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Sustainability through Building Management Systems

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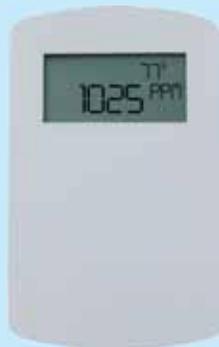


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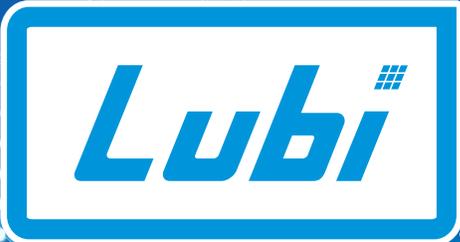
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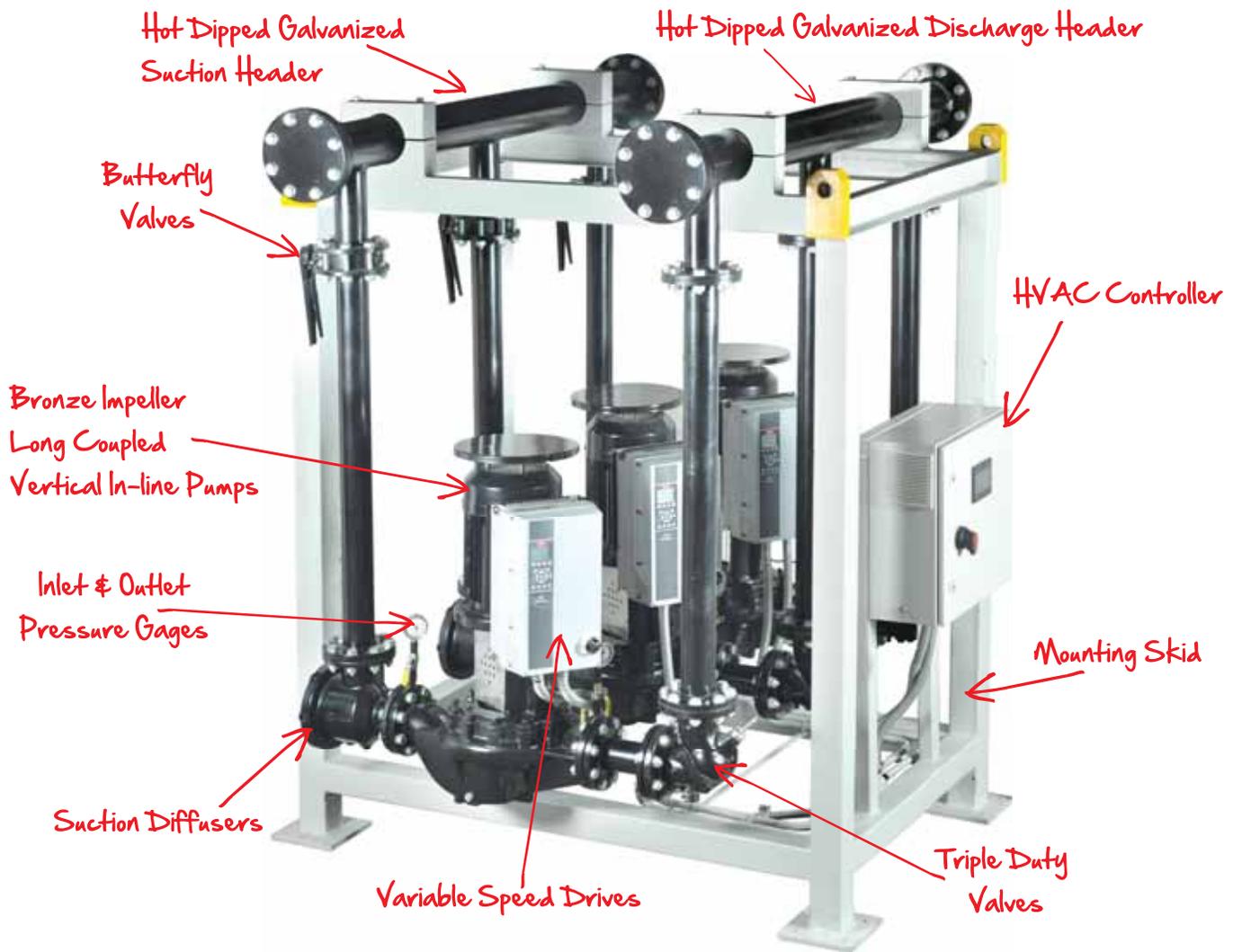


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Publisher's Letter

Hello and welcome once again to Cooling India. Energy is the backbone of modern living. According to the US Energy Department, the building sector consumes almost 50% of all electricity produced there. Same is the case in many developing countries. China has already become the number one energy consuming country in the world. India is soon catching up. According to ISHRAE, many commercial buildings have an energy performance index between 200 to 400 kWh/sqm per year and there is pressure on the energy resources more from the HVAC equipment that consumes more electricity in these building.

With Chinese economy now slowing down and India becoming the fastest growing economy in the world, the construction industry is witnessing a fast growth. Some of the key growth drivers are more housing demand and increase use of commercial office spaces. The net result would be more energy requirement for the building sector. So obviously, we should not commit the same mistake that China did - producing more power to quench the energy thirst. Instead, we should be building structures which are energy-efficient. The Bureau of Energy Efficiency or the BEE has already a decade back come up with an Energy Conservation Building Code (ECBC). The guidelines have to be strictly enforced. The energy consumption of building depends on the design of building envelope, selected HVAC-systems and the maintenance of them. The quality of windows also plays an important role, when building is designed. After all, as mentioned above HVAC systems comprise almost 50% of energy consumed by buildings around the world and hence, HVAC should be our priority focus.

You don't have to spend money to save energy. One can start with low-cost improvements, and the savings thus generated can be used to pay for more extensive upgrades. The load on an HVAC system can be minimised by taking some of the energy-saving measures such as appropriate insulation, usage of false ceilings and air curtains, roof reflectance and efficient lighting. Most importantly, regularly scheduled maintenance of HVAC systems can increase the energy efficiency.

On the part of the HVAC industry, they can develop better tools to help building owners and facility managers evaluate the relationship between maintenance costs and energy costs and support investment in the appropriate maintenance approach. Decisions regarding the HVAC system-for new construction and existing buildings-are most effective when undertaken as part of a facility-wide energy management program.

I hope you enjoy reading this issue, which has some good features on Building automation and energy efficiency. Do send in your comments to me at pravita@charypublications.in



Pravita Iyer
Publisher & Director

Member, Indoor Air Quality Association (IAQA)



Directors
Mahadevan Iyer
Pravita Iyer

Publisher
Pravita Iyer
pravita@charypublications.in

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

Associate Editor
Supriya Oundhakar
editorial@charypublications.in

Editorial Coordinator
Nafisa Kaisar
nafisa@charypublications.in

Advertising Department
advtd@coolingindia.in

Design
Nilesh Nimkar
charydesign@charypublications.in

Subscription Department
Priyanka Alugade
sub@charypublications.in

Accounts
Dattakumar Barge
accounts@charypublications.in

Response Department
Sonali Pugaonkar
mktg@charypublications.in

Digital Department
Ronak Parekh
dgmarketing@charypublications.in

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



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Johnson Controls Creates GE's Energy Efficient Campus

General Electric's Beijing Technology Park (GE BTP) is an energy efficient hub for GE in Beijing that has been in operation since October 2016. It has successfully applied Johnson Controls' advanced building technologies and solutions and achieved 20% annual operating cost reduction. The LEED certified GE BTP provides over 3,000 employees with a green and comfortable work environment. Spread over 75,000 square meters, the GE BTP houses multiple business units under one roof, and includes a main functional area.

The green features of this campus include an open office concept to encourage closer collaboration and resource-sharing, and a car-lite culture that gives parking priority to vehicle owners who actively car pools. These



are just a few examples of the green initiatives that have been rolled-out as part of being a LEED certified building – not only should the building and the users work to reduce emissions, they should also live green in their daily lives. To ensure that the campus meets stringent sustainability standards that adhere to LEED guidelines, Johnson Controls was engaged as a professional green building consultant from the early stages of the building design process. The collaborative arrangement has resulted in the adoption of an innovative hollow-core design for the square park with a glass curtain wall system and external sunshade that optimizes use of daylight in the building. The reduction of artificial lighting energy consumption has enhanced the overall comfort of indoor environment. ■

Carel Announces Financial Results

Carel, a multi-national specialising in control solutions for air-conditioning, refrigeration and air humidification, has announced its consolidated results for the 2016 financial year, confirming and indeed improving the positive trend in earnings recorded over the last five years. As of 31 December 2016 Carel Group consolidated sales totalled 231 million euros, an increase of 13.5% over the 203.5 million euros posted in 2015, with positive trends in all business areas.

"The focus of our innovation continues to be improved efficiency and sustainability in the air-conditioning and refrigeration sectors", commented Francesco Nalini, Carel Group Managing Director. "Our growth in 2016 is the result of the most innovative solutions in these areas, and shows how our R&D efforts are focused in the right direction. We have also seen very positive results from our systems designed for new refrigerants with a low environmental impact, especially natural refrigerants. In 2017 we intend to continue investing in all of these solutions, with even greater attention to connectivity, envisioning the added value we can offer our customers through machine learning algorithms". Export sales for 2016 accounted for 80% of the Group total:

analysis of earnings by geographical region shows how growth in terms of markets was driven by Europe, with an overall average increase of 19%, as well as good performance in Asian markets (+8%). The growth recorded in 2016 was moreover accompanied by an increase in staff numbers across the Group: the number of employees grew by 132, bringing the total to 1222. Worth highlighting is the significant increase in employment at the new CAREL manufacturing site in Croatia, inaugurated in 2016, from 18 to 76 people.

Again underscoring the strategic importance Research and Development has always played in maintaining the Group's leadership in the HVAC/R market, with the aim of ensuring differentiation and offering customers technologically-innovative solutions at increasingly competitive costs, in 2016 6.4% of sales were invested back into R&D, a 4.6% increase over 2015. As part of the Group's international expansion strategy, in 2016 two new sales offices were opened in Thailand and Korea, so as to strengthen Carel's Asian presence. Finally, to boost production capacity, the Group's fourth foreign manufacturing plant was inaugurated in Labin, Croatia, second only to headquarters in terms of size. ■

Faulty Refrigerator Causes Deadly London Tower Fire

A faulty refrigerator-freezer and building cladding were the causes of a recent large fire at the 24-story Grenfell Tower residential building in London, the city's police has reported. The fire, which began June 14, left 79 people dead, or missing and presumed dead, in what is reportedly the deadliest fire in London since World War II. In announcing its findings June 23 on the cause of the inferno, the Metropolitan Police said the Hotpoint FF175BP line of refrigerators, of which one fourth-floor unit was determined to be the source of the fire,

had not been subject to any product recall. Insulation on the block and outside cladding also failed safety tests. The fire spread along the building's cladding. British police confirmed the horrific blaze started by a refrigerator fire, and said exterior cladding attached to the public housing project failed fire safety tests carried out by investigators. A tenants' group complained for years that the

building was a firetrap but those concerns fell on deaf ears. Investigators believe the building's exterior cladding allowed the deadliest fire in mainland Britain. ■





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Honeywell Launches New Cloud-Enabled BMS

Honeywell recently introduced a new cloud-enabled building management service that prioritizes the most impactful maintenance activities to optimize building performance. Combining advanced automation and data analytics, Outcome Based Service enables Honeywell service engineers to watch building assets around the clock, identifying anomalies faster than traditional maintenance, saving them time and money. Without close monitoring, energy consumption can drift by up to 7 percent annually. The service taps building connectivity and sensors to ensure that building equipment is performing at its best. Early pilots show reduction in energy spending and reactive service calls.



“Data provides valuable insights about building health if you have the right combination of technology and expertise to efficiently gather and analyze it,” said Aseem Joshi, Regional General Manager of Honeywell Building Solutions in India. Outcome Based Service provides the following actionable insights:

- Real-Time Analytics – Honeywell’s analytics evaluates facility data real-time to find issues faster, improve performance and efficiency, decreasing maintenance time.
- Dynamic Tasking – Instead of routine scheduled inspections, analytics prioritize maintenance of higher-impact activities, mitigating downtime and improving efficiencies.
- Performance Dashboards and Reports – The easy-to-use, cloud-based interface monitors building performance against an organization’s Key Performance Indicators. ■

Schneider Electric India Affirms Commitment to Energy Efficiency

Further reiterating its commitment to energy efficiency and access to clean energy, Schneider Electric India, showcased a range of low-cost clean technologies which were on display at the catamaran as part of the Nomade des Mers (Nomad of the Seas) expedition. The expedition – which began in 2015 at Brittany (France) and will conclude in Indonesia – arrived at the Chennai port on April, after passing through Morocco, Senegal, Guinea Bissau, Cape Verde, Brazil, South Africa, Madagascar, Mozambique, the Maldives and Sri Lanka. The Schneider Electric Foundation, under the aegis of Fondation de France, is a key patron of the expedition to aid research and promote low technologies (low tech).

The mission of the Nomade des Mers project, is to showcase useful, simple and accessible technologies that are also environmentally-friendly: low technologies.



The catamaran will spend three years travelling the globe testing independent technologies and developing the international low-tech stakeholder and user community.

On board, low-tech devices will be put to the test, optimized and linked to others to assess synergies toward achieving a self-sustaining ecosystem. Speaking about the expedition, Nadine Bouquin, Vice-President Offer Creation & Governance, Schneider Electric said, “Schneider Electric Foundation is delighted to act as main patron of this project and support the expedition which is very much aligned to our commitment towards promoting sustainable low cost technology and solutions for a greener future.”

The arrival of the ship at the Chennai port was celebrated by Schneider Electric at its Chennai plant. The objective of the event was to create innovative low tech solutions for a greener future. ■

Low-GWP Alternative Refrigerants Testing Results Issued

The Air-Conditioning, Heating, and Refrigeration Technology Institute (AHRTI), the research arm of the Air-Conditioning, Heating, and Refrigeration Institute (AHRI), released the first research report as part of its ongoing testing of flammable refrigerants, many of which were identified as possible replacements to high global warming-potential (GWP) hydrofluorocarbons that will be phased down under the Montreal Protocol. The research

and testing program is part of a \$5.2 million commitment on the part of AHRI, ASHRAE, US Department of Energy, and the California Air Resources Board to further test in real-world settings low-GWP, but mildly flammable or flammable, refrigerants. “The ongoing global effort to phase down the use of high-GWP potential

refrigerants requires this vital research, which will help us update relevant codes and standards so that appropriate, climate-friendly alternatives can be safely used in



air conditioning and refrigeration equipment,” said Karim Amrane, AHRI’s Senior Vice President, Regulatory & Research. The report, Benchmarking Risk by Whole Room Scale Leaks and Ignitions Testing of A2L Refrigerants, was developed following testing at UL, which began in June 2016. ■

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Trane Advances Connected Building Technology

Trane, a leading global provider of indoor comfort systems and services and a brand of Ingersoll Rand, is advancing connected building technology to address one of the world's most pressing issues, which is to improve the energy and operational efficiency of



commercial buildings. According to the U.S. Energy Information Administration, buildings consumed approximately 40 percent of the nation's energy in 2016[1].

Trane announced two new and enhanced connected buildings solutions, Trane Tracer Ensemble building management system and Trane Air-Fi® CO2 Wireless System, which can optimize building performance and enable more efficient building management. The new solutions highlight Trane's commitment to provide intelligent systems, building automation and energy management services to help optimize a building's performance. "Buildings today are full of hidden potential and have wasted energy flowing throughout, due to inefficient heating, cooling, and lighting," said Dave Molin, vice president, controls. "Through the use of new Trane technology, we can access valuable data and insight that can be the catalyst for new levels of efficiencies." The new Tracer Ensemble and the enhanced Air-Fi Wireless CO2 give facility management professionals the flexibility to manage buildings more efficiently with long term data collection and analysis, while reducing costs and delivering a better indoor environment to tenants through secure data-driven, technology-enabled services. By maintaining and analyzing building data effectively, facility managers can use this information to enhance overall operations and management. ■

UN Seeks low-GWP AC Solutions

The countries, with UNEP and UNIDO, are continuing their work in the second round of PRAHA (Promoting low global-warming-potential refrigerants for air-conditioning sectors in high-ambient-temperature countries). This year the United Nations-managed PRAHA program (Promoting low global-warming-potential refrigerants for air-conditioning sectors in high-ambient-temperature countries) will continue with a second round of research aimed at finding a solution for high-ambient temperatures where air-conditioning is a necessity. "The Gulf countries use 15% of global air conditioning, making a significant contribution to global CO2 emissions," said Ole Nielsen, Chief of UNIDO's (United Nations Industrial Development Organization) Montreal Protocol Division,

commenting on the initiative. PRAHA II, funded by the Multi-lateral Fund, will now be extended to include more countries, including Egypt, Pakistan, Tunisia, and Vietnam, with UNEP (United Nations Environment Programme) and UNIDO still responsible for managing the implementation. The PRAHA project aims primarily to solve the vicious circle inherent in air conditioning: By cooling ourselves down, we heat up the earth. "By building prototypes and testing various alternatives, it became clear that a full product redesign would be necessary, and the appropriate components would need to be developed and made commercially available," said Nielsen. "International conferences and study tours in China and Japan educated participants about alternative technologies." ■

San Francisco Airport Aims to Achieve Zero Net Energy

In April, San Francisco Airport (SFO) co-hosted an event with USGBC Northern California to welcome guests as passengers on the airport's journey to become the first "triple zero" airport campus in the world. This bold charge of our five-year strategic plan to achieve zero net energy, carbon neutrality and zero

get to zero, what's stopping others?"

SFO curtailed emissions by 33 percent from a 1990 baseline and cut water use by 12 percent and natural gas by 5 percent over the last three years. Conserving these resources saves the airport an estimated USD 650,000 in annual utility costs.

