

Cooling India

India's foremost Monthly dedicated to the growth of HVACR Industry

Interviews -

- **Urbanisation drives growth for cold chains**
- Greg Allen, CEO, Wellington
- **Huayi compressors: OEMs' Choice**
- Sandeep Sekhani
Director, Safe Refrigerations Pvt. Ltd.

Internet of Cooling Things

An analysis on how Internet of Things makes comfort systems smarter.



- Metro Cooling
- Achieving Energy Efficiency
- Solar Passive Ventilation
- Phase Change Material based Free Cooling

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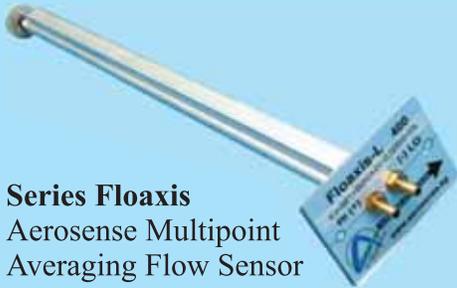
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Publisher's Letter

Hello and welcome once again to *Cooling India*.

The Internet of Things (IoT) is redefining business models and today almost every industry is faced with digital disruption. IoT has emerged as the biggest gamechanger to survive and thrive. And of course, HVAC&R industry is one of the prime movers in this direction.

Today, the IoT has truly revolutionised the HVAC&R industry. It is changing the ways HVAC&R solutions are being monitored, analysed and controlled. IoT adds a new dimension by providing a wider and smarter network that can access sensors that are used to detect the presence of occupants in the room and then personalise the heating or cooling settings of the rooms based on the chosen set levels used on a regular basis. Energy efficiency, comfort, remote monitoring, remote control and ease of maintenance are some of the advantages as a result of using the power of the Internet. Capabilities such as improved fault detection and diagnostics, asset management, maintenance and enterprise integration have added new dimensions in terms achieving greater efficiency.

India is short by 10 million tonnes of cold storage capacity and over 50,000 refrigerated trucks due to which over 30% of agricultural produce goes waste every year apart from the fact that more than 20% of produce from fields that gets lost due to poor post harvesting facilities and lack of cold chain infrastructure. Therefore, the cold chain industry in India presents huge potential in terms of expansion.

The inaugural edition of REFCOLD India, scheduled to be held in Gandhinagar, Gujarat between 22nd and 24th November, is all set to bring in advanced refrigeration and cold chain technologies from across the globe. COOLING INDIA, being the media partner for this event, will come up with a special issue on refrigeration and cold chain sector in November. The issue will highlight the key market trends, technological innovations, product update etc. We invite you to be a part of this REFCOLD India special issue.

Hope you enjoy reading this issue as always. Do send in your comments to me at pravita@charypublications.in.



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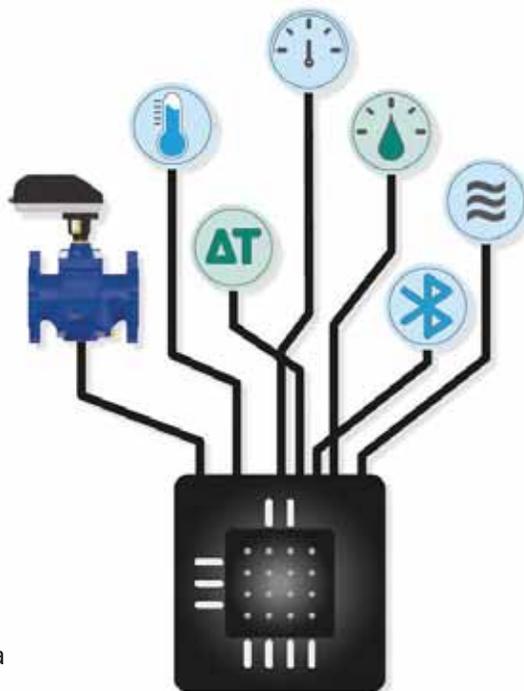
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Contents

Vol. 14 No. 3 | October 2018

Features

- Internet of Cooling Things** 22
– Subhajit Roy
- Metro Coolings** 28
– Supriya Oundhakar
- Achieving Energy Efficiency for Odisha Ice Cream Factory** 34
– Anand Joshi
- Solar Passive Ventilation for Comfortable Indoor Air Quality** 42
– Prof. Dr. OmPrakash G Kulkarni
- Phase Change Material based Free Cooling** 48
– Dr Jahar Sarkar



(Cover Page Image Courtesy: www.pixabay.com)

Departments

- 4** Publisher's Letter
- 8** News
- 16** Appointments
- 18** Awards
- 20** Market Watch
- 60** Pre-event Report - REFCOLD INDIA 2018
- 62** Post-event Coverage - Food Logistics 2018
- 64** Product Profile
- 65** Event Calender
- 65** Index to Advertisers
- 66** Cooling Museum

Interviews



Urbanisation drives growth for cold chains

32

Greg Allen
CEO
Wellington



Huayi compressors: OEMs' Choice

40

Sandeep Sekhani
Director, Safe Refrigerations Pvt. Ltd.



In Brief

- 55** Embraco's Innovative Solutions for Commercial Refrigeration
- 56** WING Air Curtain
- 58** FlowCon Energy FIT System
- 59** Bitzer

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2	Chilled Water Temp in °C (Assumed)	5°C	5°C
3	Supply Temp. from CT / LTMCS	33°C	30°C
4	Approach to WBT	4°C	1°C
5	ΔT for Chiller	28°C	25°C
6	Chilled Water Compressor Motor Kw for 1200 TR	720	643
7	Energy Saved in %	-	10.7%
8	Energy Saved in Kw	-	77 Kw/Hr
9	Total Running Hours per Annum	8640	8640
10	TOTAL POWER SAVED PER ANNUM	-	6,65,280 Kw



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Power Ministry Launches Chillers Energy Efficiency Program

Chillers consume more than 40 per cent of the total energy in commercial buildings. Chiller star labelling program to save more than 500 million units of electricity in 2019 along with greenhouse gases reduction. Ministry of Power launched an ambitious program to encourage the deployment of energy efficient chiller systems in the country.

The Chiller Star Labelling Program has been formulated by Bureau of Energy Efficiency (BEE). The program envisages providing star rating in terms of its energy performance. Initially, the program is launched on voluntary basis and will be valid upto 31st December 2020. A K Bhalla, Secretary, Power, emphasised the need to improve energy efficiency in space and process cooling sector, considering the occasion of 24th World Ozone Day and the 31st Anniversary of Montreal Protocol, which will be observed on 16th September 2018.

"This initiative will promote advancement technology for central HVAC (Heating, ventilation, and air conditioning) systems and will also facilitate energy



A K Bhalla, Secretary, Power, emphasised the need to improve energy efficiency in space and process cooling sector,

efficient solutions for the large commercial and industrial applications," A K Bhalla added. Chillers are used extensively for space conditioning of buildings and for industrial process cooling applications. The size of Indian chiller market which stood at 1 Million Tonne per year at 2017, is projected to grow at a CAGR of 3.6 per cent fueled by growth in the retail, hospitality and infrastructure projects. Chillers, being energy intensive system, contribute more than 40 per cent of the total energy consumption in commercial buildings. Therefore, it is important to

optimise energy performance of chillers and create awareness amongst the end users to adopt transition towards energy efficient chillers.

BEE has developed an online registration platform for easy and expeditious approval under this initiative. The manufacturers will be able to register online for availing appropriate star rating of chiller equipment. Based on the test certificate from designated agencies and after due verification from BEE, the star label (1 to 5) will be awarded with five stars being the most efficient chillers. ■

Blue Star has achieved a significant landmark by completing 75 successful years of operations. To commemorate this historic milestone, the company rang the 'Opening' and 'Closing' bells at the National Stock Exchange (NSE) and the Bombay Stock Exchange (BSE), respectively. Blue Star also released a special cover with a cancelled stamp issued by the Department of India Post to mark this momentous occasion.

Commenting on the Platinum Jubilee, Suneel M Advani, Chairman of the Board, Blue Star Limited adds, "We are proud to ring in 75 years of engineering excellence. We are witnessing a paradigm shift in consumer expectations and hence our credo: 'I am Blue Star. I take pride in delivering a world-class customer experience.' Over the years, Blue Star has sustained steady growth and profitability. We are confident that our business model

Blue Star Completes 75 Years

which is as strong and robust as the products and services we offer, combined with the vigour and agility of our young leadership, will lead our way to our centennial."

Founded during World War II on September 27, 1943 by Mohan T Advani as a three-member team repairing and reconditioning air conditioners and refrigerators, Blue Star has a strong foothold in international markets apart from domestic markets. It is well on its way to establishing itself in new lines of businesses such as water and air purifiers, air coolers, and engineering facility management. The company's integrated business model of manufacturer, installer and after-sales service provider offers comprehensive solutions for the residential, commercial and infrastructure segments, which has proved to be a significant differentiator in the market place. The

traditional central air conditioning business has successfully morphed into a full-fledged electro-mechanical turnkey solutions provider delivering superior project delivery. This leading B2B Company has in recent years acquired a B2C profile as well as Blue Star has become a name to reckon with in the residential segment with a range of consumer durables. With a turnover of over Rs 4600 crore, it has a network of 32 offices, five modern manufacturing facilities, over 2800 employees, and a robust channel management system comprising 3000 channel partners and 1000 retailers as well as 800 service associates reaching out to customers in over 800 towns. It exports to 19 countries across the Middle East, Africa, SAARC and ASEAN regions, where its products stand the test of time in some of the most difficult and extreme climatic conditions in the world. ■

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USGBC to Organise Greenbuild in Mexico in 2019



The US Green Building Council (USGBC) announces that Greenbuild, the world's largest green building conference experience, is returning to México City June 18-19, 2019 and taking place at the Hilton Mexico City Reforma. Greenbuild Mexico will be held in conjunction with SUMe Sustentabilidad para México AC and offer a forum for the green building community to unite, change lives, revolutionise business and address issues, such as climate change, human health, energy use and air quality. Updates on Greenbuild Mexico will be available online.

"By bringing Greenbuild back to Mexico City we're continuing to build on the important conversations and connections that were made at last year's inaugural conference," said Mahesh Ramanujam, President and CEO, USGBC and Green Business Certification (GBCI). "It's time to reflect on the innovative work that's been done over the past year from across the region and recognise the efforts of architects, developers, consultants, policymakers and more who are creating new opportunities to advance the green building movement."

Last year at its inaugural event, Greenbuild Mexico highlighted the importance of this type of conference in the Latin American region. "Mexico is a leader in many subjects and green building isn't the exception. This event, helps us to continue the conversations around this important issue, to generate progress, produce results and show them to the market," said Alejandra Cabrera, SUMe's CEO. Greenbuild Mexico attendees will hear from industry leaders on their vision of the future of green building in Mexico; connect and build business relationships with industry professionals; and get the latest green building and LEED updates. ■

EU Ratifies Kigali Amendment

The European Union has ratified the Kigali Amendment to the Montreal Protocol, which will bring about a global phasedown of hydrofluorocarbons (HFCs)

- powerful greenhouse gases. HFCs, used mainly in refrigeration, air conditioning and heat pump equipment, are thousands of times more harmful to the climate than CO₂. In response to the rapid growth of HFC emissions, the 197 parties to the Montreal Protocol adopted the Kigali Amendment in 2016 to reduce gradually their global production and consumption. The EU has been phasing down HFCs since 2015. EU member states are in the process of ratifying the Kigali Amendment individually. Commissioner for Climate Action and Energy Miguel Arias Cañete said, "We encourage all parties to the Montreal Protocol to take action on HFCs as soon as possible. Delivering on the Kigali commitments will play a vital role in our global efforts to tackle climate change,



as well as driving innovation and creating new economic opportunities in the refrigeration and air conditioning sector."

Global implementation of the Kigali Amendment would prevent up to 80 billion tonnes CO₂ equivalent of emissions by 2050. This would make a significant contribution to the Paris Agreement objective of limiting the global temperature rise to well below 2°C.

All 197 Montreal Protocol parties agreed to take steps to gradually reduce the production and use of HFCs. The first reduction step to be taken by the EU and other developed countries is required in 2019, while most developing countries will start their phasedown in 2024.

The Kigali Amendment will enter into force on 1 January 2019. For the objectives to be achieved effectively and cost-efficiently, all governments and relevant industries should already be taking action now to ensure that the most climate-friendly alternatives are being used. ■

DiversiTech Acquires hilmor from Stanley Black & Decker

DiversiTech Corporation, a leading aftermarket manufacturer and supplier of highly-engineered components for residential and light commercial heating, ventilating, air conditioning and refrigeration (HVACR), announced that it has acquired hilmor from Stanley Black & Decker. The acquisition was completed August 10.

Introduced to the HVACR market in 2013, the hilmor brand enjoys a leading reputation as a trusted supplier of innovative and quality HVACR tools. More than 300 hilmor products ranging from manifolds and gauges to vacuum pumps and electronic tools are available to HVACR technicians across the US, Canada and Latin America. The brand has consistently introduced new and revolutionary products over the years, including its Compact Swage Tool, Compact Bender and Dual Readout Thermometer.

"Our mission, and the driving force behind all we do, is to simplify the way our



customers work," said DiversiTech CEO Andy Bergdoll. "The addition of the hilmor brand to the DiversiTech family is a major step towards furthering that mission. We're adding a tool brand and a portfolio of products that are synonymous with innovation and are highly complementary to the products we currently offer," he added. DiversiTech Chief Sales and Marketing Officer Bud Sjogren added that the DiversiTech leadership team is working closely with its hilmor and Stanley Black & Decker counterparts to ensure a seamless transition. "Several key hilmor personnel will be joining the new business under DiversiTech, further securing continuity, expertise and an extended platform for growth," said Sjogren. ■

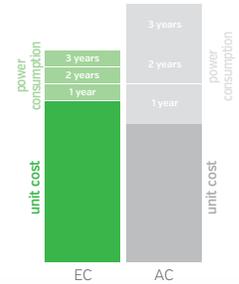
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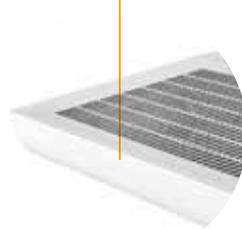
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JC-Hitachi Air Conditioning Announces Women's Education Scholarship Program

Asian University for Women (AUW) and Johnson Controls-Hitachi Air Conditioning announced that Johnson Controls-Hitachi Air Conditioning has donated USD 50,000 to support full scholarships for students of Asian University for Women in Chittagong, Bangladesh.

AUW is a leading international, independent university for women in South Asia that is committed to making world-class liberal arts and sciences education accessible to women who aim to become leaders in their communities. The Johnson Controls-Hitachi Air Conditioning Scholarship will be granted to highly-motivated young Asian women who demonstrate academic excellence and leadership ability as they develop their skills, expertise, and professional networks to solve the most pressing issues of the day with innovative and bold solutions. The scholarships will cover their tuition, room and board, healthcare, textbooks, school supplies, and all other educational expenses.

Johnson Controls-Hitachi Air Conditioning and its family of companies carry out a wide range of social responsibility activities, guided by our five values of Integrity First, Purpose Led, Customer Driven, Future Focused and One Team.

"Johnson Controls-Hitachi Air Conditioning is very excited to have the opportunity to support the Asian University for Women. We sympathise deeply with school's philosophy, spirit and aspiration to promote women's empowerment and status improvement. Being future focused is one of our core values, and we see this as a unique opportunity to support the next generation of female leaders and businesspeople in Asia," says Franz Cerwinka, Chief Executive Officer of Johnson Controls-Hitachi Air Conditioning. ■

Japanese Retailer Seven-Eleven Adopts Honeywell's Environmentally Preferable Refrigerant

Honeywell announced that Seven-Eleven will be Japan's first leading retail chain to adopt its next-generation Solstice N40 (R-448A) refrigerant as a lower global-warming-potential (GWP) alternative to the older R-404A refrigerant, which has an impact on global warming that is more than 3,900 times that of carbon dioxide.

Seven-Eleven is adopting Solstice N40, which offers a 65 per cent reduction in global warming potential compared with R-404A to comply with strict GWP reduction targets set for the Japanese food retail industry. Seven-Eleven has begun installing the environmentally preferable Honeywell refrigerant in condensing units (manufactured by Hitachi-Johnson Controls Air Conditioning and distributed by Hitachi Appliances) at all new and renovating stores across the country.

Industry leaders, Seven-Eleven Japan (operator of Seven-Eleven convenience stores), Hitachi Appliances, Hitachi-

Johnson Controls Air Conditioning and Honeywell conducted a series of trials before selecting Solstice N40. A full year of data showed Solstice N40 led to 20 percent energy savings in the Hitachi condensing units compared to R-404A.

"The trial results confirmed that Solstice N40 is an effective solution for our large estate of convenience stores in Japan to achieve our goals in reducing both overall carbon footprint and operating costs," said Hisashi Ohashi, Head of Construction and Equipment Department, Director and Executive Officer, Seven-Eleven Japan. Solstice N40 is a class A1 (nonflammable) refrigerant by ASHRAE 34 and is classified as Inert Gas in Japan.

With GWP of 1387 (IPCC, AR4) that is 65 percent lower than R-404A, it is also non-ozone-depleting and available for retrofits. Additionally, Solstice N40 is designed as a near drop-in alternative to R-404A, requiring only minimal system adjustments. ■

Chennai Central Rly Station Bags IGBC Green Building Certificate

The Chennai Central railway station has received the Indian Green Building Council (IGBC) certification for adopting green building concepts and features in the station. The award was given under green railway stations rating system by IGBC and the council's Chennai chapter Chairman C N Raghavendran presented



a plaque and certificate to Southern Railway General Manager R K Kulshrestha at a function recently, a release said.

