cleaning system using PCO and UVGI is - YTL Starhill Global REIT Management. Starhill said the indoor air quality of Wisma Atria shopping mall and office tower gets improved from August. It is installing an "air cleaning system using UV technology capable of purifying air inside the ductworks of its AHU. This is on top of deploying autonomous disinfection robots that use innovative UV-C LED technology effective in killing microbes including viruses like Covid-19; as well as applying antivirus and antimicrobial coating to high-touch surfaces such as lift buttons and escalator handrails.

Such steps taken by owners of malls and other public areas give assurance to visitors. **Cheng Sin Yew, Trane vice-president of mature market for HVAC & Transport, Asia Pacific** said, "In a typical commercial building or shopping mall, it takes about six air changes to clean and filter away the contaminants." ■

Truck Refrigeration Unit Market Projected at USD 15 Billion by 2025

The demand for refrigeration unit is driven by the increasing demand for frozen and chilled products and increasing sales of commercial vehicles. Truck refrigeration unit market estimated at USD 10.5 billion in 2018, is projected to reach USD 15.0 billion by 2025, at a CAGR of 5.21%, reports Reportlinker.

Light Commercial Vehicle segment estimated to be the largest truck refrigeration unit market. LCVs are preferred for transportation of perishable goods within the city. With rising urbanization in developing countries, refrigeration unit market is expected to grow in future. However, fitment of the frozen refrigeration unit requires certain power output of light trucks as frozen refrigeration unit comes with high capacity compressor. So, the refrigeration unit fitted in LCV is economical. The roof mount system segment is estimated to be the fastest LCV refrigeration unit. The reasons attributed to the growth of this system are enhanced operational efficiency, lightweight, compact size, and low maintenance cost among others. On the other hand, the split systems are economical compared to the roof mount system, and hence, presently it has a higher adoption rate in the developing countries of Asia-pacific. However, owing to its benefits over the split system, the roof mount systems are projected to dominate during this period.

Asia Pacific region is projected to lead this market, as India, China, and Japan, have a substantial consumption of frozen and chilled products. Countries such as India and China are improving their cold storage infrastructure in order to prevent wastage of items. Thus, to maintain the shelf life of perishable commodities, the demand for refrigeration unit is expected to remain significant in the coming years. ■

TECHNOLOGIES DRIVING The Indian FM Market

The feature covers the technologies responsible for rapid transformation of the Facility Management segment and how it will enhance the performance of Facility Management System in India over the years.



According to the Frost & Sullivan report, the Facility Management (FM) segment in India is on a steady growth penetration between 25%-30%. The commercial segment contributes more than 90% of the total FM market in comparison to the other facilities that rely on in-house operations. The rising awareness of benefits associated with Facility Management Services (FMS) is expected to drive the future of this

segment. Technology is developing rapidly, and FM companies need to keep up with the evolving requirements of their customers. Increased use of the internet and cloud-connected devices have led to tools like mobile apps, that enable facility managers to monitor a building remotely (on or off-site) and make decisions accordingly.

Internet of Things (IoT) and analytics, use of Building Information Modeling (BIM) tools, cloud solutions, drones and robots are some of the key technologies that will have a high impact on the FM sector.

Internet of Things (IoT) and Analytics

IoT (Internet of Things) is used to connect all sensors and devices through building automation and exchange, analyze information and optimize controls automatically. Current applications of Big Data analytics in FM are mainly focused on resource optimization and productivity improvement. Virtual energy audits are made possible by using Big Data analytics. Such installations enable proactive energy management programs that can save approximately 25% of energy.

ISS, an FM service provider, is using IBM's Watson IoT platform to manage its portfolio of 25,000 buildings globally. ISS and IBM integrate and analyze data from the devices and sensors embedded in buildings.

Building Information Modeling (BIM) tools

BIM tools are used by contractors and architects to develop and scale virtual models of building projects. BIM tools contain in-depth information on buildings, specifically related to several engineering departments along with architectural data. Facility managers use BIM tools to document new spaces, maintain facility documentation and create a streamlined collaboration channel, which helps reduce operating expenses. BIM tools integrated with ongoing work-order programs or facility maintenance software, improves the ability to retrieve operational and maintenance manuals, floor plans and asset information.

Cloud Solutions

Cloud-based FM software provides a centralized database that can be accessed remotely, via any device, at any time. Cloud services provide real-time asset management driven by connectivity, IoT and data analysis. It also reduces IT costs, as the software is maintained and supported by specialists, who take care of maintenance and security updates. Combining cloud solutions with data analytics in FM brings significant productivity gains by connecting the field to the office.

Drones

Drones allow faculty to monitor and gather information from places that are dangerous and hard to reach, such as rooftop equipment or building façades. It helps decrease downtime and accidental risk by providing safe inspection. It also helps reduce the costs associated with site visits, specific labour and downtime. Drones are at an initial stage in Indian FM but are expected to bring unprecedented opportunities for improved efficiency. In the future, drones will be able to serve transportation roles in FM services. For example, FM companies such as G4S have adopted the use of drones in a few facilities with the help of drone service providers.

AI and Robots

Artificial Intelligence (AI) and service robots are rapidly increasing in deployment levels in commercial and industrial buildings for technology optimization and service efficiency enhancement. AI and robotics will drive the transition from smart buildings to cognitive buildings and bring new opportunities for FM efficiency. Organizations can pilot robots for repetitive tasks or partner with suppliers that have expertise in the deployment and maintenance of robots.

The FM market in India is transforming and is driven by technological innovation, new business models, emerging value propositions and creative new service offerings. The key growth areas include remote management, predictive maintenance, building performance, energy management, sustainability, workplace optimization, and risk management. ■



Sustainable Transition

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In around every corner, topic of 'Health' leads the conversation. The ongoing pandemic has its own flattering achievement but, induced go green culture. This all is shaping our attitude to transition, till we adapt to 'new normal' environment. Corona virus rode in our seat, disrupting the green building market, restricting activity in relevant segments. As a result, now we have green opportunity times to innovate: built environment, lessen more GHG emissions and sustaining transition ...

- **Gopal Krishna Anand**

Nature's all novel transition, is forcing new thinking patterns, enabling newer visions and sensing new opportunities, to utilize its emerging potential. As visible, a probable offshoot of pandemic is 'green opportunity'. Good things are happening, pollution levels dropping; ozone layer over Antarctica recovers, global air currents shifting back to normal.

The green opportunity time is a positive gift of pandemic, to enable us shape a healthier future for all. Through this delicate time, U.S. Green Building Council announced its new vision, "healthy people in healthy places equals a healthy economy," which outlines actions and priorities that support the global recovery



effort. And, while we shift focus on green buildings, they provide reduced operating costs, reduced energy consumption, healthy environment and improved indoor air quality. The perspective lies in deploying IoT technology and processes to optimize indoor environment, occupants' comfort and well-being with sustainable design to increase operational efficiencies.

Green Intelligent Smart building

Green building term points to environmental sustainability. Improving, intelligence and integration, make buildings greener to achieve good air quality. The 'Intelligent' points towards technical solutions involving building automation, allowing centralized control of a building's energy systems, improving indoor air quality, heating, air conditioning, lighting and also thermal comfort of those within the building. The term 'Smart' points towards

“ **A nation that destroys its soils destroys itself. Forests are the lungs of our land, purifying the air and giving fresh strength to our people.** ”
– Franklin D. Roosevelt.

improving services and is an expansion upon building automation systems focusing on innovative users -friendly technologies to control systems remotely through smart phone. **Wigginton and Harris research** mentions, more than 30 separate definitions of the term 'intelligence' exist, relative to buildings. The **Intelligent Building Institute of United States**, defines IB as that provides productive and cost-effective environment through optimization of four basic elements: structures, systems, services, and management and the interrelationships between them. **European Intelligent Building Group** describes IB as, which creates an environment maximising effectiveness of building's occupants, and enabling efficient management of resources. A good **working definition maybe**: An intelligent building uses the latest technology and processes, to operate safely and efficiently.

Markets forecast positive trend

On technology front, intelligent building automation technologies monitor and control the building facility environment. In 2019, the global **Intelligent Building Automation Technologies market** size was USD 64.76 billion. With a CAGR of 7.2% during 2021-2026 it is expected to reach USD 105.92 bn by 2026 end. For energy efficiency and environmental design, intelligent building uses interconnected systems to assist BMS automation. Allied Market Research reports, **global intelligent building market** size valued at USD 12.37 bn in 2017 and growing at CAGR 19.6% from 2018 to 2024 is projected to reach USD 42.65 bn by 2024. The rise in need for energy efficient infrastructure, increased market for building automation and control system, penetration of IoT in BMS are some of the major factors to propel the growth of market.

ASHRAE standard and virtual conference

Result has shown that post-occupancy evaluation (POE) and the environmental measurements comply with ASHRAE 55 standard and TC 7.5 is concerned with the impact and interactions of smart building systems on the total building performance; methods for achieving intelligent control and operation of building processes. The building activity, changes in codes, design and new energy efficiency strategies were just some of the topic discussed among buildings professionals at a



New LEED guidance from USGBC Credits integrate public health and social equity with sustainability planning.



conference wherein, **Sheila Hayter, P.E. ASHRAE's Past President, and senior engineer at the National Renewable Energy Laboratory** remarked, the Winter Conference and AHR Expo provides an excellent setting for buildings professionals to collaborate on new ideas and share knowledge. As we

explore ways to incorporate renewable energy technologies into integrated building concepts, ASHRAE will take an even greater leadership role in defining the relationship between buildings and the power sector. Hayter highlighted, society updates and initiatives related to the theme **'Building Our New Energy Future'** and also, how ASHRAE is preparing buildings professionals for the challenges and opportunities of designing efficient and grid-responsive buildings within the changing energy sector.

Additionally, the fourth ASHRAE International virtual Conference at Beirut to be held November 5-6, 2020, with focus on 'Efficient Building Design' will deliberate upon novel building technologies that enhance environmental quality in buildings; and the impact of energy reforms on both - the demand and the environmental quality, with goal of saving costs, providing the needed thermal and air quality environment for better performance and improved health.

IAQ and thermal performance of buildings

Increasing ventilation, air filtration and physical distancing of occupants are few measures needed in COVID-19 times. We know that poor indoor air quality and thermal comfort condition in the workspace affect occupants' health and work productivity. The challenges, addressing health of the built environment are - lack of adequate ventilation of indoor spaces, causing poor air quality, inadequate thermal performance of existing buildings and 'just ventilation' strategies. The IoT and Industry 4.0 is making new breakthroughs in the standards and functioning of IAQ solutions

equipment. Building teams should ensure IAQ systems operating as designed, and determine ventilation that minimizes spread of COVID-19 through the air. Technavio predicts **global indoor air quality solutions** market to post a CAGR of close to 6% by 2022. According to KD Market Insights report, **global indoor air quality monitoring device** market is expected at a CAGR of 7.8% during the period 2018-2023. IAQ monitoring device market is driven by factors such as technological advancements and rising adoption of green building and smart home technologies.