To realize its goal of becoming a zero net energy campus, the airport is setting energy use intensity (EUI) targets as contract obligations for all capital projects. These projects report proposed energy conservation measures and renewable energy potential throughout each delivery phase to the airport's



waste-to-landfill requires new partners to reimagine the way SFO designs, constructs and operates to achieve deep sustainability outcomes and to revolutionize the passenger experience and the industry at large. Chief Development Officer Geoff Neumayr explained, "We have a 5,000-acre campus with an asset portfolio of over 14.5 million square feet, across nearly 70 buildings that currently consume 440GWh of energy each year. If we can

newly formed ZERO Committee, which advises the Project Management Office's allocation of its \$100 million Zero Net Energy Capital Fund.

The ZERO Committee also ensures adherence with SFO's zero net energy guidelines, sustainable planning design and construction guidelines and the LEED Campus Master Site Certification Program, administered by Anthony Bernheim of T1 Partners. ■

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Elanpro Launches Hi-Tech Portable Ice Machine

Offering true portability and durability, Elanpro, India's leading commercial refrigeration company, has launched a portable Ice Maker with distinctive features like single water tap and optional online plumbing. Since these ice makers are portable, just put water into the machine and ice is produced in just a few minutes! Elanpro Portable Ice Machine is part of the affordable, hi-tech Elanpro Ice Machine Series (EIM) that combines productivity, reliability and ease-of-use with aesthetic appeal and quieter operation.

The product is equipped with intelligent water use design. Elanpro Ice Machine Series is equipped with new water management design that offers food service operators a low cost



of ownership and superior performance even in the most challenging water conditions. The product uses both tap and bottled water. The technologically advanced machines reduce scale build up and the associated costs of scale mitigation, all while remaining very water efficient. The plates are made of stainless steel enhancing the durability.

The Ice Machine also comes with automatic timer function, full and deficient water alarm that enables to leave the ice maker unattended, with the confidence. It is aimed at meeting the on-demand ice needs of small juice parlors, bars, restaurants, luxurious residential apartments, sports bar, gym, spa, sports injury and trauma centre etc.

A user friendly product, Elanpro Portable Ice Machine delivers high levels of reliability and energy efficiency. Just with a mere press of few well labelled buttons, one can enjoy the first batch of ice produce within fifteen minutes only. The product is capable of producing upto 15 kgs of ice every day. ■

Danfoss Opens Customer Application Development Center in Florida

Danfoss recently celebrated the grand opening of its 'Engineering Tomorrow' Application Development Center in Tallahassee, Florida. A state-of-the-art laboratory, Danfoss' new customer Application Development Center features three fully-automated test facilities capable of accommodating residential and commercial air-conditioning and heat pump equipment, including rooftop units, from 1.2 to 50 tons and air-cooled chillers up to 150 tons. Additionally, the lab will be able to test mildly flammable refrigerants at global nameplate voltages, with real-time data acquisition and performance analysis.

"Danfoss has a long tradition of innovation," remarked John Galyen, president, Danfoss North America, during the grand opening celebration. "This new Application Development Center affirms our commitment to helping our customers Engineer Tomorrow and advance energy efficiency and climate-friendly solutions."

"One of the major drivers behind this significant investment is the increasing federal regulations and testing requirements impacting the HVACR industry, including aggressive energy-efficiency standards from U.S. Department of Energy and new targets for environmentally-friendly, low-GWP refrigerants from U.S. Environmental Protection Agency," Galyen explained. "This Application Development Center will enable us to help our industry prepare for



the transition by providing much-needed lab capacity to ensure compliance with evolving and future requirements." Globally, Danfoss has a network of Application Development Centers to provide industry partners with a collaborative laboratory environment and the application expertise necessary to meet challenges. "Our objective is to make each of our Application Development Centers a place where local Danfoss application experts work with our customers in a collaborative, innovative environment that accelerates technology and propels business," said Stefan Pietrek, senior director – global applications, Danfoss. "This ADC is designed to support testing specifically for the North American air-conditioning market." Gregory Handzel, manager of the Application Development Center, further explained that the collaboration facilitated by the ADC will help customers improve performance through system-level testing. "This lab enables engineering teams to validate new concepts and develop products and solutions that solve key challenges in today's market." ■

Climaveneta Units Installed at New La Rinascente Store in Rome

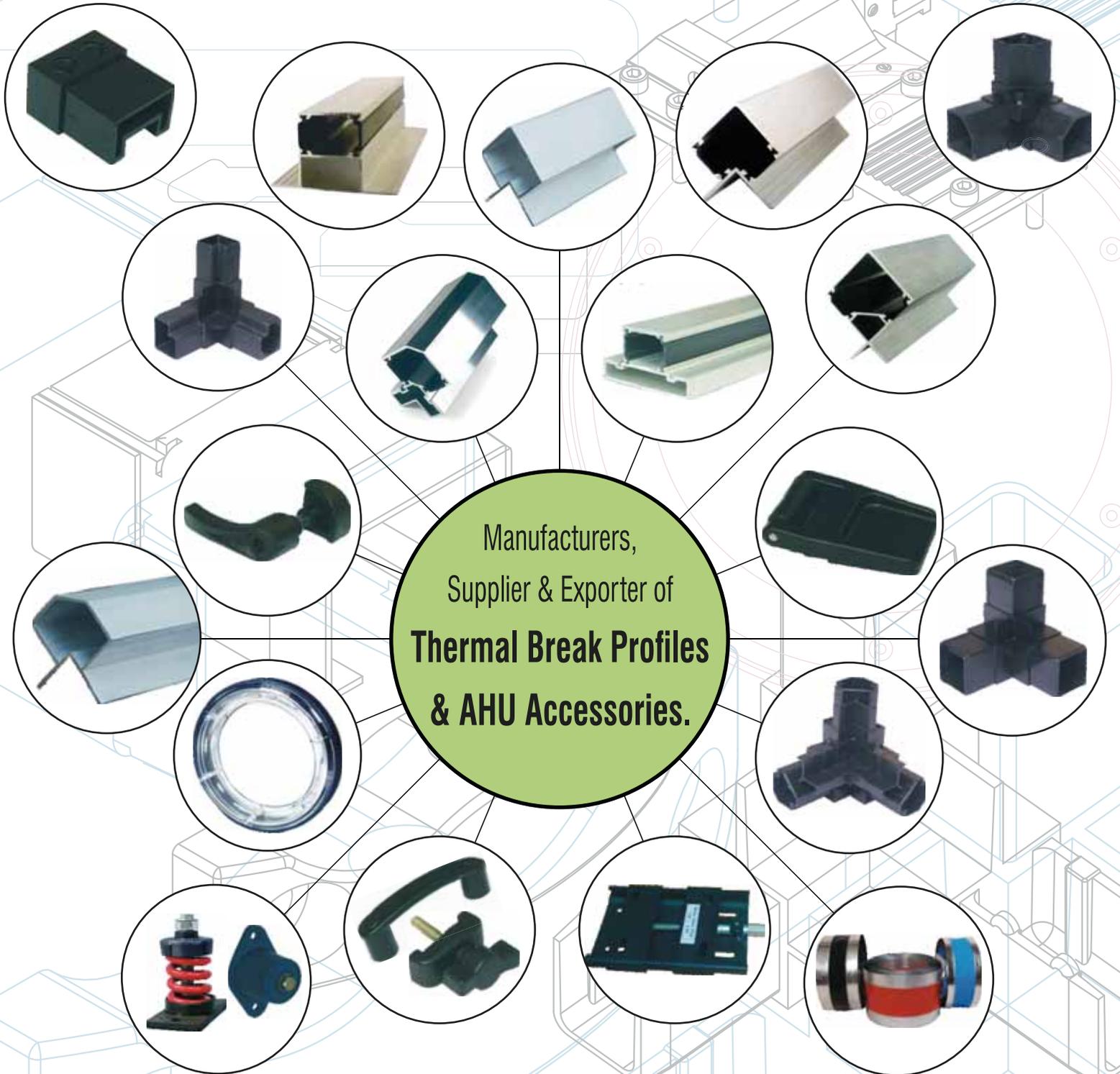
Mitsubishi Electric Hydronics & IT Cooling Systems, through its brand Climaveneta, has supplied the air conditioning units for the new store, where Presint Engineering is in charge of the Site Management and Arcadis is in charge of the Project Management. Specifically, they installed a TECS-FC / K 1204 chiller and a multi-purpose heat pump ERACS2-Q / SL-CA 3222 for a total cooling capacity of almost 2,200 kW.

The units have been selected for their high efficiency, as well as their capability to offer the best internal comfort to the



customers throughout the year, offering a unique and irreplaceable shopping experience, as expressed by La Rinascente's mission. ■

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Fausing Officially Becomes Danfoss CEO

Kim Fausing has officially taken over as the new CEO of Danfoss recently, following the departure of Niels B Christiansen. After nine years as the CEO of Danfoss, with impressive financial results, a high performing organization, increasing growth and a digital transformation on track, CEO Niels B. Christiansen has decided to leave Danfoss.

COO Kim Fausing, who worked closely together with Niels B. Christiansen in the Executive Committee, has become the new CEO.

The 52-year-old Kim Fausing, joined Danfoss in 2007 as president of the Refrigeration & Air Conditioning Division. He has broad management experience from leading positions in global industrial companies. In 2008, he became executive vice president and COO, with responsibility for all the Danfoss



Kim Fausing

segments as well as the Danfoss Business System and Global Procurement.

Chairman of the Board, Jørgen Mads Clausen praises Niels B. Christiansen's significant importance to Danfoss. "Niels' mission in Danfoss is completed with honors. All financial figures are pointing in the right direction, the business is growing, and the organization is in great shape. I find it only natural that a CEO after 12 years at the helm would want new challenges and

on behalf of the Board of Directors and myself, I would like to thank Niels for his outstanding leadership of Danfoss. At the same time, I am very pleased that we have such a highly competent successor in Kim Fausing, who for the past nine years has also played an important part in driving the positive development of Danfoss," says Jørgen Mads Clausen. ■

Nexstar Network Welcomes New Coaches Heath Betts & Jeff Stagnoli

Nexstar Network is thrilled to announce the addition of Heath Betts and Jeff Stagnoli to its coaching bench. Former Training Accountability Coach Gresham Ard is moving into a business coaching role. Betts will move into the training accountability coach position formerly occupied by Ard Nexstar Director of



Nexstar Network Welcomes New Coaches Heath Betts & Jeff Stagnoli

Coaching Scott Pearson said this will be a smart move for the company. Betts has more than 30 years of experience in the HVAC trade and held many different roles during that time. In moving to his new business coaching role, Ard is looking forward to working with the leadership among the member residential service companies. Ard has worked with Nexstar

members for the last two years as training accountability coach. Nexstar training accountability coaches assist with strategies to ensure that training concepts taught in the in-person Nexstar training classes are enforced and practiced.

Stagnoli has more than 25 years in the HVAC and plumbing trades, working in the field, and in sales, marketing and management. Similarly to Ard, Stagnoli will be working closely with owners and upper management at member companies. Betts and Stagnoli join a team of 38 dedicated coaches, trainers and support staff who work with plumbing, HVAC and electrical residential service contractors to help them improve their businesses. ■

Olesen is ASHRAE President

Bjarne Olesen, PhD, Fellow ASHRAE, is ASHRAE's President for the 2017-2018 term.

Olesen has previously served on the Board of Directors as Treasurer, Vice President and Director-at-Large. In Olesen's theme, "Extending our Community," he focuses his theme on three directives; extend our global community; extend our technological horizons; and extend our value to members. "Extending our global community will acknowledge our interconnectedness worldwide and embrace our shared needs and objectives," Olesen said. "The technical guidance we produce for all members is made stronger by global diversity."

From the start of Olesen's time with ASHRAE, he did not have the opportunity to get involved with a local chapter to



Bjarne Olesen

dedicate his time and efforts to the HVAC industry – and believes in the importance of working together to create a better built environment.

Olesen earned his Ph.D. in Heating and Air Conditioning in 1975 and Master of Science in Civil Engineering in 1972 – both degrees obtained from the Technical University of Denmark.

"Many of our members are only active on one side – either the technical side, mainly at the Society level, or the grassroots side at the local chapter level," Olesen said. Olesen is the Director of the International Center for Indoor Environment and Energy and a Professor at Danish Technical University. Olesen has been a part of many technical committees and been a Coordinating Officer of various committees. ■

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Emerson India Wins Assocham Cold Chain Industry Awards 2017

Emerson's status as an innovator and an industry leader was affirmed yet again at the prestigious ASSOCHAM (The Associated Chambers of Commerce & Industry of India) Cold Chain Industry Awards 2017. Their Copeland Scroll Digital™ Receiver Units HLR was adjudged winner in the Best Innovative New Cold Chain Technology Solution category.

The award was organized by ASSOCHAM, a leading industry body that has more than 400 Chambers & Trade Associations in its fold and serves more than 4,50,000 members from all over India. It was presented by Minister of State (MoS) for Food Processing Industries, Sadhvi Niranjana Jyoti at a grand function in New Delhi.

Speaking on the occasion, Shirish Adi, vice president & managing director, India, for Emerson's Commercial and Residential Solutions platform said "Emerson Digital™ Receiver Units HLR are a unique offering for the India Cold Chain market and have received a very good response. Winning the ASSOCHAM award is a true recognition of our game changing products and reinforces our leadership position in the heating, ventilation, air-conditioning & refrigeration (HVACR) Industry"

The Digital HLR is designed to meet the needs of Cold Storages, Quick Service Restaurants, and the Retail segment. Among its breakthrough features is its compact design that provides for a remote condenser and digital scroll™ technology,



which combine to provide significant space and energy savings.

This award for Emerson comes close on the heels of the ACREX Awards of Excellence 2017 win for its horizontal scroll compressor in the Innovation category. The product was a winner on account of its horizontal arrangement, compact design and low weight, making it an ideal fit for the height sensitive rail air conditioning application. ■

Climaveneta Shortlists for 2017 RAC Cooling Industry Awards

Now in its 13th year, the industry's biggest and most-respected Awards event, the RAC Cooling Industry Awards, champions the leading innovations and environmental successes in the refrigeration and air conditioning industry. The refrigeration and air conditioning industry faces major challenges. As a huge user of power, the cooling industry is under increasing pressure to reduce carbon emissions and tackle climate change. As well as the need for improved energy performance, and other environmental issues, such as noise, refrigerants, containment, recyclability and materials, are driving change throughout the industry. This year, the awards will recognize the innovation used to tackle many of these issues through a total of 15 categories. Mitsubishi Electric Hydronics & IT Cooling Systems, through its brand Climaveneta has two projects; Cajamar Headquarters in Spain and Loccioni Leaf Lab in Italy, shortlisted both for Building Energy Project and International Achievement. In addition Climaveneta's new a heat pump for 4-pipe systems with full inverter technology, i-FX-Q2, has been shortlisted for both Air Conditioning Innovation and Air Conditioning Product of the Year.



The shortlist for this year's competition was fierce and the judges only selected those who demonstrated the very highest standards. The winners will be announced at another spectacular evening at the prestigious London Hilton, Park Lane on September 27th. ■

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LEAP for Projects began with Lean execution principles to eliminate waste by removing repetition, rework, and redundant tasks. Honeywell revolutionized automation project execution by extending this approach through simplification with independent workflows, standardized design, and enabling engineering to be done from anywhere in the world. Our original LEAP offering enhances our project implementation services with our most innovative, enabling technologies—Universal I/O process and safety cabinets, virtualization, Cloud engineering, and auto-device commissioning. This keeps automation off the critical path of your project.

The Evolution of LEAP

LEAP for Operations utilizes the LEAP project methodology to optimize, simplify, and run operations more efficiently. LEAP for Operations extends LEAP efficiency principles to provide a step change in productivity and throughput once an automation project is implemented. LEAP has now evolved to apply efficiency to ongoing operations through edge device integration, Cloud-enabled execution, and universal and connected assets.

A Variety of Tools

Our focused new product development programs have expanded our capability to address more project and operational challenges in both brownfield and greenfield applications. LEAP for Operations may

include a variety of solutions with a flexible deployment strategy to bring more value out of operations. Solutions may include automated documentation, collaboration tools, integrated controllers, advanced alarm management, real-time analytics, proactive asset management, and Cloud-based execution with built-in cyber security.

Edge Device Integration

Our flexibility in integrating both Honeywell and third-party equipment is second to none. Our SmartLine transmitters can be configured in the Cloud to be delivered with the configuration parameters pre-set and ready to go out of the box. We can detect and interrogate devices and quickly confirm that the configuration matches what was configured during the function design. We can add fire and gas assets both in the plant and the associated infrastructure, plus the skids that bring in feedstock and serve as fiscal metering stations. In short, we can add more.

Universal and Connected Assets

Now, we have expanded what we do with devices by adding a broader set of universal and connected assets. Universal Channel Technology is now integral to the ControlEdge PLC and ControlEdge RTU, with increased integration to Experion. We have also created an Ethernet Interface Module allowing us to integrate other subsystems like the electrical control and management system (ECMS), motor drives, or other third-party PLCs on an Ethernet IP topology.

Cloud-Enabled Execution

With Experion Orion Console, the operator can make use of any Experion functionality, such as advanced alarm management tools or the new embedded Profit Controller. We continue to improve our virtualization and cloud engineering tools, both for initial project development and future maintenance. Our Virtual Engineering Platform (VEP) serves as a virtual lab for testing without physical hardware. We can link initial configuration of the system designed in our VEP to Honeywell TRACE, which documents the initial plant configuration and readily manages and documents future changes or updates made to the system. Our project offering is enabled for cloud-based execution when appropriate.