The rating system facilitates energy efficiency improvements, use of renewable energy sources, water management and rain water harvesting, health, hygiene and sanitation, green cover. Some features implemented at the railway station as

evaluated by IGBC include well-developed passenger amenities, pre-paid air-conditioned hall, LED lighting, Solar panels, and use of solar water heaters to meet 90 per cent of hot water requirements.

Green railway stations rating is a tool to facilitate adoption of green concepts, thereby reducing the adverse environmental impacts due to operation and maintenance, it added. ■

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Jomard to become Flakt Group CEO



Thierry Jomard is all set to take up Flakt Group CEO. He will join the company in October. He has worked for 25 years with United Technologies at both Carrier and Otis, including a spell as President of Carrier Commercial Refrigeration.

Dr Walter Rohregger was appointed to the role in October 2016 following Flakt Woods' acquisition by investment group Triton and merger with DencoHappel. He is said to be leaving to pursue other activities. Speaking on behalf of the board of directors, Herbert Doleisch said, "We are confident that Thierry will lead Flakt Group into a phase of profitable growth with innovative products, solutions and services with an obsession to meet and exceed our customers' expectations. We would like to thank Walter for his outstanding commitment and contribution to the significant improvements made in the last two years in bringing together two ventilation companies into Flakt Group."

Dr Walter Rohregger has extensive experience in leading national and international companies in senior executive roles. First with GKN, a global engineering group, where he spent 25 years and most recently as the CEO at Wittur, a private equity owned leading independent supplier of elevator components and solutions. ■

New CAREL site in Casablanca



The CAREL Group is continuing to expand internationally, with the opening of a new site in Morocco, called CAREL Maghreb. CAREL Maghreb, a subsidiary of CAREL France, is located in Casablanca and became officially operational on 16 July after successfully completing an initial start-up period of a few months.

CAREL Maghreb is headed by Loick Le Goff, Sales Manager for the Maghreb and north-west Africa. The opening of this new CAREL site is aimed at increasing coverage of the North African market and the development of new business projects to give CAREL a leading position in its sector and put it at the forefront technologically in the entire area as happens in the rest of the world. ■

ACCA & TRC Add Word of Caution to Thermostat Replacement Incentives

The Air Conditioning Contractors of America (ACCA) announced that the ACCA and the Thermostat Recycling Corporation (TRC) have sent a letter of support to associations representing utility companies, policy makers, and environmental advocates who are engaged in the replacement of old thermostats with new, more energy-efficient models. However, with that support comes a call to be watchful that their good intents are not sullied by a failure to responsibly dispose of replaced mercury-containing thermostats.

ACCA and TRC underscore their apprehension that inadequate oversight of thermostat replacement procedures could lead to the improper handling or disposal of mercury. The letter notes that there have been too many instances where mercury-containing thermostats have been left behind with consumers rather than properly disposed. This is particularly confounding given that the TRC has an effective mercury-containing thermostat collection process in place that is widely accessible and offered at no-cost.

"Contractors are concerned that

thermostat replacement programs, which often encourage consumers to change out their own thermostats, are not adequately educating consumers about environmental regulations and laws that require mercury-containing thermostats to be recycled in a specific manner," said Todd Washam, ACCA Director of Industry and External Relations. "The lack of consumer education and awareness could lead to older mercury-containing thermostats being disposed of in a manner that is harmful to human health and the environment. Thermostat replacement program sponsors must work closely with industry professionals who are trained on the proper collection and disposal methods."

Ryan Kiscaden, Executive Director of the Thermostat Recycling Corporation, adds, "The replacement of old thermostats with new energy-efficient models sends a good message. Ensuring that the replaced mercury-containing thermostats are responsibly disposed of sends a great message. This is especially true in low-income service areas where environmental justice concerns are paramount." ■

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Johnson Control Appoints Visal Leng as VP & President, Building Solutions, APAC

Johnson Controls International plc has named Visal Leng Vice President and President, Building Solutions, APAC effective from September 28, 2018. In this role, Leng will serve as an officer of the company and oversee Johnson Controls Building Technologies and Solutions operations across the Asia Pacific region.

Leng joins from Baker Hughes, a GE company where he served as President Asia Pacific of the world's first and only full stream provider of integrated oilfield products, services and digital solutions.

Prior to the merger of Baker Hughes with GE in 2017, Leng held a number of roles with increasing responsibility with GE,



Visal Leng

France.

Leng will report directly to George Oliver and be based in Shanghai. ■

including President of its Asia Pacific oil and gas operations. "Visal is a seasoned leader with strong business acumen and a growth mindset. He will be instrumental in driving the company's growth platform across Asia Pacific to position Johnson Controls as a leader in smart and sustainable solutions for our customers," said George Oliver, Chairman and CEO of Johnson Controls. Leng holds a master's degree in civil engineering from Ecole Speciale des Travaux Publics (ESTP) in

Oleas to Step Down as GEA CEO

Jürg Oleas is to step down in February after 14 years as CEO of GEA. He will be replaced by Stefan Klebert, who was most recently CEO for eight years at German industrial group Schuler AG. Klebert (53) joins GEA's executive board next month, taking over from Oleas on February 18.

Oleas, a Swiss national, born in Ecuador, has been a member of GEA's executive board since 2001, and was appointed CEO in 2004. He will now leave the company after completion of the fiscal year. Stefan Klebert started his career at Festo AG & Co,



Jürg Oleas

board of ThyssenKrupp Services AG. ■

where he initially worked as a sales management assistant in 1991.

He subsequently held various positions in marketing and sales before joining escalator and lift company Schindler in 1999. Between 2002 and 2003, he assumed responsibility as chairman of Haushahn-Gruppe as well as MD of Schindler Deutschland Holding GmbH. He went on to be chairman of ThyssenKrupp Industries service Holding GmbH and a member of the executive

Capital Cooling Appoints Steve Steadman as CEO

With an aim to continue their rapid growth and expansion, Capital Cooling Refrigeration has appointed industry expert, Steve Steadman, as their new Chief Executive Officer. Steve will join the Edinburgh-based refrigeration supplier as CEO from the start of November this year, bringing with him a wealth of commercial business and industry knowledge, which will complement Capital Cooling's recently refreshed management board.

Boasting over 30 years of experience working for large, blue-chip companies such as Sainsbury's, where he was responsible for the development of capital equipment and refrigeration, Steve has also successfully run his own businesses within the retail shopfitting and commercial



Steve Steadman

refrigeration sector. Steve's move comes from Viessmann Refrigeration Systems, where he was Managing Director for the UK arm of the German company after accepting the role in January 2015. Since taking up his position at Viessmann, Steve was able to successfully grow the business and its brand, generating sales of cold rooms and refrigerated cabinets to new customers and markets in the UK. Using this extensive experience and impressive expertise, Steve will focus his efforts at Capital Cooling on steering the brand from a sales and service perspective, allowing the refrigeration enterprise to develop a new and exciting product portfolio which will introduce the company into new market sectors. ■

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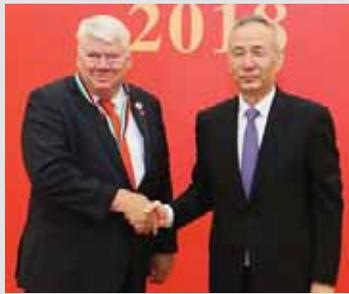


Danfoss Chairman Receives Chinese Award

Danfoss Chairman of the Board Jørgen M Clausen has been awarded with The China Friendship Award – the highest award for foreigners - as a recognition of 22 years of Danfoss contribution to the development of the Chinese society.

22 years after Jørgen M Clausen decided to open up Danfoss first operations in China in 1996, the Chinese market has grown to be Danfoss second home market and the second biggest market for the company with more than 5000 employees, six production sites, and 6 billion DKK (805 M Euro) in sales.

This weekend Danfoss Chairman of the Board Jørgen M Clausen was awarded with the prestigious Chinese Government Friendship Award by the Chinese Vice Premier Liu He at a ceremony at the Great Hall of The People in Beijing. At the ceremony Jørgen M Clausen also was congratulated personally by the Chinese Premier Li Keqiang and presented him with the famous Danfoss thermostat and the arguments for installing heat meters on apartments and household level to facilitate a charging system based on usage, to reduce smog and CO2 emissions. The Chinese Government Friendship Award is considered to be the highest award for foreign experts who have made outstanding contributions to the country's economic



Danfoss chairman receives prestigious Chinese award

and social progress. It was established in 1991. "It is a great honour for me to receive this award, which I receive on behalf of the Danfoss team in China but also on behalf of Danfoss all over the world who has contributed to the great growth and development in our Chinese business," says Jørgen M Clausen. Danfoss has experienced high growth rates in China and expectations are continuous growth and development – primarily due to the focus on energy efficient solutions to

create a healthy environment, food and water safety and creating solutions for the heavy urbanization process taking place in China. Danfoss CEO, Kim Fausing is expecting the big potential in China to be further unleashed over the coming years.

"The China Friendship Award is a recognition of the work the Danfoss China team has been doing the last 22 years. The China Friendship Award is a recognition of the work the Danfoss china team has been doing the last 22 years. We are proud to receive this recognition, and by taking active part in the development in China, we expect to be able to grow our business further in the years to come. And at the same time work hard to continue to develop business with our partners in China," says Kim Fausing. ■

A-Gas Named Employer of the Year

A-Gas is proud to announce that it has been awarded Employer of the Year at the Business Leader Awards 2018. The award recognises organisations that have created stimulating and encouraging work environments and are committed to supporting employees, resulting in a well-motivated and integrated workforce.

"This award is a testament to the hard work and dedication of each member of our team across the world; our people, culture, values and commitment to health and safety make A-Gas truly unique and we are very proud to have this recognised



at such a prestigious event," comments Ian Podmore, Group Chief Operating Officer, A-Gas, "Congratulations to every member of our team, this wouldn't have been possible without your unwavering dedication. Together we can!" This year, A-Gas celebrates its 25th year in business; the company began as a small team of experts based in the UK and now stands as a global market leader with over 600 employees worldwide.

The awards welcomed over 600 CEOs, entrepreneurs and business leaders to celebrate the achievements of organisations in the South West, UK. ■

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Cold Chain Monitoring Market Worth \$6.46 Billion by 2023

The growth of the cold chain monitoring market can be attributed to the growing governmental focus on issuing policies impacting the supply chain efficiency of fast-growing pharmaceuticals sector in Europe and North America, increasing demand for temperature-sensitive drugs, rising demand for better food quality and need to reduce food wastage, growing demand for generic drugs owing to higher accessibility.



Picture Courtesy: www.onsetcomp.com

According to the latest MarketsandMarkets research report 'Cold Chain Monitoring Market by Component (Hardware (Sensors and Data Loggers) and Software), Application (Pharmaceuticals & Healthcare, Food & Beverages, and Chemicals), Logistics (Storage and Transportation), and Region - Global Forecast to 2023', the market is expected to grow from USD 3.80 billion in 2018 to USD 6.46 billion by 2023, at a CAGR of 11.17 per cent between 2018 and 2023. The growth of the cold chain monitoring market can be attributed to the growing governmental focus on issuing policies impacting the supply chain efficiency of fast-growing pharmaceuticals sector in Europe and North America, increasing demand for temperature-sensitive drugs, rising demand for better food quality and need to reduce food wastage, growing demand for generic drugs owing to higher accessibility.

The cold chain monitoring market is segmented based on components into hardware and software. The hardware segment is estimated to hold a larger share of the cold chain monitoring market in 2018. The hardware segment is expected to continue to hold a larger market size since a wide variety of hardware components with varying prices are deployed to monitor the cold chain for various applications. Cold chain monitoring solutions

require lots of sensors and other hardware components for effective network monitoring, and a few of these hardware components can be comparatively expensive.

The rising demand for high-quality food products has resulted in the growth of the cold chain monitoring market for the food & beverages application. The growing demand for meat and seafood owing to the dietary changes of people in various countries is driving the use of cold chain monitoring solutions in this application. Food quality and durability are directly related to the effective maintenance of cold chain operations. The dependence of the food and beverages industry on cold chain monitoring solutions has been gradually increasing.

The high growth of the transportation segment is driven by the growing distribution network of the cold chain. Nowadays, cold chains have become vital for modern supply chain solutions, transporting larger volumes of more sensitive or vital cargo over greater distances through diverse climatic conditions. Being prone to environmental variations, cargo needs to be maintained at a specific temperature or within an acceptable temperature range, which is also driving the growth of the market for the transportation segment.

The Americas is the largest market for cold chain monitoring. The Americas to hold the largest share of the global cold chain monitoring market in 2018. Pharmaceuticals and healthcare is expected to continue to account for the largest size of the cold chain monitoring market in the Americas in the next few years. Various pharmaceutical companies supplying numerous drugs that require cold chain monitoring solutions are based in the country. Increasing demand for chilled and frozen foods in North American countries triggered the cold chain market growth in North America, thereby, driving the growth of the cold chain infrastructure market, which includes refrigerated storage and refrigerated transport. The main factors for supporting the growth of cold chain monitoring market in the Americas are the regulatory environment for the pharmaceuticals industry and the rise in the demand for generic drugs. ■



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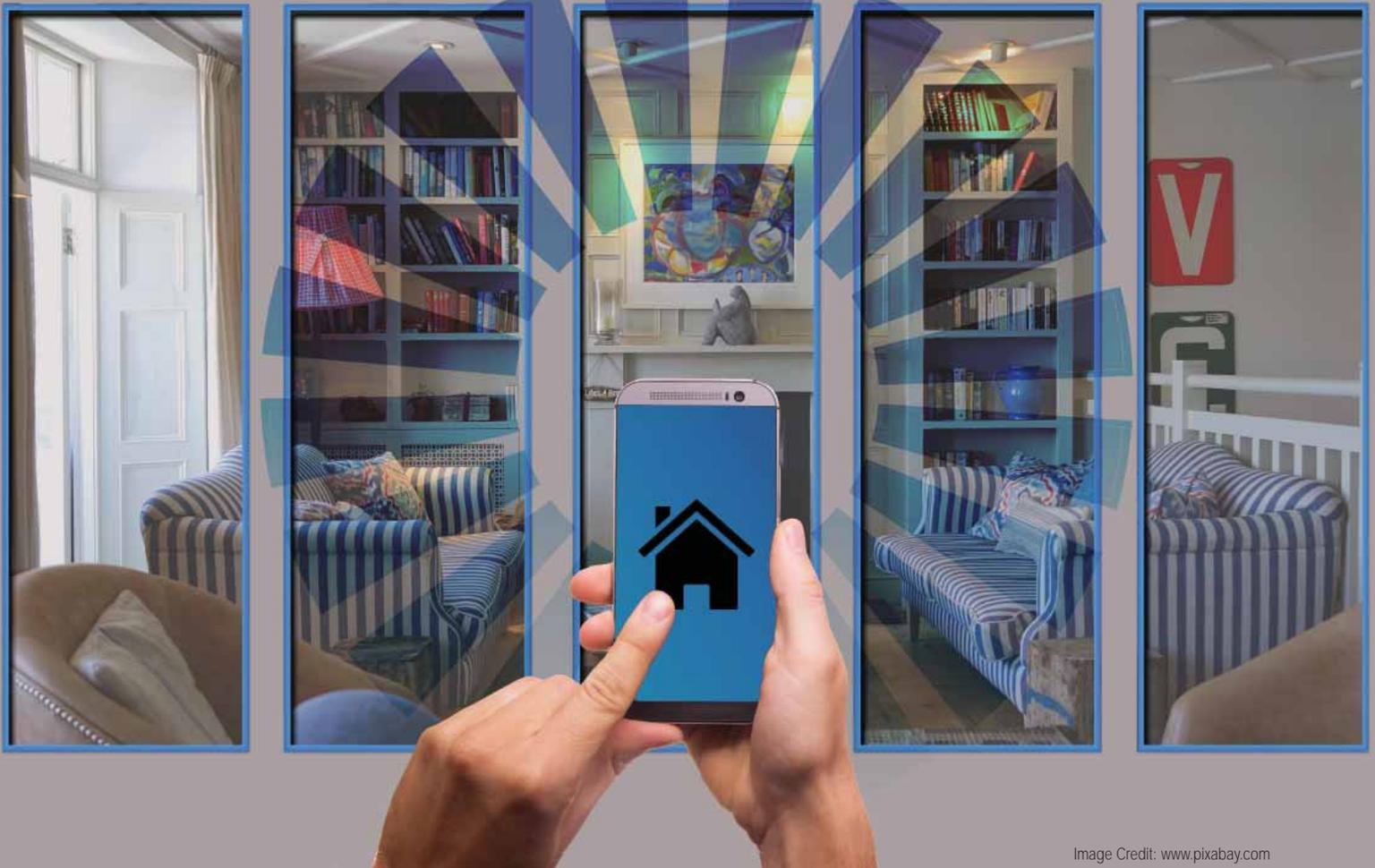


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An analysis on how Internet of Things makes comfort systems smarter.

– Subhajit Roy, Group Editor

Technology is forever progressing and the technology managing comfort systems has gone through major transformation. HVAC and building automation systems now take and analyse huge amounts of sensor data to run systems more efficiently and can provide a more comfortable environment. The recent developments in Internet of Things (IoT) enable a lot of new capabilities that make these systems even better. These capabilities include improved fault detection and diagnostics, asset management, maintenance and enterprise integration. For example, all the various building technologies such as HVAC, lighting, security etc. are now converging, which in turn means larger data which needs to be stored and managed. “IoT provides just the thing for handling such huge amounts of

data via Cloud. This data can be assessed with the help of various tools whereby we can optimise energy usage of any building or manufacturing unit,” explains Gaurav Mathur, Head - Business Development (BS), Grundfos India.