New LEED Guidance for pandemic planning

Pandemic has reasoned challenges, in how we interact with buildings. USGBC is exploring how to address these challenges in the near term, with tools like the LEED Safety First pilot credits and Arc Re-Entry. The Safety First pilot credits are part of USGBC's economic recovery strategy introduced in May 2020 that centers around on new post-pandemic vision the 'economy' strategy. The **two new Safety First pilot credits** as part of the LEED for Cities and Communities rating system are designed to help local governments and development authorities, to better prepare for and respond to **future pandemic events**. The Safety First: **Pandemic Planning** credit is intended to help cities and communities prepare for, control and mitigate the spread of disease during a pandemic that poses a high risk to people. The Safety First: **Social Equity in Pandemic Planning** credit systematically considers equity implications across all phases of the pandemic preparedness, planning and response process.

Mahesh Ramanujam, president and CEO of USGBC, says, "The key to a better future lies in our ability to create places that support human and environmental health. LEED-certified cities and communities are already moving in that direction and they understand that effective planning is critical to tracking performance and making improvements. The current



pandemic is revealing new lessons every day and LEED's Safety First pilot credits provide a roadmap for taking action and bringing a more integrated and inclusive approach to rebuilding a healthier economy."

The new LEED pilot credits outline sustainable best practices that align with public health and industry guidelines related to cleaning and disinfecting, workplace re-occupancy, HVAC and plumbing operations. The credits can be used by LEED projects that are certified or are undergoing certification.

Trends in 2020 and beyond

Zero net energy home construction is a new trend, as climate crisis is a driving force towards more energy-efficient homes with safer IAQ, using green material. In the era of digital transformation and climate change, economics of building ownership are changing. Building-to-Grid (B2G) is an emerging platform that supports digitalisation and homes that are ready for the future, optimizing energy consumption, and comfort.

Glancing up, other three major industry trends for intelligent buildings stand to change market development scenario. Firstly, in 2020, investments are becoming a resource. The message is shifting from climate change to climate emergency, a new focus in action. Second trend includes energy efficiency for the reason to optimize major energy consuming systems in the buildings and deliver efficiencies. The transformation is contingent on the convergence of IT and OT. The biggest challenge is not technical, but human capital. Thirdly, the venture capital community has made PropTech as one of the largest targets for funding with estimates of near \$20 billion in 2020. PropTech is the category of digital technologies designed to buy, sell and manage real estate. The three predictions mentioned by Casey Talon, Research Director at Navigant Research in a post, are complementary, driving growth. They hold good for 2020 and beyond, and highlight opportunities for intelligent building solutions providers to bolster their financial well-being.

The year 2020 and beyond will see a paradigm shift, in bringing business improvement and tackling climate change. We must take advantage and utilise green opportunity times, provided by pandemic. As visible, during this time of uncertainty and isolation, only digital opportunities do connect, share, and engage all living beings.

High-performing buildings

Hines built more than 100 million sq.ft., of LEED-certified space and most of it at the Gold or Platinum level.

USGBC's Roger Platt, Senior Vice President, Strategic Partnerships and Growth, reflects on one of



the green building industry's biggest advocates, Hines role in spearheading the green building phenomena globally that remains largely under-reported. He uniquely shaped today's cutting-edge standards for the highest performing buildings in the world and inspired others to

follow his lead. In 2013 when accepting USGBC's prestigious President's Award, **Gerald D. Hines** said, "We decided early on it was important to have the most energy-efficient buildings possible. We always thought the clients would appreciate low operating costs and better conditions for their employees ... tenants today say I won't be in anything but a (LEED) Gold building or Platinum." This kind of market transformation doesn't happen without leaders like Hines.



Climate sustainability

We can continue to create a climate - fit for life. The abundance of carbon dioxide in atmosphere measures climate change's impact on human health. Reducing embodied carbon is the most urgent opportunity, as it stands today, with the manufacture of building materials making up 11% of total GHG emissions. Earth has natural carbon sinks: oceans, plants and soil, which absorb carbon from the atmosphere and lock it away. Businesses must take a cue from nature, and find ways to use and store carbon to reverse global warming, working in greater harmony with nature. Obviously, sustainability rests in our thinking.

Resilience to transition

The gene in human beings, carry attributes to transition with remarkable resilience. COVID Pandemic shadowed us, as if climate change pandemic was not enough. We were caught unprepared, inspite of warning signs of potential danger entering the world, endangering humanity. Globally, management of environmental health issues concerns all in 2020. World has transformed into virtual, networking, data creation, online education as routine now; while technology webbing in man's well-being and health-friendly environment. Cloud-based technology and BMS are evolutionary step in green intelligent buildings, adaptable to human needs to enjoy comfort and environment. We must analyse data, twittering from digital technologies to trace the demands of occupants. Buildings of future must connect the various digital tools in an integrated, dynamic and functional way, even better, if integrating future pandemics into analytics.

Conclusively, we are the architect of our own green-built prospects. The good option is to germinate new thinking and fathom comprehensive potential of what the future holds for green intelligent technology. Human creativity and skills developed during such times of green opportunity, and endowed upon us by pandemic default, will bloom potential in human beings, for the rest of year 2020 and beyond. Hence, institutions focused on 'green' must design strategy to invigorate effective renewal of digital technologies in handling climate, comfort and healthy built-environment to transition into new normal future.

To say at the end, a holistic vision of environmental issues will assure sustainable solutions: for sustainability is the choice for future into 'new normal' transitioning. ■

“Focused in developing solutions to address market demands ...”



In an exclusive interview with Cooling India, Esequias Pereira speaks about the topics concerning the HVAC&R sector and how is the industry coping up with the ongoing pandemic and advance technologies that are contributing to environmental sustainability.

Esequias Pereira Junior, Senior Sales Manager at Nidec Global Appliance, deals with Embraco brand portfolio for Asia Pacific region.

What are the updates within the industry concerning the refrigeration sector in India? How does the situation compare to what's happening globally?

In India, the refrigeration sector is in expansion, following the growing development of the food retail sector and changes in society, such as the increase in the number of working women, which reduces the time for daily grocery shopping and increases the need for keeping food fresh for longer. In other regions of the world this changes in economy and society have reached its peak and the growth is only incremental at this point.

Regarding technology updates and market demands, the Indian market evolves in the same direction of what is happening globally: energy efficiency, natural refrigerants, sustainability, competitiveness, low noise and quality in food preservation, with the addition of adaptability to voltage fluctuations. As Embraco is always attentive to market demands, we have been focused in developing solutions to address these demands, with high investments in research and development.

What are the various technologies in place for the sake of next generation refrigeration and cooling solutions? In what direction is market demand headed?

The main technologies in place for the sake of next generation refrigeration and cooling solutions are changes in the compressor's design in order to provide more energy efficiency, size reduction with embedded technology, the use of natural refrigerants and improvements in terms of acoustic perception. Another important technology in place is the variable speed compressors: known as inverter technology, which is ideal for regions with constant voltage fluctuations due to its wide voltage working range.

Variable speed compressors provide better temperature control, lower noise and energy efficiency. They can alone reduce energy consumption to the extent of 30% to 40% on average, in comparison with conventional fixed speed compressors (on-off), depending on the application. That is because variable speed compressors come with an embedded set of electronics that allow the compressor to control its working speed, decreasing it when the ideal temperature has been achieved and also increasing it when there is need for more cold, whereas fixed speed compressors turn off when the ideal temperature is reached, and turn on

again when there is need for more cold - which requires a big amount of energy. The electronics in variable speed compressors, allow it to be connected to mobile devices and have its performance controlled and managed remotely. As for the future, we see that natural refrigerants are gaining more and more preference especially for residential and light commercial applications, because of their contribution to mitigate global warming and to reduce operating costs. Natural refrigerants have GWP very close to zero and can add around 10% to 15% benefit in energy efficiency.

India is also a signatory to the Paris Agreement; how do we stand as a country in meeting regulations to achieve a low-carbon footprint?

There are a lot of initiatives, plans, monitoring and regulations that can be put in place by a country to achieve a low-carbon footprint. The Paris agreement has a holistic agenda towards the aim of decreasing global warming, involving CO₂ emissions, use of renewable energies and increase in energy efficiency. Regarding the HVAC&R sector, the Indian government has been fostering the development of sustainable solutions in this industry, and this is an important step towards reducing global warming, migrating from high global warming potential HFCs (hydrofluorocarbons) to low GWP options, such as natural refrigerants.

Considering the on-set of COVID-19, it is surely a game-changer. How would businesses have to re-write the script through which they function?

Whereas, Covid-19 has temporarily slowed down the industry activity in general, it has accelerated very important trends, such as the digital transformation and the plans and initiatives

Image by William Iven from Pixabay



for a more sustainable future. Businesses, from now on, must accelerate their plans of digitization, 4.0 industry, environmental impact reduction plans, sustainable solutions and so on, in order to keep up with this new moment in human history.

From the industry perspective, what are the pressing questions that need to be addressed concerning HVAC applications, meeting client and market demand?

The refrigeration market in general and our customers in particular, which are residential and commercial refrigeration equipment OEMs as well as wholesalers and distributors, are concerned with future proof solutions, which means solutions that are sustainable and comply with future regulations, have the lowest possible global warming potential, the best energy efficiency available, and that also take comfort and space use in consideration, being small and with low noise levels.

We have a big R&D team and structure to study and develop solutions with these characteristics, in both segments residential and commercial. Some examples of Embraco solutions that synthesize this approach are the FMF, the most energy efficient compressor in the market, and the Bioma, an outdoor condensing unit that has three access doors for easy maintenance and is 50% more silent than its market counterparts.

Tell us about technological advancement and the call for energy efficient solutions, also how big is this demand?

The demand for energy efficient solutions is one of the biggest market demands in the present global scenario. It is a demand that comes not only from our customers, but also from the end consumer and large food and beverage brands, and is fostered by local countries' regulations as well.

According to the International Institute of Refrigeration (IIR), refrigeration and air conditioning together respond for 17% of the electricity consumption in the world. After reliability, the strongest wave of evolution in compressors has been energy efficiency. It is measured by the Coefficient of Performance (CoP), which is the cooling effect divided by the energy you consume to create this cooling effect.

The evolution in this aspect, in our Embraco portfolio has been big both for commercial and residential applications. In commercial refrigeration, for example, an Embraco NE compressor had a CoP of 1.2 twenty years ago. Today, you can have an Embraco EMC series, much smaller, doing the same job, with a CoP of 1.9, which means 60% more energy efficiency. In domestic refrigeration, the EM, launched in 1982, evolved from an CoP of 1.19 when launched to 1.96 in 2015.

What are the updates concerning policy and regulation around refrigeration? What role can the government play for the future?

The main regulations around refrigeration are focused on themes like: refrigerants and the phase-out of HFCs, energy efficiency standards, and safety standards. These are themes regulated by the government and its agencies, so the state plays a major role in defining the future in this regard.

But, some international cooperation between countries proposing long term regulations can significantly change the refrigeration sector status, such as the Kigali Amendment, as the next step after the Paris agreement, proposing to gradually reduce the consumption and production of hydrofluorocarbons (HFCs) to eliminate its use. With this, we expect that the industry shall massively transition to more environmentally friendly and available alternatives such as hydrocarbons.

