

Cooling India

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

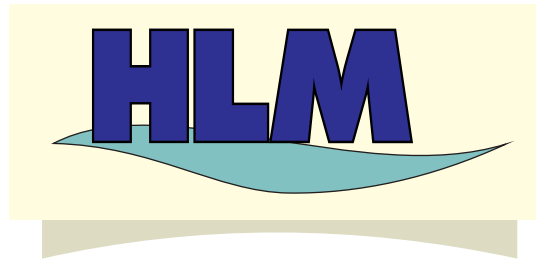
The FUTURE of
HVAC is
AI and IIOT/IOT?

AI

IoT
(Internet Of Things)

IIoT





HLM India Wishes you a Happy New 2019

New Design Changes for better durability

Increased Holding Time

Available with Reefer Units / Eutectic Systems

Built-in GPS and Temperature Tracking (Optional)

OEM Suppliers to Tata Motors

Better Finish with Colour Choices and Branding



- A Transport Solutions India Group Company

HLM India Pvt. Ltd.

Corporate Office: Sr. No. 170, Plot D-1, Chakan Talegoan Highway, MIDC Chakan, Pune 410501.

Pune: +91 7447 436 849 | Mumbai: +91 8888 899 322 | Nagpur : +91 9822 688 198

Web: www.hlm.co.in email: marketing@hlm.co.in

32 Years Of Trust

Werner Finley
Process Cooling Since 1986

Many Processes. One Cooling solution



Data Center



Laser



Machine Tool



Automobile

Water Chillers
Oil Chillers
Coolant Chillers
Panel Air Conditioners
Heat Exchangers



Healthcare



Pharmaceuticals



Werner Finley Pvt Ltd, #14,
Phase -1, Peenya, Bengaluru -
560058, Karnataka, India

web: www.wernerfinley.com
e-mail: info@wernerfinley.com
Telephone : +91 95907 57711



Publisher's Letter

Hello and welcome once again to *Cooling India*.

First of all, let me wish you a happy new year! May we all have more to celebrate, enjoy and be happy about!

As we walk into a new year, many of us reflect on the journeys, that we have made in our lives. We also set the stage for our desires in the next year. Dr. Om Prakash G. Kulkarni reminds us why it is important to adopt new technologies and make every possible move to make the world a better place. In this direction, he also explains us how Internet of Things and Artificial Intelligence are radically transforming the way HVAC works.

In the Interview, Neeraj Bansal, CEO, DHL SmarTrucking talks about technological innovations towards achieving an optimised, cost-effective temperature-controlled supply chain and highlights the challenges that are faced during the operations of cold chain supply logistics.

Phase Change Materials (PCMs) are thermal energy storage materials being extensively used as a reliable source of energy to maintain required temperatures in various industries. According to industry estimates, the global PCM market is registering a CAGR of around 20 per cent from 2016 to 2022. Experts from PLUSS Advanced Technologies examine the energy efficiency aspects of using PCM as far as HVAC&R industry is concerned.

Ice slurry, which is a suspension of ice crystals in a carrying liquid phase, is considered as a very promising secondary refrigerant. Further, CO2 has also great potential as secondary refrigerant and supermarket installations with CO2 as the secondary refrigerant have been installed with good results. Dr. Jahar Sarkar tells us about these next generation secondary refrigerants.

Green building and sustainable architecture are becoming the new norm. India's green building market is estimated to double by 2022 at 10 billion sq ft, valuing around US\$ 35-50 billion. Academicians from IEST Shibpur reveal the nuances of high-performance green buildings. They also illustrate the ways to develop a green building.

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


Pravita Iyer
Publisher & Director



Directors
Mahadevan Iyer
Pravita Iyer

Publisher
Pravita Iyer
pravita@charypublications.in

Editor-in-Chief
Mahadevan Iyer
miyer@charypublications.in

Group Editor
Subhajit Roy
subhajit@charypublications.in

Associate Editor
Supriya Oundhakar
editorial@charypublications.in

Advertising Manager
Nafisa Kaisar
nafisa@charypublications.in

Design
Nilesh Nimkar
charydesign@charypublications.in

Subscription Department
Priyanka Alugade
sub@charypublications.in

Accounts
Dattakumar Barge
accounts@charypublications.in

Digital Department
Ronak Parekh
dgmktg@charypublications.in

100/- Per Copy
1000/- Annual Subscription

Chary Publications Pvt. Ltd.
906, The Corporate Park, Plot 14 & 15,
Sector - 18, Vashi, Navi Mumbai - 400 703.
Phone: 022 27777170 / 71

 www.facebook.com/coolingindiamagazine
 www.linkedin.com/in/coolingindia
 www.twitter.com/coolingmagazine

Disclaimer: Chary Publications does not take responsibility for claims made by advertisers relating to ownership, patents, and use of trademarks, copyrights and such other rights. While all efforts have been made to ensure the accuracy of the information in this magazine, opinions expressed and images are those of the authors, and do not necessarily reflect the views/collection of the owner, publisher, editor or the editorial team. Chary Publications shall not be held responsible/ liable for any consequences; in the event, such claims are found - not to be true. All objections, disputes, differences, claims and proceedings are subject to Mumbai jurisdiction only.

Printed by Pravita Iyer and Published by Pravita Iyer on behalf of Chary Publications Pvt Ltd., and Printed at Print Tech, C-18, Royal Ind. Est., Naigaum Cross Road, Wadala, Mumbai 400031 and Published at 906, The Corporate Park, Plot 14&15, Sector - 18, Vashi, Navi Mumbai - 400 703.

Editor: Mahadevan Iyer

Subscribing
Cooling India is now a
click away
Just log on to
www.coolingindia.in

DRI™ INNOVATIVE AIR SOLUTIONS

HEALTHY AIR for HEALTHY PEOPLE



Energy Recovery Ventilators

PROTECT YOURSELF INDOORS against OUTDOOR POLLUTION



Don't Let Outdoor Pollutants (PM2.5, PM10, SOx, NOx) affect your health
Air Purification Systems

COMPLETE SOLUTION for IAQ & ENERGY RECOVERY



Treated Fresh Air Units

INSPIRED BY THE ANCIENT ART OF COOLING



Chilled Beams

ULTIMATE IN FRESH AIR HVAC SYSTEMS



Dedicated Outdoor Air Systems

DOAS with REFRIGERATION ON BOARD



New launch at ACREX INDIA 2019
28 February-02 March 2019, Hall 1, Booth # E- 37

COOL LARGE AREAS ECONOMICALLY™



Direct / Ducted Evaporative Coolers

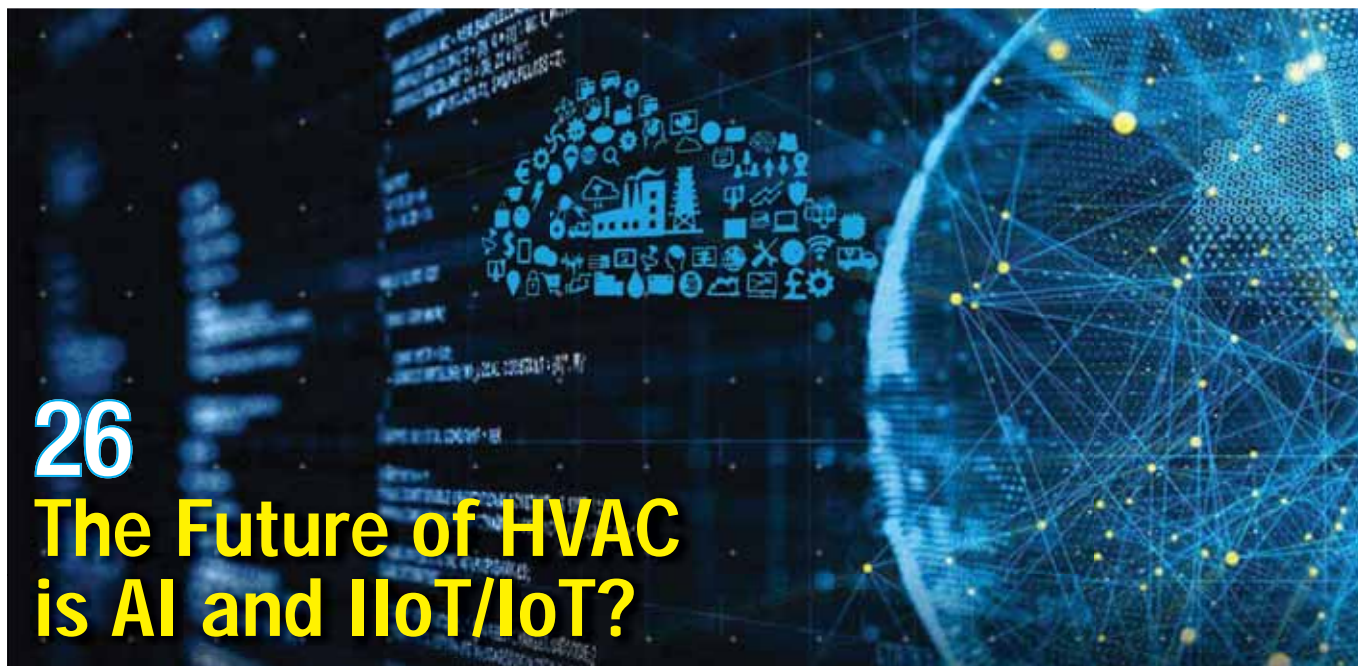
ARCTIC™
**INDIRECT
EVAPORATIVE COOLING**



Indirect Evaporative Coolers

Contents

Vol. 14 No. 6 | January 2019



26

The Future of HVAC is AI and IIoT/IoT?

Features

Perishables exports: Mind the cold-chain gap 22

– Hetal Gandhi

Cold Chain Logistics and Refrigeration Using PCM 38

– Devakar Dhingra, Shreyas Srivastava

Next Generation Secondary Refrigerants 44

– Dr. Jahar Sarkar

The ABCs of Green Building 50

– Bijan Kumar Mandal, Shounak Chowdhury



Departments

4 Publisher's Letter

8 News

16 Appointments

18 Awards

20 Market Watch

25 Post Event - India Cold Chain 2019

58 Product Profile

62 Pre-event Report - ACREX INDIA 2019

64 Company Profile

65 Event Calender

65 Index to Advertisers

66 Cooling Museum

Interviews



DHL SmarTrucking will invest in innovations: Bansal

34

Neeraj Bansal
CEO
DHL SmarTrucking



Ammonia, the Safe Refrigerant?

47

Rajendran
President, Association of Ammonia Refrigeration (AAR)

EVAPORATIVE CONDENSER



Optimizes Energy Savings for Industrial Refrigeration

- For Ammonia/Freon/other refrigerant's condensation at lower temperature
- Compact & Modular Construction

INDUSTRIAL COOLING APPLICATIONS

Dairy
Chemical
Ice-Cream

Meat Processing
Pharmaceutical
Ice Plant

Food & Beverage
Fisheries
Cold Storage

DISCOVER MORE ON:

www.thermaxglobal.com/process-cooling

☎ 1800-209-0115

✉ enquiry@thermaxglobal.com

Eco Niwas Samhita 2018 to Save 125 bn Units of Power By 2030

The Ministry of Power has launched the ECO Niwas Samhita 2018, an Energy Conservation Building Code for Residential Buildings (ECBC-R). The Code was launched on the occasion of National Energy Conservation Day 2018 in the presence of Sumitra Mahajan, Speaker, Lok Sabha and R K Singh, Minister of Power and New and Renewable Energy recently. Implementation of this code will have potential for energy savings to the tune of 125 billion units of electricity per year by 2030, which is equivalent to about 100 million ton of CO₂ emission. R K Singh stated that building sector will have highest growth in energy demand in coming 10-15 years. Government is encouraging all building professionals including architects, builders to generate awareness towards energy conservation while constructing new residential homes.

The implementation of this Code will give a fillip to energy efficiency in residential sector. It aims to benefit the occupants and the environment by promoting energy efficiency in design and construction of homes, apartments and townships. This Code has been prepared after extensive consultations with all stakeholders, consisting of architects and experts including building material suppliers and developers. The parameters listed in the Code have been developed based on large number of parameters using climate and energy related data. Initially, Part-I of the Code has been launched which prescribes minimum standards for building envelope designs with the purpose of designing energy efficient residential buildings. ECBC for commercial buildings was already in place and revised and updated version of ECBC for commercial buildings was launched in June 2017. Energy demand in the building sector will rise from around 350 billion units in 2018 to approximately 1000 billion units by year 2030. ■

Honeywell Helps Modernise Kunsan Air Base

Honeywell announced a USD 28 million infrastructure modernisation project with Kunsan Air Base, a US Air Force Base located in South Korea. The project includes facility upgrades that aim to help improve infrastructure and equipment reliability while lowering the base's annual energy consumption by more than 18 per cent and water consumption by over 7 per cent. The project is expected to generate approximately USD 1.7 million in annual energy savings.

The project will be funded by a 25-year energy savings performance contract awarded to Honeywell by Kunsan AB, the Air Force Civil Engineer Center and Defense Logistics Agency-Energy. The contract enables the funding of the upgrades with annual energy and operational savings resulting from the project work. Honeywell guarantees the savings, eliminating the need for upfront capital investment and making it a self-funding project over the contract term.

Kunsan AB, located south of Seoul on the Yellow Sea, is home to 2,800 US Air



Force members, Army soldiers, US civilians, and local national employees. Kunsan AB has approximately 630 buildings comprising a total area of 4.1 million square feet. The project work, which includes installing newer and more reliable equipment, and modernising temperature, humidity and lighting controls, will help Kunsan AB meet the strategic energy goals of the US Air Force that include improving base resiliency and optimising energy efficiency.

Honeywell will help upgrade building controls and centralise management through Honeywell's Enterprise Buildings Integrator (EBI), an integrated platform that ties together building systems for centralised monitoring and control. EBI will help enhance mission readiness and resiliency at the base by delivering a single point of control and enabling real-time decision making. ■

ASHRAE Publishes Updated Residential, Construction Standard

ASHRAE has released an updated edition of ANSI/ASHRAE/IES Standard 90.2-2018 Energy-Efficient Design of Low Rise Residential Buildings. The standard establishes minimum whole-building energy performance requirements (design, construction, and verification) for energy-efficient residential buildings.

The 2018 revision of Standard 90.2 outlines cost-effective residential building energy performance measures that are at least 50 per cent more efficient than those defined by the 2006 International Energy Construction Code (IECC).

"Standard 90.2 provides a mechanism by which any residential building design can be easily evaluated against performance objectives," said Theresa Weston, PhD, chair of the Standard 90.2 committee. "This update to the standard offers better alignment between this

standard's requirements and marketplace product availability as well as some revisions to improve the document's clarity and internal consistency."

The 2018 edition of Standard 90.2 provides clarification for modeling software requirements, guidance on the use of international climate data presented in ASHRAE Standard 169, a new normative appendix on proper installation techniques for critical thermal resistance building components, improved prescriptive envelope performance data tables, new performance specifications for ground-source heat pumps, minimum lighting efficiency provisions for single-family, large single-family, and multi-family homes, guidance on pool heater pilot lights, pump motor efficiency, and exterior de-icing systems and clarifications to multi-zonal building air-leakage testing procedures. ■

India's **No.1** Entrance Automation & Loading Bay Equipment Company



High Speed Doors - Prime Freezer

- Designed specifically to provide a perfect solution where temperature control is critical and safety concerns are at a premium.
- Suitable for both positive and negative temperature, operating temperature range : +5 to -35° C.
- Internal heating system provided within the guide prevents ice formation even during intensive cooling.
- The high operating speed combined with an excellent seal optimizes the internal traffic flow and provides energy savings.
- Heavy duty motor: 400V three phase, opening speed upto 2.5 m/s with inverter system.
- Size upto : 4500 mm (W) x 5000 mm (H).

Dock Levelers | Dock Shelters | Fire Rated Shutters / Doors | Rolling Shutters | Sectional Overhead Doors



TOLL FREE
1800 209 0200
From Anywhere in India

Alfa Laval to Sell Heat Exchanger Business

Alfa Laval signed an umbrella agreement with the LU-VE Group, headquartered in Uboldo, Varese, Italy, to sell parts of its air heat exchanger business, related to commercial or industrial air heat exchangers, currently placed in the Greenhouse division. The closing of the agreement is expected during first half of 2019.

The product group commercial/industrial air heat exchangers represent the major part of today's Greenhouse. It was moved there in 2016, along with a few other selected product groups, to give it the best possible conditions to improve its performance. The strategy has proven to be successful and the air heat exchanger business reported revenues of more than SEK 1 billion (Swedish Krona) during the last twelve months. "This business has made big improvements the last two years both in terms of growth and profitability," said Tom Erixon, president and CEO of the Alfa Laval Group. "However, we concluded it would have even better opportunities to continue developing under the ownership of the LU-VE Group."

"Alfa Laval's commercial air heat exchangers will fit perfectly into the strategic design of growth and qualification of the LU-VE Group," said Iginio Liberali, president of LU-VE. "With the acquisition, the Group will be among the three largest global operators in the sector. It will reinforce our capability to offer services and components of high quality and reliability." The agreement to divest the commercial/industrial air heat exchanger business to LU-VE Group will affect about 400 employees, mainly based at the production sites in Italy, Finland, and India, and the purpose is to transfer the employees to the LU-VE Group as per closing date of the transaction. Alfa Laval will continue to supply air heat exchangers — such as Alfa Laval ACE, Alfa Laval Niagara, and Alfa Laval OLMi — for heavy process industry applications. ■

GRIHA Launches CITIES Rating

Green Rating for Integrated Habitat Assessment (GRIHA) Council kicked-off the 10th GRIHA Summit by launching GRIHA for CITIES rating, in the presence of Harinder Sidhu, Australian High Commissioner to India, Prof Ian Jacobs, President and Vice Chancellor, University of New South Wales (UNSW), Sydney, Australia, and many other dignitaries. The GRIHA for CITIES rating has been structured as a framework for sustainable development of a city, to be achieved by measuring 'greenness' of existing as well as proposed cities. The rating sets performance benchmarks for key resources such as energy, water, and waste, and evaluates performance in areas such as smart governance, social wellbeing, and transportation.

On the sidelines of the inaugural, GRIHA signed two Memorandum of Understanding (MoUs); one with Global Association for Corporate Services (GACS) on training and awareness on green buildings and the second with Public



Works Department (PWD), Govt of Maharashtra, on green rating for 1608 existing buildings in Maharashtra. Dr Ajay Mathur, DG, TERI, said, "India and Australia are the two countries which share the same climate. But Australia is the only country with the similar climate that has an active energy-efficiency programme."

Harinder Sidhu, Australian High Commissioner to India, said, "Government has an important role, but it needs the combined effort of the private sector and the academia. Research institutions, such as UNSW and GRIHA Council, help in connecting and incentivising government to make the enormous contribution to this goal of sustainable urban future." ■

Carrier Selects North American Replacement for R-410A



The Chemours has selected R-454B as its next generation refrigerant that is sold as Opteon XL41 after extensive testing and evaluation, as the primary lower Global Warming Potential (GWP) refrigerant to replace R-410A in ducted residential and light commercial packaged products sold by Carrier in North America beginning in 2023.

The selection of R-454B enables Carrier to achieve its exacting performance standards, while exceeding the anticipated requirements of future regulations. With a GWP of 466, Opteon XL41 (R-454B) reduces CO₂ emissions by 78 per cent and improves energy efficiency when compared to R-410A, and it provides over 30 per cent reduction in GWP when

compared to R-32, another industry candidate to replace R-410A. Opteon XL41 was specifically developed to achieve the maximum possible reduction in GWP to satisfy long-term regulatory requirements. "As the world moves towards more environmentally sustainable solutions, equipment manufacturers are searching for lower GWP options that will meet future regulations and can deliver on performance. Opteon XL41 achieves just that," said Diego Boeri, Vice President of Chemours Fluorochemicals. "We are thrilled to work in collaboration with Carrier to bring about transformative change for the air-conditioning industry. Chemours is committed to delivering world-class technology through responsible chemistry that reduces impact on global climate change." Opteon XL41 (R-454B) is an ASHRAE Class A2L (lower flammability), hydrofluoroolefin based refrigerant and was chosen by Carrier for its balance of performance, energy use, and safety. ■



30%
Energy savings*

* using CAREL expansion valve
and Ultra EVD module

SmartCella, the essential solution for small cold rooms

A flexible system that can satisfy all needs in term of installation, usability and expandability

SmartCella is a smart and compact solution for the complete management of small single-phase cold rooms.

It is based on an intuitive user interface and benefits from the know-how and experience acquired with **ir33+** logic.

Installation is simplified thanks to DIN rail in the box for fast wall mounting and it is available on a vertical or horizontal layout to solve all installation issues.

The slim IP65 box is ready to integrate 3Hp relay or isolator, auxiliary terminal board.



CAREL ACR Systems India Private Limited

Mumbai Office : 402 & 403 , Vikas Commercial, Bhakti Marg, Next to Tridev Apartment , Mulund (West) 400 080, India,
Tel : +91 (022) 41192929 | Fax +91 (022) 41192930

Delhi office : 312, Prakashdeep, Tolstoy Marg, Connaught Place, New Delhi 110001. Tel : 011 43629500

Chennai office : office no. 728 , 'AMARA SRI', situated at Old No.313, New No.455, Block No.75, 7th Floor, Anna Salai,
Teynampet, Chennai 600018. Tel +91 44 4904 8300

California Prohibits HFC Refrigerant



The state of California has enacted unilateral prohibitions on high-global warming potential hydrofluorocarbons. The California Cooling Act affects new and retrofit equipment. Manufacturers cannot sell equipment using prohibited refrigerants that are manufactured after January 1, 2019. It is based on the vacated US EPA SNAP Rule 20 and 21, with the exception of motor vehicle air-conditioning. It prohibits high GWP HFC refrigerants, such as R404A and R507A, in supermarket systems, condensing units, and self-contained units.

In addition to prohibiting specific high-GWP HFCs, the California Cooling Act also establishes an incentive programme for early adoption of low-GWP technology in refrigeration systems. The original EPA SNAP rules were rolled back after the US Court of Appeals for the District of Columbia decided that the EPA could not use a section of the Clean Air Act to target HFCs.

California voted to pass the California Cooling Act in August last year. It is expected to reduce HFC emissions by up to 17 million tonnes CO₂ equivalent annually by 2030. ■

To get the latest News and Updates, read

Cooling India

To subscribe, go to page 49

Email: sub@charypublications.in

Clairco to Address Concern of Indoor Air Pollution

Clairco - clean air as a service company which offers air quality monitoring and purification services announced its mission to address the concern of indoor air pollution. Backed by Anand Subramanian, Senior Director, Ola cabs and incubated by real estate company- Brigade Group, Clairco is an IoT based air quality monitoring and purification company that uses low drag nano-tech air filters which can be retrofitted to any type of air conditioning and turn them into air purifiers. This helps save a lot of money by not spending on expensive hardware. Clairco has developed this patent-pending air purification system to help address the issue of indoor pollution.