While the previous systems also functioned well, they had no or lesser communication capability between each of their components which resulted in making the entire process extremely complicated. However, now with IoT this has completely taken 360-degree turn. “The seamless communication between each and every component is helping the system react to the changing environment more effectively and efficiently,” Mathur observes.

HVAC and building automation systems have been taking and analysing sensor data to run systems more efficiently and provide

more comfortable environments for many decades now. However, recent developments in IoT technologies are enabling a lot of new capabilities that make comfort systems even better. According to Shrikant Bapat, General Manager, Building Technologies & Solutions, Johnson Controls India, these new advances include increased affordability of edge computing, the miniaturisation of processing units, inexpensive and massive scale Cloud storage, and increasing communication bandwidth through protocols like NarrowBand IoT or 5G.

To boil it down, Bapat explains, there are three distinct ways in which IoT is already helping make comfort systems better:

- Firstly, embedded computing and communication with edge devices are allowing more intelligence and local controls for HVAC devices and systems. Previously, due to constraints of bandwidth and computing power, all information and decision-making had to flow through hierarchical network structures, making the process less adaptable, less responsive and more complicated to manage.
- Secondly, like a lot of technology platforms these days, comfort systems are looking skywards. Cloud and edge technologies, coupled with machine learning and artificial intelligence, is enabling better automation and management of comfort systems. Building automation and energy management systems have been around for some time. But now, various building technologies such as HVAC, lighting, security and more are converging. This allows new insights to be derived from a combination of different data sources.
- Finally, customers now expect customised solutions. "Off-the-peg" will simply not cut it in many areas now. To accommodate this, comfort systems can now be more finely personalised, and occupants can interactively engage with them. This is enabled by an increased proliferation of Mobile technologies and immersive experience delivery mechanisms such as augmented reality (AR), virtual reality (VR), and natural language capabilities. Occupants can now feel more in control of their environments, while comfort system maintenance professionals can now prioritise the most important issues to solve them faster.

"Modern comfort systems are not just being driven by cost and sustainability considerations anymore. There is increasing realisation around their impact on the productivity of people and spaces, which creates an exponentially greater value for enterprises," summarises Bapat.

IoT makes the devices communicate with other devices on real time basis and provides feedback on real time basis. It makes



Serena Ometto

IoT Marketing Manager, CAREL

“When referring to a comfort system, I would expect to forget about the system itself and just enjoy the perfect ambient conditions.

the system to adjust and the user feels more comfortable. An example of a smart device is when the user says, "I am feeling cold" and the system recognises and increase the set temperature to make the user comfortable. Yoizo Ito, Director & Business Unit Head, Air conditioners, Mitsubishi Electric India Pvt Ltd defines a smart comfort system as: A device that helps in recognising the users body temperature by using thermal image devices and adjusting the temperature before the user gives intervenes for temperature correction. He said, "An AI based smart device is one that analyses the position of hands or legs to find the comfortability of body (human being like to keep the hands and legs closer to body when they feel cold and vice versa), check ambient temperature, scan the room in every minute to identify the heat source (cold source) which is affecting the current room temperature and then adjust the capacity of the system, change the direction of air flow to contain the heat source or cold source before it reaches the occupant. It tends to create enough air movement around the occupant to provide a comfortable feeling and adjust the set temperature in accordance with ambient temperature." Therefore, a smart comfort system enhances the adaptive cooling capability of human body.

Mitsubishi Electric has introduced the "mirA.I." air conditioners which is fit and forget type air conditioners with AI powered systems. These units can heat and cool, adjust capacity, can measure human body temperature, feeling of temperature in human body by movement of body parts, identify the heat or cold source, create natural wind movements around occupants etc.

Serena Ometto, IoT Marketing Manager, CAREL also believes that a smart system should make our life easier and help us feel better. So, she said, "When referring to a comfort system, I would expect to forget about the system itself and just enjoy the perfect ambient conditions. That's what IoT applied to a comfort system can do."



Shrikant Bapat

GM, Building Technologies & Solutions
Johnson Controls India

“Modern comfort systems are not just being driven by cost and sustainability considerations anymore. There is increasing realisation around their impact on the productivity of people & spaces, which creates an exponentially greater value for enterprises.





Gaurav Mathur
Head - Business Development (BS)
Grundfos India

“The IoT has truly revolutionised the HVAC industry. Real Time Monitoring, Predictive Maintenance, Remote Diagnostics etc. have now become a possibility.”

Serena shares a few examples of IoT application in comfort system:

- Interaction with the system, if any, is now enabled through the Smartphone in our pockets, with an effective graphic interface. We can adjust the working conditions, due to an unexpected change in our routine, by simply sending a new command, even remotely. The function is enabled by the new smart thermostat, connected via to our standard home Internet connection.
- System maintenance, even in the event of an equipment failure, can be managed proactively by the installer. Emergency calls due to a cold shower in winter or a hot temperature inside the home in the summer are no longer necessary, as the information is automatically shared by the system via the Internet. Through remote monitoring of working conditions, new maintenance contracts can guarantee that problems are identified and fixed before even one realises there is an issue.
- Furthermore, a connected system can use external information to adjust working conditions and increase performance of the equipment. Weather conditions can be used to adapting control based on outside temperature; the cost of electricity, especially in the case of large buildings, such as in commercial applications, can be used as the basis for scheduling operation so as reduce energy bills.

Advantages of IoT-enabled HVAC systems

Talking on the advantages of IoT-enabled HVAC systems over traditional ones, Gaurav Mathur of Grundfos India, said, “The IoT has truly revolutionised the HVAC industry. Real Time Monitoring, Predictive Maintenance, Remote Diagnostics etc. have now become a possibility. It adds a new dimension by providing a wider and smarter network that can access sensors that are used to detect the presence of occupants in the room and then personalise the heating or cooling settings of the rooms based on the chosen set levels used on a regular basis.”

These levels in turn influence and guide individual elements within the heating and cooling systems in terms of temperature



Yojo Ito
Director & Business Unit Head,
Air conditioners, Mitsubishi Electric India Pvt. Ltd.

“IoT-enabled devices saves more energy and give better comfort for occupants on real time basis.”

levels, fan speeds, compressor speeds and air flow direction. This in turn leads to lower energy bills and improved energy efficiency while compared to traditional or conventional HVAC systems.

“IoT has also changed the way HVAC systems can be monitored and controlled,” Mathur adds. Citing an example, he said, “Through advanced information collection the system on its own is enabled to predict and prevent any breakdown. This means lesser downtime, reduced maintenance costs and enhanced life cycle.”

On the other hand, Serena Ometto of CAREL opines that the advantages of IoT-enabled systems are not only focused on the end user. “All of the system stakeholders can use the shared information for different purposes. Maintenance personnel and installers can lower their business costs by reducing unnecessary site visits through remote diagnosis. Equipment manufacturers can increase system quality by analysing the actual behaviour of units in the field,” she said.

“Nonetheless”, she adds, “IoT does not just mean connecting things together: IoT also connects people. By using mobile apps and the web, IoT enables new ways of engaging customers. While in the past the distance between manufacturer and end user was quite evident, now direct interaction is possible, allowing new marketing concepts and opening the way for new business models. This is the challenge of IoT: not just new technology, but above all a new market approach.”

Yojo Ito of Mitsubishi Electric India states that IoT-enabled devices saves more energy and give better comfort for occupants on real time basis. “Traditional systems are electro-mechanical devices with pre-defined settings with limited adjustment by the user and used to control functions independently. IoT enabled devices can constantly change as per the input received from various other connected devices and collectively increase the comfortability to user. Comfortability of winter and summer conditions are different for human body and an IoT device with ambient temperature sensor will able to maintain different temperatures and air flow patterns based on the ambient conditions,” he avers.

IoT involves machine-to-machine communications and Shrikant Bapat at Johnson Controls India claims that his company has been connecting systems and products to provide analytics to its customers for decades.

Johnson Controls has developed Smart Connected Chillers, large air conditioning units used to cool buildings that range from hospitals to universities to commercial buildings. Technicians use data analytics from the Smart Connected Chiller to keep buildings running efficiently and to maintain a continuously comfortable environment. Here’s how they work: Johnson Controls collects data from the chillers, stores it on its platform in the Cloud and accesses it via an application used by internal service technicians. With this app, they can evaluate the condition of the chillers and receive alerts to identify and solve potential problems with the units. The company has recently launched a customer-facing portal so that they also can analyse data to better understand how their chillers are performing. ■

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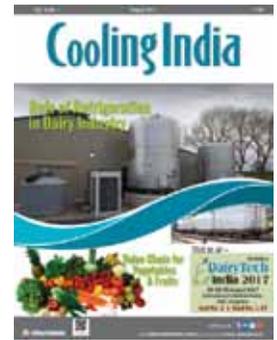
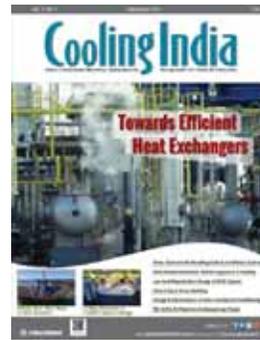
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The article sheds light on working of cooling systems at metro stations.

– Supriya Oundhakar, Associate Editor

Burgeoning urbanisation leading to rise in traffic woes has generated an impetus for Mass Rapid Transit System in India. The metro rail has been witnessing exponential growth since its first introduction in Kolkata and later in Delhi. The segment has gained momentum with successful installation of metro projects in Kochi, Mumbai, Chennai, Jaipur, Lucknow, Bengaluru, Hyderabad, and Gurugram. As a result, HVAC sector has envisaged the growth potential due to spike in metro projects that are crisscrossing length and breadth of India.

Underground metro projects have major requirements for cooling system, ventilation system, pressurisation system, fire smoke extraction system etc. Elevated metro projects usually do not require major HVAC system except for booking counters and mechanical ventilation of a few utility areas and axial fans at the platform area. In underground confined area metro stations, it is

necessary to supply mechanical ventilation in order to extract the heat dissipated by metro rails, passengers' movement, lights and fans, escalators, air conditioning units etc.

The cooling load at metro stations is primarily the heat generated by arriving, stationary and departing metro rails. The skin loads are a much smaller percentage as the stations being underground where the temperatures range from 22 to 27-degree Celsius. The sudden rush of passengers alighting a train adds a short burst of load. The cooling system, thus, has to cater to sharp load fluctuations and adjust cooling medium flows of chilled water and recirculating air, explains Nimesh Mehta, Chairman & Managing Director, Perfect Infra Limited.

While shading the light on working of cooling systems at metro stations, Stefano Ruzzon, HVAC Projects and Dealers, CAREL Group Sales Manager briefs, for metro systems, solutions



Nimesh Mehta
Chairman & Managing Director
Perfect Infra Limited.

“The sudden rush of passengers alighting a train adds a short burst of load. The cooling system, thus, has to cater to sharp load fluctuations and adjust cooling medium flows of chilled water and recirculating air.

can be exploited that lower the ambient temperature by using water as the source of cooling. When one kg of water evaporates, it absorbs around 700 W of energy from the surrounding air. If the evaporation process is triggered by a device with lower power consumption, such a device will be greener than equivalent traditional cooling equipment, such as a chiller. Having significantly lower energy consumption, evaporative cooling systems are, therefore, particularly cost-effective in summer.

In the Madrid Metro, for example, CAREL has installed high-pressure spray units with stainless steel racks housing the nozzles used to atomise and cool the air. The humiFog solution proposed cools the environment to within the limits established by law. A special pump delivers high-pressure water that is sprayed through stainless steel nozzles, producing an imperceptible and uniform mist. The droplets evaporate spontaneously and almost instantly, humidifying and cooling the air. Consuming around 5 W of electricity per l/h of atomised water, the system provides about 700 W of cooling: the ratio between cooling capacity and power consumption is 140:1, elaborates Ruzzon.

The CAREL system ensures an inside temperature of 28°C when the outside temperature is 34-degree C. The experience in Spain has allowed CAREL to monitor and compare real data, highlighting how evaporative cooling has proven to be more advantageous than traditional systems, due to lower energy consumption and less maintenance.

Akhilesh Shriwas, Senior HVAC Engineer, Egis India, explains, in cooling system for underground metro stations - chilled water is provided from a chiller plant room and the same is supplied to the Air Handling Units (AHUs) and Fan Coil Units (FCUs) at various levels of the stations to serve the public areas, offices and ancillary rooms etc. Water-cooled chillers operate during revenue hours and air-cooled chillers operate during non-revenue night hours. For ancillary or 24x7 rooms, standby FCUs provide for uninterrupted air conditioning of those rooms.

Cooling system for above-ground metro stations is done by Variable Refrigerant Flow (VRF) air conditioning system with standby system arrangement (complete VRF system for 24x7 operating rooms) and public area remain unconditioned, adds Shriwas.

According to Detailed Project Report of Pune Metro, the metro station will be cooled by using AHUs located in environmental control plant rooms throughout the station. Each platform will be



Stefano Ruzzon
HVAC Projects and Dealers
CAREL Group Sales Manager

“The experience in Spain has allowed CAREL to monitor and compare real data, highlighting how evaporative cooling has proven to be more advantageous than traditional systems, due to lower energy consumption and less maintenance.

served by at least two separate AHUs with the distribution systems combined along each platform to ensure coverage of all areas.

Detailing the nuances of working of these air conditioning systems, the report further explains, these air conditioning systems mix return air with a desired quantity of outside air. The outside air requirement depends on occupancy with a minimum of five liters per second per person or 10 per cent of circulated air volume, whichever is the greater. The provision of free cooling by a simple two-position economiser control system will be included with the use of enthalpy sensors to determine the benefits of using return air or outside air. This will signal the control system to operate dampers between minimum and full fresh air so as to minimise the enthalpy reduction needed to be achieved by the cooling coil. The report recommends to use energy-efficient water-cooled chiller units with screw compressors at each station.

Mukesh Sehgal, Managing Director, Contec Airflow Projects, suggests, the underground stations will need to be designed around Variable Refrigerant Volume (VRV) based system. The tunnel ventilation, fire smoke exhaust fans will require major design, feasibility study before these systems can be proposed for cooling with VRV systems. For pressurisation and ventilation, if required temperature control can be integrated through VRV system.

Chennai Metro is exploring gas-based cooling technology to keep the stations cool in the underground stretch. According to Chennai Metro Rail Limited, the new VRF technology will reduce the consumption of water as cooling medium that is necessary for operating water-based cooling system. Refrigerants are used as cooling medium in VRF units. The flow of refrigerant is controlled by the inverter compressor of the VRF outdoor unit. Then, it is circulated within the station to multiple units.

Dubai Metro has installed the world's first district-cooled



Mukesh Sehgal
Managing Director, Contec Airflow Projects

“The tunnel ventilation, fire smoke exhaust fans will require major design, feasibility study before these systems can be proposed for cooling with VRV systems.



Akhilesh Shriwas
Senior HVAC Engineer, Egis India

“Optimum design calculation for capacity sizing of equipment, appropriate selection and installation of equipment for 24x7 rooms in metro stations are necessary for easy service and maintenance of the equipment in 24x7 rooms.

mass transit system. In District cooling, the chilled water is distributed through an underground insulated pipeline in order to cool the indoor air of all stations. Being economical, it is energy-efficient helping in reduction of CO₂.

Like all other infrastructure projects, HVAC metro projects have its own challenges. To achieve operating performance requirements of HVAC system i.e. to maintain the temperature and relative humidity in the metro station at desired level especially during peak hours is the biggest challenge.

Dealing with large size equipment in underground metro stations is also a challenge i.e. lifting, shifting and installation of heavy HVAC equipment like chillers, pumps, and fans with proper implementation of safety. Usually, metro projects pass through major commercial and residential areas. The heat and noise dissipating through the outdoor units is also one the major problems in its placement.

For installations of above ground metro outdoor units can be aesthetically installed with proper consideration in the orientation of heat and sound dissipation in the nearby residential or commercial establishments. These smaller units do not pose any major challenge. Placement of outdoor units in underground metro will definitely require careful planning for heat and sound



Serdica underground railway metro station
Photo - Delyan Kovachev, www.sofiaglobe.com

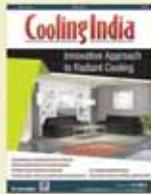
dissipation and space requirement of these units, states Sehgal.

He further suggests that VRV based cooling systems will be an ideal choice. This will not only save on space but also in other utilities like make up water (for water cooled condensers), space, sound and aesthetics.

Optimum design calculation for capacity sizing of equipment, appropriate selection and installation of equipment for 24x7 rooms in metro stations are necessary for easy service and maintenance of the equipment in 24x7 rooms. Selection of the equipment and materials is in full compliance with the local climate and operating conditions keeping in mind performance requirement and lifecycle of selected equipment, concludes Shriwas from Egis India. ■



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Urbanisation drives growth for cold chains

Wellington is a leading global provider of IoT solutions, Cloud-based fleet management platforms, energy-efficient electronic motors and connected refrigeration control solutions for the retail food and beverage markets.

Greg Allen, CEO, Wellington gives a sneak peek into the company's products and services through this interview with **Cooling India**.

Please take us through the company's journey.

Wellington has been evolving rapidly, it started as a motor company in 1996 and has since evolved into a refrigeration hardware company and now into supplying Internet of Things (IoT) solutions to the food and beverage market. We understood early on that a commercial refrigerator is more than just an equipment that keeps food and beverage cold. It is a vital point of sale (POS) and touches both the retailer and the consumer. It is a POS device that can be connected to the Cloud, optimised to improve operational and sales performance and can be designed with a reduced energy footprint. Over the last seven years, Wellington's strategy has focused on developing products and solutions that help customers optimise their refrigeration fleets.