When it comes about Indian legislation, the government has been raising the efficiency standards for home appliances, including refrigerators. The fast growing penetration rate of refrigerators, the interest in greener options and the industry capability to deliver more efficient solutions are a good match and seems to bring a bright future not only for the industry, but for the end users as well. As an example, in order to achieve the new India BEE (Bureau of Energy Efficiency) maximum rating, valid from January 2020 on, it is required the usage of inverter technology (variable speed compressors) combined with natural refrigerants.

Project related information that you'd like to share with us?

Just to give an idea of the energy efficiency that can come from the combination of variable speed and natural refrigerants in compressors, we would like to share the results of a co-developed project with a visicooler manufacturer, a customer that is present in 115 countries. The co-development project involved two product lines: a horizontal freezer, for frozen products, and a vertical showcase, for beer and energetic beverages conservation. The solutions used the Embraco FMF compressor, which brings the features of inverter and bivolt technologies combined with natural refrigerant R290, making it not only sustainable but the most efficient commercial compressor in the market. The result was a reduction of 55% of energy consumption in the applications, when compared with conventional similar systems.

In addition, the Embraco brand bivolt technology allows the compressor to work in a broad range of voltages, assuring that the appliance will keep working even with power peaks and unstable energy lines. ■

PARADIGM SHIFT IN BUSINESS SUSTAINABILITY

To conserve environment is one of the strategies to meet the challenges in Post COVID-19 scenario

Image by pixabay.com

During last week of August 2020, a webinar session was organized by PHD Chamber of Commerce and Industry (PHDCCI) on 'Paradigm Shift in Business Sustainability – Strategies to Meet the Challenges in the Post COVID-19 scenario'. At the session, Dr. J. P. Gupta, Chairman, Environment Committee, PHDCCI stated, 'environment is a key driving factor for running the industry and there is a need to run the industry with consideration towards the environment for sustainability and growth', while introducing Dr. Sujit Kumar Bajpayee, Joint Secretary, Ministry of Environment, Forest and Climate Change, Government of India.

Speaking at the session, Dr. Sujit mentioned, pandemic and climate change are related to anthropogenic activities. Due to e-pandemic, many businesses need to change models of sustainability and understand that we all need to take ownership of the future. Industries must come forward to conserve the environment and to ensure long-term business sustainability. Due to the lockdown, CO₂ emissions are predicted to fall down around 8% in 2020. He threw light on the impact of Covid-19, that has molded our ways of sustaining business and that there is a need to recover business from this pandemic. The key to long-term business sustainability is the need to take care of workers, employees, nature, and environment. Covid-19 has forced individuals, institutions, and society to rethink the ways we have conducted so far and our decision making at home, work, and society.

Adding further, he said, while the pandemic has given a lot of challenges, it provided an opportunity to jump-start the economies, rebuild societies through recovery plans and focus on climate change and environment conservation. Talking about the importance of environment and conservation of natural resources, he remarked upon the importance of bio-diversity - the foundation of life on earth, its connection to human lives that allows us to grow while catering to our basic, cultural and spiritual needs. We need to realize that our life and livelihood revolves around nature and the environment.

Dr. Sujit concluded saying, the nature is also an essential source of many medicines. And, industries like agriculture, construction, food and beverages are highly dependent on nature. Such industries require direct extractions of resources from the forest or rely on ecosystem services such as healthy soil, clean water, and a stable climate. Due to many reasons, lots of species have gone extinct which has disrupted the eco-system. The impact of this pandemic is so complex that it will be continued to be analyzed for years. We need to manage our ecology in the right manner; help nature to help ourselves and conserve the bio-diversity to sustain nature to stabilize the earth.

Dr. D. K. Aggarwal, President, PHDCCI observed that the silver lining of the pandemic is the improvement in the quality of air and water. We could see the goodness of 'Nature' due to the lockdown and, we can see that it has taken its course of stabilizing the things. Talking about business sustainability, he said, in today's times, it is driven toward the contribution to the environment and society. The environment is pivotal, we owe our duty and responsibility towards it to ensure that we do not pollute or damage it. In these times, many companies are investing their funds in environmental, social, and corporate governance companies. We need to give back to the planet, people, and profit to sustain the environment. There is a change in business models, and the technology is driving factors for running the business. It's time to change the business models, which look at the environment and contributes to 'Self-reliant' India.

Saurabh Sanyal, Secretary-General, PHDCI delivered a formal vote of thanks to all the delegates and participants assuring that PHD Chamber of Commerce and Industry will stand in full solidarity with the government and environment to grow an eco-friendly self-reliant country.

The session was moderated by Dr. Ranjeet Mehta, Principal Director, PHDCCI; and witnessed the presence of Dr. R. K. Somany, PHDCCI Former President, and other industry stalwarts' pan-India. ■



COOLING TOWERS

INSTALLATION BENEFITS

Cooling tower is an essential utility in chemical, petrochemical, pharmaceuticals, specialty chemicals, engineering companies, where any sort of thermal processing requires Process Cooling. Out of conventional cooling methods to dispense heat to atmosphere sink, two predominant heat dispensing media air and water are widely deployed. Water dominates air, having better thermal characteristics.

Process cooling selection is a skilful decision, as it depends on variety of variables like heat load, temperature differences, and extent of cooling, geographical location, resource availability, ambient conditions and cost of operation. A wise decision at inception returns for a life.

For example, in desert-like geography or average cold ambient areas, air cooling may be cheaper, whereas water cooling can be preferred, where ample water is available and lower atmospheric dew point areas prevail.

Here, we shall focus on water as cooling media, conventionally called as Cooling Water. It is a dominant utility and attracts a good amount of 'Cost of Operation'. Improper

design of cooling water system will impart Process Inefficiency in system and drain a lot of cost, always.

Cost control opportunity in cooling water system is enormous right from selection, installation, operation and maintenance. Our target of discussion in this article are-

- Installation of cooling towers : At ground or at Highest Level floor
- Central Distribution network vs. Discrete distribution network
- One pump for all floors Vs one pump for each floors.

Beyond selection of type and size of cooling tower based on Thermal load and extra margins, the question comes here is to brain-storm on various aspects of Installations to eliminate inherent power inefficiencies from cooling water system, right at design stage and receive best returns for life cycle.

Installation of Cooling Towers: At Ground Vs Highest Level Floor

Industries deploy two type of cooling tower installations. One is On Ground shown in Figure-1. But installations at Highest Possible Elevation in the premise are very rare as shown in Figure-2. The second option is much better in terms of power cost saving and on other factors. Table-1 narrates distinct pros and cons of Conventional and Highest Elevation installations. A numeric sample calculation at the end will flash economical advantage of it. Careful citation on Table below speaks all about it.

Table-2 show power cost comparison for both the options, Considering 100 TR cooling tower, for 5 Deg Delta T range, with equipment requiring cooling water, installed at 20 mtr elevation from ground. Circuit has same equipment and distribution piping network.

Nozzle header of second installation option 10 mtr. above highest point in C W distribution circuit.

Savings in fan power cost per year are not accounted here, we can avail advantage on power saving, as a function of TR rating of cooling tower and pumping head difference. For big capacity cooling towers, numbers of modules of say 500 TR can be installed at top floor level, leaving flexibility margin.

It is empirical to install cooling towers at highest possible level in plant, forming monomeric type piping circuit with proper citation on their plant specific installations.

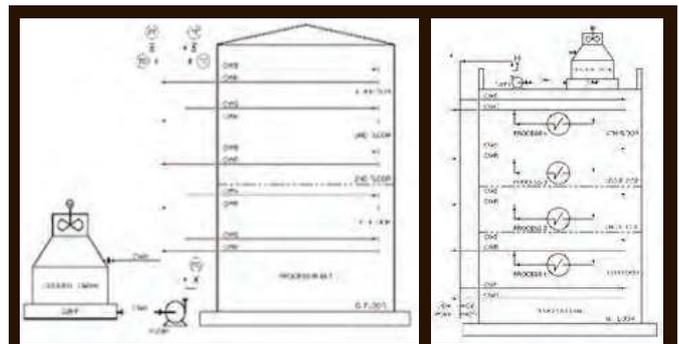


Figure 1: Cooling Tower at Ground

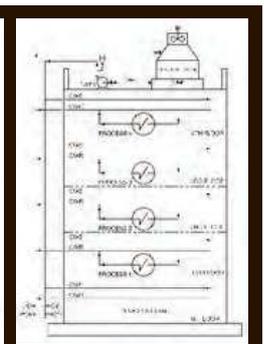


Figure 2: Cooling Tower at Top Floor

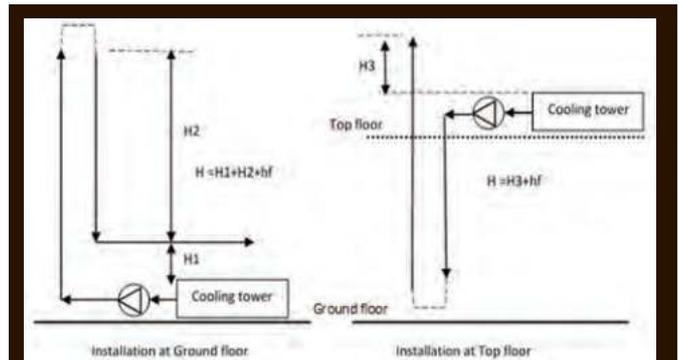


Figure-3: Pumping Heads

Table – 1

Parameter of comparison	Cooling tower at Ground Floor Figure-1	Cooling tower at Highest Elevation Figure-2
Installation		
Cooling tower type	It can be Natural or Forced draft cooling tower	It can be Natural or Forced draft cooling tower
Cooling tower size / Capacity	For given duty, size remain same in both the cases	For given duty, size remain same in both the cases
Cooling tower Basin Size	Design based on thermal loads and Return header water drains at time of Pump-Off.	Design based on thermal loads and no line drain containment margin required in basin sizing.
Pump capacity in CuMH	Does not depend on type of installation	Does not depend on type of installation
Pump Head in Mtr. (Power controlling parameter). Refer Figure-3, where total pump head $H_g > H_t$	Pump head H_g comprise of Highest elevation of service + Line loss + Head Loss across equipment inlet – Outlets	Pump head H_t comprise of Differential elevation between highest point of service and Tower inlet nozzle + Line loss + Head Loss across equipment inlet – Outlets
	High head requirement	Low head requirement
Pump location	Pump suction favourably below basin water level for positive suction head at ground floor.	Pump can be placed anywhere below basin level. It can be at tower floor, ground floor or at intermediate floors.
Water proofing / drainage requirement around CT	Not required as installed on Ground	Proper water proofing and drainage of spilled water is a must requirement.
Resistance to Atmospheric Air intake in cooling tower to dispense heat through CT	Needs open space around tower.	No such resistance is a constraint.
Surrounding affected by drift	Drift may deposit on surrounding structure and accelerate corrosion. In some cases, it may result adverse effect on process, nearby.	Being at highest elevation, Drift does not deposit on structures and droplets dispersed over large area causing less potential to corrosion.
Performance		
Back pressure required at Spray nozzles of cooling tower for atomization	Function of tower size, type and model and normally 0.5 -0.8 kg/cm2g pressure required.	Function of tower size, type and model and normally 0.5 -0.8 kg/cm2g pressure required.
Higher Return line hydraulic Head at inlet of nozzle than specified – Does it contribute to tower performance? (refer figure -3), where $P_1 > P_2$	NO. <ul style="list-style-type: none"> Higher than specified head at spray type nozzle does not contribute to extra atomization. Distributor nozzles of wooden cooling towers do not require any back pressure. H2 part of Head is not utilized beneficially here. 	Just required Pump head can be selected as specified for Nozzle Performance, by OEM.