Working on the concept of predictive intelligence on the connected devices, Clairco analyses air quality data of a particular premise on a real time basis and installs ultra-low resistance air filter in existing air conditioning units and converts them into smart air purification system. Also, by running machine learning on the data of air pollution collected around the premise and mapping it against the filter life, Clairco replaces the filter on the exact time, ensuring clean air at all times. Other companies in the space use time as a yardstick to change filter and not pollutant data and thus have fixed interval of changing filter which is not accurate. Because of this predictive intelligence

technology, Clairco is able to promise clean air unlike any other company in India.

With 14 out of 20 most polluted cities in the world in India, and the cost of asthma medication reaching record 55,000 crore per year, the indoor air quality monitoring market is estimated to reach Rs 33,000 crore (USD 4.63 billion) by 2022.

Aayush Jha, Co-founder and CEO, Clairco said, "Air quality has been continuously deteriorating in the country. Delhi and other tier 1 cities have yet again witnessed dangerous levels of pollution. Air quality indoors often becomes five times worse than outdoors and we spend more than 90 per cent of our time indoors. Thus, we at Clairco believe that improving the air quality in indoor spaces; to begin with, can be a huge step to battle the dangers of this hazard. Further, businesses can benefit immensely by providing clean air in their spaces, as they continue to serve customers. Our first of its kind air quality monitoring and purification solution is measurable and affordable. Clairco charges its customers a monthly subscription fee for businesses of all sizes and scale. This helps businesses ensure a better experience without investing considerable capital expenditure. Our technology enables us to be the only company in India that can guarantee clean air for indoor spaces." ■

Haier Signs Pact with Geoclima

According to sources in China, Haier Central Air Conditioning has entered into a strategic cooperation agreement with Italian air conditioning and refrigeration chiller manufacturer Geoclima. The memorandum signed at the end of November will allow to establish a network of interoperability and sharing of product technology and market resources to accelerate Haier's localisation needs in the European water market.

The agreement is also said to include

the joint development of new high-efficiency products. Established in 1994 producing air- and water-cooled chillers, Geoclima has been a pioneer in the adoption of HFO refrigerant technology in chillers using oil-less Turbocor compressors.

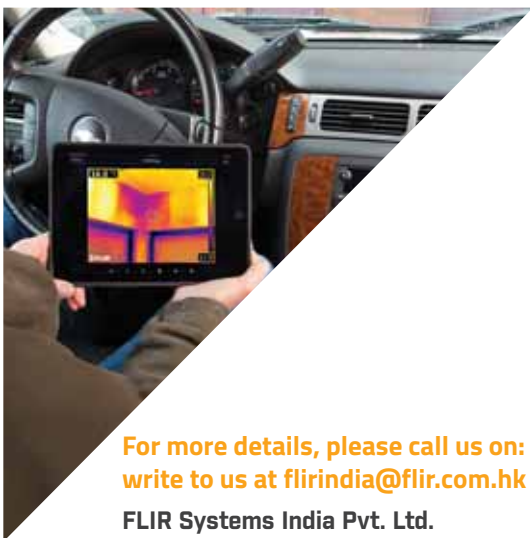
With its headquarters and main manufacturing facility in north-east Italy, and further factories in Russia and Thailand, Geoclima produces around 500 chillers per year. ■

FLIR C3™

FIRST POCKET-PORTABLE THERMAL CAMERA WITH WIFI

- ✓ Pocket-portable thermal imaging
- ✓ Measure max or min. temperature
- ✓ Transfer images via Wi-Fi to FLIR Tools app
- ✓ Rugged enough to withstand a 2 m drop test

The compact FLIR C3 is designed to be your go-to tool, whether your work is building inspections, facilities maintenance, HVAC, or electrical repair. The touchscreen is a snap to learn, so you can quickly get to the job of finding hidden problems, documenting repair, & sharing images over Wi-Fi.



Images for illustrative purposes only.

For more details, please call us on: +91-11-4560 3555 or
write to us at flirindia@flir.com.hk

FLIR Systems India Pvt. Ltd.

1111, D Mall, Netaji Subhash Place, Pitampura, New Delhi - 110034 | Fax: +91-11-4721 2006

[f/FLIR](#) | [t/FLIR](#) | [y/FLIR](#)



WWW.FLIR.IN

Scientists Develop PCM for Containers

University of Birmingham scientists working with a Chinese railway rolling stock company, have developed the world's first shipping container using phase change materials (PCM).

The Birmingham scientists and their counterparts at CRRC Shijiazhuang have developed a 'refrigerated' truck-to-train container that is said to be easier and more efficient to operate than conventional equipment. Once charged, the phase change material inside the container can keep the inside temperature between 5-12°C for up to 120 hours, it is claimed. It does not need a power supply during its journey and the container's location and temperature can be monitored in real time using mobile communication technologies. Several cold chain logistics companies in China are reported to have expressed interest in the container, which is said to provide a more stable temperature, compared with mechanical units, and hence a higher quality of goods at the destination. The technology has recently completed commercial trials carrying real goods for 35,000km of road and 1000 km of rail transport across different climate zones.

"Energy storage is an area of world-leading expertise at the University of Birmingham and cold chain technologies research is one of the most important topics at our Centre for Energy Storage," commented Professor Yulong Ding, Director of Birmingham Centre for Energy Storage, who led the research at Birmingham.

"We have developed a productive collaboration with CRRC Shijiazhuang and this innovative technology marks the beginning of developing an efficient and economic rail and road freight cold chain." ■

Johnson Controls to Adopt Wind Power

Johnson Controls' unitary HVAC product factory in Wichita, Kansas, is adopting renewable energy i.e. wind power to provide all of its electricity requirements.

The company's 120,000 m² primary manufacturing campus employs 1600 staff and is the source of York, Luxaire, Coleman and Champion brands of residential heating and air conditioning equipment.

The wind farm is scheduled to be completed and delivering clean energy to the Wichita plant by the end of 2019. The decision to rely on wind power will reduce the company's greenhouse gas emissions by 18 per cent and save about USD 2.7 m over the life of the 20-year contract. "This renewable energy agreement is a win-win for the business. This plant will operate on 100 per cent clean energy, dramatically reducing emissions and saving costs," said Liz



Haggerty, Johnson Controls' Vice President and General Manager. "Sustainability is a core value of our company. We've set a goal to achieve a 25 per cent reduction in our global greenhouse gas emissions intensity by 2025."

Since Johnson Controls set its first sustainability goals in 2002, the company says it has reduced greenhouse gas emissions from global operations by nearly half and cut energy use in US manufacturing locations by 25 per cent. ■

Carel Expands its US Production Plant

The ground-breaking ceremony for the expansion of Carel USA production plant located in Manheim took place on December 5. The US plant expansion plan, which will more than double the area devoted to production from the current 35,000 to 70,000 square feet, is part of a global geographic footprint expansion strategy, involving mainly the US, Europe and China, serving the company's organic growth for the coming years. In particular, expanding production capacity in the United States will allow the company to be even closer to customers and meet their needs more promptly and effectively; moreover, it will be a fundamental step in increasing market share in the country, avoiding bottlenecks and improving logistics. The building expansion work is expected to be completed



by the end of 2019 first semester.

Francesco Nalini, Chief Executive Officer, Carel Group's commented "The extension of the plant of Manheim follows the implementation, in the same plant, of the first US programmable controller production line, completed last summer, and shows the interest of the Group to the North American market. We expect this country to represent a significant accelerator for Carel's growth, which will be based on innovation, energy efficiency and customer care". ■



NANOVA[®]
CARE COAT

Visit us at
ACREX INDIA 2019
28 Feb to 2 Mar 2019
Hall No. 1, Stall No. D72
Bombay Exhibition Centre NESCO,
Goregaon (E), Mumbai - 400063.

ULTRACORR ACX

Thin film anti-corrosion
nano coating for
HVAC coils
and condensers



Corrosion
Protection



Dissipates
Heat



RoHS



THIRD PARTY
TESTED

Harind Chemicals & Pharmaceuticals Pvt. Ltd.

An ISO 9001:2015 Certified Company

Unit Nos. C 1804 to C 1807, Kailas Business Park,

Vikhroli-Hiranandani Link Road, Vikhroli (W), Mumbai - 400079, India.

Tel: +91-22-62364200 / 62360839 | info@nscindia.com | www.nanovacarecoat.com



Haug Joins Güntner

Former Beijer Ref Germany MD Martin Haug has joined heat exchanger manufacturer Güntner as managing director for sales and marketing in EMEA.

Haug, who has over 25 years of experience in the refrigeration and air conditioning industry, resigned as Beijer Ref Deutschland MD in October after six and a half years in the role. Previous experience was gained at Stulz, York, Frigotechnik and Swiss Beijer Ref company Paulus AG.

In 2000, he was awarded the Bavarian State Government Master Prize. After holding management positions at various



Haug Joins Güntner

well-known companies, he was most recently Managing Director at Beijer Ref Deutschland GmbH for six and a half years.

As Managing Director at Güntner, he will be responsible for Sales and Marketing for the EMEA region. With his experience, we will continue to drive Güntner's growth in a dynamic market and increasingly global competitive environment. He says, "For me, it is important to further establish the well-known quality of both the products and the employees in the market and thus, further expand our growth and market position." ■

Samantha Slater Joins AHRI Government Affairs Team

The Air-Conditioning, Heating, and Refrigeration Institute (AHRI) announced the appointment of Samantha Slater to head its federal and state legislative activities as Vice President, Government Affairs. Slater comes to AHRI from the Renewable Fuels Association, where she was lead lobbyist for the past 10 years, with accomplishments that included preserving ethanol's role in the federal renewable fuels standard as well as the federal tax credit for ethanol. Slater has spent more than 20 years in government relations, working across party lines of all levels of government as an industry advocate on public policy issues related to energy, environment, and the economy.

Previous experience includes positions with the National Corn Growers Association, where she played a key role in



Samantha Slater

securing a renewable fuels standard in the 2005 Energy Policy and Conservation Act; the Electric Power Supply Association; and the National Independent Energy Producers, all of which involved significant federal and state public policy advocacy.

Slater holds a degree in International Studies from American University in Washington, DC. "We are excited to welcome someone with Samantha's extensive federal and state government experience to our public policy advocacy team," said AHRI President & CEO Stephen Yurek. "Her knowledge of the legislative process, her extensive contacts on Capitol Hill, particularly, in the energy and environment related committees, and her track record of accomplishment in the public policy arena will be invaluable to AHRI as we strive to achieve our legislative goals in the 116th Congress," he added. ■

Pierre E Cohade Appointed to Board of Johnson Controls

The Board of Directors of Johnson Controls International appointed Pierre E Cohade as a Director. Cohade served as Chief Executive Officer of Triangle Tyre, China's largest private tire manufacturer from 2015 to May 2016. Previously, Cohade served as senior advisor at China Vest Group, Wells Fargo's investment banking affiliate in China. Cohade also served as president of Asia Pacific Tire, Goodyear Tire and Rubber Company.

Cohade currently serves as Non-Executive Director on the boards of Deutsche Bank China, Acorn International and CEAT India. He is also the Chairman of IMA in China, a leading peer group forum for CEOs and senior executives located in China. He currently resides in Shanghai. "Pierre brings to us extensive experience operating large, global companies combined with an in-depth knowledge of China



Pierre E Cohade

which is Johnson Controls' largest growth market," said George Oliver, Chairman and CEO, Johnson Controls. Cohade graduated from SKEMA Business School with a bachelor's degree and has a master of business administration degree from Pennsylvania State University.

The Johnson Controls Board of Directors also announced current director and AIG President and Chief Executive Officer Brian Duperreault intends to retire as a director at the conclusion of the company's 2019 annual meeting of shareholders.

"I want to thank Brian for his dedicated service to the company since 2004," said Oliver. "Brian's wise counsel has been invaluable to me and our executive management team as we continue the transformation of the Johnson Controls portfolio." ■

Be sure. **testo**

Intuitive, Efficient, Reliable Everything for HVACR Industry



Testo- Your competent partner for all HVACR measuring tasks

- The new **testo 440** for most intuitive air velocity & IAQ measurements
- The complete climate monitoring system **testo 160** for measurement, monitoring and documentation
- Testo's compact and smart flue gas analyser **testo 330i** for every job on boilers and burners
- The smart and networked thermal imager **testo 872** for Best in Class thermal images
- Testo's compact **Smart Probes** for more mobile, more productive and easier measurement than ever before
- The lightest air capture hood **testo 420** for larger swirl outlets for measuring air capture, temperature and relative humidity
- Testo's digital **Refrigeration Manifolds** for the comprehensive evaluation and correct regulation of a refrigeration or air conditioning system

Testo India Pvt Ltd

Head Office:

Plot No. 23, Sind Society, Baner Road, Aundh, Pune - 411007, Maharashtra, India

Tel: +91 20 2592 0000 | Fax: +91 20 2585 0080 | Email: info@testo.in

Regional Offices / Representatives:

Ahmedabad | Baroda | Bengaluru | Chennai | Guwahati

Hyderabad | Indore | Kolkata | Mumbai | New Delhi

Visit us at:

Acrex India, 2019

28th Feb- 2nd March 2019

(Thu-Fri-Sat)

Bombay Exhibition Centre, Mumbai

Stall Number: L48, Hall Number: 1

www.testo.com



SS-000AD19PRINT-ADS

CRI Pumps Wins National Energy Conservation (NEC) Award 2018

CRI Pumps has won the National Energy Conservation Award 2018 in Pumps Category for manufacturing energy efficient pumps for the fourth time.

G Selvaraj, Joint Managing Director, CRI Group said, "We pursue excellence and the awards are a natural result of our mission to conserve energy. It is a matter of honour to receive this prestigious award for the fourth time. All through the years CRI has endeavoured to offer energy efficient pumps through innovative design and technology. This in turn greatly benefits the customer, environment, society and the world at large. C.R.I. would tirelessly continue on its mission to conserve energy, a very scarce natural resource. We take this opportunity



to thank all our customers, dealers, stakeholders, dedicated employees and the authorities for their trust and support in achieving our mission"

CRI offers a range of BEE 5 Star rated pumps for various applications. CRI's energy efficient products are well recognised by various government institutions, as trustworthy products

for various projects across the globe to save energy. CRI contributes in the country for the projects of EESL (Energy Efficiency Services Limited) to replace the old inefficient pumps with 5 Star rated smart pumps with IoT. Until now, CRI has installed over 10 lakhs star rated pumps across the country resulting in a cumulative saving of more than 9,000 MUs of power for the nation. ■

Ingersoll Rand Gets US Chamber Foundation Best Environmental Stewardship Award

The US Chamber of Commerce Foundation Corporate Citizenship Center has named Ingersoll Rand the winner of the 2018 Corporate Citizenship Awards in the category of Best Environmental Stewardship.

Ingersoll Rand was recognised for addressing greenhouse gas (GHG) emissions in its own operations and products, and continued research for a sustainable future. The company achieved its commitment to reduce its own greenhouse gas (GHG) footprint by 35 per cent by 2020 by focusing on four areas energy reduction, optimisation of refrigerant charging, upgrading its fleet to improve gas mileage two years early. "Ingersoll Rand's commitment to environmental stewardship runs deep and is core to how we operate and help our customers succeed," said Eric Rankin, Vice President of Environmental Health and Safety (EHS) at Ingersoll Rand, who accepted the award on behalf of the company. "It is an honor



to be recognised by the US Chamber of Commerce Foundation with this year's Best Environmental Stewardship Award as we continue to strive for better and faster ways to reduce our impact on the environment."

"Ingersoll Rand is leading a steadfast commitment to reduce its environmental footprint," said

Marc DeCoursey, Senior Vice President of the US Chamber of Commerce Foundation. "Its dedication ensures a more sustainable future for communities around the world."

The US Chamber of Commerce Foundation Corporate Citizenship Awards honour businesses for their significant positive impacts in communities around the world. For 19 years, the awards program has illustrated how every day, businesses serve as a powerful force for global good. Companies and chambers of commerce from around the world compete for the awards, making them one of the most coveted opportunities for recognition in corporate citizenship. ■

VISIBILITY DEFINES A LONG TERM IMPRESSION

Media does the first entry to open your door in the mind of your clients

Advertise in

Contact Nafisa

+91 22 27777199

+91 9870884159

Cooling India

Wide Range of Energy Efficient Industrial Refrigeration Equipment

Rotary Twin Screw Compressor Packages



Capacity Range :
404 kW to 3300 kW
@ 23 Deg F SST
& 104 Deg F DT.

High Speed Reciprocating Compressor Packages



Capacity Range :
70 kW to 470 kW
@ 23 Deg F SST &
104 Deg F DT.

Frick India Automation System



Ammonia Air Cooling Units



"A" Series Coils
(Aluminum Tubes
with Aluminum Fins)

Capacity Range :
17.9 KW to 108 KW
@ 45 Deg F TD



"S" Series Coils
(Stainless Tubes
with Aluminum Fins)



Frick India Ltd. (AN ISO 9001:2015 COMPANY)

809, "SuryaKiran", 19 K. G. Marg, New Delhi-110 001

Ph: 23322381/84/91 Fax: 011-23322396 email: delhi@frick.co.in

Factory : 21.5 Km., Main Mathura Road, Faridabad - 03

Ph: 2275691-94 Fax: 0129-2275695. email: fbd@frick.co.in

BRANCHES :

Ahmedabad : gujarat@frickmail.com
Bangalore : bng@frickmail.com
Chandigarh : frick.chd@gmail.com
Chennai : chennai@frickmail.com
Cochin : cochin@frickmail.com
Jalandhar : jalandhar@frickmail.com
Kolkata : kolkata@frickmail.com
Mumbai : mumbai@frickmail.com
Patna : patna@frickmail.com
Hyderabad : hyd@frickmail.com
Vizag : vizag@frickmail.com



You Still can't beat the System when it's all FRICK INDIA



Air Handling Units Market worth US\$ 12.91 bn by 2026

The increase in demand for air handling units from the application sectors such as commercial buildings, industries, hospitals, universities, data centers, laboratories, and server rooms is propelling the growth of this market.

According to Marketsandmarkets, the air handling units market is projected to reach USD 12.91 bn by 2026, at a CAGR of 5.7 per cent from 2016 to 2026. The increase in demand for air handling units from the application sectors such as commercial buildings, industries, hospitals, universities, data centers, laboratories, and server rooms is propelling the growth of this market.

The custom air handling units segment is estimated to account for the second-largest share of the air handling units market and is projected to be the fastest-growing type segment from 2016 to 2026. The growth is mainly attributed to the rising demand for custom air handling units from the commercial application sectors such as pharmaceutical industries, shopping malls, hospitals, and universities.

The 15001 - 30000 m³/h capacity segment is anticipated to grow at the highest CAGR in the air handling units market from 2016 to 2026. These are medium size air handling units which are used in commercial applications such as hospitals, shopping malls, commercial buildings, data centers, and laboratories. Due to the increasing awareness regarding the impacts of pollution on environment and human health, there is a high rise in the use of air handling units. Air handling units are not only used for cooling and

heating purpose, but also for providing fresh air, humidification, and controlling relative humidity. These features contribute towards the growing demand of 15001 - 30000 m³/h capacity air handling units.

The commercial segment is estimated to account for the largest share of the air handling units market in 2016 and is projected to be the fastest-growing segment from 2016 to 2026. This growth can be attributed to the increased demand of air handling units in the commercial application sectors such as shopping malls, hospitals, universities, data centers, industries, cleanrooms, and server rooms.

Asia-Pacific is estimated to be the largest market for air handling units. This large share can be attributed to the growing demand for air handling units from the application sectors such as shopping malls, hospitals, universities, data centers, industries, cleanrooms, and server rooms in this region.

Key players operational in the market include Daikin Industries (Japan), Carrier Corporation (US), Trane Inc (Ireland), Johnson Controls, Inc (US), GEA Group AG (Germany), Systemair AB (Sweden), Flakt Woods Group (Sweden), CIAT Group (France), Trox GmbH (Germany), and Lennox International (US) among others. ■



Prime Freezer Doors designed and manufactured by Gandhi Automations are sturdy, and dependable. These doors are an ideal solution where temperature control is critical and safety concerns are at a premium. The doors are manufactured with European collaboration and technology with innovative and creative engineering.

The high operating speed combined with an excellent seal optimizes the internal traffic flow and provides energy savings. Heavy duty motor of 415 V three phase has opening speed up to 2.5 m/s with inverter system. It is suitable for both positive and negative temperature, operating temperature range +5 to -35 degree C. Prime Freezer Duo Door has a special double curtain construction with space in-between that maintains the temperature difference through air pressure applied by a blower.

The doors are ideal for internal heating system provided within the guide that prevents ice formation even during intensive cooling and effectively operates in any situation. Innovative insulated curtain with high thermal efficiency is

Gandhi Automations Offers High Speed Freezer Doors

available optionally for additional saving on energy costs. High speed freezer doors have revolutionary soft bottom edge and sensor combine to ensure operator safety at all times. Prime Freeze High Speed Doors are a perfect solution where cold storage with negative temperatures to as low as -22°F is required.

The curtain is made of reinforced PVC vinyl with heated side guides. Optionally a special and innovative insulated flexible curtain is also available. High Speed Freezer Doors are the solution when temperature control is critical and where forklift traffic is high.

Key features include:

- **Industry's highest operating Speed:** Operating speed up to 2.5 m/sec the fast cycle time maximizes productivity and energy savings.
- **Save energy:** Short open time and tight seal reduce transfer of air.
- **Increase refrigeration efficiency:** Automatic and fast door cycle improves efficiency of the freezer room.
- **Reduce frost:** Optional insulating curtain and heated side posts helps to reduce frost.
- **Save costs:** Self-re-inserting or self-repairing door curtain avoids downtime and minimizes maintenance.
- **Extremely safe:** The flexible door curtain is free of rigid components.
- **Long lifetime:** Gandhi Automations' high performance doors contain very few wearing parts.
- **Conform to EN13241-1:** Structure in stainless steel is optional.

The creation of a loading air-lock between freezer and loading bays, the division of a freezer into a number of areas, the insulation of a fork-lift truck charging area, the closure of deep-freeze tunnels, etc. all these concrete examples requiring the installation of flexible cold storage doors may be summed up into three types of insulation:

- between two deep freeze areas,
- between refrigerated area and ambient temperature,
- between deep-freeze area and refrigerated area.

The range of Gandhi Automations isothermal high-speed flexible doors for the cold chain increases insulation and reduces maintenance costs in perfect safety by adapting to each configuration. ■
For more information, e-mail: sales@geapl.co.in



A vast improvement in cold chain logistics is the need of the hour for furthering growth in export of perishables – items whose quality runs the risk of going bad during transit – from India. Key perishables exports from India include seafood and pharmaceuticals, which are exported primarily through the sea route, besides fruits and vegetables. Given the stringent quality standards of major importing nations, these items require the right temperature to be maintained in each leg of the supply chain.