What are the growth drivers of commercial refrigeration?

Our growth in commercial refrigeration is largely driven by ensuring that we meet and exceed the needs of our customers as well as staying ahead of electronics and digital technology

trends which are being adopted rapidly by large food and beverage brands, and retailers. Our food and beverage customers are focused on improving the energy efficiency of their cooling solutions at the right cost and are increasing their efforts to acquire technologies that will help them connect their point of sale coolers directly with consumers. They are leveraging connectivity and software solutions to improve sales revenues and reduce equipment costs.

What products are offered by the company for commercial refrigeration?

Wellington offers a wide range of products and solutions segmented under three business categories; ECR Energy Efficient Motors – led by the class-leading ECR2 motor and ECF2 fanpack, helping customers reduce the energy footprint of their refrigerators; SCS IoT solutions – led by the SCS Connect Cloud connected refrigeration



controller, providing connectivity, asset management and data services to improve the performance of a customer's refrigerator; and iPX Proximity marketing solutions, connecting POS equipment to consumers and providing powerful consumer insights to improve sales. Revenue from our ECR2 and SCS Connect solution has increased fourfold in the last two years as the company has diversified into new markets such as supermarket display and food service.

What kind of technological innovations would you like to incorporate in your products and services to make them more energy efficient?

Our SCS controllers are bluetooth iBeacon enabled and will eventually expand into new IoT connectivity technologies such as LPWAN and other IoT focused cellular technologies. Our hardware is designed to control next-generation high efficiency componentry like Variable Capacity Compressors (VCC), ETX expansion valves and variable speed fans. We are utilising wireless technologies, near field communication (NFC) and QR code technologies for consumer engagement. Our future software innovations will be focused on analysing the 'data lake' from large fleets of connected refrigerators and using that data to optimise fleet performance. Our EC motors are being designed to further improve efficiencies at a lowest total cost – with ease of fitment and long lifetime paramount.

How do you see the acceptance of your products in the market?

Our products are widely used by global food and beverage brands across the carbonated soft drink market, beer, dairy and ice cream, and other refrigerated food brands. International supermarket chains continue to deploy our energy efficient motors in their display cases and quick serve restaurants in their food service equipment. Acceptance is increasing as the markets' focus turns increasingly to energy efficiency and POS equipment productivity.

What are the expansion plans?

The majority of our revenue growth, currently running at between 20 percent to 30 percent annually is organic. In 2018, we completed our first acquisition of Australian proximity marketing company iProximity. iProximity's digital marketing tools are now an integral part of our IoT platform offering. The beverage market is a core market for us, and we are working on growing in other refrigerated and ambient food markets. Our growth will come mainly from growing within food and beverage, expanding into adjacent markets such as food quality and loss, as well as the food service market. We continue to make investments in EC Motor products, IoT and software platforms, and are expanding our product range outside of the refrigerated beverage market. Further acquisitions that complement our product



Wellington SCS Connect with diagnostics app

offering, and support access to new markets are not off the table as we continue to grow.

What are your suggestions to potential clients?

We take our lead from clients and are customer driven in all we do. We look for our customers' suggestions on where our products and service investments should be focused. We do believe that the world is becoming more connected, more worried about the integrity of the cold chain as food and beverage is delivered to the consumer and is putting much more focus on the consumer's experience. So we always present technology options to customers to help them understand how our technology is developing and how we can help them improve in these areas.

What is your outlook for this industry?

We see the outlook as very positive. Urbanisation is driving increasing demand for chilled food and beverage and that comes with a need for improved integrity in the cold chain. This in turn drives growth in the retail sector as well as cold food chains. Increasing environmental regulations, energy prices and load on energy infrastructure will also continue to drive energy efficiency demands in equipment such as refrigerators. We see the format of retail changing, an example is the Amazon Go model with 100 percent connected cashierless retail and with other retailers deploying smaller format neighbourhood stores that are tailored to the community. These factors will result in increasing investment in connected and energy efficient commercial refrigeration and innovation in POS equipment generally. This increased investment, combined with the evolution in available technology options, will cause food and beverage brand marketing teams and equipment buyers to increasingly focus on improving their equipment ROI via digital enhancements including productivity improvement, consumer engagement, and food safety monitoring; a trend which we are already seeing. ■



Achieving Energy Efficiency for Odisha Ice Cream Factory

This case study highlights improvements in plant efficiency and safety of Ammonia Refrigeration System at a modern technology Ice Cream manufacturing unit. The plant is located at Cuttack near Bhubaneswar, Odisha.



Photo Credit: www.pond5.com

The directive from the owner was to upgrade in phases the existing refrigeration plant for higher efficiency and safety, involving reasonable investment. Many a times plant upgrade or modernisation leads to complete change of plant whereby heavy investment and payback estimated at 3 to 4 years are estimated. Hence, it was decided that plant improvement be based on green design aiming to achieve highest efficiency and safety management plan. The objective was to keep RoI period less than a year plus achieving minimum 15 per cent energy savings. The refrigerant used for

plant is pure Ammonia (earns a high environmental mark with ODP & GWP being Zero) which breaks down to its natural components of nitrogen and hydrogen in a relatively short time. The facilities' refrigerating system is operated through natural (gravity) flooded feed.

Noted Prevailing Problems

A systematic study was made to accordingly implement the above. The primary step was to prepare a HAZOP report and investigate operational plant problems on day to day basis. We proceeded by recording plant operation

parameters and operating hours. After careful study, following problems were observed in the existing refrigerating system:

1. The chiller rooms and freezer rooms are not able to achieve desired temperature in spite of long running hours of compressors.
2. All unit compressors including standby were required to remain in operation in order to meet the required refrigeration capacity.
3. The compressors were running full load at all times.
4. The compressor suction pressure and

plant evaporating temperatures did not correlate. The suction pressure was much lower than the corresponding room temperature.

5. The compressor discharge pressure was high considering the ambient conditions.
6. Complete plant had to be operated manually.
7. The air cooler coils for chiller (cold) rooms and freezer rooms were frosted.
8. Although the cold room and freezer rooms were designed at - 25°C room temperature, however the best temperature achieved would be below -14°C.
9. The defrosting system was manual and was never able to defrost the coils completely.
10. Plenty of oil was getting accumulated in ACU or freezer coils.
11. Plant safety management was non-existent.
12. The level control system was bypassed and operators were manually throttling the valves on receiver supply line.
13. Freezer air cooler coils were starved for liquid supply, but operators were afraid of liquid surge to compressor.
14. Operators were kept occupied by operating various valves and using all efforts to check operation, temperature and liquid level.
15. Due to small leakages through flange joints, strong ammonia odour was continuously felt in the machine room.
16. The chiller rooms and freezer rooms were located around the plant and many times the loader would be trapped in the room, thus, preventing the trapped person to freely communicate with plant operators.

Energy-Efficient Measures & Novel Solutions

Above conditions lead to high energy consumption and loss of production while overall plant was unable to perform at designated requirements. Also considering that the allocated budget to rectify the above was quite limited and in view of time constrain, it was decided to concentrate on achieving desired room temperature, increase plant efficiency and improve plant safety at shortest period of time.

Another constraint faced was limited job site availability of highly skilled and certified manpower to operate the plant. Hence, it was required to provide an automatic operating system which can be easily handled by professional plant operators.

The following functions were performed to update plant operation, smoothly and trouble-free:

1. Installed dual safety (relief) Valves on all pressure vessels with required pressure ratings.
2. Calibrated compressor safety cut out, repaired and re-connected for safety.
3. Installed (on each compressor) easy to use automatic compressor control system with energy monitoring.
4. Installed fully automatic air purge on condenser and liquid receiver circuit.
5. Installed automatic hot gas defrosting system (replacing the existing manual defrost) on all air cooling units in chiller



Plant discharge pressure before plant modification



Plant discharge pressure after plant modification



Fully automatic air purger in operation



Ammonia Leak detection system



Cold Room Safety



Plant piping after modification

rooms and freezer rooms.

6. Installed temperature monitoring and control devices for all cold rooms and freezer rooms.
7. The automatic level control system was serviced and put into use.
8. Installed the reflex type level gauges and removed the glass tube one.
9. Installed an integrated automatic ammonia leak detection system.
10. Replaced all flange type valves were replaced with 40 bar weld in-line valves. The valves were chosen with back seating facility.
11. The chiller room alarm system with built-in battery back-up was installed on machine room doors for trapped loader and generate alarm in plant room. This unit was incorporated with inbuilt battery backup so that it can work independently in the event of power outage.
12. The overall above system improvement is anticipated to provide a Low Life Cycle Analysis (LLCA) and low carbon emissions where the refrigerating system gets greener and the energy savings add to the bottom line footprints.

Above performance was successfully implemented within 10 working days. This was done together with the valuable assistance of plant operators and one certified welder, without any downtime or disturbing status quo of plant operations. Once the required changes were in place and analysis performed against baseline and prevailing industry standards, the positive results achieved on the same was evaluated as follows:



Easy to use compressor automation system



Data monitoring system with webbased operation and mobile application to monitor plant performance online anywhere in world



Plant piping before modification



Automatic liquid level control, temperature control and hot gas defrosting system

1. The compressor discharge pressure reduced significantly to 160 PSI from 220 PSI.
2. The automatic operation of compressor units removed operator interference and resulted in smooth loading / unloading of each compressor. Additionally, overall energy requirement for compressor was reduced significantly.
3. The safety valves and release system ensured increased safety at plant and no discharge of ammonia in plant in case safety valve pops up.
4. The automatic ammonia leak detection and alarm system increased plant safety meeting OSHA's PSM requirements extending operator flexibility in working around the plant.
5. The automatic hot gas defrost system replaced manual defrost operation.
6. The defrost time was reduced to 15 minutes instead of 45 minutes.
7. The increase in cold room or freezer room temperature during defrost reduced to 2°C from 10°C.
8. The cold room or freezer room design temperature of 25°C was successfully achieved.
9. The time required for freezer operation reduced 25 per cent.
10. The number of compressors required reduced. The standby compressor remain as standby, was never required to operate.
11. Reducing compressor running hours by 25 per cent.
12. The automatic level control system made sure that ACU or freezer coils are flooded thus, preventing liquid slop- over to the compressor.
13. The automatic level control system avoided operator's interference by throttling valves on receiver supply line.
14. Oil accumulation in ACU and freezer units was eliminated.
15. Frosting on ACU and freezer units eliminated.
16. The online data logging and remote monitoring system installed helped customer to monitor the plant on mobile phone while travelling abroad and enjoy his holidays.
17. The temperature control system made sure that required temperatures are maintained continuously. No under shooting or overshooting observed. All temperature was maintained within $\pm 2^{\circ}\text{C}$.
18. The weld in lines valves eliminated the leakages through flange joints of the valves.
19. The back-seating facility in the valve assured operators that now they don't have to pursue in tightening valve glands.

Looking Ahead

After observing a trouble-free plant operation for a period of one year, an estimated 30 per cent energy saving was derived with an overall payback recovered within four months. Additionally, it also improved product (ice cream) quality and production capacity as compared to (prior to above improvement) previous year. ■

Anand Joshi
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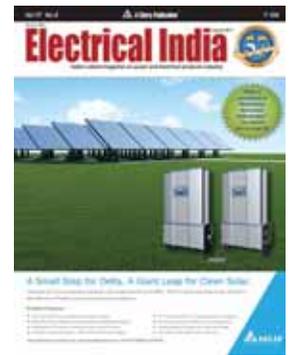
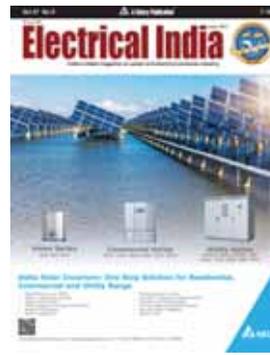
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Huayi compressors: OEMs' Choice

Huayi compressors have been extensively used by leading commercial refrigeration and domestic refrigerator OEMs over the last 6-7 years.

Sandeep Sekhani, Director, Safe Refrigerations Pvt Ltd

SAFE Refrigerations Pvt Ltd, an expert in the field of HVAC&R products, has been appointed as the sales and marketing partner for Huayi compressors in India. In an interview with Cooling India, Director of Safe Refrigerations Sandeep Sekhani talks about the USPs of the newly launched world-famous Huayi-Trucool Refrigeration compressors. Excerpts:

Huayi-Trucool Compressors was launched in India in December last year. How is the response so far?

It has been exactly 12 months since we formally launched Huayi-Trucool compressors in India. Frankly, response has



Huayi compressors have been extensively used by leading commercial refrigeration and domestic refrigerator OEMs over the last 6-7 years. They are known for their high reliability, ultra-high energy efficiency, having wide voltage range and its ability to work in high ambient.

been more encouraging than we expected. We have installed wholesaler partners across India and offer full range of models needed by Indian customers. They are widely being used for wide applications ranging from

freezers, display cabinets, water coolers, kitchen cabinets, scientific equipment and serving aftermarket for domestic refrigerators.

What make these Compressors unique?

Huayi compressors have been extensively used by leading commercial refrigeration and domestic refrigerator OEMs over the last 6-7 years. They are known for their high reliability, ultra-high energy efficiency, having wide voltage range and its ability to work in high ambient. We have started offering unique 18-month replacement warranty that Indian customers look for, appointed specialist Application Engineers to support customers and help customers in appliance balancing.

Are there any strategies in place to make Huayi-Trucool Compressors in India?

Well, we are in this business for just 12 months – it is too early to make a specific statement on this. All we can say, Huayi does have a long-term agenda for India and it does include local manufacturing at the right time. Given the fact that very recently import duty on compressors has been raised to 10 per cent, you never know, it could happen faster than we all expect.



Range of Trucool compressors by Huayi

Are you planning to launch any new product in near future?

We have a fairly big pipeline of products that we are actively perusing to launch in India. We are currently doing market scanning for each of these and you will hear from us in time to come.



Huayi brings in the best of engineering and manufacturing excellence in compressor business and at Huayi-Trucool, we bring in knowledge or expertise of compressors business, market knowledge, customers contacts and what it takes to succeed in India.

How do you see the partnership between Huayi Compressor Company and Safe Refrigerations heading?

Huayi looks to us as its strategic partner in the region. We work with them very closely and actively to understand Indian market needs in terms of new model development, market strategies and specific needs of Indian customers that will make Huayi a preferred brand in India. Huayi leadership team joined us at product launch and regularly visit Indian customers to get a first-hand feedback on products.

How do you complement each other?

Very simply put, Huayi brings in the best of engineering and manufacturing excellence in compressor business and at Huayi-Trucool, we bring in knowledge or expertise of compressors business, market knowledge, customers contacts and what it takes to succeed in India. We are in the business for long term. ■

Huayi Compressor Company Limited, Jingdezhen and Safe Refrigerations Private Limited formally launched the world-famous refrigeration compressors in the brand name of Huayi-Trucool at a National Launch Program held on December 8th, 2017.

Huayi Compressor Company Limited with an annual turnover of over \$1 billion, has plants in China and Barcelona. It has an employee strength of 7,500 and annual manufacturing capacity of 45 million pieces. Renowned Cubigel brand is owned by Huayi Compressors Company Limited since 2012. Huayi brand compressors have been regularly used in India as well for last few years by leading white goods refrigerators and commercial refrigerator manufacturers and are known for its high efficiency, high reliability and tropicalised design.

SAFE Refrigerations Private Limited, a professionally managed company, has over 50 years of expertise in PAN India distribution of key HVAC&R products. Few key products in its portfolio are Highly Rotary Compressors, Harris Brazing Alloys and Equipment, Aspen Condensate Pumps etc. SAFE Refrigerations has been successfully serving equipment manufacturers, wholesalers and contractors across India.

Safe Refrigerations has appointed wholesalers across India and has started active engagement with key equipment manufacturers. They have also made these compressors available locally, provide application-engineering support and offer after-sales replacement warranty. It also plans to conduct customer education seminars at key location in India in few months.

Safe Refrigerations has set up a dedicated arm to promote Huayi-Trucool compressors across India and has appointed Sales and Application Engineers to support this business. In addition, the company is also providing unique 18 months replacement warranty on these compressors that a very few companies offer in India.

Solar Passive Ventilation for Comfortable Indoor Air Quality

The ventilation system that is chosen should be capable of slightly higher rates of circulation than this minimum. Large gatherings & activities that produce airborne VOCs may create a need for higher air exchange rates to maintain air quality.



Buildings that are intended to provide indoor air quality that is acceptable to human occupants and minimises adverse health effects. Various fans and air circulating devices are used to achieve this objective. Obviously, it consumes very high amount of electrical energy. Whereas changes to the 2013 ANSI/ASHRAE edition of the standard primarily focused on usability and clarity, the 2016 edition includes a major change to the scope of the standard by which residential occupancies are moved from Standard 62.1 to Standard 62.2.

The Importance of Indoor Air Quality

On average, people spend 90 per cent of their time indoors, so clean indoor air is essential for optimum health. Sadly, many homes and businesses have contaminated air.

Volatile Organic Compounds (VOCs), pollen, radon gas, smog, mold (Mold is a key factor in breaking down organic matter such as fallen leaves and dead trees. That is good for outdoors, but not for indoor), fumes, and odours all degrade home air health. Indoor air pollution can be

especially a matter of concern for people who have chronic diseases, compromised immune systems, or mold or chemical sensitivity.