Cooling Tower

Specific Power consumption, KWH/TR	High pumping head contributes to High power consumption	Low pumping head results Low power consumption.
Problem of air lock in piping	Significant: At every pump start, refilling of piping system, jacket or shell of equipment, air venting is must.	As the circuit is always full up to tower basin level, even at Pump-Off condition. Air is not locked.
Specific Fan power in Forced Draft CT, KWH/TR	Marginally high	Marginally Low
Specific Fan power in Induced Draft CT, KWH/TR	Fan runs for more hours as fresh flowing air stream may be restricted here.	Fan run hour per day may be less as unrestricted fresh air flow is available at top of plant.
Operation		
NPSH and Cavitation in pump	Depends on model selected and pump location w r to basin water level.	Depends on model selected and pump location w r to basin water level.
Operator convenience	Better approach to tower as is on ground floor	Operator has to go to tower floor.
Water quality, Chemical treatment	Identical in both the cases	Identical in both the cases
COC, Blowdown qty	Identical in both the cases	Identical in both the cases
Blowdown	Basin and Line blow down are separate	Line blowdown will serve both the purpose
Equipment / System dry out	Is Possible on leakage	Leakage will be detectable. Dry out is not a case here
Drift loss	Identical in both the cases	Normally Identical in both the cases but can be more in case high wind days.
Evaporative water loss	Identical in both the cases	Identical in both the cases
Algae / Biocide growth	As usual	May be little more, as more exposed to sun.
Economy		
Cooling tower cost	Same in both the cases	Same in both the cases
Pump, motor and foundation cost	High capital cost of pump sets	Low capital cost of pump sets
Capital cost of Sq. mtr ground coverage area occupied	High as separate installation consuming piece of land	Installed on building adding no cost of ground coverage.
Foundation and Structure cost	Tower is at ground, except foundation, structure strengthening is not the case here.	Depending on size of basin, Seismic Zone and Wind load, Part of structure strengthening may be required spending little more.
Water basin size	Basins may require margin to contain this water. Which will add on capital cost and treatment chemical consumption.	No such margins required and will benefit to reduce basing size.
Maintenance cost	Shaft seal failure may add on maintenance cost as an extra	Shaft seal failure will be less. Other maintenance cost will hardly have variations.
Maintenance Ease	Pump and Fan maintenance is easy as are readily approachable and small crane required. Overall maintenance cost difference is not great in both the cases.	Structure provision and hoisting tackles are additionally required.
Operation cost (pumping cost)	Refer Table-2 below	

Parameter	Unit of measurement	On ground installation	Highest Elevation Installation
Cooling tower capacity	TR	100	100
Thermal capacity	Kcal/hr	300000	300000
Cooling range, Delta T	Deg C	5	5
Cooling Water flow rate	M3/hr	60	60
Piping Distribution		Same in both the cases	Same in both the cases
Equipment on CT		Same in both the cases	Same in both the cases
Highest elevation of Equipment in circuit	Mtr	20	20
Head losses in piping and equipment circuit (assumed)	Mtr	10	10
Total static head from pump suction	Mtr	20	10
Pump Head required $h = \text{Total differential static head} + \text{Circuit Loss}$	Mtr	30	20
Pump set efficiency	Fraction	0.7	0.7

Power consumption (excluding motor and transmission efficiencies) $P = (\rho * g * Q * h) / (3.6 E 6 * \text{Efficiency})$	KW	7.01	4.67
Pumping Operation duration, hour/day	Hr	24	24
Power consumption / day	KWH/Day	168	112
Days of operation / year	Days/yr	330	330
Power consumption / Yr	KWH/Year	55497	36998
Power cost	Rs/KWH	7.00	7.00
Power cost/Year	Rs/year	388476	258984
Power saving	Rs/year		Rs. 1,29,492

Piping Distribution: Central vs. Discrete Distribution Network

Cooling water, being a key and most widely used utility, proper distribution and smart instrumentation controls can return great amount of money on operation cost account with additional feature of flexibility. We can preserve on pumping cost, fanning cost and control evaporative losses as well drift losses.

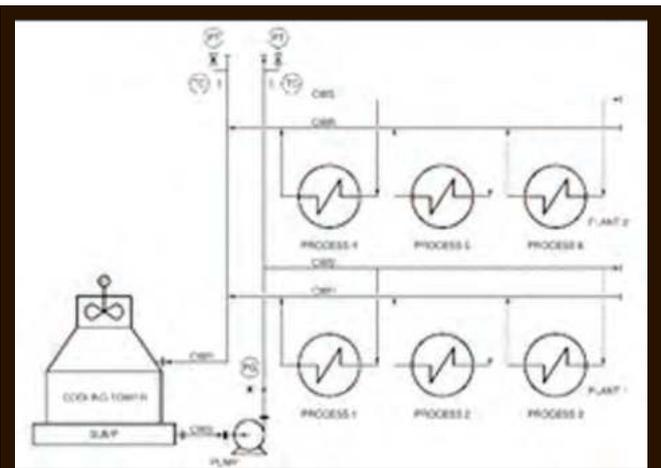


Figure- 4: Central Distribution

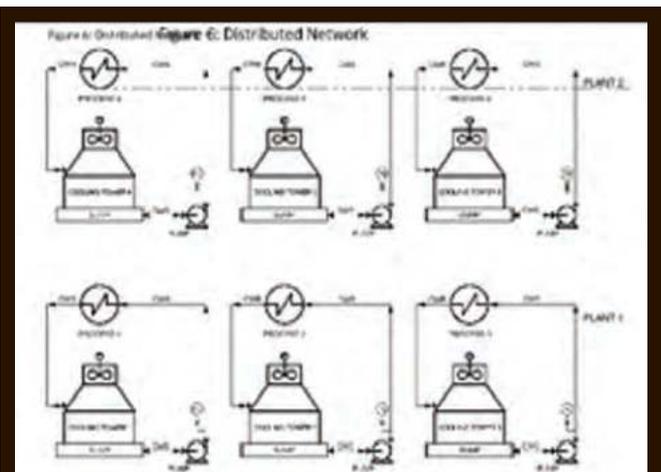


Figure-5: Discrete Distribution

Large chemical or petrochemical complexes preferentially select Central Cooling Water system from ease of operation and control point of view. This offers advantage of little remote installation of cooling towers from main plant building associated with advantage of uninterrupted air flow to towers and reducing corrosion potential to exposed assets from drift deposition. This is a good choice for mono products plants and continuous process plants. Whereas multi product and batch process plants operate preferably on demand and supply logic, with wide variations in operating parameters and process sequencing. Process or utility or both contribute to widely distributed pattern in Peak, minimum and maximum demand of heat loads. Central utilities particularly cooling water system are not the 'Best choice' for such operations. Refer Figure – 4 and 5.

Central distribution affects flexibility. We shall be operating whole cooling water system including tower, fans, pumping and piping system, unnecessarily, if one or two sets of products are to be manufactured in same or different building set ups. Such operations attract extra power and maintenance cost. Instead, discrete cooling towers for different services will-

- Impart freedom of selective circuit operation based on market demand contributing to controlled OPEX allocation.
- Smaller diameter Pipe sizes required compared to central

distribution case, saving capital investment on piping, accessories and structural costs.

- Phase wise installation of just required size, saves a lot on Capital cost and interest cost.
- Smaller cooling towers adhere lesser capital cost on equipment and civil cost.
- Well controlled flexibility of fan and pumping operation costs. A big pump and fan are not operated for part load.
- Spares inventory cost will be much less as is distributed between many identical installations.
- Lesser tooling and manpower cost in case of discrete cooling tower installations.
- Variation in thermal load of one product, do not affect the other products and utilities. It is a lead factor contributing to life, efficiencies, process safeties and product qualities.
- Plant and Costing managers have a good control on total OPEX.
- Disadvantages are extra space requirement, wide pipe racks, increased operators and cluster of piping distribution and its maintenance.

It is an opportunity to process and design engineers to inherit efficiencies at inception stage.

One pump for whole circuit Vs. One pump for each floor / cluster

Most engineers design cooling towers with one operative and one stand by pump for whole circuit, irrespective of central or discrete installations.

This is an 'Inefficiency at Inspection' stage that Drains profits for entire life cycle.

Combination of discrete and cluster distribution of cooling water connected with one or more towers will deal enormous savings on operation and maintenance cost.

It is a designer's choice and management decision.

In most process industries, equipment operating on cooling water are distributed floor wise and in clusters. Pumps are selected based on total water flow requirement and highest elevation of piping header and equipment, influence pumping head. Refer figure-1.

If scientific approach is adopted to work out thermal load calculations depending on floor or clusters and pump capacities

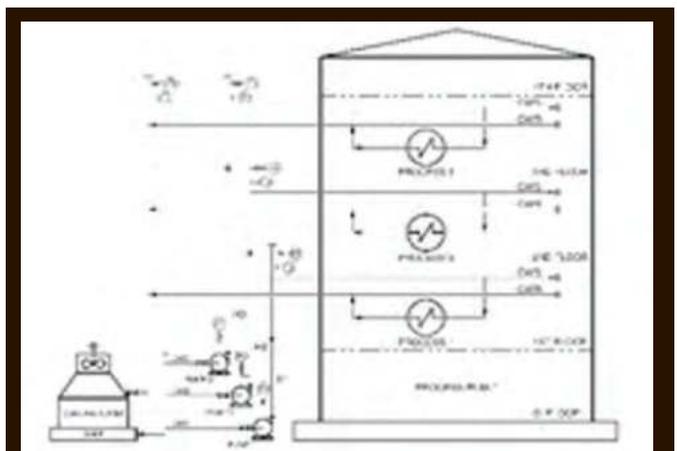


Figure-6: Distributed Network

Table – 4: Distributed network - Floor / cluster wise.

Floor	Thermal load, Kcal/hr	Water requirement, M3/hr	Highest elevation of distribution, Mtr	Circuit loss, mtr	Total pump head, mtr	Average utilization, Hr/day	Pumping power, in Rs/year
Floor 0	100000	20	4	6	10	24	₹ 43,164
Floor 1	300000	60	9	6	15	16	₹ 1,29,492
Floor 2	200000	40	14	10	24	22	₹ 1,89,922
Floor 3	500000	100	19	6	25	18	₹ 4,04,663
Floor 4	400000	80	24	8	32	12	₹ 2,76,250
Total	15,00,000	300					₹ 10,43,490

Table – 3: Common pump for entire network

Parameter	Unit	Values
Highest level pumping point	Mtr	24
Piping circuit head loss	Mtr	30
Pumping power	Kw	42.0
Annual pumping cost at 24 x 7 basis , 330 days operation and at 7 Rs/ KWH cost	KWH/year	₹ 23,28,480

are selected accordingly will facilitate selection of pumping heads accordingly. Pump heads will be a function of highest elevation in a particular circuit, not a whole plant. This will allow engineer to select small pumps sets, just required for an assigned duty.