Renowned Cyber Security

When you buy an Experion system, you get cyber security right out of the box. This includes our control firewall for our devices, a firewall for third-party devices, and firewalls that protect the control system network from the rest of the corporate business network. Experion PKS is built to conform with ISASecure guidelines. We follow a certified development process when executing projects so that security is built in. We can limit access to critical functions by configuring the scope of responsibility for any given user. Plus, we can do network security reviews using any of our 70+ security experts around the globe. Honeywell offers a suite of world-class Industrial Cyber Security Solutions and ongoing Managed Services that help protect the availability, safety and reliability of industrial control systems and site operations. ■

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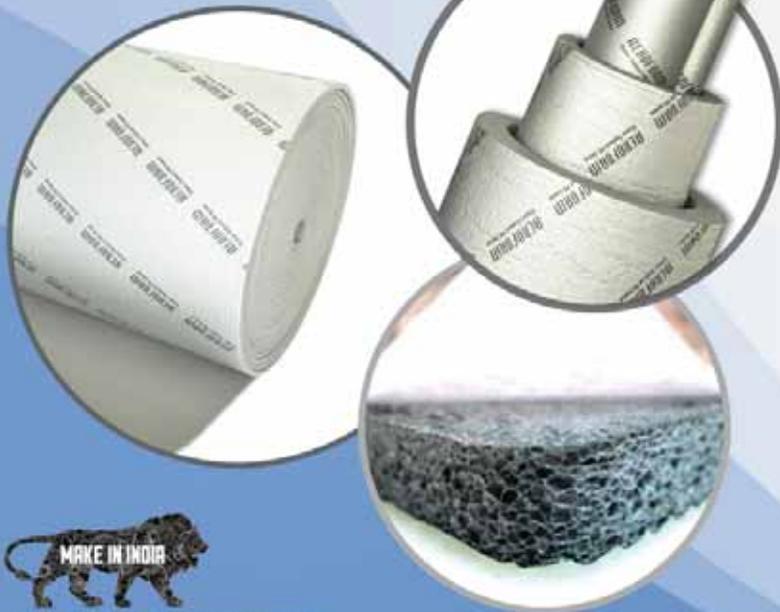


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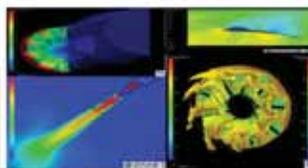


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Energy-Efficient Tyre Production in India

The Grundfos Solution Years of experience with energy-efficiency and innovative solutions quickly enabled Grundfos India to identify an opportunity for constant high pressure boosting system under variable loads: GRUNDFOS Hydro 2000 proved to be the ideal solution for Ace Tyres...

The newly built Ace Tyres factory near Hyderabad in India is a sister company of UK based ACE Limited. Ace Tyres is a commercial tyre company serving the transport, heavy plant and agricultural industries. The rigorous daily workloads on tractors, combines, forklifts, diggers, dumpers, quarry and environmental vehicles, etc. demand strong and hard-wearing tyres.

Consequently, the tyre manufacturing process involves vulcanisation of nylon and curing at extremely high temperatures. But, once the tyres are formed, all heat must be eliminated from the tyres and moulds as fast as possible for the tyres to achieve the required strength. And to secure express cooling, only a reliable booster system can guarantee a constant pressure.

The situation for some years, Ace Tyres had used a standard booster pump with fixed speed motor and by-pass valves to supply a constant pressure and keep the excess cold water circulating. However, to do so, the pumps constantly operated at full speed irrespective of the different intervals and different loads. As a result, Ace Tyres was wasting large amounts of energy to secure a constant pressure.

To cut down the operation of pumps and to get a more energy efficient and reliable cooling system, Ace Tyres initiated a partnership with Grundfos India. Grundfos' reputation as a responsible supplier of innovative and reliable pump systems appealed to the company, and fit perfectly with their requirements.

The Grundfos Solution Years of Experience with energy-efficiency and innovative solutions quickly enabled Grundfos India to identify an opportunity for constant high pressure boosting system under variable loads: GRUNDFOS Hydro 2000 proved to be the ideal solution for Ace Tyres.

However, as a responsible solution provider, Grundfos recognised after careful process study that Ace Tyres required a customised solution for their specific requirements. A Hydro 2000 with 4 x CR16-160 could guarantee 20 bar operating pressure and still adjust the performance to the loads and intervals. To secure smooth operation at a high pressure, Grundfos India made sure that the system was fitted with special headers, valves, fittings, tank etc.

Outcome

The customised Grundfos Hydro2000 booster system is the first of its kind built and sold by Grundfos India. However, it is yet another example of Grundfos' determined pursuit to deliver innovative solutions that cut energy consumption to a minimum and secure reliable operation for many years. And that is exactly why Ace Tyres wanted Grundfos to solve the task:

"Grundfos' System reliability is undisputed. That's why we preferred Grundfos Hydro 2000 for this critical application," says K Ramakrishna (GM, Operations). ■





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BAS for Energy Saving

The article highlights the effective utilization of BAS for energy saving opportunities related with HVAC system. It is to be understood that not necessarily fully automated BAS system will contribute entirely in energy saving as compared with partially automated BAS, whereas the energy efficiency should be taken into account at design engineering stage and then get the operation excellence through BAS...

Building Automation is the automatic centralized intelligent monitoring & control of a building's technical systems & services such as Heating, Ventilation and Air Conditioning (HVAC), lighting and other systems through a Building Management System (BMS) which is also known as Building Automation System (BAS). In today's world of emerging technologies specific to the building energy consumption and managing the various services with remote operation control strategies and monitoring the same, building automation plays a vital role in effectively managing the various services. These services includes Central Air Conditioning equipment, Boilers, Hot Water Generators, Ventilation Fans, Exhaust Blowers, CCTV, Fire & Alarm System, Public Alarm System, Lighting, Lifts, Elevators, Escalators, DG Sets etc.

Since the major power consumption for a typical commercial building belongs to HVAC plant and could be around 60 % to 70 % of total facility power consumption, application of BAS for HVAC monitoring and control becomes more significant from energy saving and demand management perspective. The HVAC plant mainly consist of chillers or other central AC units and associated ancillary equipment such as primary, secondary

chilled water pumps, condenser water pumps, cooling towers, AHUs, ventilation fans and TFAs etc. The type and capacity of air conditioning system depends on site dynamics. Controllers regulate the performance of various facilities within the building environment which includes:

- Mechanical Systems
- Plumbing Systems
- HVAC Systems
- Lighting
- Electrical System & Meters
- Security System
- Surveillance System
- Fire Alarm
- Lifts/Elevators/Escalators

Figure 1 illustrates the wide range of BAS applications to a commercial building.

The building automation system should play a vital role in automating system operation and optimizing the energy consumption of these HVAC utility equipment either by efficient sequence of operation to maintain the desired cooling conditions and meeting the demand as well as meeting the load variations that are primarily due to occupational diversity or seasonal variations etc. Further, monitoring the operation and consumption data results in improving occupant control, lifecycle of utility equipment and reduced operating cost. Many upcoming new green

buildings have now been built to accommodate BAS to get energy, air and water conservation characteristics.

This particular article will specifically highlight the effective utilization of BAS for energy saving opportunities related with HVAC system. It is to be understood that not necessarily fully automated BAS system will contribute entirely in energy saving as compared to partially automated BAS, whereas the energy efficiency should be taken into account at design engineering stage and then get the operation excellence through BAS.

BAS Integration & Connectivity

To get the required data from field devices or equipment, the communication needs to be established between Human Interface Unit which is the end user and field devices with the help of various controllers. Controllers are specific purpose based small computers with input and output capabilities. The input ports receive the signals from field devices and output ports transmit these signals to slave devices for further action. Direct Digital Control (DDC) system is the improved version of control systems which use microprocessors, software and electronic control devices. With the help of DDC the input data can be processed digitally and terminal devices can be effectively controlled. This is commonly used in present HVAC system controls especially for AHUs.

Most Building Automation networks consist of a primary and secondary bus which connects high-level controllers (these can be generic system or network type, terminal unit type or PLC based) with lower-level controllers, sensors, input-output devices and User Interface

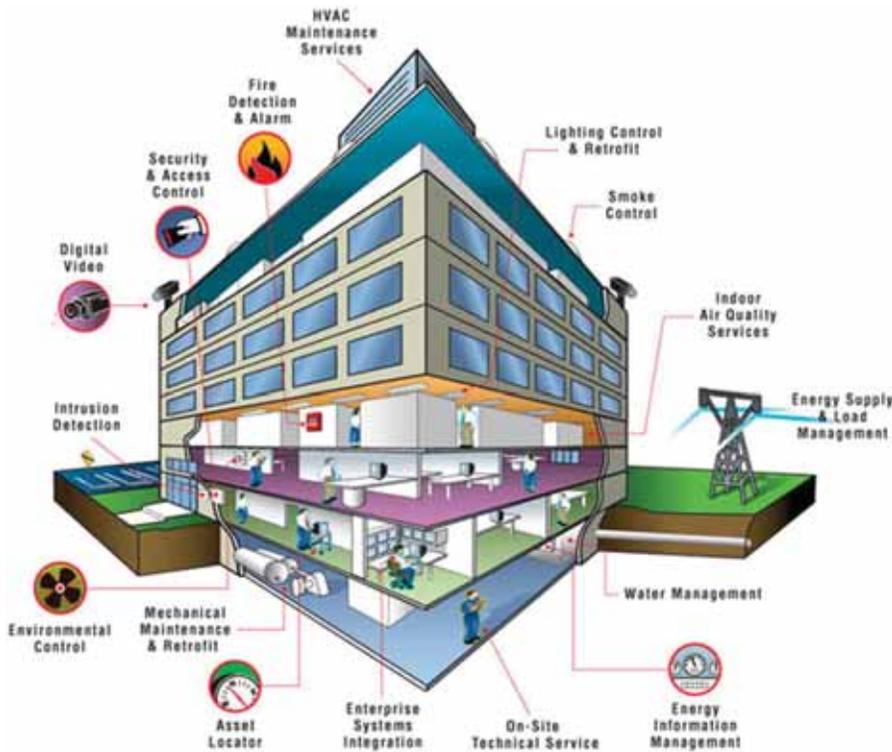


Figure 1: The wide range of BAS applications to a commercial building

(generally, a computer workstation for human level interface device with graphical interface). This communication has been accomplished with the help of protocols. In networking, a communications protocol or network protocol is the specification of a set of rules for a particular type of communication. Various type of protocols are used such as ASHRAE's BACnet protocol or LonWorks as open protocol. SNMP, TCP/IP and Modbus are also some of the specific protocols that are used for particular application based on the type of communication.

This is shown in figure 2 as a typical 3 Tier System Architecture for BAS:

The field devices which can be various sensors and control devices which include temperature, humidity sensors, pressure transmitters, difference pressure switches, CO₂ sensors, flow switches, damper and valve actuators, vavs, occupancy sensors etc. The simple example is the photocell installed at a particular location of a building such as staircase, parking area etc will sense the darkness and occupancy and will operate accordingly. The terminal unit controller will receive the signal from photocell or lighting sensor and sends the

signal for further process which executes the logic for written for corrective action to be taken and controls the lighting operation through BAS.

The first step towards this is to have as many field devices and sensors to get the required data point or parameter for monitoring or control from a central location. Physical connectivity between devices was historically provided by

dedicated optical fiber, Ethernet, ARCNET, RS-232, RS-485 or a low-bandwidth special purpose wireless network. The I/O (Input-Output) summary points is then prepared. IO summary points (Input Output points) are the data points from field devices or equipment for communication purpose which can be digital input output points or analog input-output points. Analog inputs are used to read a variable measurement. Examples are temperature, humidity and pressure sensors which could be thermistor, 4–20 mA, 0–10 volt or platinum resistance thermometer (resistance temperature detector), or wireless sensors.

The user interface involves a workstation or PC having graphic interface with various dashboards or graphs or charts that are crucial for first level information and further analysis. Complete navigation, monitoring and control can be made available through high level graphic interface. Data collection and reporting with BAS makes task for facility managers more efficient and professional with past trends and dashboards to analyze and troubleshoot the problems, since system failures gets reported in BAS system with correct associated information.

Following are the key benefits of BAS:

- I. Simplifies installation
- II. Commissioning and future expansion

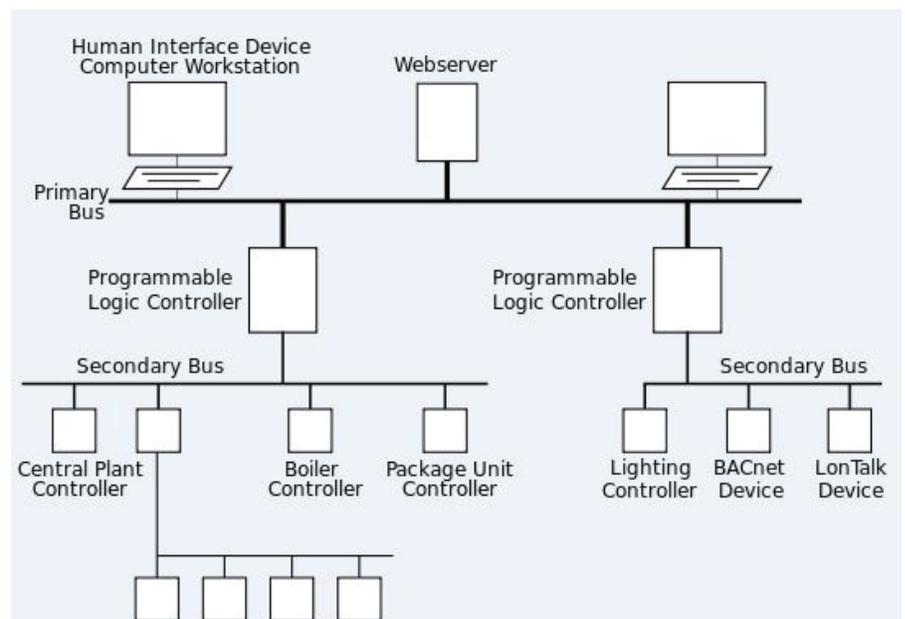


Figure 2: Typical 3 Tier System Architecture for BAS



- III. Dramatically reduces implementation time & ensures proper operation
- IV. Effectively reduces engineering and maintenance cost
- V. Saves time and money for System Integrators
- VI. Provides reliability and peace of mind to building owners and ensures energy efficient control strategies
- VII. Real time monitoring and control of building operation and performance
- VIII. Energy management and reporting

But the highest outputs from a BAS will come with efficient and appropriate design of HVAC equipment as per site dynamics as well as control strategies used for operation. For an example, application of VFD on air handling unit might not necessarily result in energy savings if the AHU is undersigned for an office room having fixed operating hours for which AHU is operated and the AHU is under-designed, which is just maintaining the desired room conditions during winter season only.

Another example is the application of VFD on primary chilled water pump and automating the same through BAS might not necessarily result in energy saving in case the chiller design is with low flow high Delta T and actual head is more than the designed head for a pump.

The lighting control for ON-OFF operation is also to be selected to suit the operation/business requirement such that the CCTV camera installed to capture

activity at particular location will not get affected or have any business or security impact by switching OFF the lights.

Because of not having clear understanding of the system, it is observed that the manual override command is often used though having full fledge BAS system and equipment are manually controlled which violets the importance of BAS. This shows the need of understanding the present installed HVAC equipment and their operation as per site conditions then adding the necessary controls for effective and efficient operation of these utility equipment.

With all the field devices and control strategies made available for high end equipment, room automation which is an inherent part of BAS becomes more important to have better control which in turn reflects in further control of high side equipment & control of the same.

The Buildings having these facilities and effective operated BAS are termed as "Smart Buildings" and various ratings such as Silver, Gold, Platinum Green Building ratings or 1 to 5 Star ratings from BEE are available for a facility. This ultimately promotes users for saving more energy and contributing to saving the Environment by carbon reduction.

Hence, BAS is not only the enhanced single point control of the systems/equipment but is also a valuable source of information for facility managers and higher management from operation,

historical data and any critical or failure incident point of view.

The various reports that can effectively be generated from BAS are:

- Operational data for an equipment/system (with available data points that are integrated with the system)
- Historical trend (graphs/charts) for consumption or variation of any operational parameter of an equipment/system
- Incident report
- Alarms and/or alerts
- Operating hours or ON-OFF trend

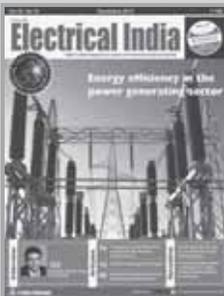
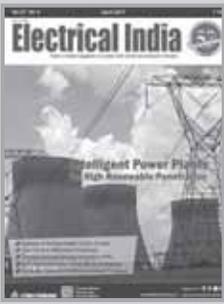
This is called as the advanced reporting system in today's world of improved technologies. ■

Abbreviation:

BAS	: Building Automation System
BMS	: Building Management System
AHU	: Air Handling Unit
TFA	: Treated Fresh Air Unit
PLC	: Programmable Logic Control
SNMP	: Simple Network Management Protocol
TCP/IP	: Transmission Control Protocol/ Internet Protocol
ICMP	: Internet Control Message Protocol
FTP	: File Transfer Protocol
SMTP	: Simple Mail Transfer Protocol
SCADA	: Supervisory Control & Data Acquisition
D.G. Set	: Diesel Generator Set
VFD	: Variable Frequency Drive
BEE	: Bureau of Energy Efficiency
IGBC	: Indian Green Building Council
USGBC	: United State Green Building Council
VAV	: Variable Air Volume

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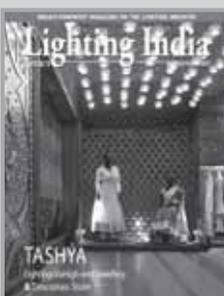
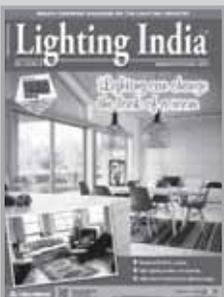
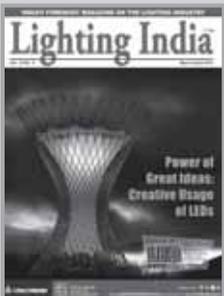
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VTS BIM: New Approach to Digital Models of Air Handling Units

VTS has created the possibilities of generating digital models of VENTUS air handling models on-line. This is possible thanks to the implementation of a new ClimaCAD OnLine 4.0 selection tool, which contains RFA files generator...

In the era of shortening of investment implementation time and the increasing popularity of the delivery of components in the 'Just in time' system, and also with the growing consciousness of the need to save energy, a need to optimize investment costs, operating costs and accelerate investments arose, as well as a need to accelerate the implementation of the whole process of investment design and implementation. IT tools and programmes are indispensable here.