Energy Efficiency & Comfort Conditioning

Most ventilation systems drive up heating and cooling costs while decreasing indoor comfort. Much like venting a room by opening a window, ventilation systems can degrade energy performance because they exhaust air without capturing the heat. Because exhaust fans need makeup air to operate properly, they pull in unconditioned

air through gaps and cracks in the building exterior, creating drafts. This has a huge impact on both comfort and energy costs.

Heat Recovery Ventilation (HRV) and Energy Recovery Ventilator (ERV) systems conserve energy, lowering utility bills. The heat from the exhaust air is transferred to the incoming air via a heat exchanger. Zehnder heat recovery ventilators are up to 95 per cent efficient, saving energy. This also helps to reduce the size of the HVAC equipment needed because it doesn't have to work as hard to heat and cool when the intake air is conditioned by the HRV unit.

An HRV provides a constant supply of fresh filtered air for the building's occupants. The higher the heat recovery percentage, the greater the comfort. For example, if the indoor room temperature is 70 degrees Fahrenheit and the outside temperature is 30 degrees, the heat recovery rate could mean the difference between having air in the low 60s coming into the house versus air that is over 65 degrees. Less efficient HRV systems can supply fresh air to living spaces at uncomfortable temperatures. As a result, occupants turn off the unit or use it intermittently. This is a concern because, without the constant ventilation, indoor air quality will suffer.

Ventilation Strategies for Passive House Certification

A Passive House is a building in which thermal comfort can be provided solely by post-heating or post-cooling of the fresh air flow which is required for good indoor air quality.

The Passive House Standard, a voluntary standard for ultra-energy-efficient homes and buildings is at the forefront of energy conservation. In fact, projects built to this standard are 80 per cent more efficient to heat and cool than a typical new building built to the minimum building code requirements. Most Passive House projects feature an ultra-energy-efficient envelope with continuous insulation and meticulous air sealing. Passive House construction in colder climates typically requires triple-pane windows, generous amounts of insulation, and heat recovery ventilation. Because little air is allowed to leak in or out of the building, a mechanical ventilation system is essential to protect indoor air quality.

In addition, ECBC or GRIHA or LEED for Homes awards two points to projects that go beyond basic ventilation measures and

installs a system that provides heat transfer between the incoming outdoor air stream and the exhaust air stream. An additional point can be earned by projects that undertake commissioning to verify that ASHRAE 62.2 ventilation requirements are being met by the ventilation system.

Using HVI Ventilation Standards

The Home Ventilation Institute or HVI, recommends that an HRV or ERV (Heat & Energy Recovery Ventilation Units) provide at least 0.35 air changes per hour throughout an entire home. This translates to about five cubic feet per minute (CFM) per 100 feet of floor space. For a 1,000 Cufoot home, this standard requires a continuous ventilation rate of 50 CFM-although this may vary depending on the number of occupants in the home.

For best results, the ventilation system that is chosen should be capable of slightly higher rates of circulation than this minimum. Large gatherings and activities that produce airborne VOCs may create a need for higher air exchange rates to maintain air quality. Bathrooms and kitchens may require higher ventilation rates and may benefit from having returns or fans placed strategically to remove warm, moist air.

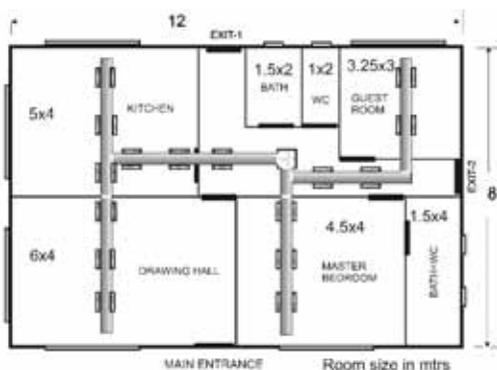
Using ASHRAE 62.2 Standards

ASHRAE stands for American Society of Heating, Refrigeration, and Air Conditioning Engineers. The organisation creates detailed ventilation standards that dictate what proper air exchange should be in a variety of different settings. These standards are very useful for businesses, as areas like game arcades, lobbies, warehouses, commercial kitchens, and hospital waiting rooms may all benefit from having different levels of air circulation.

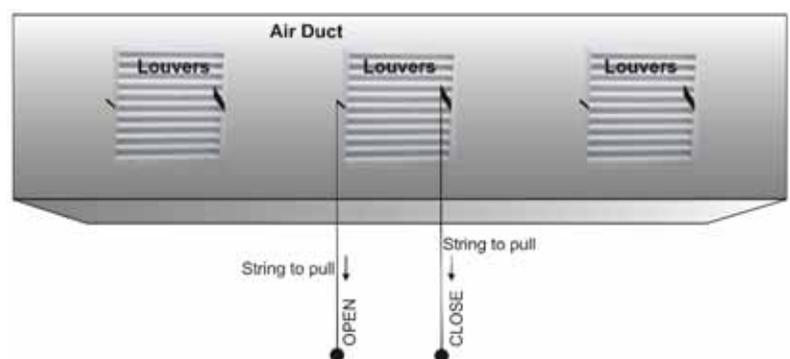
ASHRAE standards are also useful for private residences and apartments and can be used by construction companies to ensure a new or renovated building is up to par. ASHRAE standards are highly complex and take occupancy rates and other factors into consideration to determine optimal ventilation. Updated standards are also being released for 2016. In order to use ASHRAE standards to determine your home ventilation needs, it is best to consult a ventilation expert.

Using Passive House Standards

Passive House standards dictate the airtightness level of a home using an onsite pressure test to gauge the air seal. The



Solar Passive Ventilation for comfortable indoor quality





home must not exceed 0.6 air changes per hour before ventilation has been installed in order to ensure that air quality is strictly controlled. Passive house standards dictate energy usage so heat and energy recovery ventilation is the key to meeting all standards. ERVs and HRVs installed in passive homes help to make sure that at least 75 per cent of the energy is transferred from outgoing air to incoming air. Ventilation is carefully controlled to reach a rate of about 0.4 air changes per hour.

Building / Room	Air Change Rate- n - (1/h)
All spaces in general	min 4
Assembly halls	4 - 6
Attic spaces for cooling	12 - 15
Auditoriums	8 - 15
Bakeries	20 - 30
Banks	4 - 10
Barber Shops	6 - 10
Bars	20 - 30
Beauty Shops	6 - 10
Boiler rooms	15 - 20
Bowling Alleys	10 - 15
Cafeterias	12 - 15
Churches	8 - 15
Classrooms	6 - 20
Club rooms	12
Clubhouses	20 - 30
Cocktail Lounges	20 - 30
Computer Rooms	15 - 20
Court Houses	4 - 10
Dance halls	6 - 9
Dental Centers	8 - 12
Department Stores	6 - 10
Dining Halls	12 - 15
Dining rooms (restaurants)	12

Building / Room	Air Change Rate- n - (1/h)
Dress Shops	6 - 10
Drug Shops	6 - 10
Engine rooms	4 - 6
Factory buildings, ordinary	2 - 4
Factory buildings, with fumes or moisture	10 - 15
Fire Stations	4 - 10
Foundries	15 - 20
Galvanizing plants	20 - 30
Garages repair	20 - 30
Garages storage	4 - 6
Homes, night cooling	10 - 18
Hospital rooms	4 - 6
Jewellery shops	6 - 10
Kitchens	15 - 60
Laundries	10 - 15
Libraries, public	4
Lunch Rooms	12 - 15
Luncheonettes	12 - 15
Nightclubs	20 - 30
Machine shops	6 - 12
Malls	6 - 10
Medical Centers	8 - 12
Medical Clinics	8 - 12
Medical Offices	8 - 12
Mills, paper	15 - 20
Mills, textile general buildings	4
Mills, textile dye houses	15 - 20
Municipal Buildings	4 - 10
Museums	12 - 15
Offices, public	3
Offices, private	4
Photo dark rooms	10 - 15
Pig houses	6 - 10
Police Stations	4 - 10
Post Offices	4 - 10
Poultry houses	6 - 10
Precision Manufacturing	10 - 50
Pump rooms	5
Residences	1 - 2
Restaurants	8 - 12
Retail	6 - 10
School Classrooms	4 - 12
Shoe Shops	6 - 10
Shopping Centers	6 - 10
Shops, machine	5
Shops, paint	15 - 20
Shops, woodworking	5
Substation, electric	5 - 10
Supermarkets	4 - 10

Continued on Page 47

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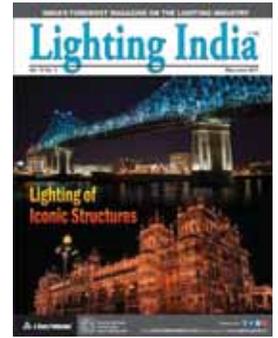
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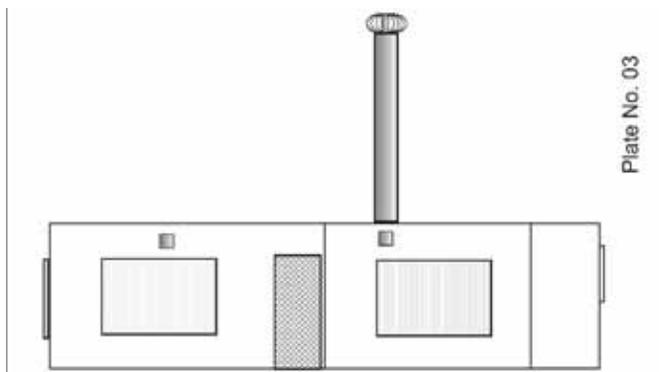


Diagram A: Solar Passive Ventilation for comfortable indoor air quality

Building / Room	Air Change Rate- n - (1/h)
Swimming pools	20 - 30
Town Halls	4 - 10
Taverns	20 - 30
Theaters	8 - 15
Transformer rooms	10 - 30
Turbine rooms, electric	5 - 10
Warehouses	2
Waiting rooms, public	4
Warehouses	6 - 30

We must be aware of local regulations and codes.

Fresh air supply - make up air - to a room based on the table above can be calculated as

$$q = n V \quad (1)$$

where

q = fresh air supply (ft³/h, m³/h)

n = air change rate (h⁻¹)

V = volume of room (ft³, m³)

Example - Fresh Air Supply to a Public Library

The fresh air supply to a public library with volume 1000 m³ can be calculated as

$$\begin{aligned} Q &= (4 \text{ h}^{-1}) (1000 \text{ m}^3) \\ &= 4000 \text{ m}^3/\text{h} \end{aligned}$$

Practical Installing Cases

The attached drawing 'A' shows the principle of the Solar Passive Ventilation for hot regions typically for a residential house.

Construction

The ducts made up of 18 swg GI sheet of size 300x300 mm c/s these ducts are fitted with louvers, the opening or closing of which can be adjusted by pulling the hanging strings. These ducts are painted as per the aesthetic need of the room. The ducts emerging from various rooms are brought at on place near the convenient centre of the building. A puncture is made to the RCC slab. A chimney of size 600x600 c/s and height of 3000 mm made up of 16 swg GI sheet is erected on the roof which is painted with mat black heat absorbing paint. On top of the chimney, a turbo ventilator is fitted for efficient flow of hot air and avoid in grace of rain water or any other insects. The windows can either be kept closed or can be provided with inlet having wood

wool with slow water drip humidification (WWH) (similar to desert cooler), this would further lead to better cooling effect.

Principle of Operation

The chimney on the rooftop gets substantially heated up and inside air moves due to thermo syphon effect. The turbo ventilator accelerates this air circulation rate. Now, obviously the space inside chimney pull the air from the ducts i.e. from the various rooms. Thus, the air from rooms is sucked and thrown outside due to simple thermo-syphon effect. The outside air is sucked in through the gaps of windows and doors. In addition to intake of fresh air this develops a slight negative pressure in the room and the temperature drops down offering cooling effect. If the WWH system as explained above is provided then it would lead to further higher cooling effect.

Live Case Study

- Punjab Energy Development Agency (PEDA) building at Chandigarh in India is a remarkable example of this in business or commercial building (Photographs are attached). Ministry of New and Renewable Energy Sources (MNES-Gol) is encouraging such type of Solar Passive Ventilation through their all State Nodal Agencies viz. PEDA, MEDA, CREDA, GEDA, NEDCAP etc. it is also encouraged by Bureau of Energy Efficiency (BEE), LEED, ECBC and GRIHA Rating.
- At Masdar university in UAE, they have erected a tower in an open space surrounded by academic buildings. The ventilation in an open area is worth experiencing and studying.
- There are some residential houses also having adopted this concept located in Aurangabad, Dhulia of Maharashtra and Rewa of Madhya Pradesh.

Future Scope for R&D

The above explained concept has been successfully proven for cooling application.

- It is necessary to try and evaluate the performance for heating application in cold zone or during winter for room heating application. If the top ventilator is supplemented with a solar powered fan to push the air downwards and the tower wall is provided with heat exchanger fins from inside then the air will get heated due to heat of the tower and it will get spread into the rooms. This would substantially reduce the use of room heating load using electricity. The room heated throughout the day time would retain the heat after sunset and only during early morning hours artificial heating source may be required.
- If the walls of the tower are provided with heat retaining material, the cooling and heating function can be extended for full night also. ■

Prof. Dr. OmPrakash G Kulkarni

Scientist,

Renewable Energy and as Inventor of World's first Solar Thermal/ Renewable Energy Based Cold Storage/ Refrigeration system



Phase Change Material based Free Cooling

Phase Change Material (PCM) based free cooling is a promising sustainable technique best applicable for locations with diurnal temperature variation more than 12°C.



Marxer Haus uses PCMs for heating & cooling

Photo Credit: Roland Kornej, Filmfabrik Woessner / www.phase-energy.com

Due to energy security, urban heating and environmental problems (ozone layer depletion and global warming) related to mechanical cooling as well as increasing demand of indoor environmental control, the passive cooling methods have gained increasing interest. Various passive cooling techniques are shown in figure 1. Natural ventilation is simple and very old technique but suffers from many drawbacks such as overheating problem, wind direction dependency, etc.

To overcome these, the free cooling methods have been introduced and considered as a potential tool for day-night cooling applications. Such systems require the energy supply only for fan operation and storage unit, which makes it more advantageous over mechanical cooling. Storage unit incorporates PCM, where cold is stored from ambient air during night, and it is released to the indoor ambient during the hottest hours of the day. PCMs can store a large amount of cold and phase

change occurs at a constant temperature. Hence, PCM based free cooling gained much more attention recently.

Phase Change Materials (PCM)

PCM (classified as latent heat storage) is a substance with high heat of fusion. PCMs can transform their physical structure from solid to liquid or from liquid to gas or vice versa depending on whether the process is an exothermic (release of heat) or endothermic (absorption of heat). Amount of heat energy stored depends on

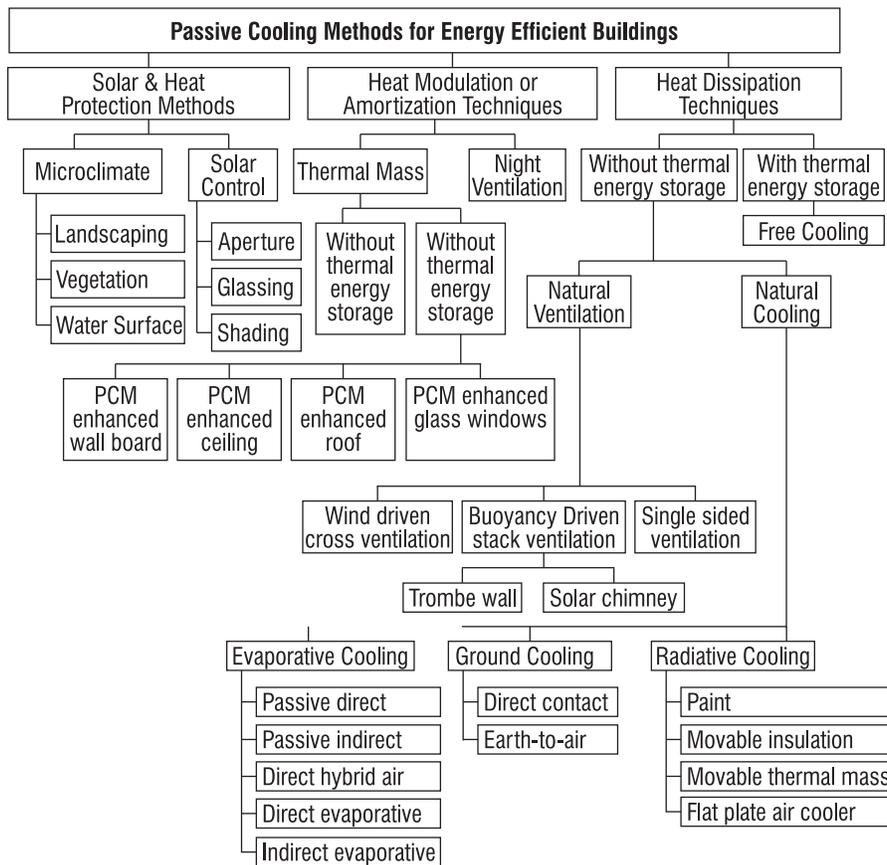


Figure 1: Classification of passive cooling methods

the melting temperature, the temperature range at which it melts and the latent heat capacity per unit area. PCM to be used in the thermal storage systems should possess following desirable properties:

- Suitable phase-transition temperature
- High volumetric latent heat of transition to minimise size
- Good heat transfer to assist charging and discharging
- Favourable phase equilibrium
- High density to allow a smaller size of storage container
- Small volume change on phase transformation
- Low vapour pressure to reduce containment problem
- No supercooling to get proper heat extraction
- Sufficient crystallisation rate
- Long-term chemical stability
- Compatibility with materials of construction.
- Non-toxic, non-flammable and non-explosive for safety
- Low cost and large-scale availability

Phase change materials can be divided into different subcategories based on their chemical composition. Three groups are: (i) organic compounds, (ii) inorganic compounds and (iii) inorganic eutectics or eutectic mixtures (Figure 2). Each group has its typical ranges of melting temperature and melting enthalpy.