It is not necessary to have dedicated cooling towers for each floor. One tower with a common basin, suction header, connected with number of pumps and dedicated piping circuits can be integrated with advanced instrumentation.

Particularly in batch operations, there are opportunities to shut off cooling water circulation, floor or cluster wise. Varying demand, time cycle, peak loads, stand by parameters, if are managed manually, will lead to an erroneous operation. On the other hand, little of smart instrumentation will yield a lot on Operation Cost. The question is: What to do and How?

Referring Figure – 1 and 7, will make it very simple to understand the concept.

First case in Figure -1 depicts, one cooling water circuit for entire process or plant building. As described above, it has advantage of ease of operation and less complex piping network, but greater operation inefficiencies.

Figure -6, is more scientific and new age approach on distributed network based on demand and supply, which inherit selective operation of system Automatically and returns numerous financial gains.

Example below, elaborates distinction between these two aspects.

Say, a plant manufacturing XYZ product. Equipment are laid on floor 1,2,3 and 4 and connected to a common pumping system with required piping distribution network. Each floor height is 5 mtr. Total thermal load of 15,00,000 Kcal/hr at. Cooling tower is selected for 5 Deg C delta T cooling capacity. 500 TR Cooling tower is selected equipped with 300 CuMH pump.

Table-3: hereunder elaborate power consumption at 24 x 7, 330 days/year and Rs 7 per KWH power cost, Pump has to operate continuously, irrespective of thermal load demand, as one

or other process unit or step demands cooling. Centrifugal pump operating at 70% efficiency.

Variation in fluctuations of cooling water demand, depending on customer equipment operation cycle, associated variation in water flow rate, line velocities and head loss. A common pump is pumping specified almost same quantity of water and head, is an assumption here.

Table -4: elaborates floor wise distributed network, where additional investment is in separated vertical supply and return headers and pipe rack, which is not a great investment. Horizontal headers at each floor, their sizes, and elevations are same as in case above.

Total 6 pumps are connected with a common suction header connected with the same cooling tower selected based on full range flow and pressure head calculation, as required at respective floor. Pressure Transmitter on supply header of each floor will signal to operate specific pump with respect to set point. Installation of VFD on pumps will further facilitate flexibility to control flow rate depending on pressure set points. Pump or VFD can further be tuned to differential temperature between supply and return headers. Higher delta will signal to speed up the pump and visa Vis. It can advanced to stop idle pumping as a function of time and delta T. Sixth pump is selected of highest capacity and head amongst 5, as a common stand by.

Saving potential based on above are complex to calculate as an example, but are really contributing on average operation hours as assumed in Table below. It can be varied with product, process, distribution network, thermal load demand. One may find an adoptive idea for their specific requirement and deploy accordingly.

Energy optimization is a continuous improvement process and can be adopted at any stage of 'Plant Life cycle'. Specific approach and spectrum of options, instrumentation, controls and selection of right set up can definitely lead to optimum costs. ■



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CORONAVIRUS NOT TRANSMITTED BY FOOD

Scientific Review to understand Nature of its Survival

From April to August 2020, American Frozen Food Institute (AFFI), in partnership with North Carolina State University (NC State) researchers, conducted a scientific literature review to understand the nature of survival and persistence of virus that causes COVID-19, in foods and on food contact surfaces, food packaging materials, and the potential for food-borne transmission.



For now no evidence to support that SARS-CoV-2 can spread by foodborne routes ...

AFFI and NC State University released study results, confirming that, although there is a slight chance for virus contamination, there is no evidence for the spread of SARS-CoV-2 through consumption of food or in association with food packaging, and no known cases of food-borne COVID-19. This conclusion substantiates similar statements made by the U.S. Centers for Disease Control and Prevention, U.S. Food and Drug Administration (FDA), U.S. Department of Agriculture (USDA) and the WHO.

Scientific literature confirms that surface contamination can occur, and that SARS-CoV-2 is unlikely to be inactivated by freezing. The virus can persist at refrigeration and ambient temperatures for a matter of hours to days, depending upon a variety of environmental conditions and the state of the virus (aerosol vs. surface-deposited), among other factors.

AFFI Senior Vice President of Scientific Affairs, Dr. Sanjay Gummalla said, “There is just no scientific evidence in the currently available literature to support that SARS-CoV-2 can be spread by foodborne routes.” He reiterates, it is highly unlikely that the virus could be transmitted from consumption of, or contact with, frozen foods. For that to happen, a person would need to consume food contaminated with viral particles, then the virus

would have to reach the respiratory tract, and infection would result only if an amount equal to the infective dose happened to come into contact with the right cells to initiate virus infection.

Relative to recent reports of SARS CoV-2 detection in some high protein foods or on food packaging materials, it is important to note that there are not yet scientifically vetted protocols available for detection of SARS-CoV-2 in these sample types. This is especially important since the methods used are unlikely to be able to discriminate between virus that can cause infection versus remnants of infectious virus.

Dr. Lee-Ann Jaykus, William Neal Reynolds, Distinguished Professor in the Department of Food, Bioprocessing, and Nutrition at NC State, and former NoroCORE Scientific Director added, “External contamination of food with the virus can only occur by direct exposure to relevant secretions from infected individuals, or indirectly if the food to come into contact with a surface or hands that were contaminated with SARS-CoV-2.” He concluded saying that we are currently relying on unsubstantiated reporting to implicate foods in SARS CoV-2 transmission.

The international scientific community must come together to assure that any future implications are based on sound science that is universally accepted for making risk management decisions. ■

The Air is Changing! Are you? - Part 2



Continuing extended text from Part 1 already published in our August issue of Cooling India.

Designed by macrovector / Freepik

A Sample Calculation on how a DOAS System can be applied to - **DOAS Technology Options:** Various technologies are available in market today and each one of them carries a few advantages unique to them. No technology is panacea and each one of them prove superior in a particular application for a particular internal and external load profile. Let us introduce you to these technologies, however it is outside preview of this paper to analyse each technology in detail from an application point of view. To judge the right application one would need a detailed analysis including simulation techniques to compare them with each other and conventional HVAC system from first cost and operating cost perspective. However we have provided the performance parameters of all the options on the peak DB with MCWB and peak WB with MCDB conditions for India. Delhi summer and Mumbai monsoon have been chosen as the outside conditions for the same. The various DOAS technologies evaluated in the paper are:

- OPTION I: Baseline system with dehumidification coil only (CC)
- OPTION II: Rotary passive desiccant air-to-air heat exchanger coupled with dehumidification coil (EW+CC)
- OPTION III: Rotary passive desiccant air-to-air heat exchanger coupled with dehumidification coil and sensible air to air heat exchanger (EW+CC+SW)
- OPTION IV: Active desiccant dehumidification wheel (with condenser heat reactivation) coupled with DX Cooling coil (CC+ADESCW)

- OPTION V: Rotary passive desiccant air-to-air heat exchanger coupled with dehumidification coil and passive desiccant dehumidification wheel (EW+CC+PDHC).

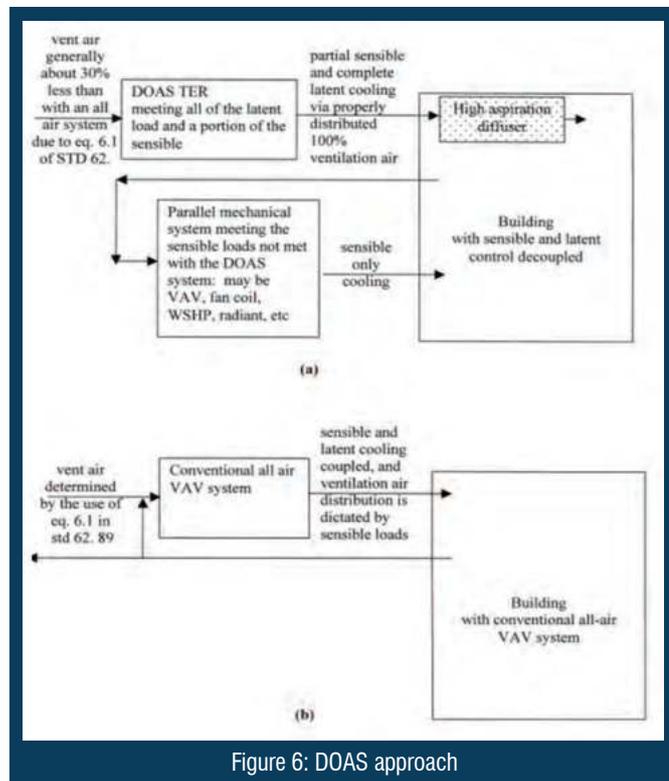


Figure 6: DOAS approach

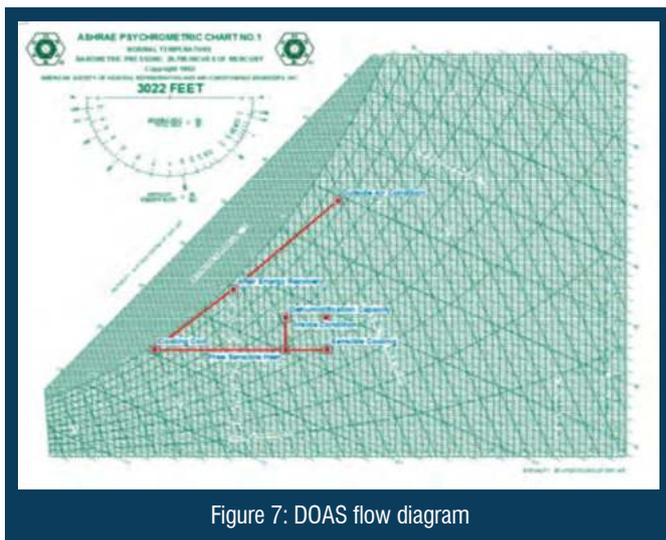
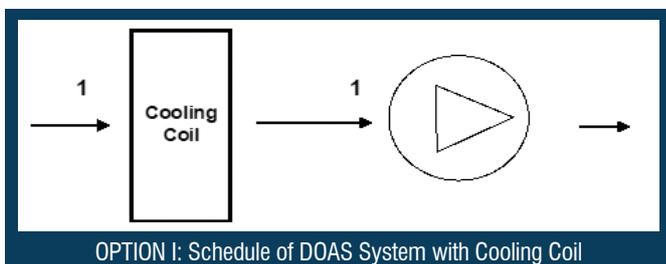


Figure 7: DOAS flow diagram

OPTION I: Baseline system with dehumidification coil only (CC)

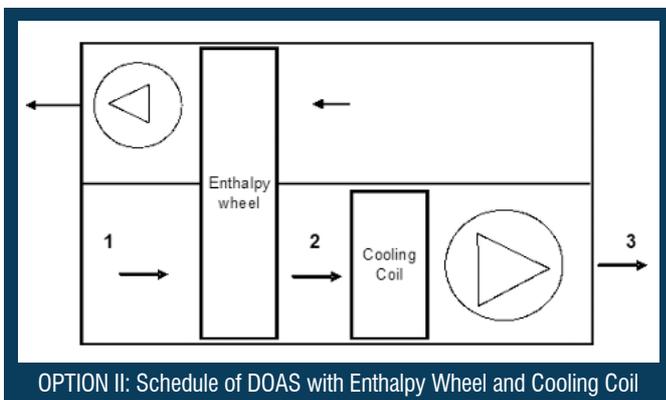


OPTION I: Schedule of DOAS System with Cooling Coil

S. No.	1				2		
	Outdoor Sir Conditions				Supply Air Conditions		
	cfm	DBT °F	grs/lb	Btu/lb	DBT °F	grs/lb	Btu/lb
1	1000	110	75	38.3	44.8	43	17.4
2	1000	85	162	45.9	44.8	43	17.4

OPTION II: Rotary Passive Desiccant Heat Exchanger With Coil (EW + CC)

This option gives high efficiency heat recovery and reduces the total installed tonnage of the HVAC system. Since the recovery reduces the both latent and sensible load of the outside air (the recoveries can be as high as 85%) and the dehumidification coil reduces the dew point to almost 45°F, this approach is most widely used and is highly cost effective and paybacks are often negative.