Building Information Modeling (BIM) can be defined as a smart combination of multiple pieces of information in one place, in one digital model. BIM is

nothing but just a digital reflection of the physical and functional properties of the whole object and its specific installations or used components. There are many programmes available in the market, offering BIM class. The following ones can be listed here: Autodesk Revit®, Graphisoft ArchiCAD®, BIMVision®, Nemetschek Allplan®, Nemetschek Vectorworks®, Tekla Structures®, and SketchUp®.

In the MEP branch (Mechanical, Electrical and Plumbing), the models in the RFA (Revit®) format seem to be the most popular. This file format makes it possible to develop a multi-branch, parametric digital model of the building,

so it is possible to conduct various analyzes (e.g. power supply, endurance, maintenance, etc.), leading to the optimization of the investment before construction works begin. The analyses are the more precise and reliable, the more accurate the data and parameters defined in the model are. Therefore, the entire design industry strives to ensure that only libraries provided by equipment manufacturers are in use, because they contain a set of parameters characterizing the individual components of the facility and its installations.

Producer Libraries

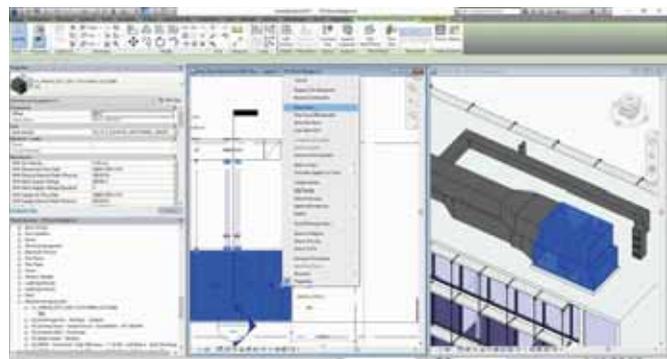
More and more producers provide digital models of their products. Usually, they are only example models or models containing basic nominal operating parameters with exemplary manner of their connection to installation connectors. These models are a good solution in the case of quite simple devices.

Digital models of VTS air-handling units

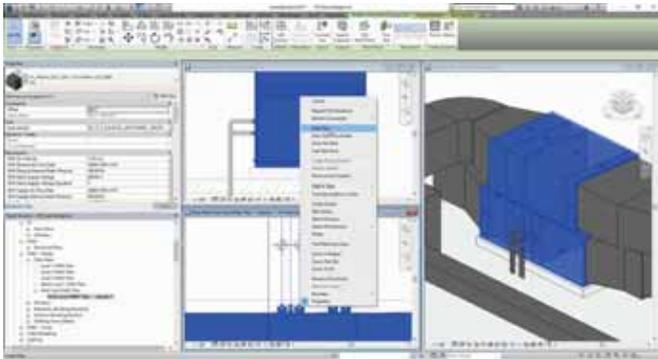
The application of air-handling units cooperating with the air ducts system is related to the need to design adequate



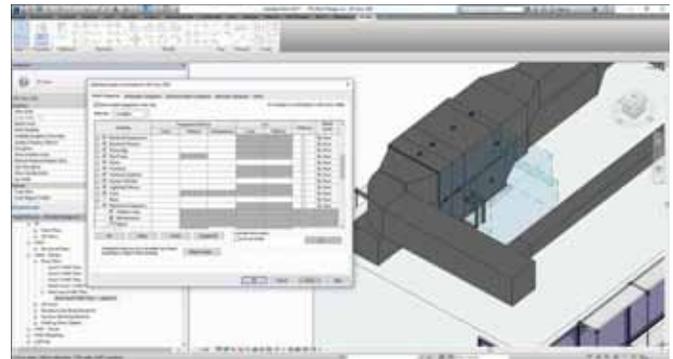
Picture 1: The process of configuration of VENTUS air-handling units in the ClimaCAD OnLine 4.0 selection programme



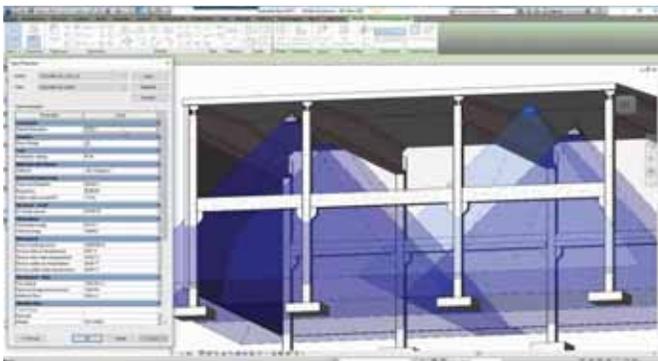
Picture 2: Modeling air-handling ducts coming out from the VENTUS unit



Picture 3: An example of modelling hydraulic connectors in a VENTUS air handling unit



Picture 4: An example of the service zone of the VENTUS air-handling unit



Picture 5: VOLCANO family application in the project



Picture 6: WING family application in the project

system for the whole building and the specification of the intended use of specific rooms already at the beginning of the project.

It often happens that the initial assumptions evolve during the project. The concepts of distribution of hydraulic, electrical and air systems change, together with the manner of installation connection to the air handling unit.

In such cases, static producer libraries of devices contain parameters which are outdated (not following the changes), which on the other hand does not ensure updated data in the multi-branch data exchange. The libraries can be modified manually, but this process is extremely time consuming and fraught with risk of errors.

In order to meet these needs, VTS has created the possibilities of generating digital models of VENTUS air-handling models on-line. This is possible thanks to the implementation of a new ClimaCAD OnLine 4.0 selection tool, which contains RFA files generator.

The generated objects contain the parametrized connectors:

- air ones,
- hydraulic ones,
- sanitary ones,
- electric ones,

as well as the complete dimensional data, the device maintenance zone and the service (repair) zone. Connector parameters are presented both in metric or imperial units, according to the user's preferences. Each connector can be used in the Preset or Calculating mode without the loss of data.

The new object can be generated in just few minutes.

Digital models of WING air curtains and VOLCANO air heaters.

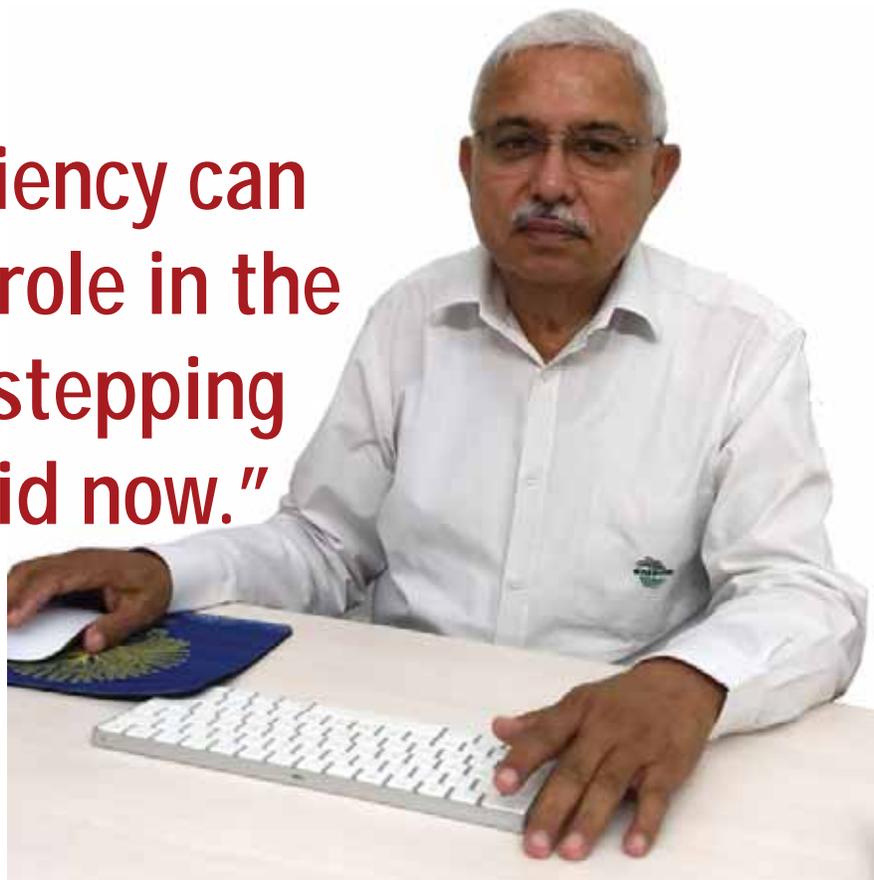
VTS also provides digital models of WING air curtains and VOLCANO air heaters. The models contain parametrized electric and hydraulic connectors. The families are constructed in a manner enabling the designer an intuitive selection of the correct

installation, either vertical or horizontal, together with the presentation of the range of air stream. The parameter of any inclination angle of an air heater in relation to the horizontal plane is available in the case of VOLCANO air heaters. An adequate air stream has been defined for any position of device operation. The visualization of air stream scope enables the designer to distribute the devices in a way that ensures the meet design criteria.

The release of so called families for the Autodesk Revit® environment by VTS makes it easier to design agencies to model the building installations on the basis of using the same platform. At present the on-line generator is a unique solution in BIM environment. It enables the generation of a VENTUS air-handling unit model practically in no time in any configuration and with any parameters. ■

Marek Obuchowski
VTS Corporate Senior Product Manager
Email: sales-india@vtsgroup.com

“Energy efficiency can play a major role in the future if the stepping stones are laid now.”



Ensavior promotes concepts and products which to a large extent address the issue of energy efficiency and indoor air quality. The company engages with the project right from the conceptualization stage and thereby, facilitates right selection, optimum design and implementation of most energy-efficient products. **Lalit Malhotra, Vice-President-Technical, Ensavior Technologies** sheds light on trends of HVAC industry, his company's various products and services, challenges facing the HVAC segment and many more in an interaction with **Cooling India...**

What are the products offered by your company catering to Indian HVAC market?

Ensavior is offering the following energy efficient equipment and systems for the HVAC industry:

Pumping System

We offer a wide range of pumps (both constant speed and variable speed) for applications such as HVAC, plumping and firefighting. We also have skid mounted systems along with their controllers, thereby, offering a complete solution. We believe in taking the job from the intent of providing a comprehensive engineering solution rather than mere equipment selling.

Pressure Independent Control Valves (PICV) and Automatic Balancing Valves (ABV)

An effective and efficient HVAC system must provide correct energy output, when and where required. Water circuit balancing is essential to ensure that chilled water system delivers correct flows to all terminal units in an HVAC circuit. Proper hydronic balancing is the key to making an HVAC system perform efficiently and cost-effectively. To cater to this critical feature, we are offering PICV and Automatic Balancing Valves.

Thermal Energy Storage (TES) Systems

TES systems use optimum capacity

chillers for using cheap off-peak electricity to store chilled water at night which can be used for meeting the peak cooling demands during the day. While TES shaves off the peak connected demand due to significant reduction in installed chiller capacity. TES system can help lower operational costs by enabling the shifting of energy consumption of chillers from peak hours (day) to off peak cost hours (night). It is prudent to note that chillers perform with much better efficiency and lower power consumption when operated at low ambient temperatures during night time as compared to day time. This contributes to a considerable energy and operational cost savings on an ongoing basis.

Chilled Water Thermal Storage systems are ideally suitable for provision of chilled water backup for mission critical facilities like data centers, defence installations and high tech manufacturing.

Ultra Violet Germicidal Irradiation (UVGI) Systems

UVGI system uses the ultraviolet energy to kill or inactivate microbes (viral, bacterial, fungal species) from forming on the cooling coils of the air handling unit and thus eliminating the possibility of unwanted unhealthy contaminants within the air-conditioned space. In addition, it also prevents the increase in power consumption by keeping cooling coils clean without any increase in airflow yet achieving the desired heat transfer. It acts as an independent maintenance system for cooling coils.

Electrostatic Precipitation System

Electrostatic precipitation systems are used for removal of grease and smoke from commercial kitchens and also smoke, fumes and oil/coolant mist from industrial process plants. It is a proven electrostatic precipitation technique to remove smoke, grease, mist and other particulates from the air to keep the outdoor air safe, healthy and pollution-free.

What are the growth drivers of your products?

Ensavior has its growth strategy in place where we focus on energy efficient and sustainable systems for the HVAC and related sectors. This strategy also looks at increasing the base business and penetration into tier-II cities. We are also gearing up to cater to the HVAC aftermarket services.

We have come a long way, delivering reliable products and services to our customers. In return, we have gained their trust and repeat orders. In our journey so far, we have thrived financially and continue to invest in our brand awareness.

Advancement in products according to the need of the hour:

TES Systems: The state-of-the-art radial diffuser design for TES Tanks ensures proper stratification of hot and cold zone

throughout the operating cycles keeping tank volume (water requirement) to a minimum.

PICV: The FlowCon SM PICV, is the most advanced PICV on the market today, which can secure points for the building's LEED certification as well.

- Guaranteeing the prevention of overflow in fully open and part open conditions has 100% authority at all times and is independent of pressure fluctuations. This leads to reduced system pressure drop and a consequential reduction in pump energy use. The accurate control of flow rates at all conditions result in temperature differences across the coils being closer to design, therefore, increasing chiller efficiency and reducing pump frequency.
- Increases the accuracy in water flow control with the pressure independent



Energy efficiency can play a major role in the future if the stepping stones are laid now. With growing energy demands, the best alternate fuel is - energy efficiency. Steadily increasing energy prices and the increasing supply-demand gap are going to create big challenges for the Indian economy.

feature preventing flow rate fluctuations and consequentially, temperature changes with variations in pressure.

- Possible to link the FlowCon SM valve to the VFD pump and thereby, ensure optimal operation. It has an innovative feature, that it can correspond directly the actual flow rate to the BMS system without considering the exact differential pressure. It furthermore holds the option of direct verification of actual valve performance, settings and possible error codes, which can be used for easy building maintenance.

All our range of products is uniquely unconventional and offer great benefits and various applications in the industry, specially HVAC. We have been innovative enough to advance our products to cope up with the changing needs of the environment as well as industry.

What are the trends in current HVAC market? How would you envisage the growth with particular emphasis on energy efficiency and sustainability?

Trends in HVAC Market

The HVAC market in India is forecast to reach 25k crore by 2019. The HVAC market is influenced with growth drivers such as technological advancements which drive demand of the market with high growth rates, extreme weather conditions, steady urban development and rising infrastructure projects.

Pertaining to HVAC segment, energy efficiency, precision in design approach for resource conservation, inclination towards shorter lead time for delivery of products and services, automation and green manufacturing practices are the key elements in the current scenario that will

continue to dominate the trend in pursuit of sustainability.

Treating sustainability as an objective along with all of above trends are encouraged and followed, such is the orientation of industry today. Choices of products and services have become peculiar. For all those practicing innovation, dynamic approach, flexibility and adaptability towards the emerging trends, the horizons for growth are wide and open.

Growth with energy efficiency and sustainability

The HVAC systems are responsible for a very high share of the consumed energy, which in effect contributes to global warming and climate change. Energy usage is on a gradual increase and thus, due to this reason, many projects are looking towards renewable energy sources like geothermal and solar energy.

Energy efficiency can play a major role in the future if the stepping stones are laid now. With growing energy demands, the best alternate fuel is - energy efficiency. Steadily increasing energy prices and the increasing supply-demand gap are going to create big challenges for the Indian economy. Energy efficient technologies will help address these challenges. We work closely with our customers to save energy through our energy efficient product range and solutions.



Smarter technology will be taking center stage, as everyone continues to battle for efficiency. There is more data available than ever before, allowing for better measurement via big data and analytics. We have to be on the lookout for simple-to-use, software solutions that make the job of delivering indoor comfort easier and more effective.

While incremental operating cost savings are being noticed with higher system efficiencies, options to upgrade to variable-capacity systems, and increased IAQ options are clearly becoming more broadly understood by the end users. With a good economic backdrop, this should continue to positively drive the HVAC segment.

In the long-term, the greatest potential for improving energy productivity will come from smart and sustainable cities with connected infrastructure where water, wastewater, heating, cooling, and electricity are integrated into one system.

How would you differentiate Indian HVAC markets from the global markets, while offering your services and products?

It would be inappropriate to generalize this difference. A better distinction could be made between countries which are developed, developing or underdeveloped. May be, not even that either. Different parts of the world have different set of factors influencing their market.

A developed nation may have better economic infrastructure as compared to the other two, they are not as price sensitive as a developing country. Despite higher financial potential a cold countries like USA or UK may have better environmental conditions and subsequently

lesser sustainability challenges. On the other hand, Middle East, Asia and Africa despite having extreme conditions have enough sources to afford niche sustainable solutions. In a country like India, most of the customers are price driven, their reluctance and risk consciousness pose a major challenge to encounter. With global warming, the need for sustainability has become stringent in our country too. Thankfully we seem to have enough resources to fight it out.

What opportunities would you envisage for your company with the Indian Government's focus on development of infrastructure like smart cities, urban transportation projects?

Infrastructure development initiatives (such as Metro rail network across the country, Smart Cities, etc.) from government have certainly given rise to massive business opportunities. New entrepreneurs are getting fair chance to contribute to this development and growth of their own. It also calls for local manufacturing from players around the globe resulting in more tie-ups, mergers and acquisition enhancing the overall economy. These initiatives have transpired in producing scope and introduction of modern technologies in the country.

Moreover, with government initiatives to promote the 'Make in India' concept has heightened manufacturing activities and infrastructure development in the country and with the growth in FDI (Foreign Direct Investment), several international players are starting operations in the Indian industry, which will further fuel the country's HVAC market. Economic tailwinds combined with a business-friendly government at the center should

accelerate the growth of the HVAC business as well

What are the main challenges facing the HVAC segment in India?

There is a need for testing labs and Centers of Excellence across India which can provide an opportunity for students and faculty to relate theoretical knowledge with practical functioning and better understand applications of equipment's that are used in the HVAC space.

How do you see the future of HVAC Market?

The market for technology in the HVAC market is rapidly ever-changing. Developments for future technology focus on convenience and user experience. Although the evolution of these products in HVAC may be in their infancy, most organizations are predicting that user experience will define the industry for years to come. The emphasis on convenience is creating increased demand for technology that may not even exist yet.