Organic PCMs are classified as paraffin and non-paraffin. Paraffin PCMs are characterised by their ability to melt and freeze many times without phase segregation and degradation of their latent heat of fusion. Non-paraffin PCMs are characterised by their varied properties; each of these materials has its own properties. These are subdivided into fatty acids and other non-paraffin organic. Fatty acids have high values of latent heat of fusion and the ability of many cycling of melting and freezing with no supercooling.

Inorganic PCMs are classified as salt hydrates and metallics. Salt hydrates consist of a salt and water that combine in a crystalline matrix when solidifies. There are many different salt hydrates having melting temperature ranges between 15°C - 117°C. Salt hydrates are considered as the most important group of PCMs for application in latent thermal energy storage systems. Metallics include the low melting metals and metal eutectics. Comparison of organic and inorganic phase change materials are summarised in table 1.

The eutectics consist of two or more components where each of them melts and freezes congruently forming a mixture of a component during crystallisation process. Usually, eutectics melt and freeze without segregation. During melting process, both components liquefy at the same time without possibility of separation.

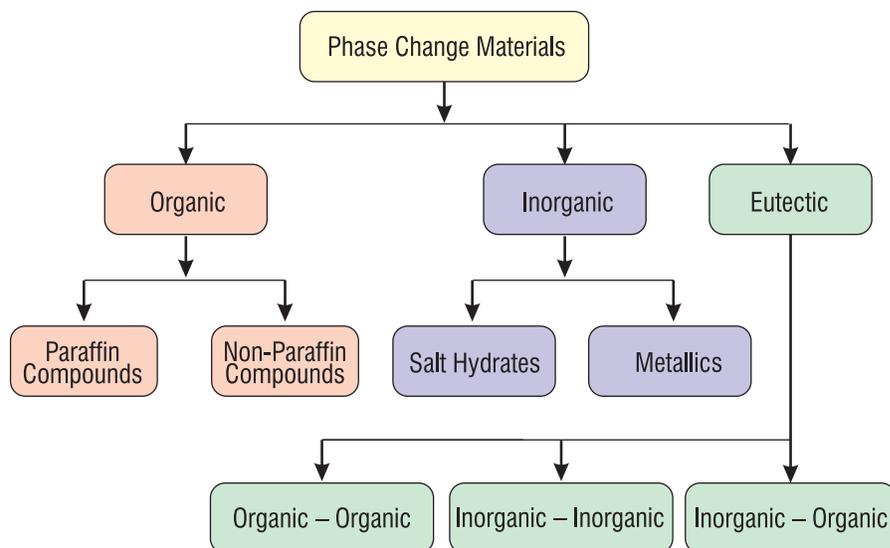


Figure 2: Classification of phase change materials

Table 1: Comparison of organic and inorganic PCMs

	Organic Compounds	Inorganic Compounds
Merits	<ul style="list-style-type: none"> • Exist in wide temperature range • Freeze without much supercooling • Compatible with building materials • Chemically and thermally stable • High Latent heat of fusion • Recyclable, non-reactive and safe 	<ul style="list-style-type: none"> • Low cost and readily available • High thermal conductivity • Non-flammable • Sharp phase change • High volumetric latent heat storage capacity
Demerits	<ul style="list-style-type: none"> • Low solid state thermal conductivity • Flammable • Low volumetric latent heat capacity • Low phase change enthalpy 	<ul style="list-style-type: none"> • Supercooling • High volume change • Segregation • Reduce in efficiency in repeated use

Working Principle of PCM Based Free Cooling

If the night or early-morning time ambient temperatures are very low or within the comfortable temperature range compared to the daytime, the concept of free cooling is the most suitable, in which, the cool energy available during the night or early morning hours is stored and utilised during the daytime to achieve comfort temperatures in the indoor space. PCM is suitable for free cooling, because of the small temperature difference between the day indoors and night outdoors. The working principle of PCM based free cooling for buildings is shown in figure 3, which consists of following two modes of operation:

Charging process (Solidification of PCM)

This occurs during the night when the outdoor air temperature is lower than room temperature (Figure 3a). Cool outdoor air flows through the PCM and absorbs heat from the liquid PCM. The PCM then begins to solidify at a specific temperature. This process stops when the ambient

temperature is almost equal to that of the solid PCM.

Discharging process (cooling of air)

Cool stored in the PCM is released when the room temperature increases beyond comfortable levels (Figure 3b). The solid PCM absorbs heat from the hot indoor air. The temperature of the indoor air is reduced as a result of flowing through the PCM unit. This cooled air is circulated into the interior of the building. The PCM starts to melt as it absorbs heat from the air while remaining at a constant temperature.

If the melting temperature of the PCMs is in the middle of the diurnal extreme temperatures, then an equal temperature difference is available for charging and discharging. The ambient temperature of a place is dependent on the seasonal climate and its geographical location. The free cooling concept is site specific and climatic dependent. Free cooling is suitable for places where the diurnal temperature variation (difference between the maximum and minimum temperature of the place), is at least 15°C. The effectiveness of free

cooling does not depend on the average temperature of a place, but it is a strong function of the amplitude of the ambient temperature swing.

Technological Innovations

There are several options where and how PCMs can be used to meet the cooling requirements. Many research and development studies have been conducted on PCM based free cooling, which includes mainly the selection of PCM, system configuration and heat transfer improvement. PCM selection is governed by many factors (chemical, physical, thermodynamic and economic properties), which have discussed in the previous section. Heat transfer improvement includes use of fins, multiple layers of PCM, nano particles in PCM, flow turbulence, etc. Three important system configurations are discussed below.

A module of PCM based free cooling with heat pipes embedded in a PCM is shown in Figure 4. It is ceiling-mounted with a fan to throw air over the exposed ends of heat pipes. The other end of the heat pipes is in a PCM storage module. During the day, the warm air generated in the room is cooled by the PCM i.e. heat is transferred to the PCM. During the night, the fan is reversed and the shutters are opened such that cool air from the outside passes over the heat pipes and extracts heat from the PCM. The cycle is then repeated next day. The heat pipes avoid the need for complex heat exchange geometries on the surface of the PCM exposed to the air, and the system is easily retrofitted. The heat transfer rate could be improved, and the phase change time will

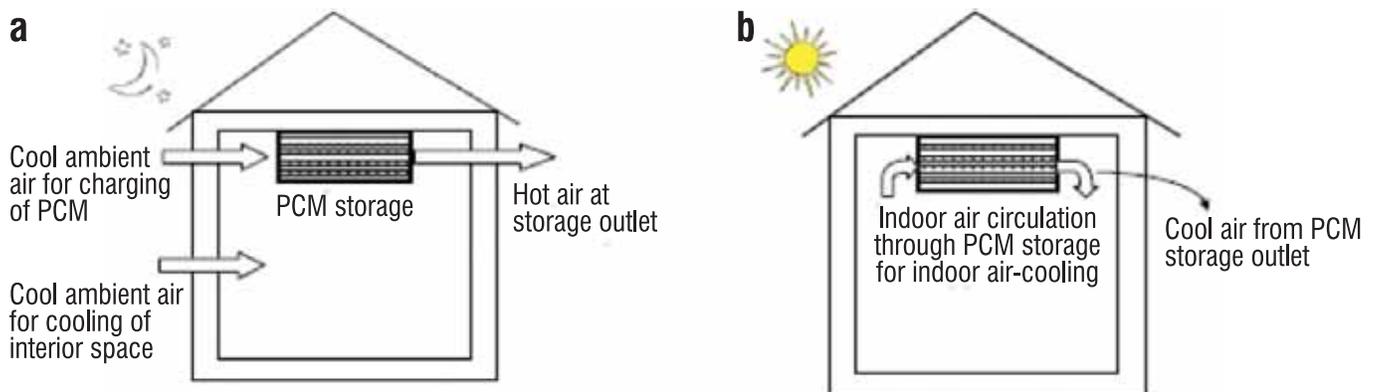


Figure 3: Free cooling working principle (a. charging process, b. discharging process)

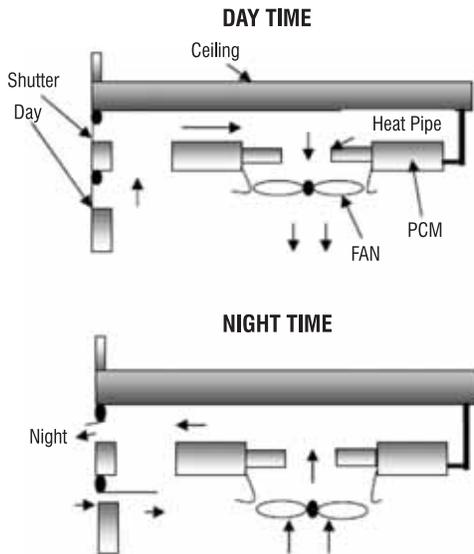


Figure 4: PCM based free cooling system with embedded heat pipes

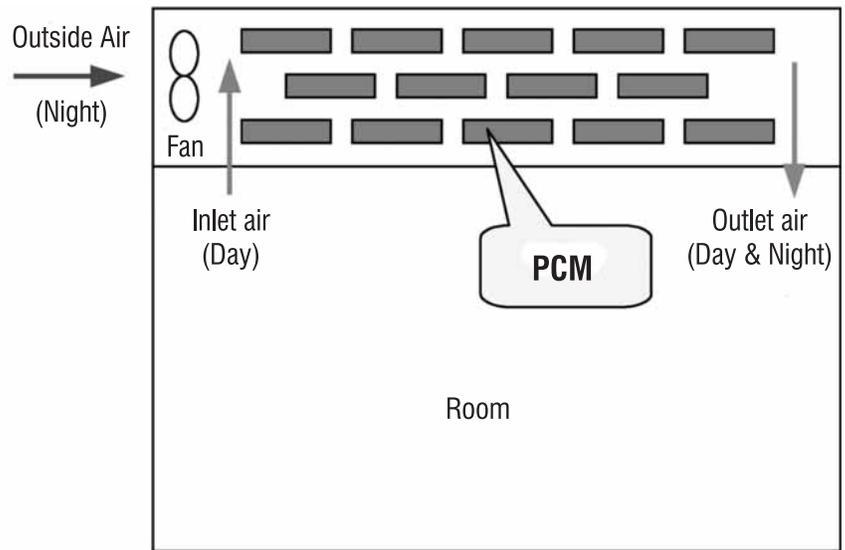


Figure 5: Schematic of PCM Packed Bed Storage system

be shortened by using the heat pipe inside the PCM.

Night ventilation system with PCM Packed Bed Storage (Figure 5) can be used for increasing building's energy efficiency. The most important component is the Latent Heat Thermal Energy Storage system including phase change material package bed and the air duct among the PCM capsules. During the night, the cold air from outside is blown through the storage system which charges the system with cold. In the daytime, cold stored in PCM is released to the air which cycles between the storage system and the room. Enough heat transfer area can be obtained by adjusting the ratio of the surface area to the volume of the PCM capsule. PCM has high energy density and the latent heat transfer process is approximately an isothermal process, which may decrease the temperature variation of building materials so that the temperature difference utilisation efficiency can be enhanced whether in cool charging process or cool discharging process. By adjusting the melting point of PCM, the cool charging temperature difference can be enlarged and the time that can charge cool to PCM can be extended at night so that more natural cool resource at night can be stored. With mechanical ventilation, enough air flow rate can be obtained. In additional, the air flow rate can be controlled to meet different cooling load

demand at daytime. This system has great potential in the field of energy efficiency building with enhanced thermal comfort level of indoor environment.

The free cooling system with PCM regenerative heat exchanger is shown in figure 6. The set up consists of a series of bulk cylindrical disc modules containing PCM on the shell side and the passages for flow of air through the tubes. These modules are stacked one over other with air spacers in between each module. The

cool air available at the early morning is made to pass through the PCM regenerative heat exchanger and this cool energy is stored by freezing the PCM. The stored cool energy is retrieved during day time for space cooling. During the night time when dampers 2 and 3 are in close position and 1 and 4 are in open position, the cool energy available in the atmospheric air is made to pass through the modular heat exchangers using a fan or blower. As the cold air is passing through the PCM

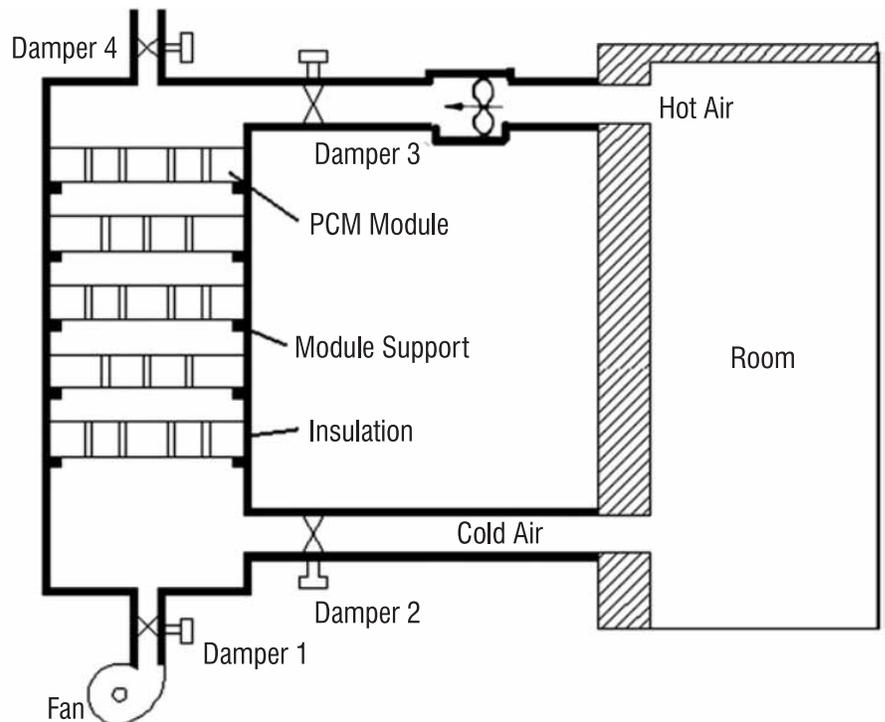


Figure 6: Free cooling with PCM regenerative heat exchanger

regenerative heat exchanger, the PCM in the modules will freeze and store its cool energy. A fan is used for air circulation during night time and the dampers are adjusted to control the flow rate of air. During the day time when the dampers 2 and 3 are in open position and 1 and 4 are in closed position, the hot air from the room goes to the PCM module by natural circulation or small capacity fan and the PCM releases the stored cool energy to the room at a slower rate to cater the cooling need throughout the day. Phase change material should be selected such that the melting or solidification temperature lies in the middle of diurnal temperature variation of the ambient air.

Feasibility & Commercial Status

The applicability of the PCM based free cooling of the buildings depends mainly on the diurnal temperature range or the amplitude of the ambient air temperature swing rather than average ambient temperature. Therefore, this system performs efficiently in the climatic

conditions where the diurnal temperature range is between 12 and 15°C. For climates where the diurnal temperature range is less, this system will require a careful design consideration including selection of appropriate PCM and appropriate PCM capsulation. Free cooling provides a significant economic benefit because of shifting peak load time of electricity usage and reducing peak air conditioning demand (reducing domestic electric energy consumption during peak period loads). About 17 per cent of the total implementation cost relates to the storage materials (PCMs). Although the free cooling system needs additional investment of 9 per cent, with payback over a period of three to four years, it consumes almost nine times less electrical power than conventional split-type air-conditioning unit. Replacing a conventional air conditioning unit with a free cooling system could reduce CO2 emissions by 430 tons per year.

Despite a large number of researches, the real case applications documenting the

potential and behaviour of PCMs in real operation conditions are quite rare and the technology has not yet been fully commercialised. The barrier to the PCM application in actual buildings may be attributed to their major drawbacks such as segregation, supercooling, low thermal conductivity, high cost and to the limited number of PCM manufacturers available around the world. European cities are the most geographical locations where PCMs with free cooling was implemented. This technology can be also promising option in India for locations with diurnal temperature variation. Finally, the concept of free cooling using PCM energy storage is still under development and more research is needed to convey the concept from the theoretical and experimental stage to the real implementation phase. ■

Dr Jahar Sarkar
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Engineering, Indian Institute
of Technology, Varanasi



SCHOTT exhibits new glass doors for chiller cabinets at Chillventa 2018

At this year's Chillventa in Nürnberg from 16 - 18 October, SCHOTT will exhibit three new innovative door systems for chiller cabinets. The new SCHOTT Termofrost CRS View will be on show for the first time. The display surface on these glass doors for cold cells and cold rooms has been further enlarged which improves visibility of the refrigerated products. The SCHOTT Termofrost Skyline glass doors for deep-frozen and chiller aisles are another highlight, giving long chiller cabinet fronts a spacious all-glass look.

"Our star attraction is the SCHOTT Termofrost Ad Door – a glass door for chillers or cold rooms – which is equipped with a transparent screen. Retailers can use this to present product innovations digitally directly at the point-of-sale or to advertise campaigns," explains Dietmar Nilles, Head of Sales D/A/CH/NL Food Display at SCHOTT.



SCHOTT Termofrost CRS View - the display surface on these glass doors for cold cells and cold rooms has been further enlarged.