However, Indian exporters falter on multiple points:

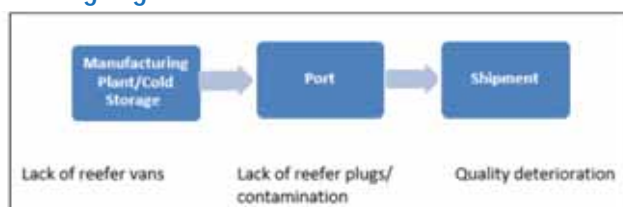
- Lack of reefer vans during transport from manufacturing plant/cold storage.
- Lack of reefer plugs for uninterrupted power supply.
- Contamination during customs verification at the port before shipment.
- Product loss because of quality deterioration during shipment.

Besides, unavailability of reefer containers at the desired time, long waiting period due to congestion at ports, unavailability of trolleys, heavy traffic at ports – all add to the exporters' pain. Further, trucks are stuck in the queue for 2-3 days at times, pushing back delivery and shoring up the logistics cost as the containers are powered using generators.

PERISHABLES EXPORTS: MIND THE COLD-CHAIN GAP



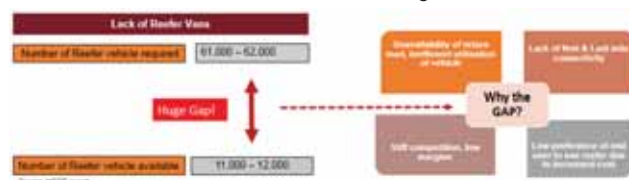
Challenges galore across the value chain



Lack of reefer vans a key challenge in the primary leg

On the ground, the key challenge is to maintain the required temperature at all points from production to shipment. To address this and to minimise product loss during transportation, logistics companies have started employing advanced tracking and monitoring devices on reefer vehicles to keep a track of temperature, humidity, and other conditions. However, there is a conspicuous lack of reefer vans. As of fiscal 2018, India had 10,500 reefer vehicles and 36 million tonne cold storage capacity.

CRISIL Research expects the Indian cold storage chain market to log a compound annual growth rate of 13-15 per cent over the five years through fiscal 2023, from around Rs 279 billion in fiscal 2018. But shortage of reefer vans could pose a challenge here.



Unavailability of reefer plugs at certain ports

CRISIL Research's interactions with market participants indicate there is a shortage of reefer plugs. Reefer container traffic accounted for almost 6 per cent of the overall container traffic at major ports in India and grew 16 per cent in fiscal 2017. However, the number of reefer plugs has not grown apace across ports. As of fiscal 2017, the total installed reefer plug capacity at India's container ports was 8,918, with the top five ports accounting for half of that.

Terminals	Reefer plugs
Bharat Mumbai Container Terminals	1,620
APM Terminals Mumbai	880
Nhava Sheva International Gateway Terminal	778
Jawaharlal Nehru Port Container Terminal	576
APM Terminals Pipavav	525

Source: CRISIL Research

Contamination during customs verification

Until recently, contamination or spoilage during customs verification was a major challenge. Factory-stuffed containers are e-sealed by exporters, but reefer containers are picked up for examination by the customs at ports and inland container depots (ICDs). Since all ports and ICDs do not have sterile, temperature-controlled examination facilities, exporters have to incur transportation costs to take them to the nearest cold-storage facility for examination. This adds to the transaction cost, and also affects timely export of the perishables. Besides, the selection of reefer containers for examination leads to contamination or spoilage if not handled appropriately.

To address this issue, in May 2018, the Central Board of Indirect Taxes (CBDT) and customs allowed factory stuffing and sealing of reefer containers with perishable/temperature-sensitive export goods in the presence of customs officials. According to the new norms, an exporter needs to apply to the jurisdictional customs commissioner for availing of supervised stuffing, along with the list of goods for export. The commissioner will permit supervised stuffing and sealing of such export goods upon being satisfied that the goods are sensitive to temperature and there are no sterile, temperature-controlled examination facilities at the destination port.

Quality deterioration after shipment

During sea travel, a major challenge the exporters face is quality deterioration because of improper handling of required temperature by shipping companies. To minimise this damage, it is necessary for shipping companies to continuously monitor temperature conditions inside the reefer container.

Shipping companies have been increasingly employing remote container management systems, wherein reefer containers turn into digitally connected devices capable of transmitting their locations, power status, temperatures and humidity. This enables the shipping company to monitor temperature, humidity and ventilation settings throughout the journey.

For seafood exports, shortage of reefer containers in peak season a key challenge

Seafood is largely exported from India to South-east Asia, the US, and the European Union, among others, primarily through sea route. APM Terminals Pipavav is the major seafood exporter port by volume and value in India.

Shrimps dominate India's seafood export basket with a 38 per cent contribution by volume and 65 per cent contribution in value terms in fiscal 2017. About 80 per cent of shrimps produced are exported from India, both in raw and processed forms.

While some large players export shrimp directly to clients, other producers sell their produce at a pre-determined quality to traders. These traders store the shrimp in third-party cold storage warehouses, from where it is transported to the ports based on client requirement in the exporting countries. The producer's proximity to ports is a key parameter considered before opting for a third-party cold storage.

Challenges across the supply chain for a player exporting seafood



When preserved and stored in a cold storage, shrimp has a shelf life of around two years. As of fiscal 2018, India had 575 cold storage capacities with a combined capacity of ~287,000 tonne for seafood storage.

The key challenges faced by shrimp exporters is preservation of quality. A slight variation in temperature can lead to deterioration in the product quality, rendering the produce useless for export. The shrimp brought by farmers to receiving centres is usually without ice, and also contains mud and debris – such exposure to ambient temperature affects the quality of the produce. Further, during the peak season, exporters face a dearth of reefer containers at the exporting ports, leading to a longer wait-time and higher logistics expenditure.

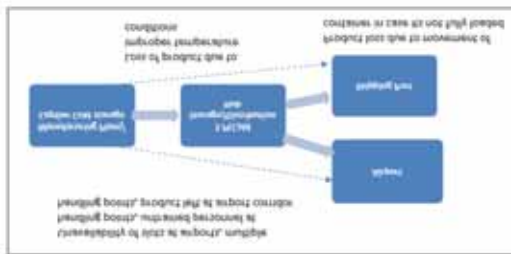
For pharmaceutical exports, product loss a major challenge

Though pharmaceutical exporters deploy both air and sea mode for shipments, sea routes are a preferred mode for transport. Typically, active pharmaceutical ingredients (API), also called bulk drugs, are transported through the sea route, because of higher shelf life and huge volumes. By contrast, formulation drugs are transported through air routes, as they have shorter shelf life compared with APIs.

Challenges across the supply chain for a pharmaceutical exporter

With the ever-increasing regulations at importer nations for pharmaceuticals products, it becomes imperative to maintain the appropriate temperatures across the value chain. A case in point is the EU, where 80 per cent of pharmaceutical products require temperature-controlled transportation, due to increased regulations on imports. Ditto for the US.

Pharmaceuticals from India are largely exported to North America, Africa, and the EU. The mode of transport for pharmaceuticals is determined on the basis of volume and shelf life of the product.



Typically, a pharmaceutical product is either directly transported from the factory or distribution hub to the port for shipping to the export country. Largely, pharmaceutical companies own a cold storage facility at their production plants to store the temperature-sensitive raw material/ finished goods. A few players, however, outsource the cold storage services to a third-party logistics player that operates cold storages near consumption centres or ports.

Key challenges faced by the pharmaceuticals companies while exporting via sea route are product loss and theft. Product loss typically occurs due to the movement of package/drum inside the container, in case the container is not fully loaded.

Over 50 per cent of temperature excursion of pharmaceutical products occurs when the product is shipped via air, as the number of handling points during air transport is higher compared with sea transport.

Many a time, drugs are left at the airport terminal or corridor for a prolonged time, resulting in damage and rejection of the order. Sometimes glass bottles get damaged during the transit, due to improper handling by untrained personnel, despite all the packaging protection taken by pharmaceutical companies. Unavailability of slots at airports is another challenge.

Products that can be normally stored in ambient temperatures are also transported in temperature-controlled containers to avoid any damage because of changes in ambient temperature.

For other perishables, lack of ventilation in stowage an issue

During shipping, frozen fruits and vegetables are stacked as a solid block, with virtually no ventilation between the stack and little or no separation between the cargo and walls, front part, or the back portion of the container. For stowage patterns of chilled products, the refrigerated air must be circulated through the cargo, or their quality is affected. ■

Hetal Gandhi,
Director,
CRISIL Research



"Cold Chain is a Science & not a *Jugaad* "

200 plus Companies showcase innovative solutions at the mMega "India Cold Chain Show 2018" in Mumbai



The need of the hour is to make good use of innovative technology and solutions as cold chain is a science and not a temporary jugaad, said Neeraj Bansal, CEO of DHL SmarTrucking India while addressing a conference on the sidelines of recently concluded India Cold Chain Show 2018 in Mumbai. He adds, "In India 85 per cent cold chain logistic and transport market is still unorganised and unreliable due to lack of trained drivers, technology use and short comings in temperature compliance. The cold chain logistic sector is under-invested and has been left in the cold. The sector has lots of challenges to address including huge food damages, wastage and operational losses," he explains.

The three-day mega trade exhibition "India Cold Chain Show 2018" organised by Reed Manch Exhibition India from December 13 to 15, 2018 at the Bombay Exhibition Centre, in Mumbai, Maharashtra, attracted thousands of cold chain industry professionals and trade visitors from across India, specially Maharashtra and Gujarat. The event featured over 210 leading companies from the cold chain industry including ICE Make Refrigeration, DHL, Mahindra, Blue Star, Gandhi Automation, Arctic, Pluss, Cold Box, Emerson, Kelley, Hormann and Honeywell among others.

India Cold Chain Show 2018 brought new technology and innovative solutions under one roof to address various challenges faced by the stakeholders of the industry in India. Some of new and innovative products at display include Ice Make Refrigeration's Cold Room and Refrigerated Containers, DHL's high-tech smart trucks, Godrej's floor care solutions, Gandhi Automation's Entrance Automation & Loading Bay Equipment, Blue Star's consumer product range among others.

Rajendra Patel, Joint Managing Director at Ice Make Refrigeration Ltd, one of the leading manufacturers and suppliers of cooling solutions equipment, said "Ice Make has been in the forefront in producing innovative cooling and refrigeration solutions to large number of varied industry sectors. We have a basket of over 25 refrigeration solutions products manufactured under four categories like Cold Rooms, Commercial Refrigeration, and Industrial Refrigeration & Transport Refrigeration and newly added Ammonia Refrigeration." Ice Make also manufactures Solar Cold Room which has been designed for cold storage requirement of farmers in interior areas where proper storage

temperature and adequate infrastructure is not available. A range of these products such as highly efficient Cold Room and Refrigerated Containers were at display at the exhibition.

Anuj Mathur, Chief Operating Officer, Reed Manch Exhibitions India said, " The unique show apart from showcasing the entire range of solutions and services for cold storage infrastructure, material handling, AIDC Solutions, refrigeration, temperature control, cold transport, cold logistics and supply chain for diverse industries with cold chain intensive business operations, also lined up various activities such as Annual General Meeting for The Federation of Cold Storage Associations of India, concurrent conferences which serves as a knowledge and networking platform for various industries such cold chain, food, pharma, healthcare, logistics, export and biotech sectors along with an industry workshop, disseminating knowledge to prospective entrepreneurs on how to start a cold storage and subsidies available from state and central government."

He adds, "India Cold Chain Show is a unique matchmaking platform that connects and features the leading companies providing latest and innovative solutions and consumers of these products and services such as cold storage owners, 3PL/4PL companies from wide industry segments."

The Future of HVAC is AI and IIoT/IoT?

Artificial Intelligence “AI” will play a large role in the era of Big Data. We have no doubt because the future of HVAC reveals AI and IoT/ IIoT.

HVAC controls have existed for a while. The first thermostat was patented in 1883! In the past era classrooms were heated by hot air furnaces operating in the basement of the building. School custodians controlled the heat through hand-operated dampers based on periodic assessments of the classroom temperature.

The technology for automated room temperature control has existed for 135 years! Has much changed in the basic temperature control architecture during that span of time? Sadly, we could say, not really. Even today, data from a single temperature sensor controls the actuation of most HVAC units in homes.

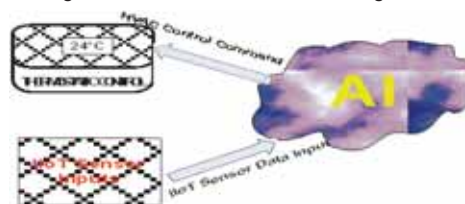
“Smart” Thermostats

“Smart” thermostats represent a very recent innovation, at least compared to the 135-year history. What makes a thermostat “smart”? Programmable schedules and vacation modes? No. Internet connectivity? Not enough. In one definition, “smart” thermostats must have more than two-way communication based on specially designed “algorithms”.

AI and IoT interplay in HVAC

The decoupling of the “algorithms” from the on-site thermostat

control allows us to visualise the interplay between Artificial Intelligence (AI) and Internet of Things (IoT).



IoT driving 3rd-party application layer

Assume, for example, that a thermostat (basic or “smart”) exists in a home. Regardless of the actual thermostat capabilities, a Cloud-based AI analytics engine can implement HVAC “algorithms” in a third-party application layer.

Where to from here

Let’s take this inquiry further. Would the existence of IoT sensors lead to the development of AI analytics engines? Or, would the existence of AI analytics engines lead to the installation of IoT sensors?

Many companies have placed their bets on this question.

AI technology is having an impact within the HVAC industry. Technologies that will affect these areas include expert systems, neural networks, intelligent computer aided design (ICAD), fuzzy logic and artificial reality. Expert systems are computer programs that mimic a human expert. Neural networks are computer programs that are designed to operate the

Building automation systems have been common for decades, providing comfort and achieving energy efficiency by managing HVAC, lighting and other systems. These on-premise technologies

Are these wider economic trends relevant to the building and real estate industry? What does a similar analysis of job growth indicate?

Three of these positions have shown healthy growth in employment over the past 15 years. The number of HVAC mechanics and installers has increased from 197,930 in 2000 to 294,730 in 2016, a growth rate of 2.5 per cent per year. Security and fire installation employment, a much smaller employment group, has grown more significantly, from 38,810 in 2000 to 67,700 in 2016 (a growth rate of 3.5 per cent per year). Employment in construction and building inspection also has grown over this time, from 68,690 to 94,960 (a growth rate of 2 per cent per year).

At the same time, there has been a slight decline in HVAC maintenance, from 59.8 per cent to 57.2 per cent. With around 5.5 million commercial buildings in the U.S., a 2.6 per cent decline means that many buildings no longer conduct routine maintenance. That alone should lead to a reduction in total HVAC employment, because it is a very manual service- and human-driven job. However, the exact opposite is happening: There are many more HVAC installers and maintainers.

Reports state that more buildings are cooling their floor space: The per centage of space that is not cooled has dropped from 23.6 per cent in 1999 to 19.7 per cent in 2012. And, the per centage of space that has 100 per cent of the floor cooled has increased from 38.6 per cent to 43 per cent. Overall, it seems that the increase in HVAC penetration and the increase in BAS penetration are driving higher employment, while the reduction in HVAC maintenance may be due to more reliable equipment that requires less ongoing service.

Based on these reliable data sources, it appears that buildings are being automated and employment in the industry is growing. Moreover, beyond raw employment numbers, other key trends are starting to impact building operations. First, the roles themselves are changing.

The report also notes that while some tasks will be automated, others will simply become more analytical or change in other ways. It's safe to assume that with the substantial increase in data from buildings,

many of the roles operating and maintaining them will become more data-driven. Moreover, the International Facility Management Association and Royal Institution of Chartered Surveyors released last year the third edition of a report focusing on the talent gap in facility management. The high-level findings are that the industry needs an influx of young, new talent (more RICS members are over 70 than under 30).

Facility management employment continues to grow, as does demand for advanced technology in buildings. A recent study commissioned by Dell and Intel found that 44 per cent of employees think their office is not smart enough, and 57 per cent believe that within five years, they will be working in a smart office. Dell and Intel include an IoT-enabled workplace in their definition of a smart office.

For now, it does not appear that automation will lead to significant job losses in the industry. However, facility and building managers need to address other, more critical issues, such as training employees to be prepared to use rapidly advancing technology and attracting more talent to the industry.

Using AI to Optimise HVAC is extremely easy

Heating, venting and air-conditioning may not be a rosy application of artificial intelligence, but there is huge cost-saving potential in using AI in HVAC.

AI seems to be everywhere. It's been tested and has proven efficient by using AI to play backgammon, chess, the game of Go and even Atari games. In some ways, AI is catching up and overtaking us. One AI application that may not sound rosy, but where there is huge potential to apply AI is the field of HVAC – that's right heating, venting and air-conditioning. HVAC systems are underappreciated technologies. They fall into the category of technology that a person uses every day and would hate to live without.

So, is there a way to apply the same smart control algorithms that have proven efficient in playing games to a commercial HVAC system that requires coordination of hundreds of control loops? To answer this,



let's start with simulation.

The goal to creating an HVAC simulation and eventually applying AI is to reduce the amount of energy used, the cost of energy and peak demand – the period in which energy is expected to be consumed at significantly higher than average rate. Depending on the local utility, the price of energy for commercial buildings changes depending on time of day and season.

Times of peak demand are often the most expensive times to use energy and occur during the hottest hours of the day – when HVAC is needed the most. Some utilities also use a building's highest peak in energy usage to set rates and apply costly demand fees. The capability to optimise the amount of energy used, the amount spent on energy and energy used during times of peak demands will greatly impact operating costs.

In the outlined simulation, the following is taking place:

- The model considers the whole building as a single zone, in which the building façade, the internal air, the furniture, etc., are always in thermal equilibrium.
- The thermal loads on this zone are treated as signals that generate from stochastic processes.
- The stochastic processes and the parameter values of the thermal model



are chosen to correspond to a realistic building.

- The HVAC power is the product of the absolute value of the HVAC thermal load and a cooling or heating factor.
- The cooling factor changes with outdoor air temperature (OAT) in a threshold linear equation.

Like riding a bicycle, controlling room temperature is almost similar to controlling speed when riding a bicycle. Considering the simple thermal model presented here, the dynamic equations of the two problems are almost identical.

In the case of riding a bicycle, many forces change the speed of the bicycle. When you pedal, there is a force pushing the bicycle and the rider forward. There are also various other forces, such as friction and gravity, pulling the bicycle backward. When these forces add up to zero, the bicycle travels at constant speed.

In the case of HVAC systems, there are a number of thermal loads that change the temperature of a room. The HVAC system usually blows cold air into the room and decreases the room temperature. There are also several other thermal loads, such as human activity and solar radiation, that increase the room temperature. When these thermal loads add up to zero, the room temperature is fixed.

Imagine that you are riding on the road with downhill and uphill grades. Will you ride at constant speed? Probably not. You will ride faster going downhill, building up that kinetic energy for the subsequent uphill. Considering this, why would you want to keep our room temperature fixed? If only we can give a comfort range to the room temperature setpoint then we can catch up on the downhill and uphill of the thermodynamics of the room as the outside air temperature and various thermal loads change throughout the day.

This room temperature “comfort range” is very different from the “dead band” commonly implemented in VAV boxes. The VAV box is the centrepiece of a Variable Air Volume (VAV) system that changes the air flow rate based on the local room temperature

and, usually, a pair of setpoints. The “dead band” prevents the VAV damper from actuating all the time. A smart control algorithm can actively optimise the room temperature setpoint within the comfort range, but the actual room temperature is still free to wander within the “dead band” centered at the optimised setpoint at any point in time.

Energy saving can be achieved by widening the “dead band”, but without optimisation, the room temperature may go against the thermodynamics of the room wasting energy overcooling or overheating. This is the equivalent of trying to ride the bicycle slower going downhill, but faster going uphill.

Results from the simulation shows that room temperature optimisation has a great potential to improve HVAC efficiency. The simulation period is a whole year and the following three-room temperature control strategies are compared with each other.

- Fixed at 22-degree C (71.6-degree F)
- Fixed at 23-degree C (73.4-degree F)
- Optimise between 21-degree C (69.8-degree F) to 23-degree C (73.4-degree F).

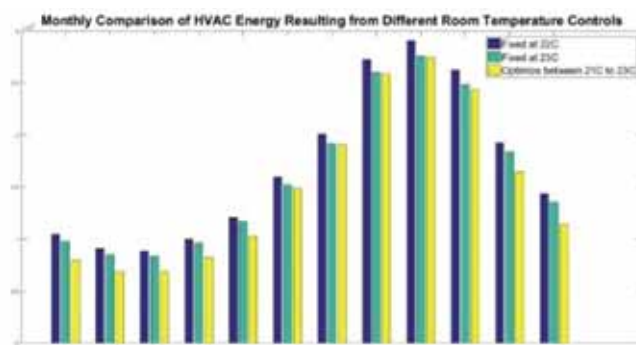


Figure 2: Monthly comparison of HVAC energy of a simulation over a whole year.

The above graph shows the results of the simulations using three different control strategies. With optimisation, the monthly



Figure 3: The People Power service can detect inefficiencies in HVAC systems around the clock

HVAC energy savings range from 5 per cent to 24 per cent from month to month. The greatest savings are achieved when the building requires some heating and some cooling on the same day. This is to be expected. As the smart control is put to work, some heating is reduced in the morning and hence there is less of a need for cooling later in the day – just like riding a bicycle.

Smart control strategies are cool (or hot)

Diagnostics help to make sure that the HVAC system can deliver a prescribed room temperature setpoint in the most efficient way. This step should come before room temperature optimisation and continue to monitor the building throughout. Comfort voting application helps to adjust and widen the comfort range improving comfort, providing more 'room' for the optimisation and hence saving more energy

SAT/SAP optimisation also contributes to energy saving but it is not necessary for

room temperature optimisation to work in a variable air volume system. This is equivalent to changing gears on the bicycle: even without changing gears, we can still optimise our speed based on terrain.

AI fault detection for HVAC

The system also warns if target temperatures for heating or cooling are not achieved in a specific time frame.

The key to reducing costly HVAC repairs comes from knowing when those systems are performing inefficiently. Something as simple as low refrigerant levels in an AC system can lead to repairs or replacements costing several thousand dollars – not to mention the wasted electricity. This monthly subscription microservice can potentially save consumers big money on repair and energy costs, while functioning quietly in the background of their lives with 24-hour protection.