OPTION II: Schedule of DOAS with Enthalpy Wheel and Cooling Coil

S. No.	1				2			3		
	Outdoor Sir Conditions				Supply Air Conditions			Off Wheel Conditions		
	cfm	DBT °F	grs/lb	Btu/lb	DBT °F	grs/lb	Btu/lb	DBT °F	grs/lb	Btu/lb
1	1000	110	75	38.3	83.75	62.40	29.9	44.8	43	17.4
2	1000	85	162	45.9	77.5	84.15	31.78	44.8	43	17.4

The benefits of this option are:

- Installed tonnage reduction
- Lower power consumption of the installed HVAC system
- Higher ADP's of sensible cooling devices hence lower Row deeps (lower pressure drop) and higher CHW temp of main Chiller
- Better performance of the chiller in terms of IKW/TR due to higher CHW temperature.

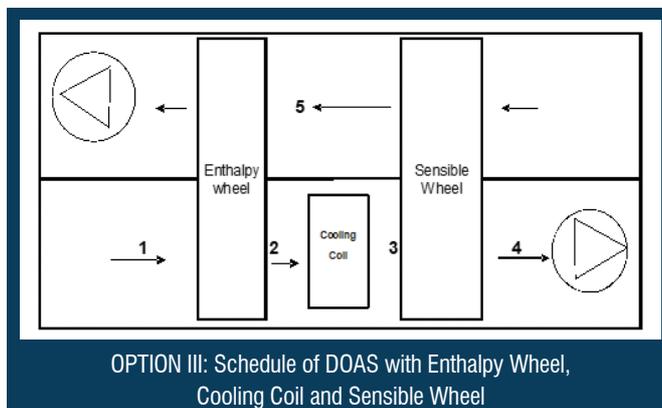
OPTION III: Rotary Passive Desiccant Heat Exchanger With Coil And Rotary Sensible Heat Exchanger (EW + CC + SW)

This option is designed keeping in mind the following objectives:

- Always provide conditioned air that is drier than the air in the space Deliver cold conditioned air whenever possible, and use recovered energy to reheat during mild weather.
- Select equipment to limit indoor relative humidity to 55% in all seasons.

This option has all the features of OPTION II and in addition supplies air at almost room temperature. The advantage here lies in the fact that during moderate weather i.e. when outside ambient temperature is low but latent loads are high (typically monsoons), the OPTION II too can have difficulty in handling the RH.

This option supplies air at almost room temperature with lower dew point than space, hence, it can continue to control the moisture without the risk of lowering the temperature.



OPTION III: Schedule of DOAS with Enthalpy Wheel, Cooling Coil and Sensible Wheel

S. No.	1				2			3		
	Outdoor Sir Conditions				Off Wheel Conditions			Off Coil Conditions		
	cfm	DBT °F	grs/lb	Btu/lb	DBT °F	grs/lb	Btu/lb	DBT °F	grs/lb	Btu/lb
1	1000	110	75	38.3	66.76	57.89	25.76	44.8	43	17.4
2	1000	85	162	45.9	60.51	79.64	27.62	44.8	43	17.4

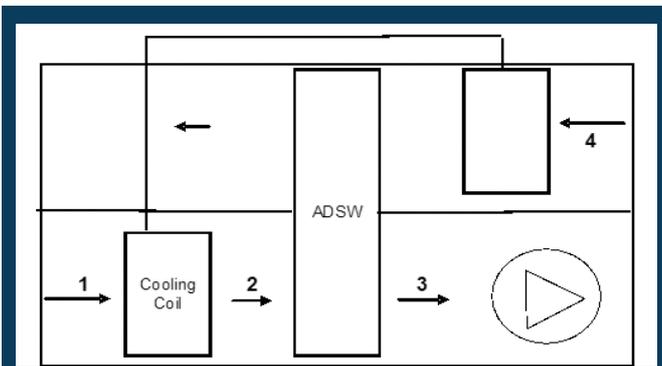
4			5		
Supply Air Conditions			Return Air on EN Wheel		
DBT °F	grs/lb	Btu/lb	DBT °F	grs/lb	Btu/lb
67.45	43	22.89	52.35	52.18	21.59
67.45	43	22.89	52.35	52.18	21.59

The benefits of this option are:

- Possibility of obtaining substantial LEED points
- Good RH control in all the seasons
- Reduced installed tonnage and lower power consumption of HVAC system
- Internal sensible cooling devices have higher CHW, lower ADP's resulting in reduced pressure drops and better IKW/TR for chiller.

OPTION IV: Active Desiccant Dehumidification Wheel (With Condenser Heat Reactivation) Coupled With DX Cooling Coil (CC+ADESW)

This option combines the benefits of desiccant dehumidification with cooling of the DX air conditioners. Contrary to the first two options, this approach uses desiccant wheel to remove moisture and lower the dew point of the supply air instead of using a cooling coil.



OPTION IV: Schedule of DOAS with Cooling Coil and Active Desiccant Wheel (React with Condenser Heat at 120°F)

S. No.	1 & 4				2			3		
	Outdoor Sir Conditions				Off Coil Conditions			Off Wheel Conditions		
	cfm	DBT °F	grs/lb	Btu/lb	DBT °F	grs/lb	Btu/lb	DBT °F	grs/lb	Btu/lb
1	1000	110	75	38.3	52.5	58.00	21.58	72.50	43.00	24.12
2	1000	85	162	45.9	52.5	58.00	21.58	72.50	43.00	24.12

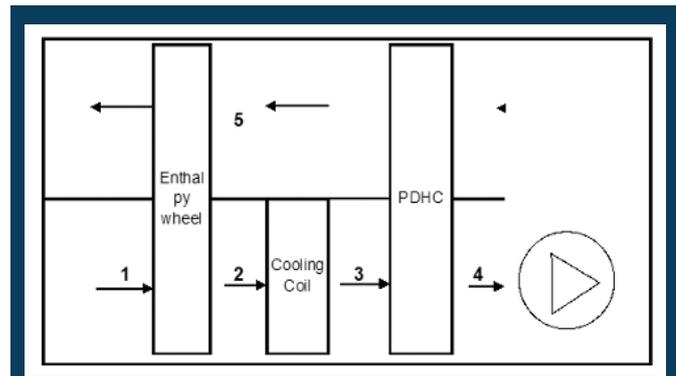
The reactivation of the desiccant wheel is undertaken by recycled heat from the DX condenser air.

The benefits of this option are:

- Meets ASHRAE standard 90.1 requirements
- CoP 65% more than a conventional DX system with reheat
- Uses recycled heat from DX system for reactivation
- No active reheat required
- Maintains RH control in all the seasons (including for areas having high internal latent loads).

OPTION V: Rotary Passive desiccant heat exchanger with cooling coil and Passive desiccant dehumidification wheel (EW+CC+PDHC)

This approach utilizes the strengths of passive total energy recovery, conventional cooling and a new type of desiccant rotor, the passive dehumidification wheel. The ability of this system lies in the fact that it optimizes the moisture removal



OPTION V: Schedule of DOAS with Enthalpy Wheel, Cooling Coil and Passive Desiccant Wheel

S. No.	1				2			3		
	Outdoor Sir Conditions				Off Wheel Conditions			Off Coil Conditions		
	cfm	DBT °F	grs/lb	Btu/lb	DBT °F	grs/lb	Btu/lb	DBT °F	grs/lb	Btu/lb
1	1000	110	75	38.3	79.63	70.65	30.19	50.73	54	20.53
2	1000	85	162	45.9	73.38	92.40	32.04	50.73	54	20.53

4			5		
Supply Air Conditions			Return Air on EN Wheel		
DBT °F	grs/lb	Btu/lb	DBT °F	grs/lb	Btu/lb
56.23	43	20.16	69.5	69.2	27.48
56.23	43	20.16	69.5	69.2	27.48

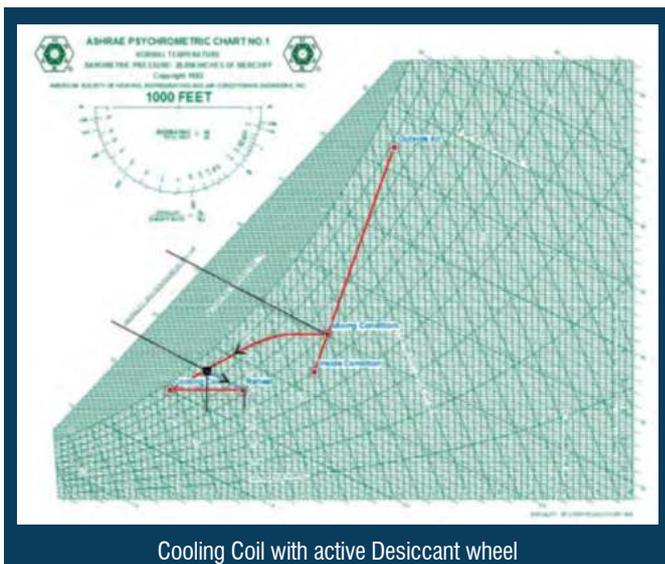
between the cooling coil and the desiccant wheel without the need of active re - activation. The passive desiccant wheel removes moisture from saturated air stream in an highly energy efficient manner.

The benefits of this option are:

- Extremely good RH control in all seasons
- High energy efficiency
- Lower dew point of supply than the other three options
- Versatile and adjusts well to varying climate
- Installed tonnage reduction for the HVAC system
- Substantial LEED points.