The European market for refrigerated and deep-frozen products is constantly growing because consumers have come to appreciate their benefits of shelf-life, practicality, food storage and ease of preparation. The retail sector is responding to this by allocating more and more space to refrigeration systems in supermarkets, fuel stations and kiosks. Due to the increasing importance of the refrigerated and deep-frozen aisles, the retail sector is constantly seeking new ways of presenting these goods more attractively. Particularly in demand are innovative shopfitting

solutions with a focus on the shopping experience and high product quality – therefore attractive, transparent chillers with maximum visibility are simply must-haves here! SCHOTT offers a wide range of swing- and sliding doors for chillers, giving the food retail industry the opportunity to boost differentiation at the POS. They also improve visibility of the refrigerated products, resulting in a convenient and appealing shopping experience for customers.

For more information, visit: www.schott.com/termofrost



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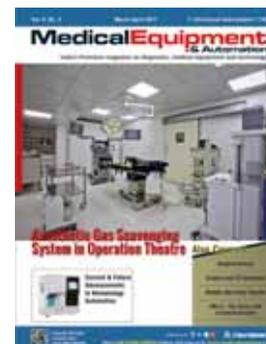


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Embraco's Innovative Solutions For Commercial Refrigeration

The global company showcases an extended portfolio for food retail, food service, merchandiser applications at Chillventa

From October 16th to 18th, Embraco participates in Chillventa International exhibition to reinforce its positioning as one of the largest players in the refrigeration segment promoting quality of life through innovative cooling solutions. Apart from offering a wide array of technologies, Embraco launches its complete and extended portfolio that enables attending an entirely new set of applications on food retail, food services and merchandiser markets.

Embraco has been positioning itself as a global specialist in its segment while presenting its new business approach – shifting from product to solution oriented. “Over the years, Embraco has begun to look at innovation from the outside-in perspective, by understanding the challenges and needs of its customers and then developing technologies. As a result, the company is focused on providing a complete platform that combines compressors, services and high quality and performance solutions,” reinforces Luis Felipe Dau, Embraco’s President.

At the booth Hall 7 / 7-114, the company showcases a portfolio for commercial and aftermarket and distribution segments through four different zones:

Food retail: Solutions for supermarket and convenience stores applications, such as self-contained reach-ins, frozen islands, cold rooms and others.

Plug n’ Cool New | Silent Unit New | FMF line-up - FMFD New

Food services: Applications for restaurants and bars, bakeries and equipment for professional kitchens, ice makers and cold rooms.

Sliding Unit New | NTX line-up New | EMC



Luis Felipe Dau
President

Merchandisers: Solutions for sought-after bottle coolers and ice-cream cabinets.

EMX New model | FMF line-up | FMX

Complete portfolio: New product launches including the portfolio extension, such as NJX (new 2hp single piston compressor), Scroll, as well as complete solutions in natural refrigerants and transitory alternatives.

NJX line-up New | Scroll complete portfolio | all Embraco platforms

Additionally, Embraco will provide a training session with a specialist in the refrigeration market, Gilmar Pirovano, Sales Senior Manager for Europe, who has 30 years of experience in the segment. The presentation highlights Plug n’ Cool, a complete solution for the food retail chain which reduces energy consumption by up to 32 per cent. The training ‘Plug n Cool’- A new concept in refrigeration takes place at Chillventa (Hall 7A, stand 7A-618), on October 16 - 1:40pm-2:00pm.



NJX

Pioneer in Natural Refrigerants

For more than 20 years, the company has used natural refrigerants in its portfolio for commercial and household as an alternative to reduce the negative effects on the ozone layer, greenhouse effects and to improve the equipment’s energy efficiency. “One of the company’s focus is to offer the best refrigeration solutions, while educating the market to its use. At Chillventa, we will be presenting our complete portfolio in natural refrigerants with alternative solutions to customers that haven’t yet migrated to hydrocarbons”, reinforces Daniel Campos, Global Sales Director.

With an innovative DNA, Embraco invests 3 per cent to 4 per cent of its net revenue in R&D annually. “We are constantly investing in research and development going towards creating the most innovative cooling technologies that contribute to people’s quality of life. Chillventa is an opportunity for the company to exhibit our global experience and expertise with solutions that feature natural refrigerants and how we are changing the industry to provide sustainable and energy efficient portfolio,” states Campos.



FMF line-up



Plug n’ Cool

WING Air Curtain



VTS is becoming a stable name in the Indian market, as they redefine the air curtain category through their new innovation that comes with a very unique design which complements the décor of every interior.

WING by VTS, the Air Curtain, is the new generation device created from passion for a light and modern design representing characteristics of gliders. It gives an impression of a minimal housing with a streamlined form of a wing that seems to float in the air. This innovation combines the matchless design and incomparable efficiency to redefine the air curtain image. WING being one of the quietest air curtain in the market, has both functional and aesthetic qualities while it meets the current requirements of being energy efficient equipment.

As we know, air curtain or air doors are mainly used in the places where the doors need to stay open operationally or required to open very frequently. The forceful turbulence created by this device prevents the flying insects, impure air and other pollution outside from mixing with the inside air of the premise. As every other air curtain, WING excels in its fundamental function which is keeping the chilled air inside at its utmost purity. But what

makes WING different from other air curtains in the market is its unique features.

Save More with EC Motor

The modern design of the EC motor and fan inside ensures up to 40 per cent energy saving compared to old generation models. Application of EC motors and precisely developed rotor, special solutions reducing air flow resistance and air structuring device blades helps WING in keeping its promise of energy efficient equipment. Along with this, the device obtains the required air stream range and the outstandingly short start-up time to full performance.

Simple Cleaning, Galvanised Steel Casing

The optimised construction of the covers enables easy cleaning for the air curtain and it does not require the disassembly of any part, always ensuring hygienic operation. Also it provides a long-term protection against corrosion and consistent aesthetic qualities with the help of its double coating (galvanization + powder paint). It is another uniqueness that it offers smart door



Wing



Wingpure

protection. Air curtain with advanced WING EC controller may perform according to the door opening sensor. Smart Door protection gives you not only permanent temperature comfort but also secure inside environment from dust, pollution, insects and unpleasant scents. The innovative and aesthetic shape of the WING curtain complements its unrivalled perfection.

Another notable feature of WING is that it can be mounted horizontally and vertically. Due to the slim design, very small height of the housing and the inclined air inlet, the device may be mounted in a limited space above the door without any effect on performance.

Unique Diamond Design

The unavoidable specialty of WING is its magnificent design. The company's Board Product Advisor, Zbigniew Wnukowicz's states; "The design is one of the best tools for providing innovative solutions that place the users' needs in the centre. Streamlined WING topped up with the side cover with a diamond shape which is nearly invisible is the fruit of the engineering idea, which led to designing the device structure in a manner that ensures subtlety that ideally matches any interiors in functional and aesthetic terms."

The diamond style side panels hide the excellent components

in an innovative curtain body to set new standards for air curtains. It not only protects the inlet of the engine cooling system but also fulfills an inspective function.

This product has started to gain much attention in the Indian market where as it is already creating a place for itself in the world market. WING is very well suitable for restaurants, hotels, public venues, shopping malls, medical facilities, and even for department stores.

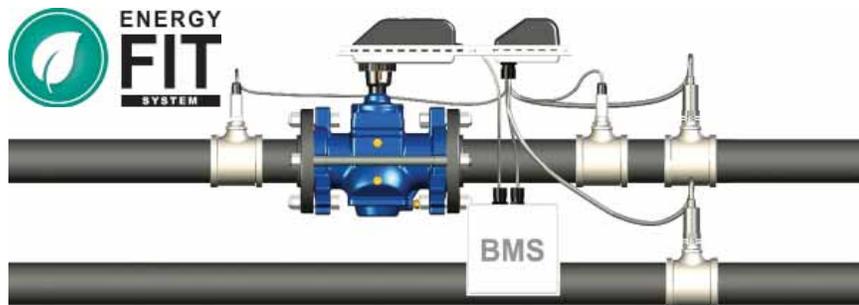
WING helps to increase the customer comfort, keeping them happy. It manages the surroundings at its best, keeping warm or cool as required, making it a comfortable and smoke free-environment. And when you have such a modern design air curtain which goes accurately with every interior, it just adds value to your brand. Along with that your usage of an air curtain for a clean environment promotes the importance of a healthy and hygienic environment to the customers. Let's WING take the charge to create a better tomorrow.

Undoubtedly the design of WING looks splendid and it adds to the beauty of any building. The unique and modern design of this Air Curtain is one of a kind in the market and definitely is a matchup to today's changing architectural world. ■



FlowCon Energy FIT System

Energy-Saving Pressure & Temperature Independent System



Ensavior presents the FlowCon Energy FIT System, the world's first pressure and temperature independent regulation valve. With the FIT System you will get monitoring, measuring, connectivity and control in one package including PICV valve, sensor kit and the new FlowCon Intelligent Interface. Download the FlowCon App and take full advantage of the FIT system.

The FIT System measures energy usage while monitoring coil performance and adjusts the PICV valve to optimise coil performance. The PICV valve maintains the correct flow, despite pressure changes, and guarantees that flow will only change when demand requirements change or ΔT is outside specification.

By optimising ΔT , flow rate requirements may be reduced resulting in significant energy savings, while having pressure independency and temperature independency and optimised comfort.

- State-of-the-art pressure and temperature independence.
- All-in-one including PICV, temperature and pressure sensors, flow meter and BTU meter.
- User-friendly with easy setting directly on display actuator.
- Cost savings due to optimised energy consumption and improved efficiency.
- Complete overview of energy and flow.
- Simple monitoring via Bluetooth or analog to BMS.
- Clear information regarding ΔT , ΔP , flow rate and BTU heat transfer.
- Flexible solution - also allowing upside-down installation.
- No piping restriction and most compact system on the market.



The FlowCon Energy FIT System is typically installed on AHUs or in the Plantroom and includes:

Intelligent Interface

Connects all FIT components and BMS. It also measures energy usage while monitoring coil performance to adjust PICV to optimal coil performance.

PICV with electrical display actuator

Maintains correct flow despite pressure changes and guarantees that flow and actuator position only changes when demand requirements change or ΔT is outside specification.

Size: DN50-250 / 2"-10".

Max. operational ΔP : 30(35)-600 kPaD/4.5(5.1)-87 psid.

Max. flow rates: 1.48-76.8 l/sec/23.4-1220GPM.

Media temperature: (-) 20°C to (+) 120°C/ (-) 4°F to (+) 248°F.

Temperature sensors

Temperature sensors measure the ΔT across the coil allowing the Intelligent Interface to adjust according to ΔT target.

Media temperature: 0°C to (+) 100°C/ (+) 32°F to (+) 212°F.

Pressure sensors

Pressure sensors measure up/downstream pressure allowing the BMS to lower system pressure to PICV's requirements and reduce pump energy consumption.

Media temp. max.: (-) 10°C to (+) 85°C / (+) 14°F to (+) 185°F.

Integrated BTU meter

The Intelligent Interface calculates the BTU and displays data via Bluetooth® on cell phone or in BMS.

Integrated Flow meter

Likewise, the Intelligent Interface calculates the flow and displays data via Bluetooth® on cell phone or in BMS.

Bluetooth®

In combination with the FlowCon App, the Intelligent Interface can provide readings from the FIT System directly via Bluetooth®. Data includes T1, T2, ΔT , P1, P2, ΔP , Flow, BTU and ΔT Target.

ΔT control

Flow only changes when demand requirements change or ΔT is outside of specification - The FIT System provides full ΔT control. ■

Email: info@ensavior.com

Original is key: BITZER India and Green Point



Only Original Spare Parts ensure complete safety when it comes to BITZER compressors. They can be ordered via BITZER's official service network Green Point

Customer satisfaction and service play a key role at BITZER, which is why the company's service arm Green Point was created back in 2006. Thanks to Green Point, BITZER claims to be the first and only manufacturer to provide a global after-sales network to date. Green Point offers state-of-the-art BITZER compressor care and services, providing manufacturers quality standards when it comes to compressor overhauls and repairs, ensuring the reliability, performance and durability of the equipment. Harvinder Bhatia, Managing Director BITZER India, comments: "We've been represented with a BITZER subsidiary in Mumbai since 1999 and have been expanding our global Green Point service and maintenance network in India since 2011. We



The free BITZER SPOT App checks the authenticity of BITZER products

now have four Green Point sites with which we offer our customers maintenance, services and training. Only Green Points commit to apply the Quality Kits which consist of unconditional replacement of all safety and wearing parts."

Original Spare Parts: only original is safe

These services also include the allocation of genuine spare parts perfectly matching the running system. BITZER Original Spare Parts are designed together with the compressor development and thus are always state-of-the-art technology. They preserve the compressor's value and ensure an exceptionally long service life. BITZER Original Spare Parts come with a parts warranty and match the highest operational standards of BITZER compressors, whereas fast supply is guaranteed by the BITZER Global Logistics Centres.

Original Refrigeration Oils certified by BITZER

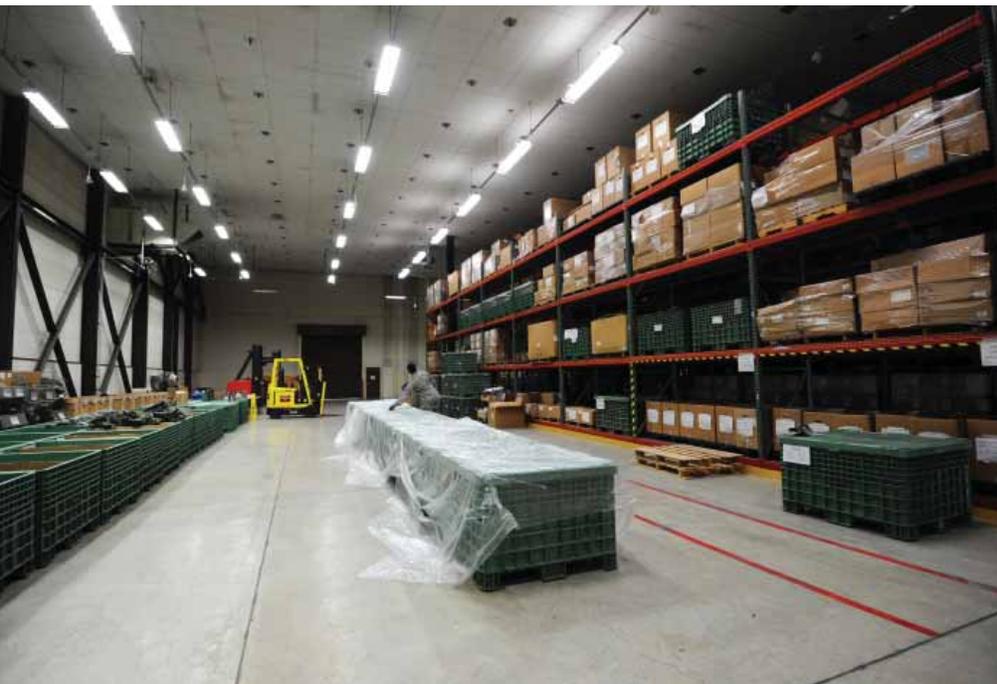
Product pirates not only sell counterfeit compressors, they also bring low-quality oils onto the market. BITZER expressly warns customers against the possible risks associated with their use. The viscosity characteristics, moisture content and chemical formulation are very different from the original products. Original BITZER lubricants feature lowest moisture content (lower than specified in standards) and specific properties optimised for BITZER compressors. Their chemical compatibility is extensively tested including distinct compressor construction materials introduced for use with the latest low-GWP HFOs and HFO/HFC blends. Due to their specific tribological characteristics, BITZER oils guarantee highest service life of the compressors. Customers who have concerns about the origin of their lubricant are invited to contact their local BITZER representative for advice.

Product benefits in one package: BITZER SPOT App

A helpful new tool for air-conditioning and refrigeration professionals has been on the App Store (<https://tinyurl.com/y76gr6qj>) and Google Play (<https://tinyurl.com/ydfupyyim>) since late August: the BITZER SPOT App. The app enables users to verify the authenticity of their BITZER products. Additionally, the BITZER SPOT App contains extensive documentation and a directory of all BITZER and Green Point service points as well as all certified dealers. ■

Opportunities galore at REFCOLD India 2018

REFCOLD India is an initiative of ISHRAE and NurembergMesse India with the objective of bringing forward the best technology solutions and increase the overall growth of refrigeration and cold chain sector.



- REFCOLD India Emerson Awards 2018
- Daikin Global Student Poster Competition
- REFCOLD India Business Summit
- Armacell REFCOLD India Innovation Hub
- **Workshops** on design, installation, operation, maintenance and troubleshooting aspects of refrigeration and cold chain plants
- Seminar sessions by distinguished lecturers from UNEP, ASHRAE, IIR, etc
- Dedicated pavilion for reefer transportation

Government Support

In line with the Prime Minister's vision of doubling farmer's income by year 2022, several government departments have come forward to endorse and support REFCOLD India 2018.

REFCOLD India 2018 has support from:

- Minister of Rural Development, Panchayati Raj and Mines - Government of India - Narendra Singh Tomar
- Minister of Agriculture, Rural Development, Fisheries, Animal Husbandry, and Transport, Government of Gujarat - R C Faldu,
- Minister of Revenue, Government of Gujarat - Kaushik Patel
- Minister of Petroleum and Energy, Government of Gujarat - Saurabh Patel
- Joint Secretary, Ministry of Environment, Forest & Climate Change – Government of India - Gyanesh Bharti, IAS
- Department of Horticulture of Gujarat
- National Centre for Cold Chain Development (Ministry of Agriculture)
- Indo-German Chamber of Commerce

The industrial refrigeration, cold chain and reefer transport industry's debut event, REFCOLD India 2018, will be held from 22-24 November 2018 at the Mahatma Mandir Convention & Exhibition Centre, Gandhinagar, Gujarat.