In addition to knowing when HVAC has not reached thermal targets within

learned time period, the HVAC Fault Detection Microservice benefits include:

- Sending in-app notifications and email alerts of problematic performance issues
- Notifying customer support or repair services during warranty coverage period
- Integrating with professional monitoring call centres for value-added services
- Reminding users of manufacturer recommended service and filter replacements
- It is compatible with a wide range of connected thermostats
- It works with a variety of other People Power energy microservices.

Future of HVAC is AI and IoT? -

AI will play a large role in the era of Big Data. There is no doubt because the future of HVAC reveals AI and IoT. The debate about IoT market strategies will continue because of the expansive, even wild projections for the IoT market.

Unfortunately, hype leads to myth, and myth leads to confusion. Moving forward means taking a step back to look for clues about how the IoT market could evolve.

3 ways AI is making buildings smarter

The future of AI in buildings is bright, but humans will always be needed to properly utilise and direct the technology.

To most individuals, commercial buildings are viewed as brick and mortar, static structures.

There is, however, a complex technological side to commercial buildings—from the software platforms that control elevators to smart lighting—that is often overlooked.

It is these features that underscore how commercial buildings can benefit from disruptive technologies like AI.

Falling costs, increased accessibility, and greater sophistication of IoT devices have made it easier to generate data on the performance of buildings, and the systems within them, on a more granular level.

At its core, IoT enables different

components to communicate with each other, without any intelligence. The lack of intelligence means that a building may generate a deluge of data that needs to be manually sifted through to glean operational insights.

This has created a prime opportunity to apply AI to turn data into actionable information. Without AI, the combing of data from a building is either time-consuming or deemed useless information.

As AI continues to infiltrate the market, below are three ways in which it can be used to make buildings smarter.

1. Predictive Energy Optimisation

When it comes to reducing energy consumption, buildings are reliant on after-the-fact reporting, essentially analysing what energy was used and then implementing a change in the hope that less energy will be used next time.

Let's use the optimisation of heating and cooling within a building as an example.

Controlling room temperature within a building is like controlling speed when

riding a bicycle. Many forces change the speed of a bicycle when it is in motion.

Peddalling creates a force that pushes the bicycle forward. There is also friction, gravity, and other forces working to slow the rider down. The bicycle travels at a constant speed when forces used to propel the bicycle forward are in equilibrium with the forces acting to slow it down.

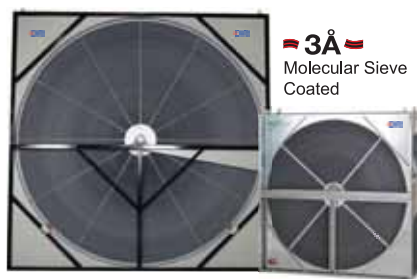
In the case of a heating and cooling (HVAC) system, there are numerous thermal loads that influence the temperature of a space. To cool a room, the system blows cold air into the space to decrease the temperature.

However, other thermal loads such as human activity, solar radiation, and heat from electronics increase room temperature. When these loads add up to zero, the room temperature is fixed.

Imagine that you are riding a bicycle on the road with uphill and downhill grades. Will you ride at a constant speed? Probably not. You'll build up kinetic energy (pedal faster) to go up a hill and perhaps coast going downhill.

DRI INNOVATIVE AIR SOLUTIONS

DRI ECOFRESH™



Energy Recovery Wheels

Certified by:



DRI ECOCOOL™



Evaporative Cooling Pads

Fire Retardant Pads (FRP)

DRISORB™



Honeycomb Chemical Filters



Granular Media

Meet us at :



14-16 January 2019
Hall B, Booth # B 3091



11-15 March 2019
Hall 8, Booth # H- 41



12-15 March 2019



28 February-02 March 2019
Hall 1, Booth # E- 37



Desiccant Rotors International

Phone : +91 124 4188888, Mobile : +91 88 2600 8129
Email : drimarketing@pahwa.com, Web : www.drirotors.com

CIN : U74899DL1984PTC017497

PAHWA GROUP
Innovation is Life



AI-based energy management platforms can identify the “uphills” and “downhills” for building operations by applying AI in the form of machine learning to advanced models of a building’s thermal characteristics.

It will identify when it makes sense to precool the building to avoid energy use during hours when energy is at the highest price (the uphill), or when to decrease cooling due to periods of inactivity within a building based on historical usage patterns (the downhill).

This is all achieved while keeping temperatures within a range that is comfortable for building tenants.

2. Preventative Maintenance and Fault Detection

In addition to optimising day-to-day operations, AI and machine learning can be relied upon for fault detection. AI techniques are well-suited in learning the relationship between input and output variables using only data, without mathematical models.

This technology can excel at analysing data from various systems and IoT devices within a building to identify anomalies and inconsistencies. After identifying these symptoms, AI can be used to target a diagnosis.

It’s also important to note the limits of AI. While at its core, fault detection is a technical problem – that AI can help expedite – human intuition and expertise is still needed.

In an ideal world, data anomalies would be automatically detected by AI-algorithms, and then immediately triaged and to identify the root cause.

However, within a building there is a deeper issue of resource constraint. There are often a lot more subtle and qualitative aspects to detection issues that require a person to filter.

Cost, ROI, and available funds must be considered from a budget perspective. There could be 10 -20 items on a list that have good ROI and comfort impact, but AI is not going to know that a room needs to be operating for an upcoming event or that a department is out of town, so prioritising that section of a building won’t cause a disruption.

For these reasons, the combination of AI within a building, paired with a national operations centre (NOC) to filter the qualitative needs of clients is the best strategy for resource-constrained facilities.

3. Improving Tenant Comfort

Using AI to optimise building operations and prevent faults will inherently create a more comfortable environment for tenants.

Exploring the relationship between comfort, direct tenant feedback, and AI is perhaps one of the more recent developments in smart buildings.

Companies are actively racing to find the best ways to personalise comfort for individuals within a shared workplace. While there is no clear-cut path to how this will develop in the future, it is certain that

humans act as the ultimate sensor within a building.

Thus, integration of mobile apps – and perhaps wearables – will likely have a large role in the way tenants interact with buildings.

As previously mentioned, AI can be used to refine advanced models of how a building performs based on a variety of variables. Using an app or other feedback mechanism for tenant input could potentially be another data stream to improve that model.

This is an early concept, and it is still unknown what this might uncover or in what way it will impact how smart buildings are operated. The goal of any smart building is to create a better experience for those within it, which makes tenant feedback vital.

The future of AI in buildings is bright but human expertise will always be needed to properly utilise and direct the technology.

The building space has been traditionally slow to adopt new technologies but embracing AI-based solutions is inevitable as it capitalises on the boom in the adoption of IoT-driven devices within facilities.

Building intelligence into buildings

What if buildings owners could see exactly how their building is being used at any given time? What if they knew how many people are using each room? How much energy is being consumed through heating, air conditioning or lighting? The condition of the drainage system, electrical equipment and elevators?

With AI, data from IoT devices, and occupant behaviour, this information becomes available to us. Digital devices, beacons and even social media statuses give insights into every aspect of a building’s condition and operation. This can span from infrastructure, climate, water and energy use, to an individual occupant’s experience. Moreover, smart buildings can use this information to automate building systems, to respond to changing external and internal factors.

Because of this, intelligent buildings have the potential to increase operational

efficiency, improve occupant experience, and optimise space and asset use.

Increasing efficiency

To increase operational efficiency in a meaningful way, we should monitor and optimise all aspects of facilities management. This includes water and energy use, as well as access and security. For example:

- Water: manage water use and flow with sensors and smart meters
- Fire: protect buildings from fire with automated functionality checks and smart detectors
- Energy: prevent waste and drive down costs with smart meters and demand response
- Elevators: remotely monitor performance and automatically schedule maintenance in response to fault detection
- HVAC: HVAC units can respond to occupancy data and automate fans, air availability and variable air volume
- Parking: sensors can monitor available spaces and enable 24/7 parking lot utilisation
- Access and security: connected cameras, instrumented perimeter doors and floor occupancy data help keep your building secure. Real-time data from sensors and IoT devices within the building's assets and infrastructure is the cornerstone of intelligent building management. Once we collect this information, we can cross-reference it with benchmark data and conduct analysis to identify operational improvements. For example, water flow sensors could trigger an alert when water pressure exceeded normal operating limits.

Analytics and artificial intelligence also allow building owners to significantly cut energy consumption and reduce operating costs. When sensor-data from the building itself is combined with external data sources, the potential for increased efficiency grows even more. For example, by combining heating and cooling data from the building with Weather Company forecasts, a connected HVAC system can

offer more efficient heating and cooling.

Improving occupant experience

Optimising space and asset use

Build intelligence into your buildings: how to get started

1. Which areas will bring the most return on investment quickly?
2. What opportunities do I have to drive down operation costs and improve workplace experiences?
3. In which situations can my buildings operate and manage themselves?

You could also start with individual processes. You might:

- Optimise maintenance by using predictive analytics to expose faults and determine their cause and impact. Automate device responses to handle this process proactively.
- Integrate sensors, devices and data to make more informed energy decisions.
- Enhance the occupant experience by introducing workstation availability apps with sensor and beacon devices to help occupants locate available space.

How Smart building is taking operational and energy efficiency to the next level

- Within a couple of years, smart building technology delivers greater returns in terms of energy saving and cutting operational costs against what you invest.
- Technologies like AI and IoT once deployed require minimal to no technical skills for facility managers as it takes a lot of decisions itself and shows you all the reports and suggestions in a highly intuitive and interactive dashboard. In fact, it becomes easier than before to optimise building operations, resolve a recurring equipment malfunction, and reduce carbon footprint since more information is available with a smart building solution.
- While the features of smart building and green building may overlap, they both are not identical concepts. Smart building solutions focus on monitoring heating, air conditioning, lighting and other systems to derive usage patterns

and take predictive actions to optimise usage and save energy. A smart building solution, also known as connected buildings also focus on improving the experience and comfort of those within a building. On the other hand, green buildings are sustainable buildings that have a minimal impact on the environment, which help us to preserve most of the natural environment around the building. LEED is one of the most widely known green building rating systems, which provides a framework to build highly efficient and cost-saving green buildings. In case of green buildings, the construction and operation promote a healthy environment across different areas like water, land, energy and other resources.

- No, that's not the case. Even though old buildings may be using pneumatic and analog technologies, smart building solutions can be implemented in old buildings through the use of effective retrofit technologies. By embedding sensors and connecting via gateways, data can be sent to the IoT cloud for further processing and to generate intelligence.
- There are a number of smart home applications based on IoT and AI; however, it is not limited to residential facilities only. All types of buildings – be it commercial or residential – can be retrofitted or built to become smart and highly automated using IoT and AI.

Conclusion


To achieve a low carbon economy, it is important that we adopt new technologies and make every possible move to make the world a better place. Smart buildings are definitely one of the ways to conserve energy by optimising systems and automating controls. If you have any questions about smart buildings, please feel free to get in touch. ■

Prof. Dr. OmPrakash G. Kulkarni
Scientist, Mentor, Adviser, Technology
Provider & Consulting Engineer in
Automation, Instrumentation, Energy
Management, IPR,
CDM & Renewable Energy





**DHL SmarTrucking will invest
in innovations: Bansal**



The single biggest challenge in Indian cold chain logistics is the consistent maintenance of optimum temperature for the product throughout its journey, informs Neeraj Bansal, CEO, DHL SmarTrucking in an interaction with Cooling India.

What are the growth drivers for Cold Chain Logistics? Which sector generates the maximum demand?

According to the Global Cold Chain Alliance, an industry group representing temperature-controlled logistics companies, the cold chain sector in India is expected to grow over the next five years with a compound annual growth rate (CAGR) of 13-15 per cent. Indeed, the cold chain segment in India is developing at a rapid pace, mainly due to the shift in focus from increasing production to improving storage and transportation facilities. Cold chain logistics has become an integral part of the supply chain industry comprising refrigerated storage and refrigerated transportation. The growing demand for cold chain logistics from organised retail, pharmaceutical industry and e-commerce, including online grocery is driving the demand for cold chain solutions in India.

India is one of the largest producers of agricultural products and one of the global leaders in the pharmaceutical sector. Yet, it is known to have fledgling cold chain, which results in supply chain losses of food and other resources. So, what are the solutions offered by DHL SmarTrucking in order to stop these losses?

As you have rightly pointed out, India is the world's largest producer of many fruits and vegetables; however, there is a high level of wastage and quality degradation due to improper handling during transportation. These perishable products depend on efficient and reliable long-haul trucking to keep their freshness intact. Fruits and vegetables are subject to rapid deterioration if

they are mishandled during transportation. Temperature and humidity also impact the shelf life of these products.

Our Coldchain SmarTrucking solution helps in keeping agricultural produce fresh and getting them to market quicker. DHL SmarTrucking Coldchain uses state-of-the-art technologies to deliver temperature-sensitive shipments and provide an unmatched shipping experience to our customers across sectors, including e-commerce, online grocery, retail, pharmaceutical and food and beverage.

What are measures taken by the company for steady and efficient supply of power to reefer trucks?

Our reefer trucks can transport a diverse variety of goods in temperatures ranging from -25°C to +25°C and to ensure that the

specific temperature is met, we have an emergency backup, which serves as a back-up power supply in case of a breakdown. With DHL SmarTrucking, businesses can track their consignments at any time of the day and monitor, not just the location of the truck, but also the temperature inside the container. We have three digital sensors respectively positioned at the front, mid-section and rear of the containers for constant monitoring of air flow inside the container, even when goods are stacked in a pallet form. These ensure that customers get real-time data on the temperature of their shipments at any time of the day.

DHL SmarTrucking functions with automated solutions that use IoT-enabled sensors, which help with route optimisation and minimise fuel wastage, for example by reducing instances of long and wrong routes and avoiding routes with heavy traffic. The alerts and status updates are sent to customers and DHL SmarTrucking's operations teams.

What are the technological innovations to achieve a more optimised, cost-effective temperature-controlled supply chain?

Today, the technology offers a variety of tools to maintain products at the right temperature and consistently monitor the shipment, using temperature sensors and GPS tracking to self-reporting alerts for computers and mobile devices. Smart refrigerated units help monitor the temperature and humidity inside the container, and the location and motion of shipments, in real time. Advanced tracking abilities give relevant advanced warning of major changes or malfunctions of any equipment. These types of notifications help ensure required maintenance is performed regularly or even secure alternate capacity before a load is compromised.

The focus on end-to-end temperature control for all cold chain products is a relatively recent trend in India; until then, temperature control used to be specified and observed only for the storage of a limited range of products. The situation is now changing as transportation regulations across the world evolve. Businesses that require cold chain services, such as those in the pharmaceutical and food and beverage sectors, are also increasingly demanding stringent standards, transparency and visibility into their shipments, due to the sensitive, sometimes critical, nature of their goods and the inherent risk of loss. It is time for a new, smarter cold chain – one that is informed by knowledge of the various economic sectors and international regulations, has robust standard operating procedures, ensures shipment security, end-to-end visibility and control, and is driven by the latest technologies that deliver competitive advantage to businesses.

What are the challenges that are faced during the operations of cold chain supply logistics?

The single biggest challenge in Indian cold chain logistics is the consistent maintenance of optimum temperature for the product throughout its journey. While there are strict standards internationally for cold chain, standards in India are not yet as stringent, and due to lack of oversight and accurate reporting,



businesses find it difficult to be fully confident in the temperature integrity of their cold chain goods during storage and transport. DHL SmarTrucking adheres to global standards for our cold chain offerings. We are FSSAI (Food Safety and Standards Authority of India)-compliant and follow the latest ISO standards for cold chain. Our reefer trucks can maintain products in the range of -25°C to $+25^{\circ}\text{C}$ for all perishable goods from food and beverage to pharmaceuticals. The reefer unit is self-powered so that proper consignment temperature can be maintained even in the case of breakdowns. Three digital sensors for Uniform Temperature Distribution Monitoring, strategically located in the front, mid-section and rear of the container to monitor uniformity of temperature, help remotely monitor and manage container temperatures in real time, ensuring that products remain fresh



during the journey and we can deliver them to our customers in top quality.

We maintain a high-security network across arterial highways, with Emergency Response Teams on standby for contingencies, to ensure complete safety of the goods while in transit. Our fleet is state-of-the-art, built with the best-quality materials for the best functionality – stainless steel interiors, T-section flooring, hybrid metal exteriors and 120 mm foam insulation to maintain strength, container temperature and quality.

What is the impact of GST on cold chain business in India?

Although the sector is experiencing certain challenges related to policy and infrastructure, initiatives undertaken have the potential

to provide a boost. Despite the concerns around GST and the issues with e-way bill rollout that this sector has been facing, once the wrinkles have been ironed out, the simplified GST structure and faster e-way bill process will make movement across borders easier and quicker. The ongoing Bharatmala project, which is aimed at expanding the Indian road network, will greatly ease traffic bottlenecks.

Companies can derive tremendous benefits from the transformation that is sweeping the Indian logistics sector. The expected infrastructure and policy developments will enhance shipping speed and ease-of-business. This will enable on-time deliveries so that companies can respond to shifts in consumer trends more quickly and cost-effectively.

What is your opinion on the Government of India's 'Make in India' campaign for making the country a manufacturing hub?

As a commercial road transport company, we do not manufacture a tangible product, we provide safe, secure and reliable road transport solutions to manufacturing companies across sectors and industries. In the last few years we have seen the introduction of a number of policies that are directly and indirectly supporting the growth of the cold chain segment in India across industries, including the Make in India campaign which aims to turn India into a manufacturing hub, which will drive the demand for smarter, faster, reliable and more organised logistics.

The Ministry of Food Processing Industries is implementing a scheme for creation of infrastructure for agro processing clusters under Pradhan Mantri Kisan Sampada Yojana to create modern infrastructure for food processing in the country. Another initiative from the government is the development of Mega Food Park Project that aims at providing a mechanism to link agricultural production to the market by bringing together farmers, processors and retailers so as to maximise value-add, minimise wastage, increase farmers' income and create employment opportunities, particularly in cold chain logistics.

What is your outlook for the sector for the fiscal 2018-19?

Our aim is to disrupt the logistics industry in India through judicious and progressive use of technology, customised to the industries we serve. This is a long-term commitment and we will continue to invest in India, a key market for DHL. We have an asset-heavy business and we are investing in technology, employees, vehicles and business needs.

Ultimately, our aim is to provide reliability, visibility and a seamless customer experience, and DHL SmarTrucking will undertake the necessary steps to ensure this. To support our customers with their logistics requirements and help them achieve business success, we will continuously invest in quality services, innovations and infrastructure. ■

Cold Chain Logistics and Refrigeration Using PCM

PCM improves the efficiency of the running application, additionally it saves on the operating and maintaining cost of the application.



Photo Credit: www.arctic-solutions.in

The world is changing. Everyone wants to achieve more out of the limited resources and in the process to operate under such conditions, several Research and development projects take shape. Be it for electricity saving, saving mother Earth from the pollution or purifying water for drinking. In a way, all such novel ideas lead to one important aspect – savings! The growing pharmaceuticals

and frozen food industries have pushed companies to take measure for their temperature-controlled transportation. The products are maintained in the prescribed range of temperature during the entire duration of transportation. The temperature-controlled transportation is so critical, especially for pharmaceuticals and vaccines, that the product which needs to be maintained between

2-8-degree C, will face severe thermal shocks if the ambient temperature leaves the specified range of transportation. Companies, globally have responded in the past few years with newer solutions which use innovative technology and advanced phase change materials (PCM) to increase performance for most applications, especially benefiting freeze-sensitive refrigerated biologics, food and

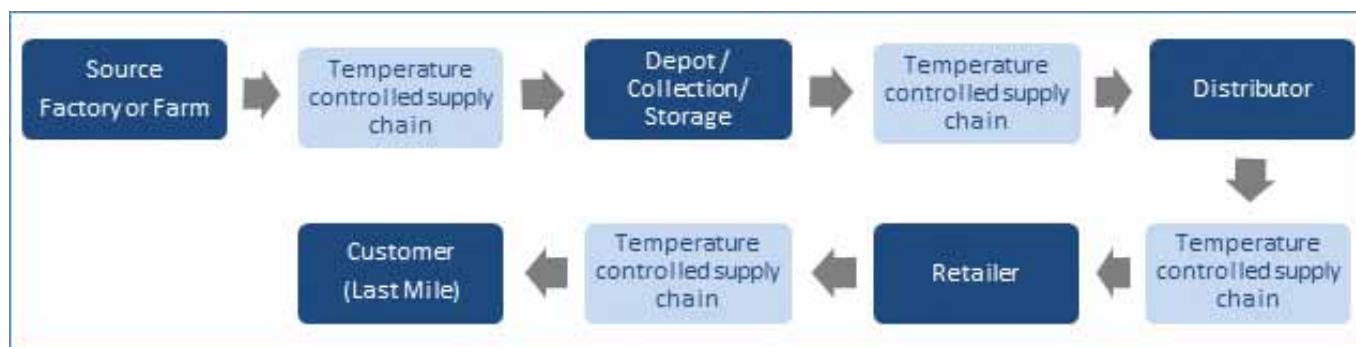


Figure 1: Various Processes in Transportation of Temperature Sensitive Products

dairy products. These improved systems offer greater performance, accuracy, reliability, and reusability by occupying minimum space, being environment-friendly and cost-efficient.

Cold chain packaging also serves an important role in the transportation of the products. Several Innovative technologies provide several methods of packaging solution, which maintains the temperature of the product, thereby protecting it from the harsh ambient outside. Passive technology includes elsewhere frozen PCM as the primary source of cooling. Infrastructure is required to be kept online on the electric grid but away from the transportation solution. Active technology uses thermostatically controlled either battery operated or diesel operated refrigeration system to maintain the temperature of the product on the go. Hybrid technology depends upon the combination of both passive and active technologies to maintain the temperature.

Cold chain includes cold storage infrastructure, transport infrastructure and point of production infrastructure. It refers to an environmentally controlled chain of logistics activities, which conditions and maintains the goods within a stipulated range of parameters that include temperature, humidity, atmosphere, packaging and other conditions. Figure 1

presents a sample of cold chain diagram: it indicates the importance of temperature-controlled environment at every step of the process. The temperature-controlled supply chain indicates to refer/refrigerated trucks, cold rooms, chest freezers, warehouses and last mile delivery solutions.

Various industries that fall under this category of temperature sensitive transportation are agriculture, dairy, frozen food, horticulture, chemicals, poultry and meat. India today has only 10,000 refer and around a same number of cold rooms. The current infrastructure can hold less than 10 per cent of the country total produce. The figure below clearly demonstrates the increase of the cold chain dependents produce. From 17 million tonnes of produce in 2009, India now requires 47 million tonnes of the produce. The growth accounts for a CAGR of 13.4 per cent and at a current rate, India will require around 115 million tonnes or produce by 2025. The current trend suggests that India's requirement doubles almost every 7-8 years.