The trends of the HVAC industry will continue to reflect the demands from the consumer and product safety. Technology will drive most, if not all, of these advancements. There is a parallel of service and product offerings from other industries which is helping to drive opportunity and innovation within the HVAC industry.

Smarter technology will be taking center stage, as everyone continues to battle for efficiency. There is more data available than ever before, allowing for better measurement via big data and analytics. We have to be on the lookout for simple-to-use, software solutions that make the job of delivering indoor comfort easier and more effective. Those who ignore new technology do so at their own peril.

For example, traditionally most devices have been connected using wires, but HVAC is also finding ways to shed the cords. The new IoT systems have expanded their multi-protocol to include new Wi-Fi control modules and integrated support for BACnet/MS-TP. The converged building and lighting control network supports both wired and wireless devices. ■

Whole Foods Installs Thermal Refrigeration Battery

Whole Foods facility managers now get real-time information on the system's performance via Axiom's integrated cloud-monitoring platform, which includes enterprise-level monitoring and analytics, historical data, and real-time key performance indicators such as kilowatt-hours shifted, peak kilowatts reduced, and battery charge level...

A Whole Foods Market store in Los Altos, California, has received the first installation of Axiom Exergy's thermal energy storage solution, the Refrigeration Battery. According to Richmond, California-based Axiom, "The project successfully demonstrates the viability and potential of (our) energy storage solution by shifting up to 1,040 kilowatt-hours of electricity load at the facility for up to 10 hours a day over the course of several months," without any changes to staff behavior or daily operations.

Whole Foods facility managers now get real-time information on the system's performance via Axiom's integrated cloud-monitoring platform, which includes enterprise-level monitoring and analytics, historical data, and real-time key performance indicators such as kilowatt-hours shifted, peak kilowatts reduced, and battery charge level.

"We are proud to be leading our industry by being the first to use such an innovative technology to shift our large refrigeration-

based energy loads to off-peak hours," said Tristram Coffin, Director of Sustainability and Facilities at Austin, Texas-based Whole Foods, which he noted "has a reputation for piloting and implementing sustainable solutions that also improve facility operations. This pilot is consistent with these efforts."

Refrigeration accounts for as much as 55 percent of an average supermarket's electricity consumption. By shifting electricity demand to off-peak hours, supermarket owners can avail themselves of lower night time rates to lower a store's costly on-peak electricity demand by up to 40 percent.

"The Refrigeration Battery is no longer a concept, it is a commercial reality," said Axiom President and Co-Founder Amrit Robbins. "By deploying the Refrigeration Battery, businesses can convert power-hungry refrigeration systems into intelligent assets that can respond dynamically to the needs of the facility and the grid operator, taking into account energy prices, weather patterns and grid programs like demand response."

The installation was done as a passive retrofit without modification of the existing refrigeration system or reprogramming of controls. The Axiom system integrator went in the facility's mechanical room, next to the compressor racks while the thermal storage tanks were placed in the loading-dock area behind the store. By using the store's existing refrigeration system, the Refrigeration Battery stores cooling at night by freezing tanks of salt water when energy costs are low. When electricity prices peak in the afternoon, the battery "discharges" to provide uninterrupted cooling services. The technology has an estimated lifespan of 25 years.

"Given the unique shape of a supermarket's demand profile, which is relatively flat compared with other commercial buildings, Whole Foods Market needed a cost-effective energy storage solution capable of providing long-duration load shifting, as opposed to peak shaving typically provided by electrochemical systems," explained Axiom Chief Technical Officer and Co-Founder Anthony Diamond. "By demonstrating consistent, daily electricity load-shifting, the Whole Foods Market installation marks an industry first and game-changer for facilities with large refrigeration-based energy loads."

Additionally, Bentonville, Ark-based Walmart has selected the Refrigeration Battery for installation at a store in Escondido, Calif. ■



Sustainability through Building Management Systems

Building Automation System (BAS) includes aspects of green buildings like efficient HVAC system, lighting, envelope, glass etc, and further enhances the performance of these systems through regular control & monitoring. These aspects interlink energy, buildings and the environment together and converge into green and intelligent building concepts...

Sustainability is primarily driven by environmental attitude and leadership. With various other goals of sustainability, building automation and control systems can help enhance the green status and ensure specific tangible results along with other measures. Building automation has been passively included in the prevailing green certification programs though not directly on fore front. Indirect credits are related to building management system that holds a high potential lies in the system to achieve credible results with existing credit heads for green buildings.

Building Management Systems (BMS) are computer-based control systems with

software and hardware applications that control and monitor a building's mechanical and electrical equipment such as ventilation, lighting, power, fire and security systems. The system originated in the 1970s when energy efficiency started gaining emphasis in the industrial sector. With the advancement of technology, the demand for energy efficiency rose and formulated the onset of BMS. The usage of BMS in green buildings optimized resource efficiency and hence, resulted in intelligent and responsive building systems. The recent boom in green buildings has further accelerated the capabilities of BMS. The mention of intelligent or smart buildings

has further evolved the concept of smart city. Thus, the application scale for the system can range from a small scale to large projects.

Incorporating a BMS in a building can effect in an insightful reduction in energy usage with enhanced efficiency. A green building interior work environment of an office space should be efficient, productive, comfortable, safe, healthy and aesthetically pleasing. Planners and designers often design the space to meet the comfort levels and perform with optimum levels for all these factors. Building automation system (BAS) helps them to operate at the right efficiency with reasonable operating costs. The comfort levels are enhanced with the system further enhancing the productivity. The tangible benefits can thus be realized with the system for superior energy efficiency, low operating and maintenance costs, enhanced indoor air quality and enhanced occupant comfort and productivity.

Building Automation System (BAS) includes aspects of green buildings like efficient HVAC system, lighting, envelope, glass etc, and further enhances the performance of these systems through regular control & monitoring. These aspects interlink energy, buildings and the environment together and converge into green and intelligent building concepts. The building management system (BMS) is the key element of 'intelligent buildings' as it controls, monitors and optimizes building services operations comprising of lighting, HVAC, security, CCTV & alarm systems, access & attendance system, audio-visual & entertainment systems, filtration and climate control. BMS is now used to automate all resource and gives an evident picture of the usage and savings in a central control server room as well as partial controls. BMS can be integrated in



the specific situations like night time purging for cooling the building, chiller management, lighting controls, speed control of chilled water pumps based on heat loads etc. BMS can also help to ensure the comfort and health of a building's occupants by automatically monitoring the amount of fresh air that enters a space. Sophisticated BMS systems can also track the occupancy status of each zone and accordingly adjust fresh air flow.

The various green building rating systems have also acknowledged the benefits of BMS for the collection and standardization of data to set a threshold of resource usage in any particular typology of buildings and have introduced various points associated to the BMS directly or indirectly.

According to CII IGBC, a fully optimized BMS can save operational energy cost to the extent of 15-20% as compared to a building without BMS. CII-Godrej GBC, which has achieved platinum green certification with LEED USGBC, performed a detailed study of the energy consumption of the building with and without the BMS. The results reveal that there is a clear energy saving of 13%, when BMS is in operation.

Total power consumption: (in defined conditions)

- Without BMS: 479 kwh/day
- With BMS: 415 kwh/day
- Savings: 64 kwh/day

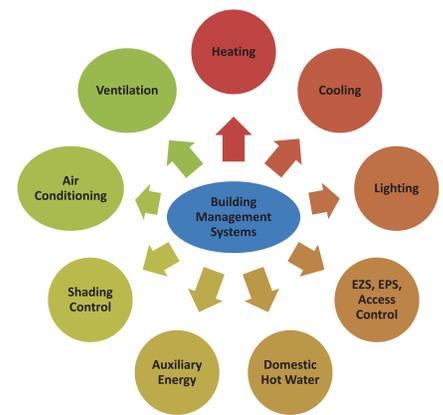
Apart from usage of BMS on a building level, USGBC LEED version 4 has introduced a pilot credit 'demand response' in which comprises a central server which collates data for resource usage and formulates strategies on a macro level through load shedding or load shifting. Demand response strategies encourage

electricity customers to reduce their usage during peak demand times, helping utilities optimize their supply-side energy generation and delivery systems. The input for this strategy comes from the building management systems directly.

By reducing overall demand for electricity, demand response helps utilities avoid building additional power generation facilities, transmission lines, and distribution stations, thereby, avoiding some of the environmental effects of energy infrastructure and consumption. Demand response also helps balance the contribution of renewable energy sources. For example, on calm days or at night, when renewable sources such as wind and solar are less available, grid operators must either find additional generation sources or influence energy users to lower demand. Demand response achieves the latter, balancing system wide usage and reducing the need for non-renewable backup generation. LEED USGBC promotes a dynamic plaque that is linked to the BMS and everyday results for savings can be monitored. They have additionally facilitated that the rating can be enhanced with better results and a silver project avails the possibility to rise up to platinum level with required results.

The typologies that can include the system ranges for all possible typologies and the system design can be modified on the basis of the requirements. Residential sector systems can focus more towards the safety and environmental control in extreme climates and helps maintain optimum comfort conditions.

Smart buildings are gaining more importance in the construction world due to the flexibility further integration of elements like renewable energy. Standards



have evolved to counter the barriers towards integration and hold the abilities to deliver more cost-effective business services. Architectures provide the newest and probably the final step in the evolution by providing a converged network against isolated entities. The adoption of an integrated building architecture provides benefits throughout the building lifecycle to all the users. Today, BMS is not only an added feature but an integral part of the entire building services. In a green building, the system helps to achieve the desired benefits with the certification program and reveal the tangible results with integration.

Hence, an BMS inclusive green building not only has an efficient building envelope, premium star-rated equipment and efficient lighting, but also the systems, controls and automation needed to provide improved scheduling, coordination, optimization, safety and usability, while being in harmony with the environment in total control. ■

Anshul Pranay Gujarathi

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Green Building Not a Green Wash

Comprehensive regulatory framework is needed to ensure that all resource intensive buildings remain resource and energy efficient when in operation. This requires a legal framework for post-construction performance, accountability and transparency to ensure that the buildings remain high performing...

The green rating system for buildings, originally, conceived as a market based voluntary system, is now becoming a proxy for regulations. This demands serious evaluation of intended benefits and unintended consequences. There is growing obsession among the state governments across the country to offer sops of extra and free built up area and fiscal incentives to push the developers to opt for green rating of buildings. State governments are doing this without setting

up independent, transparent and accountable oversight system for monitoring of the actual resource savings and environmental performance of the green rated buildings. At the same time the rating is confined to very small numbers of buildings and not capable of influencing the 60 per cent of India yet to be built.

In itself green rating of buildings is an important market based instrument expected to stimulate market demand for resource savings and efficiency. Private

voluntary rating systems are based on established criteria for energy and water savings, waste minimization, green areas and site planning. This helps to disseminate green building practices. Developers also see a 'reputational advantage' in marketing improved environmental performance of buildings. Aware consumers can also accelerate the change.

However, questions arise when regulators begin to look at rating systems as a regulatory tool to promote sustainable building practices. As rating system include wide range of sustainability criteria related to water, waste, energy, material, green spaces and site, that are often difficult to package as a single regulatory instrument for enforcement, policy makers find it attractive to provide policy backing to voluntary private rating systems. But as a policy tool, it raises crucial questions



related to scale of application, effectiveness of implementation and compliance strategy to ensure real resource savings from rated buildings when in use. If this is not addressed, it will only stoke business interest in rating without commensurate environmental benefits.

Several state governments are providing support for adoption of rating. Noida in Uttar Pradesh allows 5 per cent extra floor area ratio (FAR) to projects which sign up for green rating. 60 per cent of all projects in Noida are availing of this incentive. West Bengal has notified 10 per cent extra FAR as incentive for GRIHA an IGBC rating. Bhubaneswar grants extra 0.25 floor area ratio as an incentive to developers for ECBC compliance. Rajasthan allows 5 per cent extra FAR for 4-5 star rated buildings etc. Maharashtra cities of Pune and Pimpri Chinchwad instead of giving incentive in the form of extra built up area it has opted only for fiscal incentives that can be withdrawn if needed. This is a better practice than giving the extra built up area as once constructed it cannot be undone if found underperforming.

On the other hand, the Union Environment Ministry and several state governments allow fast track environmental clearance to buildings that are pre-certified for GRIHA and LEED. But there is no legal system in place to hold developers accountable for actually undergoing and completing the rating to get the final environmental clearance. These schemes suffer from weak penalty for non-compliance. Only Mumbai instead of giving incentives it is working on green code for all buildings. The Maharashtra system can be further improved to be more explicitly linked with the actual performance.

Reality Check

This trend towards regulatory support for green rating of buildings has made it necessary to review the impact of green rated buildings on actual resource savings during building operations. But this system is opaque. There is very little information in the public domain on the green measures,

costs and paybacks. As a result, public understanding of green rated buildings and their benefits remains poor. Responding to this public concern, the Indian Green Building Council (IGBC) volunteered to share the energy and audit data of the buildings rated by them under the LEED rating programme a few years ago. GRIHA shares limited data on the grounds that that they are contractually bound not to share the audit reports of projects.

Sometime ago the Centre for Science and Environment reviewed the data put out by the IGBC on energy consumption of large commercial buildings that were rated and awarded silver, gold and platinum rating, under the LEED green rating programme. It found several of these buildings to be grossly underperforming. Several of them – one third - could not qualify even for the one star label under the energy star labelling programme of the Bureau of Energy Efficiency (BEE) that ranks buildings based on their operational energy efficiency. The purpose of this analysis was to find out if the rated buildings, once they are operational, can meet the requirement of the energy star labelling programme of BEE.

This has serious implications. State governments are giving extra free built up area without independent official monitoring and oversight of actual energy and resource savings in green rated buildings. As mentioned earlier, several state governments including West Bengal, Noida in Uttar Pradesh, Rajasthan, Punjab among others have promised extra built up area to the developers and put the entire onus of monitoring and certification on rating agencies. Currently, both Pune and Pimpri Chinchwad offer discount on premium paid by the builders to municipality and rebate on property tax paid by the owner of the green rated buildings. The quantum of incentive is variable according to the number of stars under GRIHA rating. Even one and two star rating gets some incentive. There is no provision for penalty for underperforming. After the final rating is awarded based on the one year audit there is no further requirement of periodic audit after the

building becomes operational.

In response to a RTI from CSE the Noida authority responded saying that they have no official record of how many buildings have availed of green buildings incentives. There is no official oversight. State governments that have given incentives do not maintain record of green credentials and resources and energy savings of these buildings enjoying the official incentives. Thus, governments are giving incentive for green building without keeping any record on their actual performance.

The compliance is based entirely on self reporting by builders and rating agencies without independent official oversight. Even penalty for underperformance is linked to self reporting. Thus, green rating is becoming a proxy for green building regulations without any official system of monitoring of the green credential and actual resource savings. This can lock in enormous inefficiencies and resource guzzling and negate the benefits of green rating at an enormous cost to the government. The incentive of 5 per cent extra free FAR in Noida is costing the civic body anywhere between Rs 16 crore to Rs 60 crore based on the current circle rates and the area that qualifies for incentives.

This trend in underperformance is quite consistent with the global trend. Even in the US, where LEED rating has originated, the LEED rated buildings were found to be underperforming. But this has led US LEED to reform its system and demand annual audits of all rated buildings. The US Green Building Council -New Buildings Institute study of 2008 showed wide variability in LEED energy performance which was a cause for concern. Of 121 buildings rated 53 per cent did not qualify for star label. A good number did not track energy consumption. In Canada study by the National Research Council Canada, in 2009 shows that on average, LEED buildings used 18-39 per cent less energy per floor area than their conventional counterparts. But, 28-35 per cent of LEED buildings used more energy than their conventional counterparts. This



is the challenge of relating predicted performance and actual performance. But the US LEED has further reformed the rating system in 2013 and now mandates disclosure and sharing of water and energy use every year and for at least five years. Otherwise label is withdrawn. India needs to take this up seriously now.

The fundamental question in India, however, is bigger. Why should only a few buildings enjoy incentives for meeting the established green norms for buildings and habitat when law requires all buildings to comply with regulations? An assessment of the requirements and criteria of the green rating system shows that several requirements of rating are also integral part of the legal requirement for buildings clearance and approval process. For example, under GRIHA version 3 rating of buildings get points for meeting rules under the eco-sensitive zone regulations, coastal zone regulations, heritage areas, water body zones rules, and various hazard prone area regulations among others. But these rules are already the minimum legal requirements that all buildings must meet as applicable, irrespective of whether they are rated or not. In fact, any standard building that meets the legal requirement under various provisions of existing laws in India can qualify for two star of GRIHA rating. It is also strange that government's own energy rating system developed under star labeling of BEE has not been considered for incentive by any state government. In fact, such a practice was initially considered in Punjab, Delhi, Noida but it was eventually dropped.

This, therefore, underscores the fact that incentives should be used only to

push the top line of performance and not to promote and create business stake in minimum green measures that should be obligatory for all buildings in any case.

Green buildings will deliver only if

there is transparent monitoring system with performance data in the public domain. Disclosure of data on annual energy and other resource usage in buildings are made obligatory by all state governments. The rating agencies are reluctant to share performance data. But any project enjoying support from the government – fiscal or otherwise - should have the obligation to be under scrutiny for performance and be transparent and accountable. Without stringent measure for performance private green rating systems are becoming proxy for environmental regulations and the incentives are becoming a privilege for the few whereas these requirements should be an obligation for all.

The Way Forward

Instead of incentivizing only a few buildings to go for rating, without proper official oversight and monitoring, adopt legally binding green building code for all buildings, link incentives only with top performance and super efficiency. India is locked in a frenzy of construction to meet the demand for homes, offices, and shops. A staggering two-third of buildings that will stand in India in 2030 are yet to be built. Unless policies minimize resource guzzling and wastes with appropriate architectural design, building material, and operational management for the entire building stock, there can be massive environmental debacle in the building sector.

Such a policy opportunity has emerged in India after the recent amendment of the requirements of environmental clearance for building sector by the Ministry of Environment and Forests and Climate

Change in 2016. Now all buildings with more than 5000 square meters will need to obtain environmental clearance for building approval and certification from the urban local bodies. This is an important opportunity to reform building byelaws to introduce a range of sustainability criteria that becomes part of building approval and certification system. This can scale up application of green norms across building stock. Andhra Pradesh has already taken to lead to reform its building byelaws for such a clearance process.