The age of technology has ushered in an astounding transformation and has permeated every facet of our lives in a significant way. The changing economics of refrigeration design, engineering, storage, and transport along with shifts in consumer demand to enable the consumption of healthy and safe food, particularly, in terms of nutritional, organoleptic and microbial quality is catalysing the practice of the refrigeration industry to explore radically new ways of creating greater value to enhance quality of life.

REFCOLD India is an initiative of ISHRAE and NurembergMesse India with the objective of bringing forward the best

technology solutions and increase the overall growth of refrigeration and cold chain sector. The event is aimed to provide a platform for global investment community to connect with stakeholders in refrigeration and cold chain sector in India.

REFCOLD has over 100 exhibitors from India, China, Germany, USA and various other countries, many of who will showcase the latest in equipment, material and technologies. The show is expected to draw over 10,000 visitors from the entire Cold Storages, Food, Dairy, Pharmaceutical ecosystem in India. Delegations from France, Turkey, China will be visiting the show.

Highlights of REFCOLD India 2018

- Discover product launches, latest innovations and new technologies in refrigeration
- Training and product demos

International Associations supporting REFCOLD India are:

- United Nation Environment Program (UNEP)
- International Institute of Refrigeration (IIR France)
- China Refrigeration Association
- Turkey Refrigeration Association.

Market Potential -India 2020

- The penetration rate of the refrigerator market in India to increase to 47.5 per cent in 2026, from 27.3 per cent in 2016.
- India has the largest cold store capacity in the world.
- Indian cold storage market to grow at a CAGR of 16.09 per cent (USD 8.57 billion) by 2020 driven by the growth in the organised retail, Indian fast food market, food processing industry and e-commerce sectors.
- Refrigerated storage market in India to grow at a CAGR of 15 per cent by 2020.
- Refrigerated transportation market - the largest contributor to cold storage market in India to grow at a CAGR of 17 per cent by 2020.
- Dairy cold storage market in India is the second largest market share in India in terms of revenue to grow at a CAGR of 18.16 per cent by 2020. The growth forecast for butter is 14.5 per cent CAGR, 20.5 per cent CAGR for cheese and 19.5 per cent for ice-cream by 2020.
- Pharma cold storage market to grow at a CAGR of 16 per cent by 2020.
- Refrigerated or reefer trucks market to grow at a CAGR rate of 85.30 per cent by 2020 in terms of trucks.



involve academic community in the conference facilitate wider and to provide platform to the national and international students to demonstrate their innovative research.

REFCOLD India Business Summit

The REFCOLD India Business Summit will create excellent opportunities for partners, exhibitors and hosted invitees from the refrigeration and cold chain industry from India and across the globe.

Armaceil REFCOLD India Innovation Hub

The Armaceil REFCOLD India Innovation Hub is a platform for exhibitors and partners to showcase their creative ideations, visions, innovations, patented products, and technologies which have power to transform the refrigeration and cold chain industry to its core. Innovation Hub will be a great chance for the talented and sharp visionaries to showcase their skills. Based on the idea of Make in India campaign, we intend to promote the talented youth and companies from India to showcase their strengths.

Industry Leaders to Speak at REFCOLD India 2018

Seminar sessions will be conducted by eminent national and international speakers from the refrigeration and cold chain industries from all over the globe. These seminars will cover topics on industrial refrigeration, natural refrigerants, innovative technologies in refrigeration, efficiency improvement, troubleshooting and safety aspects, operation and maintenance in refrigeration plant and cold storage. The seminars will be conducted in four half day sessions, one each on 22nd and 24th November while two sessions will be on 23rd November to be taken by distinguished lecturers from UNEP or ASHRAE or IIR.

Concurrent Events

REFCOLD India Emerson Awards 2018

The REFCOLD India Emerson Awards will reward innovative and outstanding energy efficient projects and products in the cold chain and refrigeration industry. The awards will unearth new talent as well as set benchmarks for India's cold chain industry. The awards are open to all professionals associated with the industry and will encompass both projects as well as products. The categories are:

- Innovative Refrigeration Projects in Food Processing
- Innovative Refrigeration Projects in Dairy
- Innovative Refrigeration Projects in Logistics
- Innovative Refrigeration Projects in Retail
- Innovative Projects in Industrial Refrigeration
- Innovative Refrigeration Products

Daikin Global Student Poster Competition

As part of the REFCOLD INDIA 2018, a poster competition is being organised for the students across the world. The aim is to

Workshops

Workshops will be on design or installation or operation and maintenance and troubleshooting aspects of refrigeration and cold chain plants. These workshops will be conducted in three half day sessions in vernacular language (either Gujarati or Hindi). Workshops are free of charge based on pre-registration.

Why to Visit

- An unrivalled networking opportunity to meet over 100 exhibitors from India and abroad
- It will provide a relaxed and professional environment to network and get business done
- The expo gives unique access to experts from across India and overseas.
- REFCOLD INDIA is more than a three-day show. It provides support all year round to help meet clients' business needs. This includes supporting to have the most relevant and productive visit possible.
- Live product demonstrations

Food Logistics India brings technology into focus



Panel discussion on users' perspective on cold chain industry, moderated by Vivek L Salvia of Navi Mumbai Cold Storage Owners Association

The city of Mumbai recently witnessed Food Logistics India 2018 – an international exhibition on food logistics, cold chain, warehousing and transportation.

The 3-day event enthralled visitors and exhibitors from across the globe with state-of-the-art technologies. The event showcased products like cold chain service, reefer transportation and logistics, HVAC and refrigeration, freezers and cooling technology, climate control technology, material handling etc. Here we present you some of the key highlights of the event.

Technology to the fore

Air flow management

For over 30 years, France-based Air Quality Process has been designing and installing tailored air conditioning units that satisfy stringent hygiene requirements. The company is specialised in the conditioning of hygienic air (design,

manufacture, installation, servicing) for the agri-food industry.

Present at the exhibition, Séverine Dolci, Sales Manager at Air Quality Process explains what sets her company apart from other players available in the market. She said, "Over the years, we have gained expertise in terms of air handling, which integrates the perfect control of air flow management on a factory scale and the over-pressuring of sensitive clean rooms, for agri-food industry and, more specifically, the cheese industry."

As the Indian economy is experiencing a notable turnaround in recent years, Air Quality Process sees tremendous opportunities in this market. The company is looking for a suitable representative to market their products and solutions in Indian market, informs Séverine Dolci.

All-in-one Dehydrator

IKE Industrial, one of the major heat pump manufacturers in China, showcased energy-saving intelligent controlled heat

pump dryer at the Food Logistics India 2018 expo.

The company's WRH-100B stainless steel cabinet-style all-in-one Dehydrator was one of the major highlights of the show. Briefing about the unique advantages of the Dehydrator showcased, Ms Sunny, General Sales Manager, Guandong IKE Industrial Co Ltd said, "WRH-100B has a compact structure, great energy-saving, wide application, high drying quality, easy operation, simple installation and removable."

The company has already created footprint in Indian market by having local partnerships in some parts of the country. Now, Guandong IKE would like to strengthen its base and enhance market presence, informs Ms Sunny.

High-speed doors

Doors remain a critical element in the HVAC and refrigeration eco-system as it helps to isolate a controlled refrigerated area from an atmosphere at ambient temperature. Gandhi Automations Pvt Ltd, manufacturer of entrance automation and loading bay equipment, was one of the key participants at the recently concluded Food Logistics India 2018 exhibition.



Prime Freezer Duo from Gandhi Automations



"We firmly believe our products to be the most technically advanced systems in the market for almost all applications. We are an ISO 9001: 2015, ISO 14001: 2015 and BS OHSAS 18001: 2007 certified company and all products manufactured by us are CE certified.

Samir Gandhi
Director, Gandhi Automations Pvt. Ltd.



“Over the years, we have gained expertise in terms of air handling, which integrates the perfect control of air flow management on a factory scale and the over-pressuring of sensitive clean rooms, for agri-food industry and, more specifically, the cheese industry.

Séverine Dolci
Sales Manager, Air Quality Process



“WRH-100B has a compact structure, great energy-saving, wide application, high drying quality, easy operation, simple installation and removable.

Ms Sunny
General Sales Manager,
Guandong IKE Industrial Co. Ltd.

In the high-speed doors segment, Gandhi Automations showcased Prime Freezer Duo – the double curtain door for low temperature which is designed for simultaneous open and close operation with blower or dryer.

Features

- Dual curtain with a blower or dryer aids in isolating the freezer area from other area reducing convection.
- Partial opening and full opening available to minimise convection and energy losses through operation of freezer door.
- Suitable for both positive and negative temperature between (+) 5°C to (-) 35°C.
- Prime Freezer Duo High Speed Doors are self-repairing, the door curtain resets in case it comes out of the guide due to accident like an impact with a forklift
- No rigid elements within curtains preventing any accidental damage during operation.

Gandhi Automations also displayed its Prime Freezer – the quick, energy saving and air tight freezer door which is designed specifically for temperature-controlled rooms with both positive and negative temperatures.

Commenting on the USPs of products offered by the company, Samir Gandhi, Director, Gandhi Automations, said, “We firmly

believe our products to be the most technically advanced systems in the market for almost all applications. We are an ISO 9001: 2015, ISO 14001: 2015 and BS OHSAS 18001: 2007 certified company and all products manufactured by us are CE certified.”

Concurrent events

Apart from showcasing advanced products and technologies, Food Logistics India 2018 was also successful in terms of creating industry awareness and becoming a knowledge sharing platform. The Federation of Cold Storage Association of India organised its regional meet followed by a panel discussion on users’ perspective on cold chain industry. Moderated by Vivek L Salvia of Navi Mumbai Cold Storage Owners Association, the panel discussion saw participation of Ashish Guru, Sr Vice President, Federation of Cold Storage Association of India; Gopaal Ahuja, Chairman, Komal Exotic Spices; and Lalji Savla, Group Director, Savla Foods & Cold Storage.

Further, a Q&A session was organised on the topic “Technological shift in cold chain industry” that was attended by industry stalwarts like Arvind Surange, CMD, ACR Projects Consultants; N Srinivas, Technical Director, Lloyd Insulations; and Sojio Abraham, Sr VP, Rinac India. ■



Belimo's New Generation Butterfly valves

The latest actuator and valve technologies increase reliability and flexibility, simplify installation and thereby, reduce energy consumption by up to 80 per cent. The new generation of butterfly valves for high flows is compelling because of their simple installation, maximum application flexibility, and excellent longevity. The new PR actuators cannot only be used with Belimo valves but are also compatible with over 2500 types of third-party valve suppliers globally.

Clever Design

Thanks to lower overall height and reduced weight, the new PR actuators are quick and easy to install. With 80 per cent lower power consumption this valve-actuator combination allows for substantial energy savings. The visual position



indicator shows the position of the butterfly valve from distance.

NFC and SuperCap

Near Field Communication (NFC) allows wireless parameterisation via smartphone, even if the actuator is not connected to the power supply. This set of technologies can also run a quick and thorough functional check for diagnosis during commissioning and in the operating phase. That increases operational safety. The butterfly valves are also available with the patented SuperCap technology, which allows moving to the desired safety position during a power failure – an application utilised for example in data centers. ■

Email: info.india@belimo.ch

New Extech Laser Distance Meters Measure up to Jobsite Challenges

Extech Instruments, a world leader in test and measurement tools, announced the launch of the DT-M series of pro-grade laser distance meters. The three new Extech meters make it easy to measure distances, compute area and volume, measure angles, and stake out distances between objects. Users can quickly take measurements with one-button, point-and-shoot convenience, saving time and dollars resulting from estimating errors.

The DT-M series includes three meters with distance capabilities for a range of jobs: DT40M: 131ft, 40m, DT60M: 196ft, 60m and DT100M: 330ft, 100m. The DT-M meters' bright laser and large, backlit, 4-line display make it easy to measure targets with 0.08" (2mm) accuracy. With their compact, rugged double-molded design and wrist strap, users can take these distance meters anywhere. The pocket-sized meters are ideal for one-hand operation and measurements can be taken from the front or rear edge. A built-in bubble level ensures the accuracy of horizontal measurements.



Useful functions include minimum or maximum readings; indirect height measurements using Pythagorean calculations (standard height, height in two segments, and partial height) from two or three other measurements; 20 successive reading memory; easy addition and subtraction of multiple readings; and auto power off to conserve battery life. With the stake-out function, users can mark recurring distance intervals such as the distance between studs for wall framing, between fence posts, lampposts on a path, etc. The meter's beeping cues and numerical readings indicate if a distance is greater or less than the desired interval.

The laser distance meters are designed for construction workers, contractors, realtors, home appraisers, renovation and remodeling professionals, electrical and HVAC estimators and others who routinely need quick measurements at a job site. The DT-M series is backed by Extech's one-year warranty and comes with two AAA batteries. ■

Email: flirindia@flir.com.hk

Forthcoming Events At A Glance

Refcold India 2018

Venue: Mahatma Mandir Convention Cum Exhibition Centre, Gandhinagar, Gujarat

Date: 22th to 24th November 2018

Website: www.refcoldindia.com

India Cold Chain Show 2018

Venue: Bombay Exhibition Centre, Goregaon, Mumbai

Date: 13th to 15th December 2018

Website: www.indiacoldchainshow.com

ACREX India 2019

Venue: Bombay Exhibition Centre, Goregaon, Mumbai

Date: 28th February to 2nd March 2019

Website: www.acrex.in

DairyTech Pune 2019

Venue: H A Exhibition Ground, Pimpri, Pune

Date: 22nd to 24th February 2018

Website: www.dairytechpune.com

Company Name	Page No.
Acrex 2019	27
ALM Engineering & Instrumentation Pvt. Ltd.	IFC
Belimo Actuators India Pvt. Ltd.	IBC
Bitzer	21
Embraco	BC
Ensavior Technologies Pvt. Ltd.	5
FLIR Systems India Pvt. Ltd.	17
Johnson Controls - Hitachi Air Conditioning India Ltd.	13
India Cold Chain Show	31
International Copper Association India	19
Mist Resonance Engineering Pvt. Ltd.	7
Refcold India	39
Safe Refrigerations Pvt. Ltd.	15
Samsung India Electronics Pvt. Ltd.	9
VTS TF Air Systems Pvt. Ltd.	11
Werner Finley Pvt. Ltd.	3

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Convention Center in Buenos Aires Meets Sustainability

The Convention Center is one of the most important works done in the last years in the City of Buenos Aires. It has a total capacity of approximately 5,000 people, with a plenary room and an auxiliary room, offices, meeting rooms and a 1600 m² lobby. It consists of three underground levels to extend the landscape of the property between the University, Faculty of Law, and Thays Park. In total, it has an outdoor park of 18 thousand square meters.

In addition to preserving green space and old trees, the Center has a strong focus on sustainability, thanks to big windows and LED lighting to save energy, rainwater collection and solar panels.



Even the HVAC system has been designed in a highly sustainable way. As the building is fully underground, it is not affected by external thermal loads during the day. Furthermore, the green covering provides insulation on the roof from solar radiation, keeping internal temperature stable all year round.

To guarantee the best internal comfort even during the most crowded events, the HVAC plant designer has conceived an air conditioning system based on Climaveneta branded units: 1 ERACS2-Q/CA 2222 multi-purpose heat pump and 1 FOCS2/K 6903 chiller to produce hot and cold water for the 11 Wizard Air Handling Units. ■

USGBC Recognises Four New LEED-Certified Cities

USGBC recognised four new LEED-certified cities and communities. The cities of Chicago and San Jose, as well as the County of San Diego, have achieved LEED Platinum, and the city of Lancaster, Pennsylvania, recently celebrated its LEED Gold certification.

LEED for Cities and LEED for Communities are pilot programs that measure and track city and community sustainability outcomes based on 14 key metrics that include energy, water, waste, transportation, education, health, safety, prosperity and equitability. Performance and progress is tracked using the Arc performance platform.

The recent certifications demonstrate how local leaders are working to improve quality of life for their residents. "It's cities like San Jose, Chicago and Lancaster, and communities like San



Diego, that are proof that USGBC's vision for a sustainable future for everyone within the next generation isn't just some far-reaching ideal," said Mahesh Ramanujam, President and CEO, USGBC and GBCI, who attended the certification ceremonies for the County of San Diego and San Jose. ■

Infosys Expands LEED Certification Credentials in Mysuru

The Infosys Mysuru campus has been awarded the LEED EBOM (Leadership in Energy and Environmental Design - Existing Building Operation & Maintenance) Platinum certification by the United States Green Building Council (USGBC). Infosys now has 18.25 million square feet of highest rated green buildings – out of which 16.9 million square feet are LEED Platinum rated and 1.35 million square feet are GRIHA 5-star rated buildings.

The LEED Green Building Rating System is a globally accepted benchmark for design, construction, and operation of high-performance green buildings. Infosys has the largest building area as LEED Platinum certified in the IT office space category. To make its campuses sustainable and resource



efficient, Infosys has followed a two-pronged strategy since 2008 – to design new buildings to the highest energy efficiency standards and implement deep retrofits in old buildings.

At the Mysuru campus, efficiency improvements were achieved through large scale retrofit projects, in existing buildings including food courts, training center, guest houses and sports complex. Major interventions included the complete re-engineering of chiller plants, air handling units, building management system (BMS) retrofit, UPS retrofit, lighting retrofit, etc. These initiatives have helped Infosys lower operating costs, enhance equipment life, create healthier indoor air quality, and improve occupant comfort and satisfaction. ■

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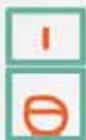
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