Technology

PCM based products can be seen in every step of cold chain logistics including PCM-based solar hybrid cold room, refer trucks and deep freezers. The PCM

improves the efficiency of the running application, additionally it saves on the operating and maintaining cost of the application.

PCM based reefer trucks

Logistic solutions at present are based on refrigerated vehicles which use fossil fuels to operate. Due to this reason, the temperature-controlled logistics become more expensive than the transportation and storage of general produced goods. There is, thus, an urgent need for shift of conventional cooling systems to non-fossil fuel-based refrigeration systems as it considerably brings down the operational costs in an affordable range of the end user as well as the seller. Use of PCM as a thermal energy storage (TES) enables the transportation of goods at a constant temperature while minimising the dependency on diesel/petrol or any other conventional fuel for continuous running of cooling units in the reefer trucks at the same time. The PCM filled encapsulation units, which are mounted in the insulated containers, are charged using electrically operated compressor during the non-operational hours and then for the next 14-16 hours it is the PCM which assures that the required temperature is maintained. This system is ideal for inter-city transportation and for the services, which requires a limited radius of transportation

FROZEN (-) 25°C to (-) 10°C	COLD (+) 2°C to (+) 8°C	TEMPERATURE CONTROLLED (+) 15 to (+) 25°C
<ul style="list-style-type: none"> Meat, Fish and Poultry Frozen fruits and vegetables Ice-cream Pharmaceuticals and vaccines 	<ul style="list-style-type: none"> Fresh fruits and vegetables Milk and Dairy products Flowers and Eggs Pharmaceuticals and Vaccines 	<ul style="list-style-type: none"> Sub-tropical fruits and seeds Chocolates Processed foods (pickled, dried, cooked) Pharmaceuticals and Vaccine.

Figure 2: Variables to consider in cold chain compliance

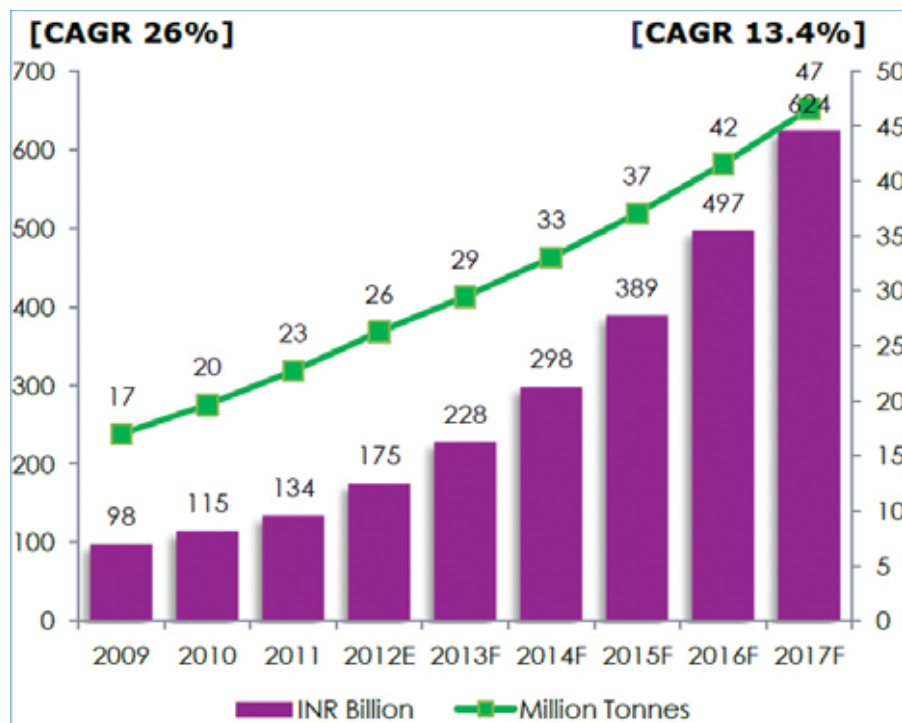


Figure 3: Growth of the Indian cold chain industry
(Source: National Summit on Cold Chain: ASSOCHAM & Tech. Sci. Research)

which can be completed during the day. One more major advantage of using such a system is that now, the truck can run on compressed natural gas (CNG) cylinders which add to more savings, in terms of money as well as the environment. Pluss' PCMs based thermoTab active plates cater to different applications needing specific temperature maintenance. PCMs ranging from (-) 30-degree C to 0-degree C are suitable to suffice cooling requirements of products like pharmaceutical, vaccines, meat, frozen food, fresh vegetables, ice creams and similar. Integrating suitable PCM to meet transportation requirements

of sensitive goods has a significant impact on diesel consumption. It cuts down the diesel consumption upto 50-60 per cent along with precise temperature control by implementing TES system.

A real-life example can be taken to explain the advantage of using this system. In a refrigerated truck with 8ft x 6ft x 6ft insulated container, if we compare the PCM plates (thermoTab active) integrated cooling system with a conventional diesel operated compressor unit, the savings on its running cost are exceptionally high. Because such a system is charged (or cooling is stored in PCM) during the non-

operational hours using grid-power supply, there is complete saving when compared to charging it on diesel. The cost of operation through diesel, in comparison to electric power for cooling, is almost two times (running cost Rs. 6-7 lakhs per annum in the case of a conventional system as compared to Rs. 2.5-3 lakhs in PCM based system). This results in a very short payback period of 4-6 months, in spite of having a little higher initial investment cost requirement. It also ensures that the cooling system remains intact and long lasting due to its non-moving components involved. This technology ensures that the perishables and temperature sensitive consumable products are safe and secure even in a situation of truck breakdown or failure of cooling systems. Then there are some other advantages as well, such as low maintenance requirement and no-special skills/training requirement to operate this system. Its robust and smart controls enable maintaining temperature and air quality parameters at just the right levels inside the storage volume. The very intuitive human-machine interface provides a hassle-free and an unparalleled user experience.

Thus, this technology promotes the usage of clean and green energy by minimising the dependency on use of non-renewable fossil fuel while ensuring the safety and quality of temperature sensitive consumable products and other perishables is maintained throughout the cold chain transportation and last mile



Figure 4. PCM filled thermoTab active plates in a reefer truck

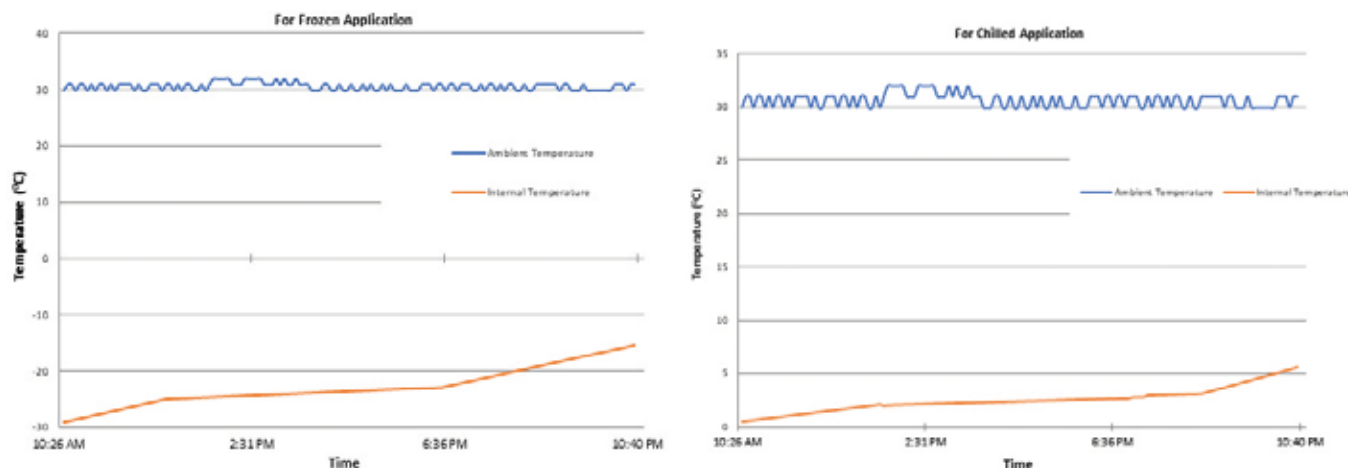


Figure 5: Temperature-performance graphs of thermoTab active based reefer trucks.

deliveries until they are finally received at consumer's end.

Benefits of PCM based Reefer Truck Units

- It is totally environment friendly; there is no dependency on fossil fuels - diesel or petrol, to continuously run the cooling unit; uses grid power to charge once a day.
- There are no moving parts and complicated components involved in this system, as a result of which at least 30-40 per cent lesser servicing and maintenance cost involved.
- The PCM based reefer cooling solution offers 8-9yrs. (approx.) of service life, which a conventional system can
- Such a solution ensures continuous safety of temperature sensitive products even in the situation of truck's breakdown.
- No special skills or trained worker needed to operate this system; just plug in the compressor to grid power supply, freeze the PCM, and use it.

PCM based Deep Freezers

In the last 5 years since 2013, more than 50,000 PCM-based Chest freezers and coolers have been launched in the market by major OEMs in the refrigeration space. Each PCM based freezer/cooler provides over 5000 hours of temperature control during the power outage annually. These numbers are only a miniscule in comparison to the total market size of chest freezers and coolers and hence the

potential for this segment to grow is very large. Proper Initiatives in R&D, strategic scheduling and marketing can easily broaden the horizons for PCM.

Experiments conducted with load and no-load conditions suggest that there is at least an increase of 6-7 per cent in the COP (Coefficient of Performance) of any refrigeration system (figure 4) after using PCM in the deep freezer. The use of PCM pouches perfectly wrapped around the evaporator coils increases the cut-off time of compressor which directly translates into the operating cost saving. The energy stored in the PCM is utilised after the compressor cuts off, therefore maintaining a long retention time. Glycol-water mixture based deep freezers have ruled over the entire market for years, it can provide you

with a cheap solution but doesn't maintains the temperature of the inner products in a constant, and desired range for more than 4-5 hours.

For deep freezers, savE HS 23N (melting temperature of -23-degree C) is encapsulated in the multilayer nylon pouches, such designed to withstand the force equivalent to 60 kg and a temperature of around 80-degree C. The installation is nothing different from installation in a conventional deep freezer. Initially, the evaporator coils are attached to the inner shell. After the coils are in place, the pouches are wrapped around the coil-inner shell assembly. Thereafter the entire assembly is put inside the outer shell. The cavity thus formed between the coil-inner shell assembly and the outer shell is filled

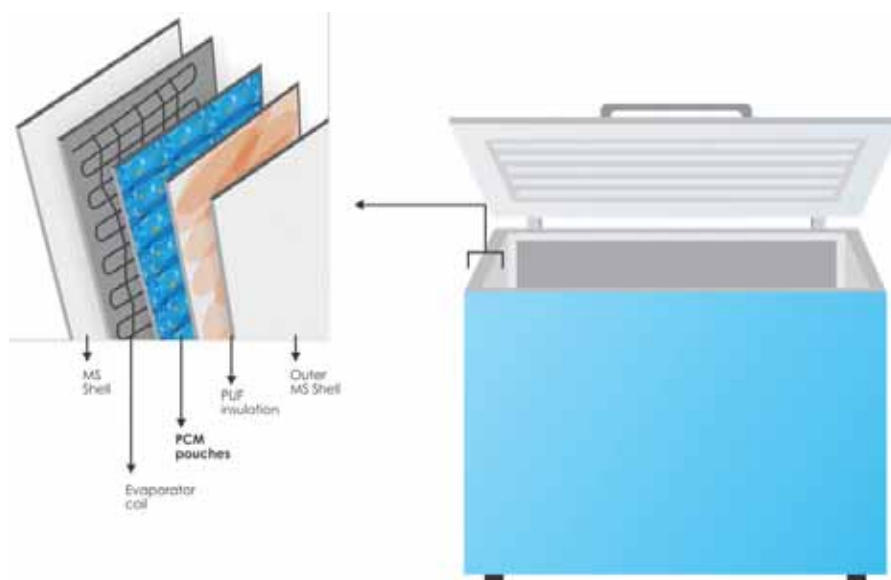


Figure 6: Pouch installation in deep freezer.

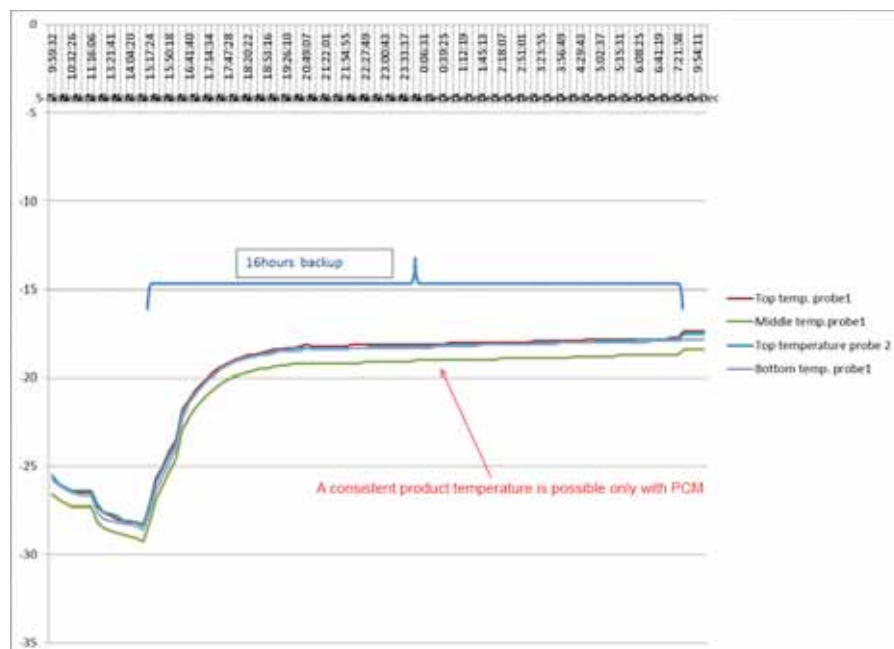


Figure 7: Retention time of HS 23N.

by injecting the high-pressure PUF insulation. The PUF being injected is maintained at very high temperature and pressure. The pouch can easily withstand the temperature and pressure, without damaging the quality of PCM encapsulated in the pouch. An important parameter to be monitored while injecting the PUF is that the PCM pouches should be properly wrapped around the coils using proper adhesive. If not, the PUF during injecting can penetrate between the coils and pouch thus affecting the heat transfer effectiveness of the entire PCM-evaporator coil system. The figure below well demonstrates the Pouch placement around the evaporator coil.

Benefits of PCM based deep freezers to conventional deep freezers:

- Energy Saving of more than 35 per cent over operating cycle of the freezer.
- Lower maintenance, due to non-corrosive nylon pouches.
- Reduce the overall weight of the system, as less quantity of PCM is required when compared to water-glycol mixture.
- Longer retention time; suitable in longer power outages of upto 16 hours.
- Precise temperature control of (\pm) 2-degree C.
- Larger shelf life, 3000 thermal stability (cycles) guaranteed, which translates to a period of 8-9 years.
- The yearly saving per 1100-liter machine is around Rs 10,000 with a payback period of less than 1.5 years.

- Considerable reduction in greenhouse effect.

PCM Solar Hybrid Cold Room

Major percentage of population in the country is dependent on agriculture for their living. Though it is important to increase productivity and produce more products from the same space of land, it is also equally important to manage the products well after the process of harvest. The wastage is 0.5-4 per cent in food grains and 4 per cent-18 per cent in different horticultural crops, with the horticultural crops being high value and more perishable.

It is thus necessary to take required steps in terms of post-harvest management at the first mile operations i.e. at the farm level to check and reduce the value loss of produced farm products. With respect to this, there is a direct relation between the availability of power and the dependency of the cold room facilities. It is impossible to operate working cold room for 18-20 hours without electricity. Alternately, diesel generators are used as a power source, which incur huge costs and are unviable as well.

Under such circumstances, a PCM based solar micro cold room, which is a small-scale standalone PCM based solar powered cold room, can be used to store fresh fruits, vegetables, exotic and temperature sensitive flowers, processed foods and other perishable commodities. This is a pioneering product in the cold chain space that bundles various innovations together.

The solar powered cold room with



Figure 8: PCM based Solar Micro Cold Room

thermal storage (PCM) backup enables storage of fresh produce – fruits, vegetables and flowers by constantly maintaining a temperature in the range of 2-degree C to 8-degree C or (-) 25-degree C to (-) 15-degree C throughout the day. The unit has a dimension of 20ft x 8ft x 8ft with solar panels mounted on the rooftop of the unit. These panels capture the available solar insolation during the sunlit day time (4-5 hours of effectively available sunlight), which is fed directly to the compressor system via special drive systems. The compressor then generates enough cooling to charge the PCM filled encapsulation units in the cold room which then in turn cools down the space and provides backup for upto the next day morning in the form of thermal energy storage system.

This product enables storage of

perishables to preserve their freshness and maximise shelf life. It comes with every feature of an ideal cold room and is completely standalone. It can also be used in combination (or hybridised) with any other source of power as and when needed. Owing to the endless opportunities one can have using such innovative system and the impact this product can have on the lives of farm level producers or farmers, the marginally high initial investment in this technology, as compared to conventional cold room systems, should never be the prime concern.

Benefits of PCM based solar micro

Devakar Dhingra
PLUSS Advanced
Technologies Pvt. Ltd.,
Gurgaon, Haryana



Shreyas Srivastava
PLUSS Advanced
Technologies Pvt. Ltd.,
Gurgaon, Haryana



cold room:

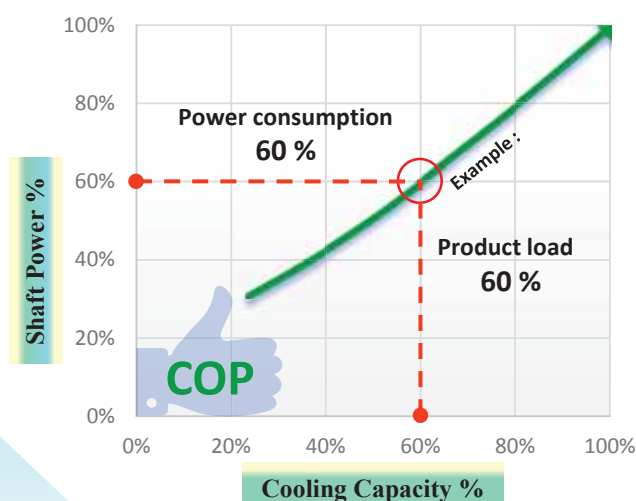
- No electricity required to run the cooling unit; thermal energy storage technique ensures 24x7 temperature maintenance.
- Ensures constant temperature maintenance which minimises wastage of fruits and vegetables during their storage.
- Such a cold room has minimal cost involved, be it in its operation or maintenance.
- Is portable; can be dismantled and installed easily at remote locations where direct transportation of complete assembled unit is not possible. ■

KOBELCO
KOBELCO STEEL GROUP

KOBELCO Two Stage Inverter Drive Compressor

Best way to reduce the factory running cost !

Outstanding energy saving performance by
Kobelco inverter drive compressor



- : Above graph for iZN 20TXII-4A @ ET=-45 / CT=40 °C
- : Cooling capacity = 302.5 Kw @ -45 °C

Kobelco iZ Series –

Cooling capacity control by inverter & iZ controller
Result: Linear capacity control **No Gas By-pass**



iZN series for NH3

ET Range -30 °C to -50 °C



iZα series for F-Gas

ET Range -30 °C to -65 °C

Patent Registered...

Motor speed accelerates according to evaporate temperature drop
20% more Qo (kW) than the same frame model at lower than -30°C

Kobelco Compressors India Pvt Ltd.

249 G, 3rd Floor, AIHP Tower Udyog Vihar, Phase 4 Near India
Bulls Building, Gurgaon – 122015, Haryana
Tel : +91 124 – 4380750 / M : +91 - 7838015982
Email Id : singh.mandeep@Kobelco.com
Web : www.kobelco-comp.co.jp

Next Generation Secondary Refrigerants

Gas hydrate slurry and pressurised CO₂ are promising secondary refrigerants due to their high-energy densities and environmental safety.

In response to the Kyoto Protocol and the rising concern about greenhouse gas emissions, there is a general consensus that the use of hydrofluorocarbons in refrigeration must be reduced, which can be achieved by reducing leakage and introducing more environmentally friendly fluids. To reduce refrigerant leakage, the use of secondary refrigeration is being promoted. Secondary loop systems thus employ two separate heat transfer loops: one for the primary refrigerant and one for the secondary refrigerant. The principle of secondary refrigeration consists of reducing the volume of the primary cooling unit (and therefore its leaks) as much as possible while using a secondary loop containing a safer fluid to distribute cooling power to users. It has several advantages such as, factory-built units can be used, local

construction of primary refrigerant piping can be avoided and installation work can be made in a simpler way. It is also possible to design the refrigeration unit in a compact way and with an extremely small refrigerant charge.

Followings are some desirable properties of secondary refrigerants:

- Enough freezing security
- Higher density (lower charge volume)
- Higher specific heat capacity
- Lower viscosity (low pressure drop and pump size)
- Good thermal conductivity (high heat transfer)
- Good chemical corrosion inhibiting
- Chemically stable, no separation or degrading
- non-toxic, non-flammable
- Food grade for food refrigeration.

To take care of growing demand of energy density, the miniaturised devices as well as large devices require more efficient cooling systems with greater cooling capacities and decreased sizes. Thus, heat transfer capacity of secondary refrigeration loop needs to be increase and this need must be met by enhancing the heat transfer capability of secondary refrigerant. Hence, many alternative and advanced secondary refrigerants are being promoted.

Secondary refrigerants

There are two kinds of secondary refrigerants, namely, single-phase fluids and two-phase fluids. Single phase fluids generally consist of some kind of antifreeze solution, corrosion inhibitor, and biocides. The single-phase secondary refrigerant

can be further divided into two categories, aqueous and non-aqueous fluids. Two-phase secondary refrigerants (phase change materials in liquid carrier) take advantage of the high latent heat during the phase change process from the liquid to the solid or from the liquid to the gaseous state.

Aqueous fluids as secondary refrigerant

Aqueous liquids are basically water-based solutions containing glycols or salts, which are used to decrease the freezing point of water. Aqueous solutions of ethylene and propylene glycol, ethyl alcohol and chloride salts have long been used as secondary refrigerants. For example, magnesium and calcium chloride water mixtures have been widely used in refrigeration applications since a long time ago. Ethylene glycol is also widely used as an automotive anti-freezing coolant. Lately, potassium acetate and potassium formate have been employed in low-temperature applications because they show advantages in terms of corrosion and desirable physical properties as compared to other mixtures.