Analysis of Various Options in Indian Conditions

When we compared the performance of all the above five options for Delhi summer and Mumbai Monsoon, it become apparent that baseline cooling coil coupled with Energy wheel had a clear advantage. In addition to the Energy wheel, if one added a passive desiccant dehumidification wheel then the need for deep dehumidification by cooling coil was transferred to passive desiccant Wheel, thereby lowering the IKW/TR of the cooling unit. Hence from the overall advantage on the ability to manage energy, IAQ and RH, the combination of cooling coil with passive desiccant heat exchanger and passive desiccant dehumidification wheel comes out as a winner. This reduces the energy consumed from baseline system by whopping 55%. On the same lines, the combination of cooling coil with passive



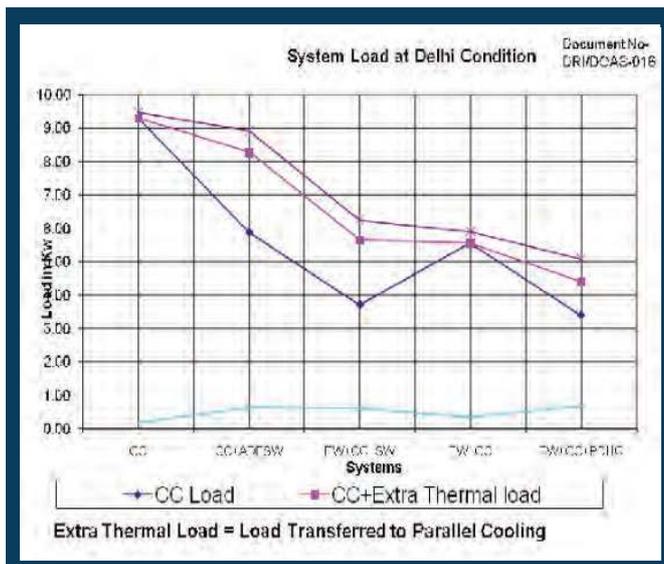
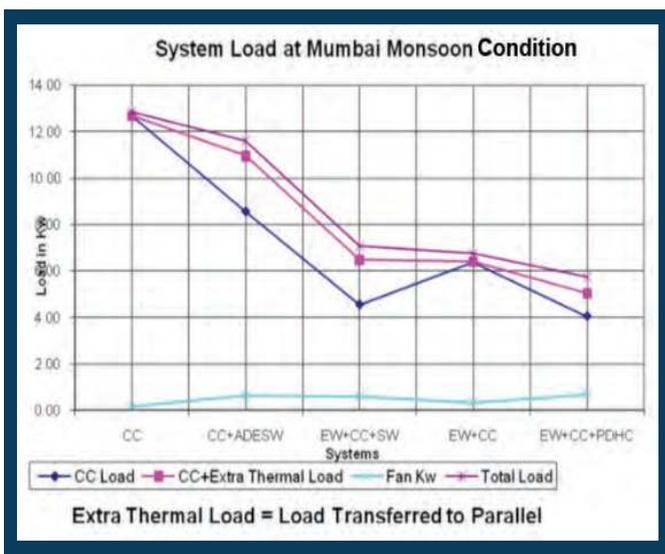
desiccant heat exchanger and sensible heat exchanger provided the same advantages with higher energy consumption of approx. 20% then former.

The combination of cooling coil with passive desiccant heat exchanger is another winner with energy reduction from baseline cooling coil but there are limitations of RH control during moderate weather conditions.

The options I & IV come into the focus where no relief air is available. In the absence of relief, air energy recovery is not possible and hence alternatives, like cooling coil only or cooling coil with active desiccant wheel needs to be looked at. Here too, the option IV i.e the combination of cooling coil with Active desiccant dehumidification wheel reduces the energy consumption by almost 10-15% for the same duty conditions. Also, it provides the supply air at elevated dry bulb temperature helping managing the RH inside.

Thus, when relief air available there, the option V comes out to be the winner and not available option IV shows promise.

The Indoor air quality requirement of higher ventilation rates along with proper RH control and energy management will



push the HVAC designer to the use of “Dedicated outside air system” in near future. DOAS holds a lot of promise with its ability to maintain the right humidity in all weather conditions. The “Divide and conquer” approach definitely allows the designer to have better management of the two key elements of air conditioning i.e., temperature and moisture. The original definition of Air conditioning can now be met in an energy efficient manner.

The DOAS has already proved itself with high potential of energy savings in nearly all applications and weather profiles. However, benefit of option-II, III and V over the first option in terms of energy saving is seen. Otherwise from IAQ, RH and energy point of view, option-V has turned out to be the most cost-effective.

However, in RH control, the last three options discussed have performed better for a wide variety of applications and weather profiles. To clearly state, that a particular option is the best solution would be a meaningless statement, as proper simulation exercises need to be conducted on a few key applications for a few weather profiles and “first cost + operating cost” matrix tabulated, giving due consideration to the importance of RH control. Some studies have indicated that the installed first cost of DOAS approach is lower than a conventional system for certain applications. A paradigm shift is taking place and designers are now actively considering these options to weed out the “Traditional problems”. In the words of Albert Einstein, “The whole Science is nothing more than a refinement of everyday thinking.” ■



GROWTH OF GREEN BUSINESS

The article presents five selected green business ideas, as world is becoming increasingly unstable due to population overgrowth as against lack of readily-available resources. The traditional energy sources are becoming meager, making it more difficult to satisfy basic human needs like transportation, food, and building supplies. Fortunately, sustainable businesses focused on “Innovation Ecosystems” are the solution for current global problems.

Innovation-driven enterprises (IDE) are start-ups whose competitive advantage and growth potential are driven by innovation. An IDE leverages novel ideas and new technologies to establish rapid revenue and job growth potential after initial investment. Innovation ecosystems are an interconnected set of people and resources (and their physical environment) that provide the context for IDEs to start, grow, and scale. All of this has allowed entrepreneurs to take on the green market as a lucrative and philanthropic way to keep the planet safe. This article presents five selected green business ideas which demonstrate the incentives of the green market.

Five Select Green Businesses

AlgiKnit

One such green business is AlgiKnit, which makes fibers from seaweed capable of being spun into yarn. Despite causing some pollution from the manufacturing process, the biomaterials allow AlgiKnit to achieve a friendly relationship among the textile industry, the biomaterials companies, and the ecosystem, thus opening the potential of biology as useful for fashion. The yarns used are durable materials made from organisms such as kelp. The production process has a minimal carbon footprint and utilizes edible, non-toxic materials. After becoming worn out, these materials can then be used as food for microorganisms and animals, both on land and in water.

Reverse Resources

Another business that aims to aid the fashion industry as well as the planet in general is Reverse Resources. The company has built a software platform in which clothing manufacturers align their waste textiles supply with textile recyclers. As roughly 25% of material gets discarded from garment production factories, it is necessary to integrate these resources back into the supply chain, which will not only reduce virgin fiber but would also strengthen textile businesses. Virtual traceability of resources is the goal of Reverse Resources in accomplishing this feat. The company's software solution, known as the Software as a Service (SaaS) platform, provides virtual support for factories and buyers to agree on how to close the loop for wasted fabrics from garment production. This leads to long-term gains for all parties involved.

Great Bubble Barrier

A third green business is the Great Bubble Barrier, which has developed an air bubble screen for riverbeds to catch plastic before it gets into the sea. The purpose behind the company owes to major pollution from cities, which pollute plastics via canals and rivers; these polluted materials are then transported to the ocean and thus damage the maritime ecosystem. Although there are barrier systems for blocking garbage blown into the sea via wind, these systems create other issues, since the garbage also blocks ship traffic and aquatic life. However,

the Great Bubble Barrier is made of air, which directs the waste to the side of a river using the natural current while capturing plastic debris, before it enters the ocean. At the same time, fish and ships still have access. By recovering the plastic waste early, the company recovers a valuable resource and brings it back into the plastic value chain, reducing CO₂ and the need for virgin plastic materials.

AquaBattery

Another friendly business for the aquatic industry is AquaBattery, which has developed an energy storage system that uses water and table salt instead of the toxic, environmentally-harmful materials in typical batteries. This system is called the Blue Battery, which is the only completely sustainable electrical storage system currently in existence. Its storage of water and table salt will revolutionize the energy storage world and foster renewable energy technology growth around the globe. This technology is safe and available at a competitive price.

LettUs Grow

The final business useful for aquatic industry is LettUs Grow. This company has developed an aeroponic, soil-free method for growing crops by hanging the roots within a dense, nutritious mist. The start-up designs efficient irrigation and control systems for indoor farms. The systems deliver higher crop yields, reduce production costs, and make farmers' lives easier. The delivery of water as a mist to the roots allows greater oxygenation of the roots, delivering better flavor and faster growth at only 5% of the water needed for traditional agriculture. Data is uploaded to the Ostara software platform, which reduces unnecessary labor and optimizes conditions for each individual plant species within the farm. This would bring affordable food growing to cities with integrated farm management software.

Conclusion

The technologies developed by these five companies bring hope that the planet will remain sustainable in the future. If all goes well, the companies will give the planet much to be grateful for. There is still work to be done, with technologies to be developed and businesses to help disseminate them. New investment structures have to be made available to bring in more risk capital players and dollars to help new innovation ecosystems in the green technology space to get started. ■



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5 YEARS	60	4000.00	7000.00	8000.00	4000.00	9000.00	10000.00
LIGHTING INDIA							
1 YEAR	6	750.00	1050.00	1250.00	750.00	1425.00	1625.00
2 YEARS	12	1350.00	1950.00	2350.00	1350.00	2625.00	3025.00
3 YEARS	18	2000.00	2900.00	3500.00	2000.00	3900.00	4500.00
5 YEARS	30	3000.00	4500.00	5500.00	3000.00	6000.00	7000.00
MEDICAL EQUIPMENT & AUTOMATION							
1 YEAR	6	750.00	1050.00	1250.00	750.00	1425.00	1625.00
2 YEARS	12	1350.00	1950.00	2350.00	1350.00	2625.00	3025.00
3 YEARS	18	2000.00	2900.00	3500.00	2000.00	3900.00	4500.00
5 YEARS	30	3000.00	4500.00	5500.00	3000.00	6000.00	7000.00
AUTOMATION & ROBOTICS WORLD							
1 YEAR	6	1200.00	1500.00	1700.00	1200.00	1875.00	2075.00
2 YEARS	12	2160.00	2760.00	3160.00	2160.00	3435.00	3835.00
3 YEARS	18	3200.00	4100.00	4700.00	3200.00	5100.00	5700.00
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MANAGING HVAC SYSTEMS IN THE CHANGED ENVIRONMENT

The article discusses that HVAC systems in a building, be it commercial one or residential, retail, educational etc., is essential for people working there, as it enables them to work in an enclosed environment, not their natural environment. The employees would want to be inside on a hot summer day, if the air conditioning was not working; depicting the dependence we have on HVAC.

The workplace dynamics have changed dramatically, post-March 2020, with the announcement of the Lock-down in the country and subsequent events that unfolded. We are not the only witness to this change but are impacted by the changes that are occurring around us. COVID-19 has radically altered many aspects of our lives that we took for granted – social interactions, working in offices, going out to the mall for a shopping binge, the dinner date and many other activities that we are no longer undertaking.

Hopefully, this is a transition phase and will be behind us shortly and we will get back to life as it was.