Message is clear. Only a few green rated buildings will not make a green movement. Comprehensive regulatory framework is needed to ensure that all resource intensive buildings remain resource and energy efficient when in operation. This requires a legal framework for post-construction performance, accountability and transparency to ensure that the buildings remain high performing. All cities must have regulations and oversight system for monitoring of actual performance of buildings; link incentives and penalties not only with the design of buildings but also with operations and performance. Make it obligatory for all buildings to disclose publicly the data on annual energy and water usage along with the built up area. Set quantifiable performance targets for different building typologies to reduce overall energy intensity and resource consumption over time. Introduce mandatory energy and water audit and consumption based energy and water billing to improve operational efficiency of all buildings.

Unlike the developed world, the challenge in India is not to retrofit the already built to make it green; but to build new, which is efficient, sustainable, affordable and comfortable for all. This will have enormous impact on the quality of urban space; water and energy resources in cities; and waste generation. ■

Anumita Roychowdhury

Executive Director - Research and Advocacy & Head of Air Pollution and Clean Transportation Programme, Centre for Science and Environment, New Delhi



UK's First Water Source Heat Pump for District Heating Unveiled

The UK's first inner city water source heat pump to heat an entire district of Glasgow will be developed by Star Renewable Energy. The 2.5 Mega Watt water source heat pump (WSHP) for medium temperature district heating will start pumping the water of the Clyde at the Gorbals by September 2018...



The River Clyde is leading Britain's industrial revolution once again, cutting carbon emissions by 50% through a renewable source of heating and hot water for homes and buildings in the legendary Gorbals area, on the south bank of the river. The UK's first inner city water source heat pump to heat an entire district of Glasgow will be developed by Star Renewable Energy. The 2.5 Mega Watt water source heat pump (WSHP) for medium temperature district heating will start pumping the water of the Clyde at the Gorbals by September 2018.

The £3.5 million industrial sized water source heat pump draws energy from the chilly waters of the Clyde and boosts it up to 80 degrees Celsius to cover over 80% of the buildings heat demand. The district heating network is set to deliver immediate carbon reductions, ensuring the district will meet the 2035 climate change goals 17 years early. The renewable project has been funded by a 50% loan from the District Heating Loan Fund and a grant from the Low Carbon Infrastructure Investment Fund (LCITP). The announcement of a renewable heat network in Glasgow has been welcomed by environmental organisations such as the WWF. Dr Sam Gardner, Acting Director of WWF Scotland, said, "Cutting our reliance on fossil fuels for heating our homes and buildings is the critical next stage in the journey to a zero carbon Scotland. This exciting new project by Star Renewables will apply tried and tested technology to draw heat from the Clyde that can then be used in sport centres, homes and offices. It is fantastic to think that having played host to the industrial revolution the Clyde can now be the source of renewable heat, helping to stimulate Scotland's part in the global low carbon

industrial revolution. The challenge now for Scotland is to build on this success as quickly as possible and move from projects to strategic deployment. With Scotland having no shortage of rivers or coastline near our towns and cities this technology could play a key role in not just tackling climate change but supporting job creation and investment across the country."

Dave Pearson, Director, Star Renewable Energy, said, "We are very pleased to have secured the support of the LCITP to bring a solution similar to Drammen back home, and hope to be able to offer heat at as low a price as can be achieved with gas boilers – but with less than half the carbon emissions and no NO_x or PM10 particulate emissions in the city. This project sends a message to everyone that heat pumps work and deliver now what we need for 2035 – no need to take half step and change later."

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Power Conservation in Residential & Commercial Buildings

India's climate suited the human peak hour productivity per day because of the ambient temperature near to our body temperature at 37 degrees C plus /minus 5* degrees C, that is 32 to 42 degrees C with comforting RH of around 55 %. The sustained productivity per day was much better compared to other regions in the globe. And of late, this is going down now due to excess food intake mixed with sugar & spice and little physical output making us, unhealthy. We are applying the same parallels to optimize the power input to the AC machines in our buildings now...

Energy conservation in residential & commercial buildings can be achieved by following steps by all of us, the user, the AC vendor to give efficient AC & educate the user to conserve and the Government to target reduction in AC usage in buildings.

1. Reducing Excess EB voltages in the day & night, in peak & non-peak hour segments,

2. Half the building's load is AC which needs fine tuning in AC machine efficiency,
3. Air conditioned air circulation in the user area by combining BLDC fan breeze,
4. Alter the AC comfort temperature settings to human users by combo effect of AC + FAN usage,

5. By following the BEE mantra as monitor to target energy & run hour reduction by the user,
 - India's climate suited the human peak hour productivity per day because of the ambient temperature near to our body temperature at 37 degrees C Plus / Minus 5* degrees C, that is 32 to 42 degrees C with comforting RH of around 55 %. The sustained productivity per day was much better as compared to other regions in the globe. And of late, this is going down now due to excess food intake mixed with sugar & spice and little physical activity making us unhealthy. We are applying the same parallels to optimize the power input to the AC machines in our buildings now.

Residential & Commercial Buildings' Energy Consumption

- In the residential & commercial



electricity consumption, we have to focus here in our daily running AC, where we are losing more energy in our 1000 to 2000 watt rated air conditioners. We are eager enough to replace our 55 watts tubelight to 18 watts LED tube light, as this is energy saving and improving the illumination inside premises appreciably. But more to that, we can concentrate on our 2000 watt energy gulping AC. If we reduce by 400 watts per hour and say 4 units per day on its 10 hour run, i.e. 20 % in our daily usage of AC, then it is huge saving for us individually, for the local EB grid & nation.

- The commoner thinks that the ceiling fan is a luxury, but is a necessity. But, the rich man must think that the air conditioner is a luxury but, not a necessity all the times of day. But he can combine the poor man's AC that is ceiling fan along with AC and get better comfort than AC alone. Air conditioning by AC consumes 20 times more power than the power consumed for air circulation by ceiling or fresh air fans. Let us live by adhering to the nature surrounding us, at the same time mildly comforting ourselves first by air circulation only, then only by air cooling utilizing the ambient bulb temperature characteristics.

- One of the main reasons for EB national crisis today is due to poor supply and excess demand in summer months of year. Apart from drop in efficiency in generation at EB, the excess demand is due to rise of air conditioner loads. The only way to the consumer is to reduce the national EB grid supply demand gap in electricity by curbing the usage of AC in our premises.

Ceiling Fan Mandatory in Air Conditioned Area

- The ceiling fan is comforting the man by two ways namely by evaporative cooling and by air circulation. To achieve both the functions, the fan has to breathe in, more from its top area under the ceiling. Here, we can increase our comfort levels by better circulation first and next by evaporative cooling from the fan by increasing the down rod size from 10 inches to 18 inches for 10 feet height building, 2 feet and above if the height of building is 11 feet and above. Visualize our old buildings with 11 to 14 feet ceiling height are always cooler than the modern day homes.
- Check the air breeze from the fan is felt on the floor or at the side walls and escaping out through windows. Are we getting blast of air or gentle & smooth

air breeze? If air is breezing through us, it comforts us by evaporative cooling and it is healthy too. A heavy noisy fan is unsafe to sit under due to noise pollution and electronic regulator retrofit can aggravate the noise more! Either service the fan, replace the old bush with new bearings to reduce power & sound. Otherwise, please go in for 5 star fans or the latest BLDC fans that consume only 30 watts now. That is a better option now.

- BLDC ceiling fans have proved to give more than 50 % savings compared to conventional fans and it is all the more saving in VA when the power cuts are more and invertors come on line. This BLDC fans + LED bulb or tubelight which consume only a quarter VA and last for longer hours on the inverter during power cuts. (Please see the image of old fan and new BLDC fan.) The energy savings by latest 5 Star & BLDC fans is possible, because as the user, we are compromising with the static pressure. But for the static pressure, these fans achieve better heat transfer by air circulation that is what the users get accustomed now. The same idea is extrapolated to the 20 feet diameter HVLS High Volume Low Speed fans that have come to the market now. HVLS fans have started



Practically we use mid position 3 in our ceiling fans.

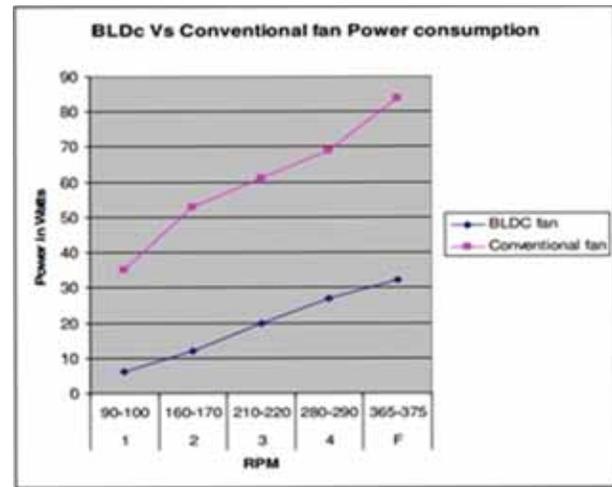
BLDC fan consumes only 11 Watts

ONLY 25 % power of what our existing fan consumes.

Knob Position	1	2	3	4	5
Old Fan Watts	18	33	46	56	67
BLDC Fan Watts	3	6	11	20	31



Classic example of Energy Efficiency from the old ceiling fan to the latest BLDC fan workings now.



This BLDC fan consumes one unit of power after running for 100 hrs, where as AC consumes one unit in one hour.

replacing multiples of ceiling fans in big hall area application and improve the comfort.

- The ceiling fan especially the BLDC type needs to be mandatorily fitted in AC room or hall application. Human is comforted by the temperature, that is 10 °C less than 37 °C, the human body temperature. Hence, raise the AC setting to 27°C from 22 °C and this gives minimum of 10 % electricity savings. But as a mandatory measure, install a BLDC ceiling fan and operate the same at mid position, thus, consuming 10 watts only, and effectively air is circulated from top to bottom only, and not scattered to outside. This practice increases the human comfort because of mild cool air breeze circulated around our human body.
- Using ceiling or room fan allows you to set the AC thermostat higher because the air movement will cool the room. AC without room fan will make the cooled air throw at one area and hot pockets in other areas in the room are not medically good to us. Practically felt, it is really the smaller blade ceiling fan + AC are comforting the humans now.
- Classic example of energy efficiency from the old ceiling fan to the latest BLDC fan workings now.
- This BLDC fan consumes one unit of power after running for 100 hrs, where as AC consumes one unit in one hour.

Air Conditioners

- In the residential electricity consumption, out of the total say, 20 units per day consumption, and more than 10 units is consumed by the AC. If the same AC is monitored by just retrofitting single phase static watt hour meter costing just Rs 400/- (ISI branded static watt-hour single phase rated 5 to 30 amps), then we can have day to day control of AC electricity consumption in domestic and commercial buildings, instead of annoying over inflated monthly EB bills.
- Also we suggest that AC OEMs can add this hour usage meter as an integral part of the indoor AC. This will show AC machine total run hours and the AC compressor run hours happening due to cut-in-cut-out to show the AC user how effectively he uses his AC in his premises. When the user buys star rated AC for Rs 30,000, the OEM is suggested to integrate this hourly usage meter (this will cost only few hundred Rs only) at the indoor unit of their split AC.
- Thus, the AC OEM can help the consumer to monitor the AC & its compressor run hours in the usage. This is what BEE says "Monitor your energy usage to target the reduction of the same." The consumer will be made aware of the AC KW consumption per hour in its total run hours, and relatively

compare his AC efficiency with others around for the given same application like bedroom, office cabin, computer room, etc.

- AC OEM is giving now, the energy efficient inverter AC and is more efficient in usage compared to 5 star rated AC. Now many existing AC users are using retrofit electronic gadget costing only few thousands to their AC so that the gadget's sensor-driven software algorithms are designed to detect the AC compressor's thermodynamic saturation and optimizes the same. In fact, this retrofit is a sensible move taken by the AC user and this gives around 20 % savings in the existing rated AC. Instead of going for new inverter duty AC, this is a low cost option available to you in between, to optimize your AC running cost.
- Keep your AC healthy by routine servicing & improving the heat transfer at the evaporation coil and at the condenser coil outdoor first. Fine-tune the AC setting temperature and check for the Freon healthy pressures at suction and discharge. If your AC fails in many of the above aspects, then it needs replacement. Replacement option is given priority only to an AC with defective internals as mentioned above, where the energy conservation is not possible as shown in its energy meter now.



• In AC usage, everyone is accountable to local & global warming. First the AC user, as electricity consumer, and next the AC OEM who had given previously, the energy-inefficient AC, and last but not the least, the Government, which needs to promote mandatorily, the energy conservation in AC, AC machine hour & KWH monitoring, star rated AC promotion and sales tax reduction in Star rated AC & other energy saving & monitoring gadgets.

Word of Caution: This KWH meters' image does not promote or canvass its brand. Because of the price affordability at Rs.400/-, its image is displayed here. Green lit digital power guard is a portable type costing Rs 2000/- displays the W, VA instantly when plugged to any appliance at its power socket.

Why AC daily power consumption varies?

Even when the same AC runs for nearly fixed hours of the day, still the AC consumption in domestic or commercial buildings varies due to many factors namely:-

1. AC indoor temperature settings are set from 20°C to 26°C now suiting to individual needs.

2. AC evaporator filter gets clogged, goes unnoticed; and to clean the same once in two weeks.
3. Condenser coils getting choked over a period of few months to years, to clear the dust first.
4. AC outdoor unit can be torched under the Sun or we can comfort the same by weather roofing.
5. The refrigerant leaks minutely over a period when not noticed; AC runs more hours to cool.
6. The AC compressor run hours vary due to operating for more hours or more people inside.
7. The conditioned air when leaking out of premises, forces the AC compressor run fully.
8. Heat source like fridge, deep freezer has come inside premises; increase the AC run hours.
9. Higher ambient outside and solar heat ingress from the roof increase the AC run hours.

Applications of Relative Monitoring

- Relative condition monitoring of air conditioners
 1. If more ACs are installed inside the same premises.

2. When the AC is serviced, the daily KWH reduction before and after the service done.
 3. When ACs are serviced to give more attention to service to Excess power consuming AC.
 4. Same area cabins and same size AC why still the varying KWH consumption can be studied.
 5. KWH reduction can be noticed instantly on every AC in-house efficiency improvements.
 6. In case of Freon overcharging, KWH consumption increases first to show impending breakdown.
 7. If the stabilizer malfunctions or due to heavy voltage variations, the KWH varies.
 8. If two AC at the same premises are 3 star and 5 star, the 5 star savings can be confirmed by monitoring.
- The outdoor unit operating in the shade will consume upto 10% less electricity than the same one operating in the sun. The high side of the split or the back side of window AC can be provided with cost effective shelter. AC efficiency improves and it can be seen in the proposed AC machine run hour meter.
 - Clean the air-conditioner filter every

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week or month depending on usage. Clean the fins once in a month. A dirty air filter reduces airflow and may damage the unit. Clean filters enable the unit to cool down quickly and use less energy. Dirty filter makes you sick too. Today buy a spare Air filter @ Rs 100/- and keep it ready as active standby. Now you have the time & effort later to clean the removed filter with detergent water leisurely not in a hurry, thoroughly and effectively. You can keep it ready for next day and insert the same whenever required.

Fridge & Other Appliances

- The only appliance working for 24 hours in a day is our fridge. With daily power cuts, it is safer to fix a time delay model voltage stabilizer (preferable with voltmeter) and high low voltage cut-out options, to the fridge. The fridge needs not daily face high voltages during resumption after power cuts. This applies to sophisticated electronic gadgets, lighting in domestic & commercial areas. Ice formation inside the fridge freezer is energy loss. Make use of the summer and winter settings of fridge thermostat so that fridge is set to optimum cool temp twice a year. Loss through higher cold temperature settings increases fridge run hours daily.
- The power cuts happening now force us, to keep our stabilizers guard active. Whenever power cut is over and on resumption, high voltage comes in and only after loading from the consumer ends, the voltage drops say from 250 to 220 volt gradually, for example. This is hazardous to our appliances.

Especially, in some areas, the night voltage stays high above 250 volts, where as in day time it is normal. Fridge, AC & TV are equipment used for more hours in house. So, it is better to install a matching stabilizer to each of the above. The stabilizer to have time delay in giving output to appliances.

- Instead of fixing an individual Automatic voltage stabilizer for individual fridge, TV, audio etc gadgets now, it is prudent to install a higher KVA Automatic voltage stabilizer at the incoming itself. As all the downstream equipment are safe and power saving in the output volt band of 200 to 220 Volts Ac i.e. at 210 Volts + or - 5 % , it is suggested that the stabilizer OEM to limit their output variation as above and not more % than that.
- The OEMs have to give a priority in watts and VA saving first. Existing stabilizers buck only after allowing the output to surge to 270 volts, so as to buck to 240 volts. All our appliances are put to over voltage strain, especially, at night facing above 250 volts always and consume more watts & VA. We need this stabilizer not only for our appliances safety but also for their power saving too. The stabilizer OEM must ensure energy saving & optimized output, then automatically, the safety protection gets achieved from this stabilizer. The Government to approve of this energy saving output aspects especially in the stabilizer manufacture.

Govt Can Promote Appliance Sale By Combo Schemes Prioritizing Energy Conservation
Summarizing above points towards

energy conservation by the user, Government can initiate for combo schemes through vendors:

- When the AC vendor sells one AC, the Government can guide to sell along with, one BLDC fan. In addition to this, the user can be advised to have one KWH meter, one run hour meter, one automatic voltage stabilizer, one aircon saver, one spare AC air intake filter, so as to reduce the consumer's AC running power cost upto 30 % from the existing full load consumption.
- When the vendor sells Fridge etc appliances, the Government can guide to sell automatic voltage stabilizer either to fix near the fridge or better to fix now, the above Total Automatic voltage stabilizer at the Lighting EB Incoming 5 Amps rated circuits.