Non-aqueous fluids as secondary refrigerant

A number of non-aqueous heat transfer liquids are also used as secondary refrigerant, which may be natural inorganic, natural organic or synthetic organic fluids. HFE-7100, referred to as a hydrofluoroether (HFE), has recently been introduced. The freezing point of this fluid is listed to be below (–) 100-degree C, making it suited for both low and medium temperature applications. It is orally non-toxic, non-flammable, and it has been found to be compatible with most common materials. Several synthetic organic heat transfer fluids (Dowtherm J, Syltherm XLT, Baysilone KT 3, Gilotherm D12 and Tyfoxit) are also available. One of these fluids was found to offer freeze protection to (–) 73.3-degree C, thereby providing

another option for low temperature systems. This synthetic fluid provides superior low temperature viscosity when compared to ethylene glycol. Like ethylene glycol, it is orally toxic and would therefore require special precautions. CO₂ is attracting attention as the ideal secondary refrigerant due to minimum viscosity change even at low temperatures [below (–) 30-degree C]. The latent heat of vaporisation is large and heat transfer efficiency is excellent when CO₂ is used as secondary refrigerant. Therefore, the bore of the pipe can be designed to be 5 times smaller because the CO₂ mass flow rate is smaller than that of the conventional secondary loop cooling system using conventional brines. This also reduces the pressure drop triggered by friction inside pipes. The energy consumption can be reduced by about 40 per cent when CO₂ is used as the secondary refrigerant. It is possible to reduce the pump's power consumption by 90 per cent when using CO₂ as secondary refrigerant compared to other systems those adopted other brines as secondary refrigerant.

Nanofluids as secondary refrigerant

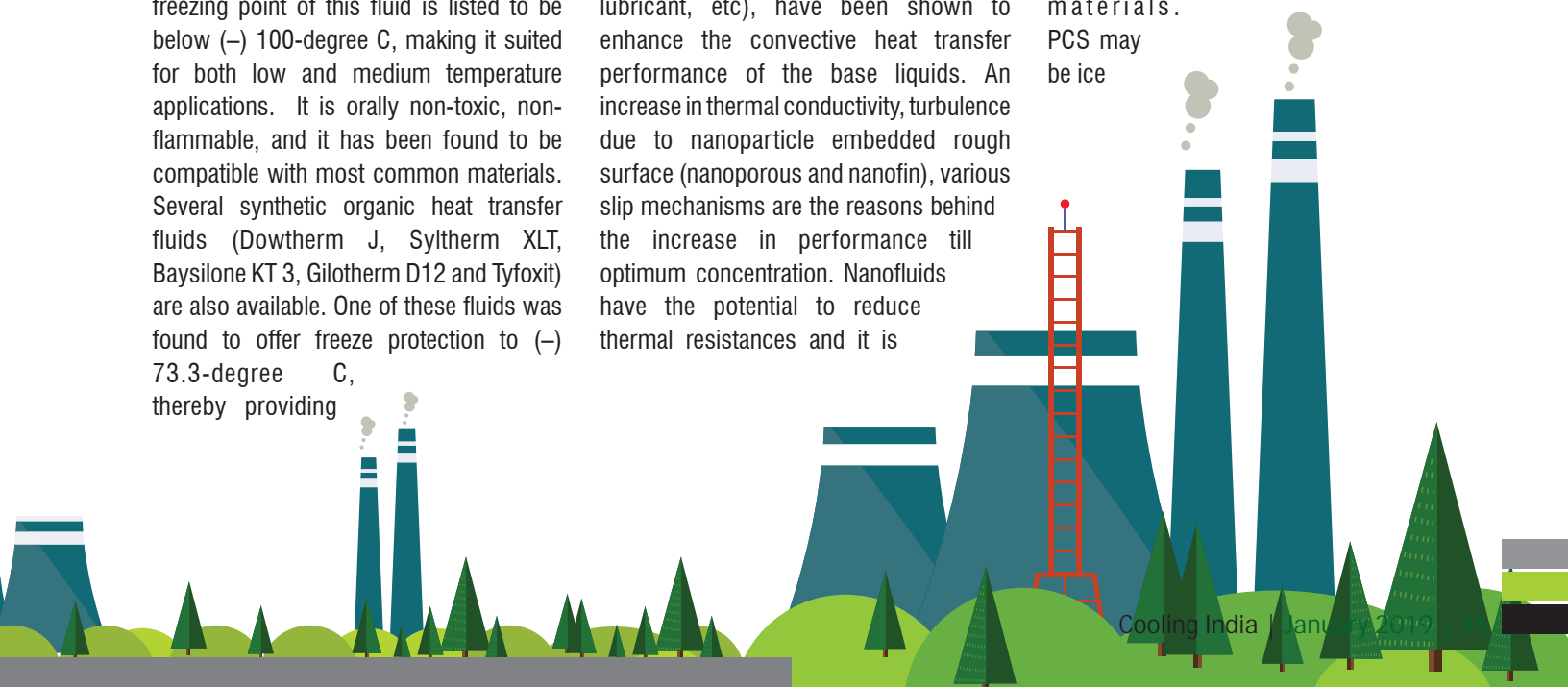
Nanofluids are dilute liquid suspensions of nanoparticles with at least one of their principal dimensions smaller than 100 nm. Nanofluids, consisting of ceramic particles, pure metallic particles and carbon nanotubes suspended in typically conventional heat transfer liquids (water, ethanol, brine solution, refrigerant, oil, lubricant, etc), have been shown to enhance the convective heat transfer performance of the base liquids. An increase in thermal conductivity, turbulence due to nanoparticle embedded rough surface (nanoporous and nanofin), various slip mechanisms are the reasons behind the increase in performance till optimum concentration. Nanofluids have the potential to reduce thermal resistances and it is

expected that these fluids will play an important role in developing the next generation of cooling technology. Hence, conventional aqueous solution (brine) based nanofluid or hybrid nanofluids have been promoted as secondary refrigerant. Nanofluids allow the refrigerator to operate with lower condensing and higher evaporating temperatures, thus increasing the system COP. As the addition of nanoparticles to the secondary fluid does promote the enhancement of the refrigeration cycle performance as it flows through the evaporator. No doubt, the use of nanofluids as secondary refrigerant will improve the performance and reduce the system size and space needed. However, most of the nanofluids yield the payback period higher than the component life and hence not beneficial for present scenario. In future, the payback period can be reduced by reducing in the cost of nanoparticles and increasing suspension stability, hence may be a alternative.

Phase change material slurries (PCS)

PCS is two-phase secondary refrigerants, mixture of carrier fluid (basically aqueous solution used as a continuous phase) and solid PCM particles. Contrary to current secondary refrigerant fluids such as brine solutions or ethylene glycol which have a low energy density, these slurries have a higher energy density than single-phase secondary refrigerants, due to both sensible and latent heat capacities of the materials.

PCS may be ice



slurry, microencapsulated phase change material slurry (MPCS) as well as clathrate hydrate slurry (CHS).

Ice slurry (suspension of ice crystals in a carrying liquid phase) is considered as a very promising secondary refrigerant. Ice slurries consist of a number of ice particles in an aqueous solution and the diameter of ice particles is equal or smaller than 1 mm. The smaller the ice particles in the ice slurry are, the better the slurries can be transported. Besides the reduction on the charge of primary refrigerant associated to any secondary refrigerant, ice slurry allows a reduction in energy consumption compared to single phase secondary refrigeration systems as well as the possibility of thermal storage. It is obtained in two different ways: firstly, the energy efficiency of an ice slurry plant is greater than that of a plant using a single-phase secondary refrigerant; secondly, the energy consumption on the pumps used in the secondary refrigerant distribution system can be reduced compared to the energy consumption necessary to pump the traditional single-phase secondary refrigerant. The optimal ice concentration depends on specific operation conditions and the heat exchanger type (smooth or corrugated tube). As a general rule, the optimal ice concentration increases as the heat exchanger length increases. Although in most cases the direct use of ice slurry improves the heat exchanger's performance, there are some cases, especially for low heat exchanger length, where the direct use of ice slurry is inadvisable. The refrigeration system pipeline diameter can be reduced by using ice slurry as the secondary refrigerant. The cooling capacity of an ice slurry is four to six times higher than that of conventional chiller water, depending on the ice fraction.

MPCS is a kind of solid-liquid suspension consisting of the carrier liquid and small particles of phase change material (PCM) with a thin shell. Paraffin waxes are often used as the core materials due to its extended melting temperature range. The shell material is usually natural or synthesised polymer, such as polyester

and polyethylene, which has high strength and flexibility. The carrier liquid is usually water. Compared to non-encapsulated PCM slurry, MPCS owns several advantages. A Phase Change Material Emulsion (PCME) is a multifunctional fluid consisting in a Phase Change Material (PCM) as paraffin, dispersed in an aqueous surfactant solution, usually water. PCMEs became popular because of their interest for comfort cooling applications as they perfectly fit with the required range of temperatures (0–20-degree C) owing to the use of paraffin. In addition, this type of fluid is specifically studied, because paraffin is chemically inert and stable and considered safe and reliable. Furthermore, PCMEs compared with other fluids show significant advantages such as a high phase change enthalpy and no capsule for the paraffin particles, which makes them cheaper and easy to produce.

Clathrate hydrate can be formed in some aqueous solution of tetra-alkylammonium salts with simple an ions (such as halides, sulphate, formate, etc.). Clathrates hydrates are solid structures similar to ice but able to trap gas molecules such as CO₂ or CH₄. They also have the advantage of being able to form by gas injection, thus without mechanical processes contrary to ice slurries. CO₂ hydrates have a high dissociation enthalpy of 374kJ/kg, which is higher than that of ice (333kJ/kg). Their formation temperature mostly lies above 0 °C and, when present, the gas pressure may be above atmospheric. Their latent heat of fusion is often lower than that of ice, except for the hydrate of CO₂. Mixed hydrates may also form, associating a gas and a salt. Because of the wide variety of hydrates, plus the effect of gas pressure when present, the melting temperature can be tailored to the application for greater overall energy efficiency. Gas hydrates are crystalline solids resulting from the arrangement of water molecules linked by hydrogen bonds constituting cages around stabilising gas molecules. Gas hydrates are solid structures able to trap gas molecules and have a high dissociation enthalpy so that they can store and

transport huge quantities of cold energy. When used as secondary refrigerants for cold storage and refrigeration applications, hydrate slurries offer high-energy densities due to their significant latent heat of fusion. The potential presence of gas in secondary refrigeration processes with cold storage is thus a new feature. Heat transfer coefficient of CO₂ hydrate slurry is nearly 2.5 times higher than liquid water.

Applications and Challenges

There are several application areas of secondary loop refrigeration system including ice plant, cold storage, refrigeration warehouses, milk chilling, fish freezing, supermarket display cases (the primary refrigerant is contained within the primary loop in the machine room and does not enter the retail sales floor), etc. Single-phase brines such as ethylene glycol, propylene glycol, ethyl alcohol, methyl alcohol, glycerol, potassium carbonate, calcium chloride, magnesium chloride, sodium chloride, and potassium acetate are widely used as secondary refrigerants for these applications. Many synthetic fluids are also being used as secondary refrigerants. Nanofluids are not being used as secondary refrigerants may be due to its cost and operational issues. Ice slurry has been used for some applications. Supermarket systems using ice slurry (a mixture of water, ice and ethanol) have also been evaluated in some European countries. CO₂ has also great potential as secondary refrigerant and supermarket installations with CO₂ as the secondary refrigerant have been installed with good results. It can be concluded that phase change slurries (ice slurry, microencapsulated phase change material slurry and clathrate hydrate slurry) and CO₂ have great potential as secondary refrigerants. ■

Dr. Jahar Sarkar
Associate Professor,
Dept. of Mechanical Engineering,
Indian Institute of Technology,
Varanasi



Ammonia, the Safe Refrigerant?



Rajendran, President, Association of Ammonia Refrigeration (AAR) sheds light on the role of AAR, trends in the refrigeration sector, concern for the global footprint of refrigeration industry on the global warming and many more in an interaction with Cooling India.

What is the role of AAR (Association of Ammonia Refrigeration) in Indian HVACR industry?

Ammonia as a refrigerant has been used in India for more than 100 years and is still most widely accepted in industrial refrigeration. However, India didn't have a body or an organisation to represent the Ammonia refrigeration industry. To address this issue, a modest group of professionals has come together with an idea of an organisation dedicated to promotion of ammonia and other natural refrigerants. In due course Association of Ammonia Refrigeration (AAR) a national organisation was registered at Pune in 2012. The main objective of AAR is to promote safe use of ammonia as a refrigerant through education, information and standards. We also provide guidelines, operating procedures, industrial standards and training material for industrial ammonia refrigeration industry in India. So far, we have trained more than 10,000 engineers, plant maintenance and operating technicians throughout India.

What are the current trends in the refrigeration sector?

Ninety per cent of industrial refrigeration in India is using ammonia as a safe and reliable refrigerant. AAR wants to bring Ammonia into Heating Ventilation and Air Conditioning (HVAC) industry also. We are conducting training and various awareness programs on Ammonia refrigeration across India.

HVAC industry is also one of sectors responsible for the rise in global warming. What is your opinion?

Climate change is taking a toll on the environment like never before. All the countries have come forward to curb the effect of rise in global warming. We are all aware that the synthetic refrigerants used in air conditioning are responsible for depletion of ozone layer, thus, contributing to the global warming. Considering increased global awareness about global warming and effects of greenhouse gases emission on earth, Ammonia has become the obvious choice for India as a natural refrigerant as it is the most energy efficient having zero global warming potential and zero ozone depletion potential. Worldwide use of

natural refrigerant has been preferred. Kigali Agreement promotes use of natural refrigerant.

In the rush to smart technologies, how refrigeration industry is all set to transform the F&B industry?

Smart technology knowledge is available and used in India. Once AAR standard is approved as BIS standard. Use of smart technology will be extensively used. Low charge ammonia refrigeration system is the latest trend in the cold storage sector.

What kind of technological innovations would you like to incorporate in the refrigeration industry to achieve energy efficiency?

AAR has developed industry standards for energy efficiency and plant safety norms. Once, it is adopted as Indian Standard by BIS, proper design and installation of the plant, equipment selection, proper valves and controls selection, and optimum design parameters will help one to achieve energy savings and plant efficiency.

What are your expectations from the government for the growth of the HVACR sector?

Government should take initiative steps to promote natural refrigerants. This can be achieved by providing more benefits by the Government. Further, the Government can provide subsidiary only to the plants with natural refrigerant. AAR is willing to cooperate with the Government to conduct various seminars and programs to bring awareness about natural refrigerants in HVAC&R industry.

What is your outlook for this industry?

There is consistent growth of the industrial ammonia refrigeration industry. AAR is developing useful publications such as cold storage design hand book, Guidelines for Installation and commissioning, training people, creating awareness about safe and efficient use of Ammonia as refrigerant with an aim to make industrial refrigeration system world-class, and energy efficient. ■



Electrical India
India's oldest magazine on power and electrical products industry

Lighting India

Cooling India
India's foremost monthly dedicated to the growth of HVACR industry

Medical Equipment & Automation

SUBSCRIPTION FORM

PERIOD	No. of Issues	Print		Digital		Print+Digital
		By Registered Parcel	By Courier	By E-mail	By Registered Parcel	By Courier
ELECTRICAL INDIA						
1 YEAR	12	1600	1800	1000	2100	2300
2 YEARS	24	2950	3350	1750	3825	4225
3 YEARS	36	4300	4900	2500	5550	6150
5 YEARS	60	7000	8000	4000	9000	10000
COOLING INDIA						
1 YEAR	12	1600	1800	1000	2100	2300
2 YEARS	24	2950	3350	1750	3825	4225
3 YEARS	36	4300	4900	2500	5550	6150
5 YEARS	60	7000	8000	4000	9000	10000
LIGHTING INDIA						
1 YEAR	6	1050	1250	750	1425	1625
2 YEARS	12	1950	2350	1350	2625	3025
3 YEARS	18	2900	3500	2000	3900	4500
5 YEARS	30	4500	5500	3000	6000	7000
MEDICAL EQUIPMENT & AUTOMATION						
1 YEAR	6	1050	1250	750	1425	1625
2 YEARS	12	1950	2350	1350	2625	3025
3 YEARS	18	2900	3500	2000	3900	4500
5 YEARS	30	4500	5500	3000	6000	7000
ELECTRICAL INDIA-E-NEWSLETTER						
1 YEAR	52			365		
LIGHTING INDIA-E-NEWSLETTER						
1 YEAR	24			365		
COOLING INDIA-E-NEWSLETTER						
1 YEAR	24			365		



Chary
Publications



SCAN QR CODE
TO KNOW MORE
ABOUT THE WEBSITE

SUBSCRIPTION FORM



Right Information **for** **Right Industry**

Yes, I would like to subscribe **ELECTRICAL INDIA / COOLING INDIA / LIGHTING INDIA / MEDICAL EQUIPMENT & AUTOMATION / EI E-NEWSLETTER / CI E-NEWSLETTER / LI E-NEWSLETTER** for _____ years at

Rs. _____
Payment needs to be in favour of "**CHARY PUBLICATIONS PVT LTD**"

Cheque/DD.No	Dated	Drawn On
--------------	-------	----------

Preferred mode will be NEFT/RTGS for which the details are as under :---

Account Name: Chary Publications Pvt.Ltd	Account Type : Current
Account Number : 000920110000322	IFSC Code: BKID0000009
Bank : Bank of India	

Branch: Chembur, Mumbai-400071

Name: _____ Designation : _____

Company : _____

Address : _____

City : _____ Pin Code : _____

Email : _____ Tel.No. _____ Mob.No. _____

Signature :

Stamp :



Chary Publications Pvt. Ltd.

905-906, The Corporate Park, Plot No. 14 & 15, Sector 18, Opp. Sanpada Railway Station, Vashi, Navi Mumbai - 400 703

Phones: +91 22 27777 170 / 171 • Email: sub@charypublications.in • Contact : Priyanka Alugade • +91 22 27777182 / +91 8652142057

Estimating the performance of a built-in environment under the sustainability framework enables capturing the status of the attributes that the built environment exhibits, determining what needs to be done, and establishing how design and construction aspects can be improved to meet the policies for sustainable development. Taking the view point of the construction and real estate sectors, green buildings are considered to be a building that incorporate green features, usually those that are highly visible such as photovoltaics, sky gardens, rainwater harvesting systems, etc even if the contribution to overall environmental performance is marginal. Others consider green buildings to be those that have obtained an assessment grade under a building environmental assessment method (BEAM). ASTM International provides a more meaningful insight by defining a green building as, 'a building that provides the specified

The ABCs of Green Building

A green building optimises efficiencies in resource management and operational performance and minimises risks to human health and the environment.

Fig. 3: Figure showing a sustainable green building

performance requirements while minimising disturbance to and improving the functioning of local, regional and global ecosystems, both during and after construction and service life.' Furthermore, 'a green building optimises efficiencies in resource management and operational performance and minimises risks to human health and the environment.' Conceptually, the ASTM description can be presented as a life cycle 'efficacy' ratio, thus:

$$\text{Life cycle efficacy} = \frac{\text{Indoor Environmental Quality (IEQ) + Services/Amenities}}{\text{Resource Consumption + Environmental Loadings}} \quad (1.1)$$

This green building concept tasks building professionals to provide for healthy, comfortable and efficient buildings whilst minimising the consumption of non-renewable resources and the emissions and waste streams to air, land and waters, over the whole life of a building.

In most BEAMs the focus of specified performance has been mainly on the assessment of indoor environmental quality (IEQ), expressed in terms of thermal comfort, indoor air quality (IAQ), ventilation, lighting quality, acoustics and noise, and provisions to ensure hygiene (such as prevention of bioaerosols), thereby addressing most health issues. Coverage of other aspects of building performance and provision of amenities has tended to be rather limited. However, buildings can be regarded as being even more sustainable when social and economic dimensions are also given greater attention than otherwise. Inclusion of additional social and economic issues is an emerging trend in the development of BEAMs, although given the impact on productivity and quality of living, IEQ is clearly germane to the economic and social performance of buildings.

Green Building Labels

Since the early 1990's building environmental assessment methods (BEAMs) have been developed in around twenty countries to provide a more holistic assessment of building performance than previously.

Some are well-established and some have been introduced recently. Schemes may cover both new and existing buildings, and an assessment method may be specific to a particular building type. The outcome of an assessment is a grade (platinum, gold, or excellent, very good, or 4-star, 3-star, etc) defined within the assessment method, and based on either the sum of points or credits obtained, or on a more complex calculation incorporating weighting factors.

In the context of this paper, an eco-label is the outcome of an assessment (grade) under a particular BEAM. To understand what a specific label signifies in terms of environmental performance or 'greenness' it is necessary to examine the range of environmental issues included in the assessment, the standards of performance



demand, the rigour of the specified assessment methods, the relative weighting or scoring of each issue, and the aggregate score required for a given assessment grade.

However, it is not feasible to quantify or rate the greenness of a given eco-label in absolute terms. Figure 1 illustrates the absolute levels of environmental performance of the current baseline/benchmarks, as well as the targets for environmental sustainability, are mostly unknowns. Conceptually, figure 1 can apply to a particular performance issue, a building, or even the building stock as a whole.

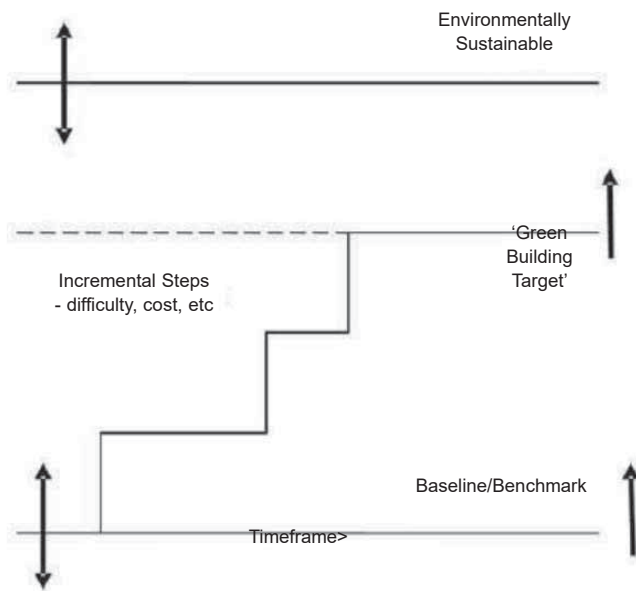


Fig. 1: Performance levels for Benchmark/Benchmarks, green and environmentally sustainable.

BEAM assessments generally cover the most significant environmental aspects. Effort is given to global impacts such as global warming, ozone depletion, deforestation, regional impacts (NO_x, SO_x, particulate emissions, river pollution, etc), local impacts (waste, water pollution, etc), neighbourhood impacts (overshadowing, noise, etc), and indoor environmental performance, even though grouping of the various issues differs amongst the tools.