Till we do, HVAC systems in buildings, industry, hospitals, homes etc., will have to be managed according to new norms as people will still need to work and be productive. There will however be a need to operate the system differently for the HVAC to be effective as well as optimal. How the O&M teams and engineering managers will need to adopt is the subject of this article - goes without saying that as the environment changes rapidly around us, the approach that the HVAC industry takes will continue to evolve.

What has changed for the HVAC Industry!

Many things; and at the same time, not much! HVAC systems still need to be operated and the operators need to run the plants in the same manner as before – see that the water and gas parameters are as per the design requirements, temperatures have to be maintained and the maintenance of the system has to be undertaken. What the O&M team did before March 2020, needs still to be done as the HVAC system has not changed, or at least most of it has not.

What has changed, is the way the systems are now operated. A central chiller designed for a building occupancy of 80% on a given day with a certain heat load to be managed is now required to operate and service a building where the occupancy has come down to 10% or even less in some cases or at some points in time. This significant change from the building design point will impact the chiller operations in many ways and will need an altered approach to O&M. With the chillers not operating as they should, will there be a need to

alter the maintenance schedules, the preventive maintenance plans etc., are questions that engineering managers are grappling with.

A major change that has occurred is the shortage of O&M staff, mainly at the plant operator and maintenance team level. Some have migrated their hometowns; some are unable to reach their workplaces, so the availability of trained and experienced HVAC personnel has become a challenge for a country with a billion plus population.

Managing HVAC Systems in the Changed Environment

While the basics of O&M will continue to remain the same such as operating as per the OEM/manufactures guidelines, safety, hygiene, etc., there will be a need for major and minor adjustments.

Revised Industry Standards/Guideline:

Changes in operating conditions always bring in changes to the way systems are operated and this is no different for the HVAC industry. Industry bodies, government agencies and manufacturers have responded to the changing environment and taken out guidelines and in some cases directives on HVAC related aspects. Since the industry is mature and professional one, the guidance that O&M teams as well as manufactures, consultants, contractors and other stakeholders take comes from trade bodies such as ISHRAE (Indian Society of Heating, Refrigeration & Air Conditioning Engineers) and ASHRAE (American Society of Heating, Refrigeration & Air Conditioning Engineers).

In India, ISHRAE has released guidelines for sector during April 2020 that addresses various aspects of this sector. These guidelines bear out general aspects of the current situation concerning the HVAC sector as well as specific guidance on changes to be made in operations as well as maintenance of the HVAC systems in different work



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Professional.

environments. These are excellent well developed and practical documents that industry professionals should familiarize themselves with; to effectively manage their HVAC systems.

Revised O&M practices: With changed circumstances, the way HVAC systems are operated will also need to be modified. Some of the aspects that HVAC O&M teams will have to consider are:

- **Operational Load:** Occupancy in buildings and work-spaces has come significantly down across most sectors and in some essential sectors, there is also a reduction in the number of employees attending work. Work From Home (WFH) is the norm for a majority of work-spaces that utilize HVAC systems for their employee environment. This means that for a building that had an occupancy of 7000 employees on a given weekday, now has only about 500 to 700 attending office and that too in different floors and offices in the building. The chillers in the buildings have not changed and neither have the associated supporting systems – AHU's, pumping systems, cooling towers, etc. The chillers and associated systems/equipment have been designed for a heat load catering to about 80% to 90% occupancy and now have to cater to a much lower occupancy level. Modern chillers operate at their highest efficiency at a loading of 70% to 80% and in fact, some chiller systems cut out when the loading goes below 25%. Running at lower loads is thus not efficient which leads to higher energy consumption and ultimately to higher operating costs. Thus, in the changing working environment, O&M teams will have to dynamically evaluate the load by constant engagement with the tenants and optimize chillers operations.
- **Distributed occupancy within work-spaces:** Even in the best times, employees complain regularly about hot and cold spots in their

offices which is most likely due to improper airflow or distribution. Meeting rooms sometimes tend to get too cold whereas some areas of the office floor just don't get any cool air. With offices implementing social distancing norms within their work-spaces, the density of staff within the workspace will reduce – where one person on an average occupied 70 to 90 sq. ft., this will now change to 100 to 120 sq. ft., if not more. The AHU systems, ducting and control systems, however, have not been changed leading to further complications in the airflow patterns. Ten-seat meetings rooms henceforth, will now only be allowed for five people, and they will surely get cold. There are no easy solutions to this problem and undertaking any major modifications is not possible at the present, as the situation is changing dynamically. O&M teams will thus have to work with the office administration staff to work out the best possible occupancy patterns that maximize the use of the HVAC systems.

- **Health Concerns:** The occupants of the workspace are genuinely concerned about the health aspects of running AHU's in the current environment. ISHRAE has in its COVID-19 guidance document on airconditioning and ventilation indicate that by taking simple and basic operations as well as maintenance actions, the HVAC systems are safe to operate in this situation. Maintaining a temperature between 24 to 30 deg C, humidity levels between 40 to 70 degrees, as well as increased fresh air intake are some of the guidelines that are provided to keep the occupants safe. Thus, the O&M teams will need to make themselves familiar with the various industry as well as government guidelines/directives continuously.
- **Maintenance:** A major factor that the O&M teams will have to consider

is the way maintenance is undertaken on the various components of the HVAC systems. Changes in AHU filter cleaning schedules, with an increased focus on sanitization and use of recommended chemicals, will be the norm. AHUs are recommended to be kept on during the weekends, so that the work-spaces can be continually ventilated, which means that the equipment will be running more and will need additional maintenance. Another area that the O&M team will have to grapple with is the Annual Maintenance Contract (AMC) – with chillers running for a significantly reduced time, some of the time-based or running hour-based schedules would not fall due as envisioned. There will be a temptation to reduce the scope of the AMC contract or maybe not take it altogether to save operating costs for the current phase. However, this is not advised as the cost of the AMC is a fraction of the cost of the equipment and the overall health of the system. A better approach would be to work with the OEM/AMC service providers to review the operating cycles and arrive at a mutually agreeable modified AMC plan.

Conclusion

Change is always constant, so the HVAC industry will need to quickly modify the way the air conditioning systems are both operated as well as maintained. This has already begun and with the unlocking of work-spaces and more businesses opening up, there will be more focus on the HVAC O&M teams to deliver safe and efficient work environments for the workforce. The changes are not major and in fact, are an opportunity for the HVAC community to refocus on the basics of design and operations which may have got diluted with time as the fundamentals remain the same and, if followed, the HVAC systems are inherently safe. ■

Climate-friendly Refrigerators

GE French door has some higher-end amenities

Refrigerators are among the most energy intensive appliances in our homes, so swapping out an old model for an energy-efficient one is a better way to lower your carbon footprint.

GE GNE27JSMSS is an energy-efficient French-door refrigerator. Those manufactured starting from January 2020, GE switched refrigerants from the potent greenhouse gas R134a to the much more efficient R600a. It is a moderately-priced fridge with modern conveniences and flexible storage.

Regarding features, its main doors close with a satisfying snap, and its freezer drawer slides smoothly. Inside, it offers number of customizable storage options and built-in dispensers. The refrigerator strikes a balance between usability and energy efficiency, along with chilled, filtered water and an ice maker. The shelving is modular and flexible while allowing for a large amount of space, which helps fridge run as efficiently as possible.

Features: Dimensions: 69.88" x 35.75" x 35.88" (H x W x D); Fridge capacity is 11.157 cu. ft.; Freezer capacity is 3.45 cu. ft. It has an internal ice dispenser in the freezer and an internal water dispenser with removable filter, located in the top right corner of the fridge. The



Spacious inside of GE GNE27JSMAFSS French door refrigerator.

fridge has a status light to alert, at time to replace the filter. Other features include one flexible shelf, 10 moveable bins and shelves, full-width deli drawer, Turbo Cool setting and Sabbath mode.

Stable temperatures help reduce premature spoilage

One of the most important aspects of fridge performance is temperature variance. The refrigerator compartment was able to maintain temperatures within 2 degrees and its freezer maintained a range of about 3 degrees was found when tested by Kyle Hamilton and Mark Brezinski from reviewed.com. This means temperatures within the

fridge and freezer are both fairly stable, even during defrost cycles. This is important because consistently low temperatures are the best way to ensure the longevity of your food.

The refrigerator has many customizable storage options. Among other features, a flexible shelf can slide its front half underneath its back half to allow taller objects to fit in front of it. It is averaging 4.5 out of 5 stars with generally positive reviews. ■

WINT launches a new solution to detect leaks in HVAC systems

Its advance artificial intelligence solution prevents risks and hazards of leaks in HVAC systems.

WINT Water Intelligence has developed a solution that detects and prevents leaks and other issues in chilled water HVAC systems and pipes. The solution prevents water damage by detecting issues, automatically shutting off water flows and isolating impacted areas.

The large building uses chilled water systems to cool the facility and ensure that occupants are comfortable. These systems consist of lengthy piping networks filled with massive amounts of water that flow throughout the building. Water is pumped at many thousands of gallons per hour, so when a pipe breaks, water accumulates quickly, causing massive damage within a very short timeframe. WINT uses advanced artificial intelligence, machine learning and



signal processing technologies to deliver extremely high detection accuracy. The solution detects drip-level leaks in chilled water pipes, allowing maintenance staff to perform corrective action before the issue becomes significant. In case, pipes burst and reach damage-potential levels, the system shuts the water off and isolates the impacted area.

Yaron Dycian, Chief Product and Strategy Officer, WINT said, "A leak or burst chiller pipe is the stuff of nightmares for facility and operations managers. Water gushes out at very fast rates and accumulates rapidly. It then flows down the building and causes massive damage in its path. Physical damages can easily reach millions of dollars, let alone the business disruption and the time to bring the facility back to order." ■

UPCOMING EVENTS

02-04
October 2020

Firamaco + Energy
Location: Spain
Contacts: ifa@ifavirtual.com

BOILERS & BURNERS 2020
Location: Europe
Contacts: st@farexpo.ru

06-09
October 2020

13-15
October 2020

CHILLVENTA ESPECIAL
Location: Virtual event
Theme Focus: Chillventa Connecting Experts

Iran HVAC & R 2020
Location: Iran
Contacts: +98 (21) 88203020

20-24
October 2020

29-31
October 2020

COLD CHAIN BANGLADESH
Location: Bangladesh
Contacts: info@savorbd.com

**GREENBUILD INTERNATIONAL
CONFERENCE AND EXPO**
Location: Virtual Expo
Contacts: media@informa.com

10-12
November 2020

WEBINAR

Company Name: Geothermal Air Conditioning
Date: 1st October 2020
Time: 12.30–1.15pm (AEST) / 12–12.45pm (ACST) /
10.30–11.15am (AWST)
Organizer: AIRAH

Company Name: NCC 2019 Section J Case Study Series: Fans
Date: 8th October 2020
Time: 12.30–1.15pm (AEST) / 12–12.45pm (ACST) /
10.30–11.15am (AWST)
Organizer: AIRAH

Company Name: Reality Capture and Virtual
Site Tour
Date: 15th October 2020
Time: 12.30–1.15pm (AEST) / 12–12.45pm
(ACST) / 10.30–11.15am (AWST)
Organizer: AIRAH



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