Conclusion

- Thinking & acting on conservation measures catalyzes our social responsibility, caring for others and sacrificing our selfish comforts. When we are safe and healthy, conservation prevails. If safety fails, conservation fails and pollution starts. So comfort our AC machines to get more input power savings, first target the input power to appliances, and reduce the same, monitor the individual energy consumption & optimize the same, thus paving for greener environment. ■



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Entire c.pCO Range Now BACnet® B-BC Certified

Guaranteed conformity to the BACnet® protocol when using CAREL products in building automation and system control applications...



CAREL, a multi-national specialising in control solutions for air-conditioning, refrigeration and air humidification, has announced that its entire c.pCO range of controllers has received BACnet® B-BC certification, confirming the reliability of the communication protocols used.

Developed starting from 1987 under the aegis of ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers), BACnet® is the first and only true open data interchange protocol for building automation. Certified use of the BACnet® protocol therefore guarantees perfect interoperability between equipment and control devices for BMS systems made by different manufacturers.

"In recent years, we have seen increasingly rapid progress towards network-connected high-efficiency systems to improve management and save energy" – stated Francesco Pesce,

Programmable Controllers Platform Manager – "The BACnet® protocol has been supported for many years on our optional cards and monitoring solutions, ensuring integration of CAREL's products into the building's systems. Now, we have decided to make further investments so as to integrate our controllers with BACnet® as standard, making it the main connectivity reference for our high-efficiency solutions. Having the entire c.pCO range of programmable controllers B-BC certified is an important achievement. This certification means we can guarantee our customers the highest reliability in efficient, high-performance and technologically-advanced connected systems."

BACnet® International is an organisation whose task is to continuously update and maintain the protocol, while at the same time promoting its correct use across the building automation sector through interoperability testing, educational programs and promotional activities. Each member is encouraged to contribute ideas, resources and suggestions for the continuous evolution of the system, to the benefit of the entire BACnet® community.

"We work very closely with BACnet® International, whose activities are fundamental in the areas of building automation and integration", Pesce continued. "Indeed starting this year we have decided to become a Gold Member, further underlining CAREL's commitment to a sector we have been leaders in for more than forty years." ■



Reducing Energy Consumption Goals in California

The Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab) has launched two projects to help the state meet its ZNE building goals...

California has established ambitious goals to reduce energy consumption in buildings, including a policy goal for all new residential buildings to be zero net energy (ZNE) by 2020. Now the Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab) has launched two projects to help the state meet its ZNE building goals.

One project will provide detailed cost and performance modeling of ZNE homes and identify barriers while the other seeks to ensure acceptable indoor air quality in ZNE homes that use natural gas. The California Energy Commission (CEC) is providing \$2 million in funding for the two projects. The DOE's Building America program is also supporting the air quality project, the results of which will inform DOE's Zero Energy Ready Home program.

ZNE buildings essentially generate as much as they consume on an annualized basis, and California has led the way in the United States in laying the path towards ultra-low energy buildings. Carbon dioxide emissions from residential and commercial buildings make up about 23 percent of the state's overall greenhouse gas emissions, of which about 14 percent are from electricity generation sources and 9 percent from building heating fuels.

"Getting to zero net energy will be a process," said Berkeley Lab researcher Brett Singer, who is leading the air quality project. "These two projects will help the state with both its near-term ZNE goals as well as longer term strategy."

California has approximately 9 million single-family homes and 4 million multifamily units, according to the CEC. An estimated 50 percent of existing buildings in California were built before California Building Energy Efficiency Standards went into effect in 1978. Doubling the rate of energy savings from building efficiency projects would result in lower total building energy use in 2030 than in 2014, despite population and economic growth, and is equivalent to a 17 percent reduction in usage compared to projected 2030 levels.

California has just a few hundred ZNE buildings now, while the number of new housing starts is roughly 100,000 a year. "On the face of it, it seems like a quantum jump, but the state is preparing through existing standards, driving towards that objective," said Max Wei, a Berkeley Lab researcher leading the second ZNE project.

Future homes: gas or electric or both?

Getting to zero net energy usually involves both reducing



demand as well as providing on-site energy generation, often with solar panels. However, different building types present different barriers to adoption, whether technical or economic.

Wei will analyze the cost-effectiveness of various approaches to lowering energy use in single family and multifamily homes, such as comparing all-electric homes to homes with gas-based heating. "If we want to achieve deep carbon reductions then ultimately we want to sharply reduce or eliminate natural gas consumption," Wei said. "Another key modeling area is energy storage and demand response and how these could be implemented to lower overall costs."

For example, Wei will investigate the cost implications of an entire neighborhood or community that does not have any natural gas infrastructure. Another question he will be looking at is how to implement offsite renewable generation. "There's the concept of community solar or shared solar—they're emerging business models," he said. "Maybe it's across the street, in a parking lot, or further away. How would you implement that, and what are the costs and benefits?"

Wei will produce modeling and scenario results for various climate zones with the goal of informing future ZNE policies. One key activity will be a detailed survey of builders on current and expected future costs. "For example, if we find that all-electric homes are more cost-effective in some regions of the state, then that would be an interesting finding," he said.

Nearer term: mitigating kitchen pollutants

For the foreseeable future, California will continue to build homes with gas-based appliances, and as those homes get more energy-efficient, usually by being "tighter" or less leaky, ventilation becomes a more important issue. The second Berkeley Lab project will look at how to provide ventilation to maintain indoor air quality in these airtight homes.

"The kitchen generates a lot of pollutants, especially in homes with gas burners," Singer said. "We want to efficiently remove those pollutants where they're generated so we don't waste energy over-ventilating the whole house."

Pollutants in the kitchen are generated both from cooking food as well as from the burners themselves, especially gas burners. Berkeley Lab researchers have found hazardous levels of pollutants such as nitrogen dioxide and particulate matter in many homes. Of course, a technology to address these pollutants ostensibly exists—the range hood.

"This project will help the state to set requirements for kitchen ventilation that effectively solves the problem of cooking-related pollutants," Singer said. "We will study it experimentally and through simulation." Berkeley Lab's indoor air team has been doing research in this area for years, everything from evaluating different kinds of range hoods to surveying consumer behavior on why people do or don't use them. Their testing has found that many range hoods remove less than half of burner pollutants. ■

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*Proposed

Cooling Tower Performance Management

The cooling tower is a relatively easy to maintain device and is relatively simple to operate and maintain. Thus the incentive to operate the cooling towers at their peak design level are very high, and creating a performance management plan for the cooling towers will go a long way in getting the best out of the HVAC system of the building...

Since time immemorial, water has been used to cool spaces by using the evaporative properties of the medium. The humble “desert cooler” used in most Indian homes in the northern part of the country showcases how effectively and at relatively low cost, water can be used to provide the occupants a better environment to work or live. Water, thus, has an important part to play in a majority of HVAC systems used in offices, malls, hospitals, industries etc. Cooling towers are essential and critical components of water cooled chiller systems. The functioning of the plant depends on all the components working as close to the

design values as possible but the correct functioning of the cooling tower has a major contribution to the overall plant operating to the expected parameters.

While the importance of the cooling tower is known to the designer and a considerable amount of time, effort and money is spent on selecting the most appropriate cooling tower for the plant, the same amount of attention is not given to operating and maintain the cooling tower during its life. The main reason for this state of affairs is the lack of awareness of the importance of the cooling tower in the HVAC system of a building. Since the cooling towers are usually placed on

terraces and are not in front of the operators, their maintenance takes a back seat, with an approach of “run to breakdown”. Considerable savings can be achieved if the cooling tower is operated and maintained with as much care as the main chiller.

Measuring to Manage

A very famous management phrase that is equally applicable to the topic of cooling tower performance is “What is not measured is not managed”. Since cooling towers are not in the plant room where the maintenance team spends most of their time, the focus on the cooling tower maintenance is usually less than what it is on other equipment of the chiller system – pumps, main chiller, panels etc. Modern chillers have state-of-the-art control systems that measure hundreds of parameters of the chiller and associated systems, giving data on gas pressure, water temperatures, electrical current etc. There are, however, rarely any systems



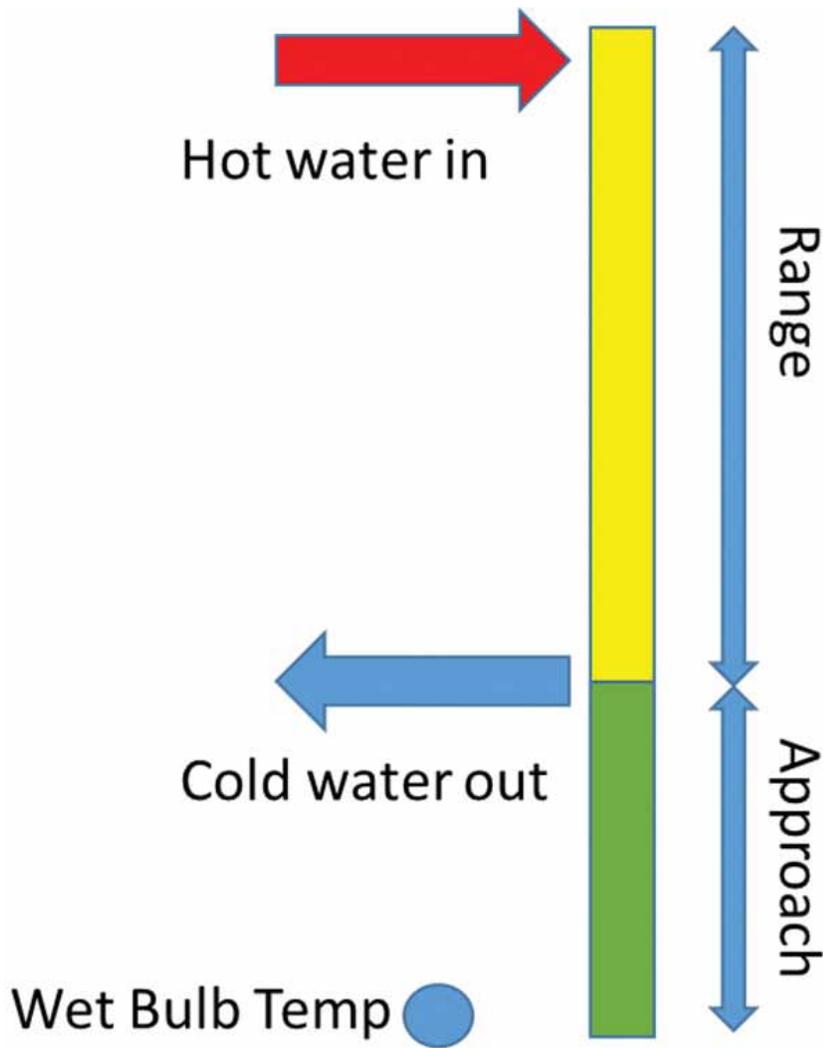


Figure 1: Range and approach linkage

that track the functioning of the cooling tower parameters. It is left to the operators to “see” how the cooling towers are operating, and occasionally log basic parameters of the tower.

A 1 degree rise in cooling water temperature going to the condenser of a chiller can lead to an increase of energy consumption by 2.5 – 3%. That’s how sensitive the system is to a change in cooling water temperature. Considering that HVAC systems consume 40 – 50% of the energy in a building, such a variation in the cooling water temperature can have considerable impact on operating and running costs for the building owners. Thus, there is a business case for measuring the performance of the cooling tower in a more in depth manner than is currently practiced in the building services industry.

Performance Management of Cooling Towers

The main function of a cooling tower is to provide the water to come into contact with the ambient air for as much time as possible over as much surface area as possible so that the maximum amount of evaporation can take place. The components of the cooling tower are all designed to achieve the optimized heat transfer and hence, to manage the cooling tower to deliver the desired results, the performance of these components and systems have to be measured. Key parameters that are used to assess the performance of the cooling tower are as follows:

Range

The “range” of a cooling tower is the difference between the warm water entering the cooling tower and the temperature of the cold water leaving the tower.

Approach

This is the most important aspect of the cooling tower design and is the difference between the cold water temp and the wet bulb temperature of the ambient air. The approach of a Cooling Tower depends on the process and it determines the size and cost of the cooling tower. The smaller the approach, the larger the size and hence the cost. Figure 1 shows how range and approach are linked

Cooling tower Efficiency: The range and approach can then be used to derive the efficiency of the cooling tower which is a very good tool for the O&M team to quickly assess how the equipment is functioning. The efficiency of a cooling tower is given by

$$\text{Efficiency} = \left[\frac{\text{Range}}{\text{Range} + \text{Approach}} \right] \times 100$$

Cycles of Concentration

Since water is evaporating and there are impurities in the water, the concentration of dissolved solids in the circulating water will keep on increasing as the water passes through the cooling tower. Higher levels of salts will lead to fouling and other harmful effects that will reduce heat transfer and hence, the level of solids has to be managed and monitored. This is done by adding make up water to dilute the dissolved solids. The CoC is calculated by the formula

$$\frac{\text{Hardness of the circulating water}}{\text{Hardness of the makeup water}}$$

Water Quality

The hygiene level of the water used in the system is also an important factor that can be used to assess the health of the cooling tower and subsequently it’s performance. A cooling tower with poor water quality will typically show lower heat transfers or conversely, higher cold water temperatures which impact chiller performance ultimately. The key parameters of water that are assessed are the conductivity, hardness and microbiological content

Factors Effecting Cooling Tower Performance

To be able to operate the cooling tower at the optimum level, it is critical to

understand the factors that impact the cooling tower's performance. The psychometric processes that occur in a cooling tower, where the cooling water transfers heat to the draft of air are complex and there are many variables such as the surface area, flow rate, etc. which add to the complexity. The key factors that impact the cooling tower performance are:

Wet Bulb Temperature

The "Approach" of the cooling tower is a function of the cold water temperature and the wet bulb temperature of the ambient air. The required cold water temperature is arrived at from the heat load calculations of the chiller design, and the wet bulb temperature is taken after studying the site conditions and available weather data. The Approach of the cooling tower is, thus, a system function and not of the cooling tower independently. If there is a change in the wet bulb temperature due to external conditions such as higher humidity, higher moisture content of the ambient air due to water bodies in the vicinity etc.

Heat Load

The size of the cooling tower will depend on the heat load of the system that is being cooled. The tower is sized for a planned occupancy level of the building and during the initial ramp up phase of a building, there are chances that the cooling tower would not be operating at the designed heat load. Thus, the performance would not be optimum.

Flow rate

The heat load determines the flow rate that is needed. Heat load will vary during the operation of the tower due to fluctuations in the occupancy of the building (lower load in the day time, peak at mid-day and tapering off again in the evening).

Other Factors

Interference of the air flow and recirculation of air also impact performance > while the design will aim to avoid these issues, changes in layout of the building and surrounding developments can result in change in these factors and therefore impact performance.

Water Quality

The heat transfer efficiency reduces drastically if the water quality is poor. Nozzles get choked due to higher salt content, higher fouling of the fins leads to poor heat exchange etc. and hence, water quality has a direct impact on performance.

Monitoring Performance of Cooling Tower

The operations and maintenance team needs to take a two pronged approach to managing and monitoring the performance of the cooling tower.

Parameter Monitoring and Analyses

Cooling towers are typically not fitted with any major instrumentation, and whatever, pressure and temperature gauges are fitted, usually, do not work due to poor maintenance. Thus, the first step in performance management of the cooling towers is to get all the basic instruments in a working condition. The key instruments that should be available on a cooling tower are the cold and hot water temperature gauges (of sufficient level of accuracy), flow meters and pressure gauges for the cooling water. Energy meters on the fan motors will aid in identifying high load conditions that are indicators of potential motor problems. Level sensors for the basin are an added safety feature to prevent air entering the chilled water line in case the cooling water basin get drained out. Another important but not often installed instrument is the online water quality meter.

The O&M team needs to log the cooling tower operating parameters on a two hourly frequency if no automated system is available. The data is then used to undertake trending studies and predict any possible operating issues or failures.

A monthly assessment of the cooling tower efficiency using the range. Approach formula to give a quick health status of the cooling tower is helpful and provides a high level check to senior management of the functioning of the equipment.

Annual performance testing

The Cooling Tower Institute (CTI) has

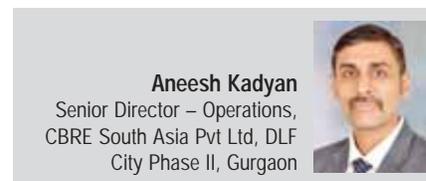
developed a testing standard to assess the thermal performance of a cooling tower. This is a comprehensive test that relies of a large no of data points and instrumentation, as well as an understanding of the design conditions and current operating conditions. The test assess the cooling water circulation rate as compared to the rate calculated by the manufacturers performance curves. The key parameters that are measured in this type of performance test are

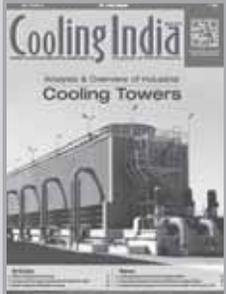
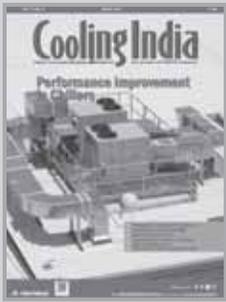
- Flow rate
- Water temperature
- Air temperature
- Brake horse power of fans
- Head of the water being pumped

The annual performance test will give the O&M team an assessment of how close or far from the design point is the tower operating based on which corrective actions can be undertaken. Similarly, ongoing performance monitoring activities will help the operators run the plant closer to the design point so that energy costs are low and system operates at the best efficiency possible.

Conclusion

Cooling towers are not a focus for the O&M team in most building operations due to either limited awareness of their importance or lack of focus of the team. This can have serious impact on the performance of the overall chiller plant and consequently, impact operating budgets, many a times, without the teams knowing why. The cooling tower is a relatively easy to maintain device and is relatively simple to operate and maintain. Thus the incentive to operate the cooling towers at their peak design level are very high, and creating a performance management plan for the cooling towers will go a long way in getting the best out of the HVAC system of the building. ■





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Delta's EMEA HQ Achieves Energy Savings upto 45 %

The Delta Energy Online building energy management system, and energy-saving solutions such as PV inverters, energy storage, EV chargers, and converters for peak shaving, all demonstrate Delta's unrivalled expertise in helping customers retrofit their existing buildings into highly sustainable, efficient and comfortable facilities...