Conceptual framework of green building stakeholders

The various driving forces behind the implementation of green-building practices are identified and discussed above. The findings of this study have practical implications for green-building stakeholders. Therefore, a new conceptual framework is developed and illustrated in Fig. 2. Governments can apply this framework to guide their green-building promotion efforts, as the framework helps them identify drivers that would motivate or force green-building adoption among industry practitioners. Individual stakeholders can apply the framework to guide their green-building decisions and hence their commitment to building green or sustainably, as the framework helps them become more aware of the importance and full range of possibilities offered by green-building. As shown in Fig. 2, each category of green-building drivers comprises various drivers influencing it. Drivers within each category are interrelated. For example, energy conservation may influence lifecycle costs of the building. Also, a driver in one category can influence a driver in the others, and vice versa. For example, rental returns may influence return on investment. In Fig. 2, whereas the outlines lead to the main categories of green-building drivers, the dashes represent situations wherein a driver

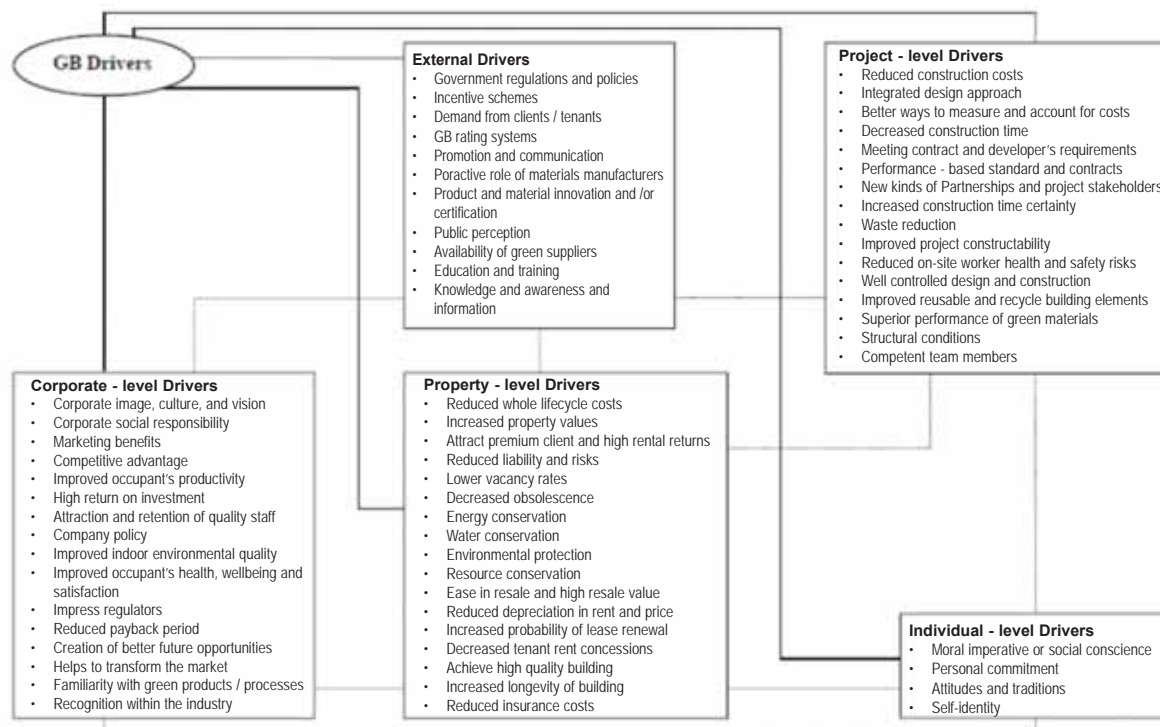


Fig. 2: Conceptual framework for green-building drivers

in one category may influence a driver in the others, and vice versa.

Classification of green building drivers

Several drivers influencing green-building adoption have been identified through a review of past studies. To better understand the drivers for green-building, it is essential to classify and differentiate between them. Generally, green building drivers can be grouped into five main categories: external drivers, corporate-level drivers, property-level drivers, project-level drivers, and individual-level drivers.

External drivers

External drivers can be defined as drivers that are mainly set by external parties, such as government, United Nations (UN), European Union (EU), trade unions, and clients/customers, to companies or organizations that building green. Simply put, external drivers refer to events that occur outside the company that develops green-buildings. In recent years, many governments around the world have intensified their involvement with the green-building market, and the literature supporting that government's role is important for driving the green-building agenda is extensive.

Corporate level drivers

This study has shown that for green-building in general, there are many more drivers at the corporate level in addition to green image. It is important to understand the internal drivers that enhance business in terms of sustainability. As discussed in the previous section, external drivers such as regulatory incentives and mandates continue to pressure stakeholders to improve the sustainability of their portfolios. Then again, the prospect of future and more burdensome legislation vis-à-vis building design and construction has led some stakeholders and companies to adopt a 'beyond compliance' culture either to reduce down-side risk or attain higher returns. These proactive actions can be viewed as ways to gain certain competitive advantages, such as differentiating oneself from competitors.

Property level drivers (sub-para)

Property level drivers include increased property values, high rental income, and reduced risks. From the viewpoint of stakeholders, the benefits of green buildings are beyond dispute. Green buildings provide distinct benefits through environmental protection to high energy efficiency. Therefore, stakeholders, are increasingly demanding green buildings to reduce both their environmental impact and occupancy cost. Most stakeholders at most times focuses on maximization of the capital value of the building.

Project level drivers (sub-para)

Although a number of project-level drivers were identified, overall, the number of academic studies providing empirical evidence on each project-level driver is limited. This may be because most certified green buildings focus more on the operational aspects of the building than the construction phase which seems reasonable as it is during the use phase of the building that the majority of emissions and environmental impacts are caused. Decisions at



Fig. 4: Bullitt Centre in Seattle

the project level have significant impact on the overall or final cost of the building. Making the right design decisions is therefore required to keep cost within an acceptable range.

Individual level drivers (sub-para)

In individual level drivers, people are proposed to be intrinsically driven to mastery their operational environment; that is to control their own lives or desire a sense of competence, and to a sense of self-regulation, personal volition, and autonomy in their behaviour.

Ways to develop a green building

Taking an intelligent approach to energy

- Minimising energy use in all stages of a building's life-cycle, making new and renovated buildings more comfortable and less expensive to run, and helping building users learn to be efficient too.
- Integrating renewable and low-carbon technologies to supply buildings' energy needs, once their design has maximised inbuilt and natural efficiencies.

Safeguarding water resources

- Exploring ways to improve drinking and waste water efficiency and management, harvesting water for safe indoor use in innovative ways, and generally minimising water use in buildings.
- Considering the impact of buildings and their surroundings on stormwater and drainage infrastructure, ensuring these are not put under undue stress or prevented from doing their job.

Minimising waste and maximising reuse

- Using fewer, more durable materials and generating less waste, as well as accounting for a building's end of life stage by designing for demolition waste recovery and reuse.
- Engaging building users in reuse and recycling.

Fig. 5: The Crystal in London



Promoting health and wellbeing

- Bringing fresh air inside, delivering good indoor air quality through ventilation, and avoiding materials and chemicals that create harmful or toxic emissions.
- Incorporating natural light and views to ensure building users' comfort and enjoyment of their surroundings, and reducing lighting energy needs in the process.
- Designing for ears as well as eyes. Acoustics and proper sound insulation play important roles in helping concentration, recuperation, and peaceful enjoyment of a building in educational, health and residential buildings.
- Ensuring people are comfortable in their everyday environments, creating the right indoor temperature through passive design or building management and monitoring systems.

Keeping our environment green

- Recognising that our urban environment

should preserve nature, and ensuring diverse wildlife and land quality are protected or enhanced, by, for example, remediating and building on polluted land or creating new green spaces.

- Looking for ways we can make our urban areas more productive, bringing agriculture into our cities.

Creating resilient and flexible structures

- Adapting to our changing climate, ensuring resilience to events such as flooding, earthquakes or fires so that our buildings stand the test of time and keep people and their belongings safe.
- Designing flexible and dynamic spaces, anticipating changes in their use over time, and avoiding the need to demolish, rebuild or significantly renovate buildings to prevent them becoming obsolete.

Connecting communities and people

- Creating diverse environments that connect and enhance communities, asking what a building will add to its context in terms of positive economic

and social effects, and engaging local communities in planning.

- Ensuring transport and distance to amenities are considered in design, reducing the impact of personal transport on the environment, and encouraging environmentally friendly options such as walking or cycling.
- Exploring the potential of both 'smart' and information communications technologies to communicate better with the world around us, for example through smart electricity grids that understand how to transport energy where and when it is needed.

Considering all stages of a building's life-cycle

- Seeking to lower environmental impacts and maximise social and economic value over a building's whole life-cycle (from design, construction, operation and maintenance, through to renovation and eventual demolition).
- Ensuring that embodied resources, such as the energy or water used to

produce and transport the materials in the building are minimised so that buildings are truly low impact.

LEED Green Building Rating System

It is a performance system where some points are achieved for satisfying certain performance criteria. Levels of green building certification are awarded based on total points earned. LEED is important in the following ways:

- Reduces operating costs.
- Enhances Building marketability.
- Increases worker productivity.
- Reduces potential liability resulting from indoor air quality problems.

Some of the benefits obtained from green buildings.

Environmental Benefits

- Protect ecosystems & biodiversity
- Improve air and water quality
- Reduce solid waste
- Conserve natural resources
- Reduce harmful emissions

Economic Benefits

- Energy and water savings
- Increased property values
- Improved employee productivity and job satisfaction
- Reduced operating cost.

Green buildings: Present Scenario

In the present-day scenario, green buildings have been constructed in many parts of the world, including India. Some of the common green buildings constructed in the world are: Bullitt Center in Seattle, Green Building in Cambridge, the Green Building Gallery in Louisville, Sky city in Changsha, the Crystal in London, Manitoba Hydro Place in Winnipeg and many others. Some common green buildings developed in India are: Suzlon one earth in Pune, Rajiv



Fig. 6: CII- Sohrabji Godrej Green Business Centre, Hyderabad

Gandhi International Airport in Hyderabad, CII- Sohrabji Godrej Green Business Centre in Hyderabad, Infosys Limited in Mysore, Infinity Benchmark in Kolkata, I-Gate Knowledge Centre in Noida, Bank of India in Goa, Ansal Esencia, 67 Sector in Gurgaon, Biodiversity Conservation India Ltd. (BCIL) in Bangalore, Olympia Tech Park in Chennai. Some of green buildings present across the world and in India has been presented in the subsequent figures. ■

Shounak Chowdhury,
PG Student, Dept of Mechanical Engineering,
IEST Shibpur, Howrah



Bijan Kumar Mandal,
Professor, Dept of Mechanical Engineering,
IEST Shibpur, Howrah



Werner Finley: Innovative Process Cooling Solutions

Werner Finley believes in delivering innovative, customised and high-quality process cooling solutions to its customers. Founded in 1986, the company has over three decades of experience in the industry. Today, the company is one of the leading manufacturers for process cooling equipment in India with rapidly growing global presence.

Werner Finley is proud to be a hundred per cent Indian company headquartered at Bangalore with two manufacturing facilities. The company has a team of over 175 people who are focused on building long lasting relationships with each client and ensuring that it works together with its clients to develop need-based solutions that cater to their individual requirements. The company believes in creating a supportive work environment that facilitates creativity and innovation.

The company caters to over 50 applications in sectors like healthcare, data centre, laser, machine tools, automobile, automation, renewable energy, pharmaceuticals, bakery etc.

Hence, Werner Finley is extremely competent at understanding each application and requirement thoroughly and providing customised solutions to cater to each application's needs.

Products:

- Air Cooled Water Chiller
- Water Cooled Water Chillers
- Oil and Coolant Chillers
- Panel Air Conditioners
- Data Centre Cooling Systems
- Heat Exchanger Systems
- Cold Rooms

Mission: Primary focus is to build trust with partners so that the company can help each other grow and achieve excellence. The mission is to lead the industry with the commitment that empowers it on every level to meet the highest level of quality, ethical practices, and customer satisfaction.



testo 115i refrigeration - app

Smart World of Testo

Worldwide the HVACR industry is witnessing growth in terms of warehousing, large buildings, malls, hospitals, commercial complexes, residential cooling and many more. The increase in overall climate temperature also mandates the establishment of better refrigeration systems in such facilities. And now when summer is around the corner, air conditioning and refrigeration has now become a part and parcel of everybody's life. Yet, the stakes are very high as these systems consume close to half the connected electrical power and the entire efficiency of

the system is dependent on the refrigeration cycle. Because of the expanding markets for refrigeration and air conditioning and changing technology, a dramatic need exists for technologically advanced air conditioning and refrigeration solutions.

To match the pace with this expanding industry where, on one hand efficient refrigeration set up is must but on the other hand it is even more important to regulate the energy usage by these systems, testo provides complete solutions for any VACR facility or system enabling energy conservation, efficient operation and reduced wastage.

Digital, not analog: One manifold for all refrigeration systems

Two main factors are crucial when it comes to the comprehensive evaluation and correct adjustment of refrigeration and air conditioning systems: The refrigerants supported by the manifold, and constantly precise measurement values. In both areas, digital refrigeration technology from Testo has for years proven its worth.

Progress and digitalisation can no longer be halted, and are changing the refrigeration sector too. The most important reasons are:

- Modern refrigeration and air conditioning systems are becoming more and more complex with better and better performance.
- New refrigerants are constantly being introduced, and old ones taken off the market.
- New legislation and regulations are changing the requirements regarding energy efficiency and environmental protection.

The measurement technology used for commissioning and servicing the plants must perform accordingly. The latest trends



and advancements are coming from the digitisation of the working system. The traditional methods and processes are now getting replaced with smart solutions. All the time consuming, manually driven operations can now be governed with just a click of the smartphone making the process more easy, accurate, fast and reliable.

Digital manifold kits testo 550 and testo 557 – including filling hoses

These instruments are perfect for the complete servicing of heat pumps, air conditioning and refrigeration systems. The digital manifold kits testo 550 and testo 557 stand out, thanks to two clamp probes, a vacuum probe (testo 557 only), the robust case, and above all the respective filling hose set. Linked by Bluetooth to the testo refrigeration app, the manifolds now make work even easier. System parameters such as sub-cooling and superheating can be monitored from up to 20 metres via a smartphone or tablet. Sending a report by e-mail and automatic, free updates with new refrigerants are also among the strengths of the little digital helper for iOS and android.

Wifi Data Logger testo 160

The testo 160 wireless LAN data logger measures, monitors and documents temperature, humidity, light intensity, UV radiation and CO₂ concentration in rooms, offices, malls or even inside display cases of exhibition rooms – automatically and without interruption – hence all indoor climate monitoring parameters in one. The loggers have small dimensions and especially, minimalistic design. And they have a 'cloak of invisibility'. An individually designable cover is available for each data logger. This allows the little high-tech wonders to blend into almost any environment, and do not distract the viewer from the exhibits – for example in



testo smart probes set - refrigeration

exhibition rooms. All measurement values are transferred by wireless LAN to the online database (Testo Cloud). From there, they can be called up by App or with a PC or tablet or smartphone and a normal browser at any time. If limit values are exceeded, an alarm is immediately provided by SMS and/or e-mail. That makes monitoring easy and data accessible anytime, anywhere on PC or tablet or smartphone.

The new testo Smart Probes AC & refrigeration test kit

Smart Probes are the unique solution for fast testing of heat pumps, air conditioning and refrigeration systems: Two high-pressure measuring instruments (testo 549i) and two clamp thermometers (testo 115i) are available in the new, testo Smart Probes HVAC soft case. This not only provides space for the four Smart Probes in the kit, but also has slots for six further Testo Smart Probes for other HVAC applications.

The testo Smart Probes AC&R test kit is supported entirely by the testo Smart Probes App. In addition to 80 refrigerants, intuitive menus are also stored for the automatic calculation of superheating or sub-cooling and evaporation or condensation temperature. Documentation with photos and comments can be carried out completely paper-free by e-mail protocol.

Intuitive air velocity and IAQ measurement: The new testo 440

Testo in its recent upgrade, combines everything which makes the air velocity and IAQ measurement technology so successful – intuitive operation, precise measurement values and an extensive probe range – and extends these advantages by wireless convenience. The testo 440 constitutes a compact handheld measuring instrument with user-friendly measurement menus and wireless probes – for the versatile and convenient measurement of all air conditioning and ventilation parameters. The testo 440 probes are available for air velocity, temperature, humidity, degree of turbulence, CO₂, CO and light intensity. Customers have the choice between wireless and fixed-cable models. The wireless Bluetooth probes ensure more freedom of movement in measurement and save space in the measurement case. In addition to this, a probe handle can be universally combined with all corresponding probes and probe attachments. This allows the user to switch in seconds from indoor air quality measurement to a determination of volume flow at a vent. Testo 440 has extendable telescopic handle which gives an additional advantage in terms of accessibility and saves time. It also comes with a 90° angle connector for flow measurement which enables the user to take both vertical as well as inside the duct measurements very easily. ■

For more info: visit www.testo.com



Mist Type Air Handling Unit (MTAHU)



An Air Handling Unit (AHU) is used to re-condition and circulate air as part of a heating, ventilating and air-conditioning system.

The basic function of the AHU is to take in outside air, re-condition it and supply it as fresh air to a building. All exhaust air is removed, which creates an acceptable indoor air quality. Depending on the required temperature of the re-conditioned air, the fresh air is either heated by a recovery unit or heating coil, or cooled by a cooling coil.

In buildings, where the hygienic requirements for air quality are lower, some of the air from the rooms can be re-circulated via a mixing chamber and this can result in significant energy savings. A mixing chamber has dampers for controlling the ratio between the return, outside and exhaust air.

The AHU is a large metal box containing separate ventilators for supply and exhaust, heating coil, cooling coil, heating/cooling recovery system, air filter racks or chambers, sound attenuators, mixing chamber, and dampers. AHUs connect to ductwork that distributes the conditioned air through the building, and returns it to the AHU. However, these AHU consume large amount of power and water. MREPL has come out with a unique combination of mist technology with or without condensing coils in order to maintain fresh or dust-free air at required temperature/humidity at minimum water and power consumption.

Mist Type - Air Handling Unit (MTAHU)

Mist Type AHU are used as part of climate control and air quality systems. The company offers superior quality mist spray air washer unit with or without condensing coil. It works on the principle of evaporative cooling by mist creation; outside air is passed over curtain of fine water droplets, causing water droplet to evaporate into air and hence reducing ambient temperature very close to wet bulb temperature. This cool and humidified air is then directed into the desired process area in order to maintain the required ambient conditions.

Mist uses its patented technology of SS 304 heavy-duty mist creator nozzles with orifice bore of less than 9mm for creating very fine mist to the size of 5 microns, hence evaporate instantaneously. It consists of air wash chamber, inside which we are operating mist creator nozzles at 2 bar pressure created by circulation pump. Specially designed multi-pass PVC Mist Eliminators are placed to arrest carryover of mist particles and allow only washed clean and cool air to pass through. Axial fan placed at the outside of mist eliminators is used to pressurise and distribute air evenly in the desired places. There are no cellulose pads inside wash chamber and hence there is no pressure or volume loss of air flow.

The company's mist type air handling unit is unique combination of mist spray technology with or without condensing coils, which maintain desired ambient temperature and humidity inside a closed process area with minimum use of power and water.

Mist guarantees that payback period for MTAHU is less than one year. They also claim, Mist type air washers provide better efficiency as compared to conventional air washers.

Salient features

- Efficient air cooling achieved at minimum power and water consumption.
- Accurate humidity control due to automated operation.
- Excellent air wash quality because of fine mist formation, thus ensuring clean air supply.
- No air gaps left in mist screen formation inside wash chamber
- Heavy-duty nozzles manufactured from SS 304 having life of 15 to 20 years.
- Mist Spray Nozzles with less than 9 mm bore gives choke-less operation. ■

For more information, visit : www.mistcreation.com

Ways to Optimise Refrigeration Efficiency and Lower Energy Costs

The article summarises steps to optimise the refrigeration system and achieve the greatest energy efficiency.

60 per cent of a manufacturing facility's total operating expenses comes from industrial refrigeration. It is no surprise that refrigeration efficiency is a priority. However, engineers often look to optimise individual components rather than taking a holistic approach, leading to wasted energy and operational inefficiencies. To avoid this fragmented approach, here are six steps to optimise the entire system and achieve the greatest energy efficiency.

1. Optimise Settings

Condensing pressure should typically be run as low as possible. Suction pressure should also be run as low as possible while still maintaining the desired room or product temperatures. Even adjusting the suction pressure up a degree could mean a 1.5 per cent savings for those compressors. There are many different settings and parts that can be checked to ensure optimal performance.

2. Size compressors to match loads as closely as possible

Selecting appropriately sized compressors up front can make or break the efficiency of a system. Two equally sized compressors, each running at 50 per cent capacity, can require 30 per cent more horsepower than one compressor running at 100 per cent.

It is also a good practice to include different-sized compressors, and to sequence them properly to keep machines as fully loaded as possible. For large systems, large compressors handle the majority of the load, while a smaller unit can be included as a trim compressor to handle the swings. This will keep the larger compressor fully loaded at all times. An analysis can help detect problems and find solutions to help compressors perform at their peak.

3. Install VFDs on screw compressors

Applying variable-frequency drives (VFDs) on screw compressors will optimise mechanical efficiencies of the



machines. The best approach is to set the slide valve position at 100 per cent and vary the RPM of the motor according to the refrigeration needs of the machine, which allows it to run more efficiently.

4. Install VFDs on condenser motors

Using VFDs on condenser motors can stabilise head pressure and prevent the motors from heavy repeats and intense start or stop cycles. Then, the fans can change speeds so they don't continually stop and start, which requires additional energy and results in mechanical wear. The biggest payback from a VFD will be on systems with variable load.

5. Use floating head pressure to maintain ideal temperatures

Floating head pressure can be used to maintain the ideal temperature for compressor and condenser operations. Higher condensing temperatures require compressors to work harder. Find the optimal break-even point where the condensers and compressors are cumulatively using the lowest overall horsepower requirements.

6. Use a completely integrated automation system

Running the machine with a completely integrated automation system will ensure efficiency and automate temperature controls within zones. Automating defrost cycles to sequence at different times can result in significant energy savings. An automated system can make calculations and adjustments automatically, whereas a manual system requires constant operator attention, is susceptible to human error and will react more slowly. ■



Swedish hospital maintains HVAC system with thermal imaging

In hospitals climate control is of critical importance, to ensure both hygiene and comfort for the patients and personnel. That is why the technical staff of a Swedish hospital, has acquired a FLIR thermal imaging camera to inspect and maintain the HVAC system.

The camera provides us with the right information and allows us to make well based decisions with regard to maintenance of the HVAC system and troubleshooting all kinds of building issues, informs one of the hospital technicians. He adds, "The air temperature in the hospital should be 22 degree C and the air coming from ventilation ducts should be 18 degree C. There are thermometers installed in

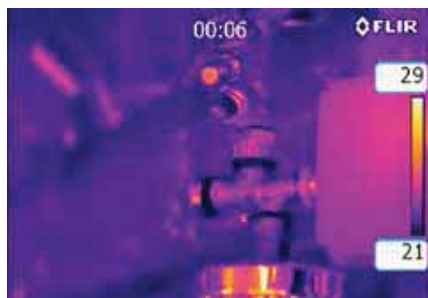
certain parts of the building and these provide feedback for the automated HVAC system we use. This gives us a general overview, but if we want more specific information about the airflows and temperature distribution in a room we need the FLIR thermal imaging camera."

"From time to time complaints might arise from patients about a room being too hot or too cold," he adds. "With the

thermal imaging camera we can quickly assess whether there is actually something wrong in that room. If nothing is wrong, the screen of the thermal imaging camera allows us to immediately show the patient that the temperatures are perfectly normal in the thermal image. And if there is a fault the FLIR thermal imaging camera helps us to find the problem much faster, allowing a quick repair."

Operation room

Some hospital rooms require even more detailed monitoring, with the operation room as a prime example. "For different types of operations different ambient temperatures are necessary. And a close control of air circulation is an obvious necessity to prevent contamination with airborne pathogens. We therefore regularly check and closely monitor the



FLIR thermal imaging cameras can be used to detect a multitude of different heat related building issues.



The hospital technicians demonstrate the use of the FLIR thermal imaging camera



Where a spot pyrometer shows the temperature in one area, a thermal imaging camera can give an overview of an entire electrical cabinet, enabling quick and accurate faults detection.



HVAC systems of the operation rooms with the FLIR thermal imaging camera." the hospital technician said.

Faults that the two technicians sometimes find in the hospital's HVAC system are clogged radiators or blocked ventilation ducts. "But there is much more we can do with the camera, such as inspecting fuse cabinets and mechanical components in the ventilation system for faults, checking whether the district heating shunt group is cooling the warm water down to the right temperature and even the backup batteries in the server room," he said.

Insulation defects

During a recent building project large parts of the building were renovated. The FLIR thermal imaging camera was used to verify whether the insulation was working perfectly. According to the technician, "Inspections with the FLIR thermal imaging camera showed that there was some warmth leakage at the window sills and that there was insufficient insulation in the attic roof. We also found that some of the radiators were not installed correctly. Based on the information from the thermal imaging inspections these faults were corrected, ensuring that the new renovated parts of the building are well insulated."

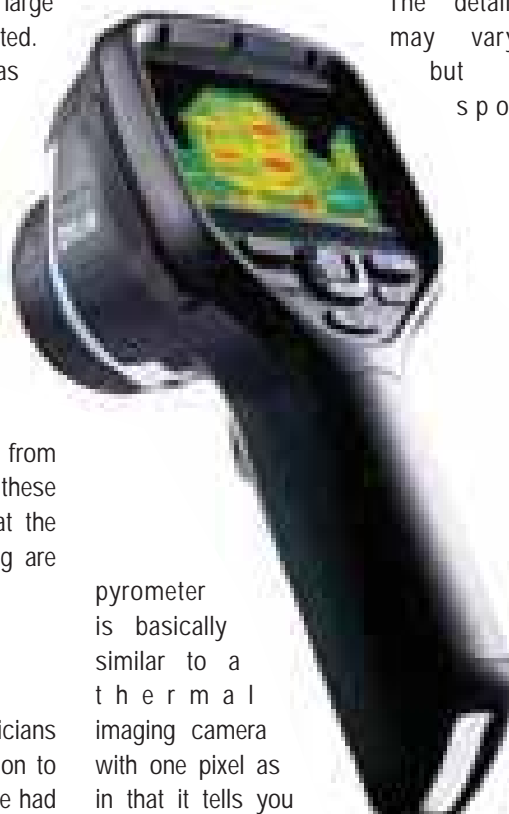
Thermal imaging vs spot pyrometers

According to the hospital's technicians the camera has been a great addition to their assortment of tools. "Before we had this thermal imaging camera we had to

base our maintenance inspections on contact measurements," he said. "We had to either touch warm components manually or use a spot pyrometer. In our experience none of these methods are as quick, effective and accurate as a thermal imaging camera."

Thermal imaging cameras have important advantages compared to spot pyrometers. The spot meter just gives you a value of a small area. Using it for inspections is very labor intensive and it lacks the overview that a thermal imaging camera gives. On a thermal image you can immediately scan an entire area for thermal hot or cold spots and see at once where the problem is located.

The details may vary, but a spot



pyrometer is basically similar to a thermal imaging camera with one pixel as in that it tells you the temperature of

one spot. A FLIR thermal imaging camera will provide the same accurate temperature readings, but it gives you not one, but thousands of temperature readings at the same time. With a spot pyrometer it is very easy to miss crucial information. The spot pyrometer gives you a number. The thermal imaging camera presents an image of the entire area. This makes a huge difference. You can immediately see the temperature distribution in the entire area and quickly spot problems that would otherwise remain undetected.

Versatile tool

The first time they saw a thermal imaging camera in action they immediately knew they needed to get one for themselves. "It started when we hired an external consultant for electrical maintenance who used a FLIR thermal imaging camera. We immediately realized that this was a versatile tool that could be used for a multitude of different applications within our hospital, so we bought a FLIR BCAM thermal imaging camera from a local distributor," the hospital technician said.

The FLIR BCAM thermal imaging camera is not currently marketed by FLIR. Its modern replacement is the FLIR Ebx-Series. The FLIR Ebx-models have an image quality of up to 320 x 240 pixels and include the features you need to make well informed building decisions like built-in insulation and dew point alarms. The cameras are specifically designed for building inspections such as, HVAC heating and cooling issues, air flow, moisture detection, insulation problems and other heat related building issues. ■

For more information, e-mail: flir@flir.com



ACREX 2019: Platform for Future Trends

ACREX India 2019 is coming to the financial capital of India Mumbai to celebrate its 20th edition from 28th Feb to 2nd March, 2019. The mega event will witness participation from more than 25 countries including Belgium, China, Czech Republic, Egypt, France, Germany, Italy, Japan, Korea, Malaysia, Saudi Arabia, Singapore, Spain, Switzerland, Taiwan, the Netherlands, UAE, UK, Ukraine and USA.

ACREX India 2019 is the flagship event of the ISHRAE – Indian Society of Heating, Refrigerating and Air Conditioning Engineers and co-organised by NürnbergMesse India creates a platform for HVAC&R industry to launch and reach out to the entire group of stakeholders and decision makers around the country and beyond.

“In addition to being the feast to the eyes, ACREX India 2019 team has put together a string of workshops and technical seminars that bring the enhancement of knowledge element for the visitors. They will have access to attending high quality workshops and seminars on topics that are related to the current trends and practices of the HVAC&R field,” informs C Subramaniam, National President, ISHRAE.

ACREX 2019 seminars and workshops will be hosting an excellent platform which amalgamates the future trends and will hold court with some of the best knowledge speakers in their respective fields – there are programs to suit the area of interests in energy efficiency, healthy buildings, indoor air quality, refrigerants, IoT apart from

engaging sessions from International Associations - USGBC, REHVA, CEEW, AAR, IAQA and ASHRAE.

“India’s aggregate cooling demand is poised to grow 8 times over the next 20 years. This is happening because of growing urbanisation, increased aspirations, need for better thermal comfort conditions, worsening ambient air conditions, increased industrialisation and a fast-growing economy. All this will add to our energy bills as HVAC consumes the largest chunk of electricity in buildings,” states Vishal Kapur, National Past President, ISHRAE.

The Indian HVAC&R market is quickly racing towards a size of more than USD 7,500 million in the next five years and that is the reason why every manufacturer in

the international market would vie for a space in the Indian sub-continent. This is what ACREX India 2019 provides to the industry, thus creating a wonderful platform for all connected to the HVAC&R industry to launch and reach out to the entire group of stakeholders and decision makers.

"February 28, 2019 will mark the commencement of the largest ever ACREX, in the heart of the commercial capital of India – Mumbai! This is the time when all that matters are to witness the showcasing

of the latest products, technology, solutions, capabilities, knowledge-spread across various identified segments in components and services, ventilation, air-conditioning, clean rooms, IAQ and building automation. ACREX 2019 spanning three days will help the visitor get updated on engineering design, procurement, project management, networking opportunities, executing business transactions," says Kapil Purandare, Convener - ACREX 2019.

ACREX India 2019 will once again be a part of the largest networking platform - Build Fair Alliance. Under the aegis of the Build Fair Alliance, the following events will be happening at the same venue:

- ACREX India 2019 covering HVAC, building automation systems and indoor air quality
- ISH 2019 showcasing plumbing systems
- FSIE 2019 previewing Fire safety & security solutions ■

Concurrent Events at ACREX 2019

Curtain Raiser: ISHRAE and Sanhua India bring the Curtain Raiser for ACREX India on 27th Feb, 2019. An exclusive precursor event for CEOs, top developers, architects, consultants and top officials from international associations to connect, share and create knowledge forums.

ACREX Awards of Excellence on 28th February 2019 is an innovative initiative by the team of ACREX involving a jury of industry experts to award products and services in categories such as innovation, green buildings, energy saving, energy saving in refrigeration segment, green product, innovation in building automation, product with technology developed in India, and Indoor Air Quality.

aQuest is a student competition organised by ISHRAE and powered by Hitachi every year, which is concluded with Grand Finale on 1st March at ACREX India 2019.

ACREX Hall of Fame is a new industry benchmark instituted by ISHRAE and powered by Danfoss, to recognise the excellence achieved in conserving energy by commercial buildings in the Indian subcontinent. The coveted recognition aims to recognise iconic projects in India which can be global benchmarks in energy efficiency and sustainability and further encourage industry to utilise these experiences in building a sustainable HVAC industry and to also further showcase success stories in the HVAC space in India.

Cooling India

invites you to our stall at



28 February to 2 March 2019
Bombay Exhibition Center, Mumbai

**Your presence will surely
be of great pleasure to us ...**



Ensavior

Saving Energy & Environment

Ensavior Technologies Pvt Ltd is a leading comprehensive engineering solutions provider company engaged in design, engineering, sales, marketing, operation and maintenance of various products and systems for building services industry pertaining to the field of Heating, Ventilation and Air Conditioning (HVAC).

The products and services promoted by Ensavior revolves around the fundamental of saving energy and environment (Ensavior - Energy & Environment Savior) with an emphasis on economic, environmental and social sustainability.

Today, Ensavior has grown to encompass several product lines serving the building services industry that includes pumps for HVAC, plumbing, fire, air purification system with a focus on Ultra Violet Germicidal Irradiation (UVGI) System, Automatic Balancing and PICV Valves, Thermal Energy Storage System, HVAC sensors and transducers, and Electrostatic precipitation system.

Ensavior has highly competent, passionate and experienced team of professionals who are not just excited by what they do, but by why and how they do it. The people are energised by the company's values and ethos and are the ambassadors for a culture that aims to think better, advise better, engage with clients better and deliver better.

Through a commitment to excellence in quality, engineering and service, Ensavior has established enduring relationships with the major contractors and corporate entities, proudly contributing to the creation of airports, office complexes, IT parks, trade centres, Metro rails, shopping malls, hospitals, five-star hotels, schools and manufacturing facilities throughout the Indian sub-continent.

Ensavior engages on the project right from the conceptualisation stage and thereby, help in right selection, optimum design and implementation of most energy efficient products. Besides that, it ensures on site job trainings to project managers, facility managers and operators so that the systems are operated in the

most efficient and simplest manner. Based on need of the project, the company also undertakes operation and maintenance of the system for which it has back up of spare parts and manpower.

The company views every project as a fresh opportunity for continuous improvement. This results in maximum cost effectiveness, efficiency, and productivity for its customers. Realising the rapid pace of new innovative product solutions reaching the marketplace, and ever changing National Code revisions and requirements, it takes pride in educating and training of its staff to offer the customers the latest in safety, convenience, and improvements.

Ensavior firmly believes that, if more the company engages with customers, the things become clearer, and it is easier to co-relate to their requirements. It has a well-established track record and its services have always met with great customer satisfaction.

It is constant endeavour of Ensavior to make every aspect of the customer requirement a little bit better, since the company knows when a customer comes first, the customer lasts.

Partners

Ensavior's strategic tie ups with Xylem Water Solutions, FlowCon International – Denmark, FTENE – Korea, Greystone – Canada, Aeropure and ESPAIR form a good mix of products that cater to the need of the hour.

Products

- **Pumping Systems** : Pumps for HVAC, Plumbing, Fire
- **UVGI System** : Ultra Violet Germicidal Irradiation System
- **Hydronic Balancing** : Automatic Balancing and PICV Valves
- **TES System** : Thermal Energy Storage System
- **ESP System** : Electrostatic Precipitation System
- **Sensors** : HVAC Sensors and Transducers

Pumping Systems: The company represents Xylem water solutions for pumping solutions, which are constantly developing

and fielding new HVAC systems that work efficiently, making buildings more comfortable, productive and healthy. It provides energy efficient pumps, boosters, circulators, controls, expansion tanks, air separators and other products and systems for buildings.

Hydronic Balancing: It is the process of optimising the distribution of water in a building's heating or cooling system so it provides the intended indoor climate at optimum energy efficiency and minimal operating cost. Ensavior has joined hands with Flowcon International, Denmark to provide the most efficient and most reliable hydronic balancing system.

Thermal Energy Storage System: Ensavior has a strategic tie up with FTENE, Korea for stratified thermal energy storage. It helps to lower operational costs by enabling the shifting of energy consumption of chillers from high cost hours to low cost hours by utilising stored energy during high cost periods and storing 'cooling' energy by running the chiller during low cost hours. Further, as lower capacity chillers may be used, the chiller can run at optimal capacity, thereby, raising its efficiency level. TES system can also be designed for emergency back-up requirements of mission critical facilities viz. data centres, defence facilities etc.

UVGI System: It leads to electrical energy savings to the tune of 10 to 15 per cent by improving heat transfer efficiency of AHU cooling coil, which in turn results in reduction of chilled water requirement from the chiller. UVGI systems irradiate the AHU coils with UV-C rays, destroying the ability of the organisms to reproduce and multiply thus, maintaining the indoor air quality of the air-conditioned spaces. The company represents Aeropure for this system that is a leading manufacturer of UV lamp systems.

HVAC Sensors and Transducers: Ensavior represents Greystone Energy Systems, Canada for a wide range of products for sensing, measurement and transmittal of data related to temperature, humidity, pressure, current, air quality, and hazardous gases. Greystone is internationally recognised as one of the largest manufacturers of HVAC sensors and transducers for Building Automation Management Systems.

Electrostatic Precipitation System: ESPAIR has developed the most sophisticated and state-of-the-art technology based on Electrostatic Precipitation for commercial kitchen for filtration and elimination of pollutants like mist, dust, smoke, fumes, microbes, etc to ensure environment-friendly, healthy and wholesome surroundings. ■

Company Name	Page No.
--------------	----------

CAREL ACR Systems India Pvt. Ltd.	11
Desiccant Rotors International Pvt. Ltd.	5, 31
Ensavior Technologies Pvt. Ltd.	BC
FLIR Systems India Pvt. Ltd.	13
Frick India Ltd.	19
Gandhi Automations Pvt. Ltd.	9
Harind Chemicals & Pharmaceuticals Pvt. Ltd.	15
HLM India Pvt. Ltd.	IFC
Kobelco Compressors India Pvt. Ltd.	43
Mist Resonance Engineering Pvt. Ltd.	IBC
Testo India Pvt. Ltd.	17
Thermax Ltd.	7
Werner Finley Pvt. Ltd.	3

Forthcoming Events At A Glance

DairyTech Pune 2019

Venue: H A Exhibition Ground, Pimpri, Pune

Date: 22nd to 24th February 2019

Website: www.dairytechpune.com

ACREX India 2019

Venue: Bombay Exhibition Centre, Goregaon, Mumbai

Date: 28th February to 2nd March 2019

Website: www.acrex.in

AGRITEX INDIA 2019

Venue: Hitex Exhibition Center, Hyderabad

Date: 5th to 7th September 2019

Website: www.agritex.co.in

Refcold India

Venue: Hiltex Exhibition Centre, Hyderabad

Date: 21st to 23rd November 2019

Website: www.refcoldindia.com

Green HVAC System for Department Store

De Bijenkorf, which translates into 'the beehive', is a chain of luxury department stores in the Netherlands, which offer clothing, cosmetics, shoes, accessories, books, toys, and homeware.

The mission of de Bijenkorf is to be the most inspiring, surprising, and creative department store in the Netherlands, where everyone is special. All the while maintaining a level of sustainability that encompasses all aspects of the business. In fact, de Bijenkorf's sustainability policy focuses on the product, the environment, human beings, and driving positive change. Even though they already use 100 per cent green electricity generated by wind and active energy management surveys are carried out



monthly, their goal is to further reduce CO2 emissions by 30 per cent by 2025.

Therefore, when it came time to replace the air conditioning systems in their Amsterdam and Rotterdam stores, the M&E consultant recommended Climaveneta branded air-cooled chillers with 4th generation HFO eco-friendly refrigerants. Specifically, two FOCS2W HFO/H/CA chillers were installed in the Rotterdam store, while a FX HFO SL-A chiller was installed in the Amsterdam store. The refrigerant HFO 1234ze selected ensures GWP levels near 0 (compared to GWP values of 1430 for R134a gas) and no toxicity, while continuing to guarantee high energy performance levels. ■

New Wireless Energy Sensor

Europe's sustainable energy engine and Schneider Electric announce the completion of a two-year collaboration to industrialise and commercialise PowerTag NSX. It is a new addition to the original PowerTag wireless energy sensor range, increasing the scope of applications up to 630A. The collaboration between the two partners helped accelerate the industrialisation and commercialisation of the technology by more than two years. PowerTag NSX is available in France, the UK, Australia, the Netherlands, Germany, Sweden and will be available worldwide in 2019. PowerTag NSX cutting-edge technology features a compact,



easy-to-install wireless energy sensor that simplifies the connectivity of individual breakers to a Building Management System (BMS). It can provide precise, real-time data to building owners and facility managers. Designed for any type of building, the wireless energy sensor monitors and measures energy use, currents, voltages, power and power factor and help reduce the electrical

consumption of buildings and facilities by up to 30%. Crucially, it features limited components, which reduces installation costs. The launch of PowerTag NSX is the culmination of a two-year collaboration between InnoEnergy and Schneider Electric. ■

Wellington's Aurora Centre is NZ's most Smart Buildings

The Aurora Centre in Wellington has joined an exclusive club - it's one of the most energy-smart commercial buildings in the country. Owned by retail and office building owner Kiwi Property, it has 5.5 NABERSNZ energy efficiency rating. The building occupied by the Ministry of Social Development has recently earned the 5.5 score after a large construction and refurbishment project.

The other two buildings are Aorangi House in Wellington and IAG building in Christchurch. The only higher scoring building for energy efficiency in New Zealand is 33 Customhouse Quay in Wellington, owned by Stride Property, which has a 6 rating.



The Aurora Centre rating is for the base building which includes the common areas, the lifts, the air-conditioning and small power loads of the tenant. Kiwi Property national facilities manager Jason Happy said the NABERSNZ rating validated the company's investment and work in upgrading and refurbishing The Aurora Centre which started in 2016. The NABERSNZ rating tool has scores from

zero to 6, with zero very poor performance to 4 which is excellent, 5 market-leading and 6 is aspirational. The \$72 million construction project joined the former Unisys House and Aurora Chambers to form a larger cohesive office space comprising 24,276 square metres. ■

Mist Type Air Handling Unit (MTAHU)



Mist Type AHU are used as part of climate control and air quality systems. We offer super quality mist spray air washer unit with or without condensing coil. It works on the principle of evaporative cooling; outside air is passed over curtain of fine water droplets, causing water droplet to evaporate into air and hence reducing ambient temperature to the required air temperature to be maintained. This cool humidified/dehumidified air is then directed into the desired process area in order to maintain the required ambient conditions.

We also supply Mist Spray system as a replacement to conventional water spray system inside existing Air Washers. Conventional system consumes high power & also requires addition of the steam in air flow as it cannot generate required humidity. After replacement the same air washer operates with lower power consumption due to reduction in water quantity & steam is not required.

Payback period guaranteed in less than one year.

Salient Features

- Most Efficient air cooling achieved at minimum power and water consumption
- Accurate humidity control due to automated operation
- Excellent Air wash Quality Because of Fine Mist formation
- No Air Gaps left in mist Screen formation inside wash chamber
- Heavy Duty Nozzles manufactured from SS 304 having life of 15 to 20 years
- Mist Spray Nozzles with >9 mm bore gives choke-less operation



Mist Ressonance Engineering Pvt. Ltd.

Regd Office : 'Anandi', 1304-1/7, Shukrawar Peth, Bajirao Road, Pune - 411 002. INDIA.

Tel : (+ 91 20) 2447 2726 / 2447 118 / 447 4972

E-mail : mistcreation@gmail.com ■ mistcool@vsnl.com ■ Website : www.mistcreation.com





ENSURING QUALITY RETAINING TRUST

Being a customer-centric engineering firm and having strategic partnerships with some of the world's best technology providers in HVAC, Plumbing, Fire Fighting, and allied fields, Ensavior™ is the ultimate choice of businesses across the industry.

Scalable, energy-efficient, and environment-friendly products are always the top priorities of Ensavior™, which is committed to bringing maximum ROI to clients. Of course, your trust matters to

FlowCon
international

PICV and automatic balancing valves with LCD display.



xylem
Let's Solve Water

Pumps and pumping systems that work smoothly on both variable and constant speeds.



ESPAIRTM

Electrostatic precipitation system with higher efficiency and very low pressure drop.



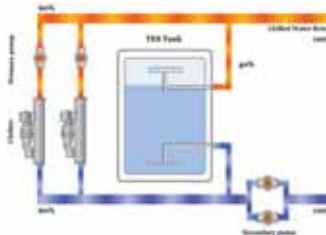
GREYSTONE
ENERGY SYSTEMS INC

HVAC sensors and transducers for building automation management systems.



FT EnE, Inc.

Chilled water thermal energy storage system that utilizes only the sensible heat of water.



aeropure[™]

Ultraviolet germicidal irradiation for cooling coil in HVAC system.



Ensavior Technologies Pvt. Ltd.

Delhi • Bengaluru • Mumbai • Kolkata • Singapore



Plot No.3, Block A, Ground Floor, Sector-19,
Dwarka, New Delhi-110075
Phone +91-11-47350382, 28043945

E-mail: info@ensavior.com Web: www.ensavior.com