Delta, a global leader in power and thermal management solutions, announced recently it has completed the renovation and upgrade of its headquarters (HQs) office for the Europe, Middle East and Africa (EMEA) region into a green building capable of achieving upto 45% expected annual energy savings, certified as a BREEAM (1) sustainable facility with 'very good' rating by the Dutch Green Building Council, and boasting a Dutch 'A-Class Building' energy label.

Transforming the 30-year-old existing office building into a sustainable working environment, the implementation of a wide range of technologies including the Building Management & Control System (BMCS), the Delta Energy Online building energy management system, and energy-saving solutions such as PV inverters, energy storage, EV chargers, and converters for peak shaving, all demonstrate Delta's unrivalled expertise in helping customers retrofit their existing buildings into highly sustainable, efficient and comfortable facilities.

Jackie Chang, President & General Manager of Delta EMEA, said, "Delta is committed to empowering the low-carbon economy through the development of intelligent energy-saving technologies. Delta has been promoting the green building concept for more than a decade; by retrofitting EMEA HQs into a green building, Delta just contributed to the creation of its 24th green building around the globe. We echo the efforts of the Dutch government in making existing buildings greener, instead of just constructing new buildings. The granting of the BREEAM certification further validates our profile as a total solutions provider. This is a memorable way to celebrate Delta's 30 years of operations in EMEA with all our stakeholders."

"The BREEAM certificate is an independent proof of the sustainability and 'green' qualities of a building. The fact that the renovated Delta Electronics EMEA headquarters building in Hoofddorp has been awarded a 'very good' BREEAM rating, demonstrates that it is possible to transform existing buildings into a highly sustainable ones. Given the focus of the Haarlemmermeer area on sustainability and circular architecture, this building is an excellent example of what can be done in this area and should serve as an inspiration to other building owners in the Netherlands," said Annemarie van Doorn, General Manager of the Dutch Green Building Council.

The portfolio of multiple techniques integrated into this green building are:

- **Building Management and Control System (BMCS):** This smart building automation platform is based on technologies developed by our subsidiary LOYTEC electronics. This advanced cloud-ready platform is compatible with all open communication protocols available now in building control, thus, enabling a highly effective, cost-efficient and eco-friendly management of the entire building. All sub-systems installed for HVAC (heating, ventilation and air conditioning), lighting, room climate control, power generation and energy storage are linked and managed by Delta's BMCS.
- **The Delta Energy Online platform:** This enterprise-grade energy management system, furnishes comprehensive, real-time and historical visualized analysis of the entire building's energy use to provide our EMEA HQs facility managers with meaningful support for their strategic plans regarding energy efficiency.
- **Renewable Energy Solutions:** The rooftop of the building is equipped with a 58.24kW solar system supported by Delta's PV inverters with efficiency up to 98.6%. The aforementioned green power can be optimally utilized by a 48kWh battery energy storage system (BESS) with Delta's 100 kW power conversion system, providing bi-directional energy conversion between the PV system, the BESS and the grid, thus, enabling peak shaving functions that further sharpen electricity consumption efficiency.
- **LED Lighting Solutions:** High-efficiency LED lighting products, smart sensors, actuators as well as LOYTEC's DALI system also integrate as an intelligent building automation platform that creates a smart lighting system. ■

Low Carbon Buildings



Buildings sector possess a significant opportunity to achieve cost effective carbon reductions. An intensive emphasis on conceptual design and life-cycle thinking will be necessary to advance the field, reduce carbon emissions, and train a new generation of engineers. Integrated Design Approach is the key and the way forward where Architects, Engineers and Sustainability experts need to collaborate towards achieve low-carbon built environment.

compared to natural causes, there is no doubt that we are burning more fossil fuels and causing more pollution than ever before. This impacts climate change and causes environmental degradation. Most fossil fuels are now imported, leading to dependency, so there are very sensible economic and political cases for reducing fossil fuel consumption.

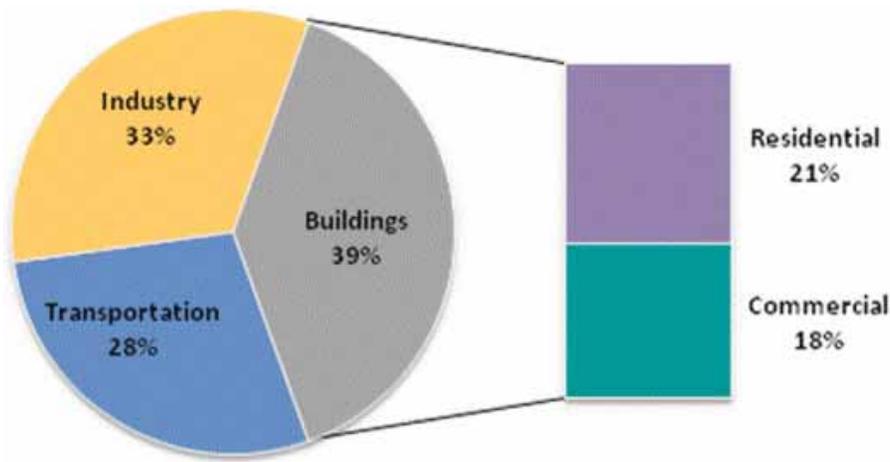
Buildings account for about half of the total fuel burn and commercial buildings account half of that for. The reduction of

The Earth's climate has changed throughout history. Most of the climate changes are attributed to very small variations in Earth's orbit that change the amount of solar energy our planet receives. The current warming trend is of particular significance because most of it is extremely likely (greater than 95 percent probability) to be the result of human activity since the mid-20th century and proceeding at a rate that is unprecedented over decades.

Whatever the truth about the proportion of global warming caused by man and



This graph, based on the comparison of atmospheric samples contained in ice cores and more recent direct measurements, provides evidence that atmospheric CO₂ has increased since the Industrial Revolution. (Credit: Vostok ice core data/J.R. Petit et al.; NOAA Mauna Loa CO₂ record.)



this figure is probably easiest on big buildings. Unless buildings become more efficient, there is no way the political target of an 80% carbon reduction by 2050 will be met.

What Are Low-Carbon Buildings?

Low-carbon buildings (LCB) are specifically engineered with GHG reduction in mind. So by definition, a LCB is a building that emits significantly less GHG (Greenhouse Gases) than regular buildings. Carbon dioxide equivalence (CO₂e) provides a simple metric for determining the environmental performance of buildings, including both embodied emissions and operating emissions.

There is presently no emissions threshold under which a building would qualify as a LCB. But to be genuinely "Climate Change neutral", a LCB would have to achieve at least 80% GHG reduction compared to traditional buildings. According to the 'Stern Review on the Economics of Climate Change', emissions would have to be reduced by 80% compared to current levels in order not to exceed the Earth's natural capacity to remove GHG from the atmosphere. By comparison, a regular building releases about 5,000 kgCO₂e/m² during its entire lifetime (though it varies a lot, depending on the project type and where it is located).

It is interesting to note that on a per-capita basis, India is one of the lowest Greenhouse Gas (GHG) emitters in the world. Its emission of 1.37 tonnes of CO₂

equivalent per capita in 2013 was nearly one-third of the corresponding global average. However, India is highly vulnerable to climate change, and has a strong interest in having a fair and equitable global agreement for minimizing the risk of climate change. Not due to anyone country alone, climate change is largely due to the historical emissions of the developed countries, India stands ready to be a part of the solution.

Opportunities for Low-Carbon Buildings

As one of the largest source of carbon emissions, buildings represent a significant target of opportunity for carbon reductions. The Intergovernmental Panel on Climate Change (IPCC) has identified buildings as the sector with the greatest potential for carbon reductions, particularly because reductions that result from improved building performance also yield substantial economic benefits (IPCC, 2007).

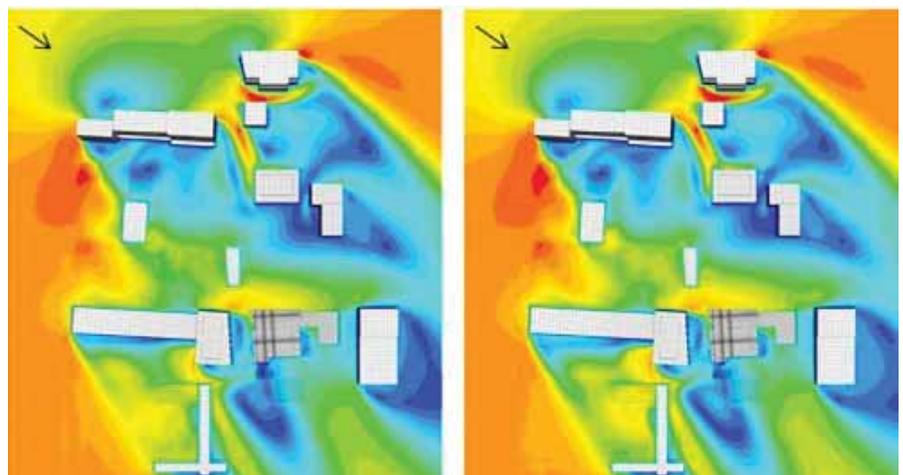
The World Business Council for Sustainable Development has concluded that the energy use of buildings worldwide could be reduced by 60 percent by 2050 using existing technologies (WBCSD, 2009). McKinsey Consulting has identified the building sector as the most cost-effective target for carbon abatement. According to McKinsey's analyses, carbon reductions for most buildings could be achieved at a negative cost (McKinsey, 2007).

Efficient Building Design

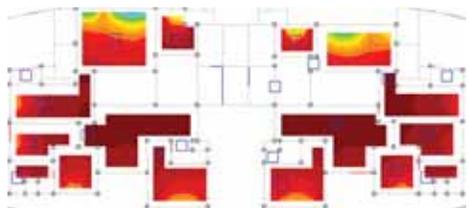
One of the best opportunities (also most cost-effective) for large-scale reductions in carbon dioxide emissions on a national and global scale is to have more efficient building design. Thus, emphasis on integrated building design for the full lifecycle of a building can lead to dramatic improvements in building performance. It requires incorporating systems thinking at the conceptual design stage, taking into account climate-specific factors and regional climate. Decisions about building orientation, façades, heating and cooling strategies, and glazing ratios, which must be made early in the design process, are crucial factors in the final energy performance of a building.

Use of Simulations as Design Tools

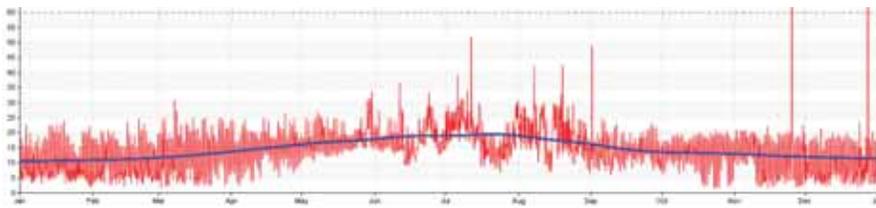
Several tools have been developed in the last few years to assist architects and engineers by providing architects with rapid feedback on environmental performance at early stages of design.



Wind CFD Analysis for Master Plan Optimization



Daylight Analysis for Façade Optimization



Indoor Natural Ventilation Analysis

Simulation results can be used for efficient master planning, building planning, façade design and MEP systems selection. It also works like a decision making tool for owners and project teams.

Building Materials

The choice of materials for a building can not only determine the embodied carbon of a building, but also has implications for the carbon emissions from building operations, through thermal mass and improved day-lighting. Appropriate building materials can moderate diurnal temperature swings or help to distribute daylight deeper into interior spaces. These help reducing heat loads and optimize building systems resulting in lower capital and operational costs.

While a building can be LCB by reducing its carbon emissions, it need to have zero emissions in its construction, operation and embodied energy, to be truly carbon neutral.

How Buildings Achieve Zero Net Operating Emissions

It is possible for buildings to achieve zero net operating emissions. There are already a number of projects worldwide that achieve this. New and existing buildings are taking steps towards becoming carbon neutral now by including a range of initiatives and technologies:

- Climate responsive design;
- Efficient Master Planning
- Efficient design of building façade
- Efficient appliances and light fittings;
- Optimizing or upgrading HVAC systems
- On-site renewable energy generation;
- Purchasing green power

How Buildings Can Go Carbon Neutral, Including Embodied Energy

Embodied energy is all the energy

required to produce a building. This can include energy required for producing and transporting building materials, on-site processes for constructing the building, as well as demolition of the building when time comes.

There are some things that can be done now to reduce the embodied energy in buildings, such as:

- Measuring the embodied energy;
- Re-using and reducing materials;
- Re-using and refurbishing existing buildings
- Considering how the building material is transported.

Transportation of building materials

Building products have to be transported from their point of origin to the construction site. The energy used for this activity is generally included in the embodied energy of products. This energy, while small compared to the energy used in the manufacture of the product, can be reduced by:

- Changing the mode of transportation, e.g. using train or ship freight rather than trucks;
- Using a fuel source with less environmental impact for transporting materials, e.g. hybrid vehicles or LPG;
- Smart route planning, where trips to several destinations in close proximity of each other are combined.

Challenges for Low-Carbon Buildings

The Role of Engineers

Engineers play a crucial in designing more sustainable buildings and are often involved too late in the design process to make all of the necessary decisions. Many key decisions, such as building orientation, building massing, glazing ratio, and the overall form of the building are made in the earliest design stages. Once these critical decisions have been made, engineers

have to attempt optimizing a poor design, but it is difficult at that point to achieve a low-carbon design.



The challenge is to integrate engineering analysis in a way that provides rapid feedback to architects and the rest of the design team early in the process. For this, engineers must be trained as designers, so they can propose multiple solutions to open-ended problems. In short, the design of high-performance buildings requires integrated systems thinking beginning in the earliest conceptual design stage. To ensure that engineers with the necessary skills are available, more of them must be trained in building science and sustainable design.

Conclusion

Buildings sector possess a significant opportunity to achieve cost effective carbon reductions. An intensive emphasis on conceptual design and life-cycle thinking will be necessary to advance the field, reduce carbon emissions, and train a new generation of engineers. Integrated Design Approach is the key and the way forward where Architects, Engineers and Sustainability experts need to collaborate towards achieve low-carbon built environment. ■

Ashish K Jain
MPM, FAAPM, AIID, LEED AP,
IGBC AP
Partner - AEON Integrated
Building Design Consultants LLP



Russia 2018 Stadiums to be More Sustainable

integral element of the 2018 FIFA World Cup Sustainability Strategy. Apart from globally recognised standards of environmental certification, the first Russian standard for green stadium certification 'RUSO THE FOOTBALL STADIUMS' has been developed specifically for the purpose of assessing and certifying World Cup stadiums....



With the aim to continue to foster green building standards at FIFA World Cup stadiums, the 2018 Local Organising Committee (LOC) hosted a workshop to discuss current practices of green building standards application, best practices for innovative design solutions and aspects of stadium management and operation after certification. The event was attended by environmental protection experts, representatives of design organisations, developers as well as regional environmental authorities.

"Currently, an active work on stadium certification is underway," said Milana Verkhunova, LOC Sustainability Director. "Nizhny Novgorod Stadium, Luzhniki Stadium, Volgograd Arena, Samara Arena and Mordovia Arena were certified at the stage of design. Spartak Stadium received the final BREEAM-in-use certificate with a 'Good' level at the end of 2016. Saint Petersburg Stadium, Luzhniki Stadium as well as Kazan Arena are currently in the process of final certification for construction."

Certification of the stadiums in compliance with recognised environmental standards is an integral element of the 2018 FIFA World Cup Sustainability Strategy. Apart from globally recognised standards of environmental certification, the first Russian standard for green stadium certification 'RUSO THE FOOTBALL STADIUMS' has been developed specifically for the purpose of assessing and certifying World Cup stadiums.

This standard was created by the Russian syndicate of scientific, engineering and construction community of professional organisations with the support of the Ministry of Natural Resources and the Environment of the Russian Federation and the LOC. It takes into

account FIFA requirements, international standards, as well as the Russian legislative practice and construction regulations. Since the registration of the standard in March 2016, active work has been done to implement it as a tool to certify World Cup stadiums. Among venues that are planning to be certified by "RUSO THE FOOTBALL STADIUMS" in the nearest future are Saint Petersburg Stadium and Kazan Arena.

Construction of sports facilities meeting green building standard requirements not only helps to minimise stadium environmental impact but also to a great extent determines its operation in the future including decreasing expenses for water and energy supply.

"The Spartak Stadium has successfully completed the certification process due to a substantial amount of energy efficient solutions implemented at the venue," said Stadium Chief Operational Officer Ivan Yachmentsev. "For example, the stadium's unique building management system effectively regulates distribution of power to various utility systems, decreasing energy consumption by 20 to 70 per cent depending on a situation. LED-based lamps in service and office rooms and corridors allow saving up to 90 per cent of electric energy for lighting compared to incandescent lamps. We've also used a wide range of environmentally-friendly materials and implemented separate waste collection as part of the certification process."

Green building standards are based on resource-efficient design and engineering solutions, including special methods of energy efficiency calculation and the provision of high-quality equipment for building, heating and cooling systems, lighting, power and water supplies. The standards also cover environmental safety of construction materials, a number of social aspects, transport accessibility, as well as general environmental factors, such as amenity planting, air quality and level of comfort.

In addition to resource-efficient technologies, stadiums are constructed in a way that enables them to preserve architectural heritage and biological diversity, ensure barrier-free environments for disabled people and people with limited mobility and to create comfortable public spaces.

For more details on the implementation of environmental, energy- and-resources-efficient design solutions for the 2018 FIFA World Cup Russia stadiums, please refer to the 2nd technical report on green certification of stadiums in Russia. Apart from the globally recognised standards of environmental certification, the first Russian standard for green stadium certification "RUSO THE FOOTBALL STADIUMS" has been developed specifically for the purpose of assessing and certifying World Cup stadiums. ■

Advance E-Water Conditioner

Are you believe that even 10-50 % improvement in your existing raw water quality saves lots of water wastage and Energy consumption without RO Plant and DM Plant? The answer is yes, this is possible if you adopt maintenance free advance eco-friendly solution...

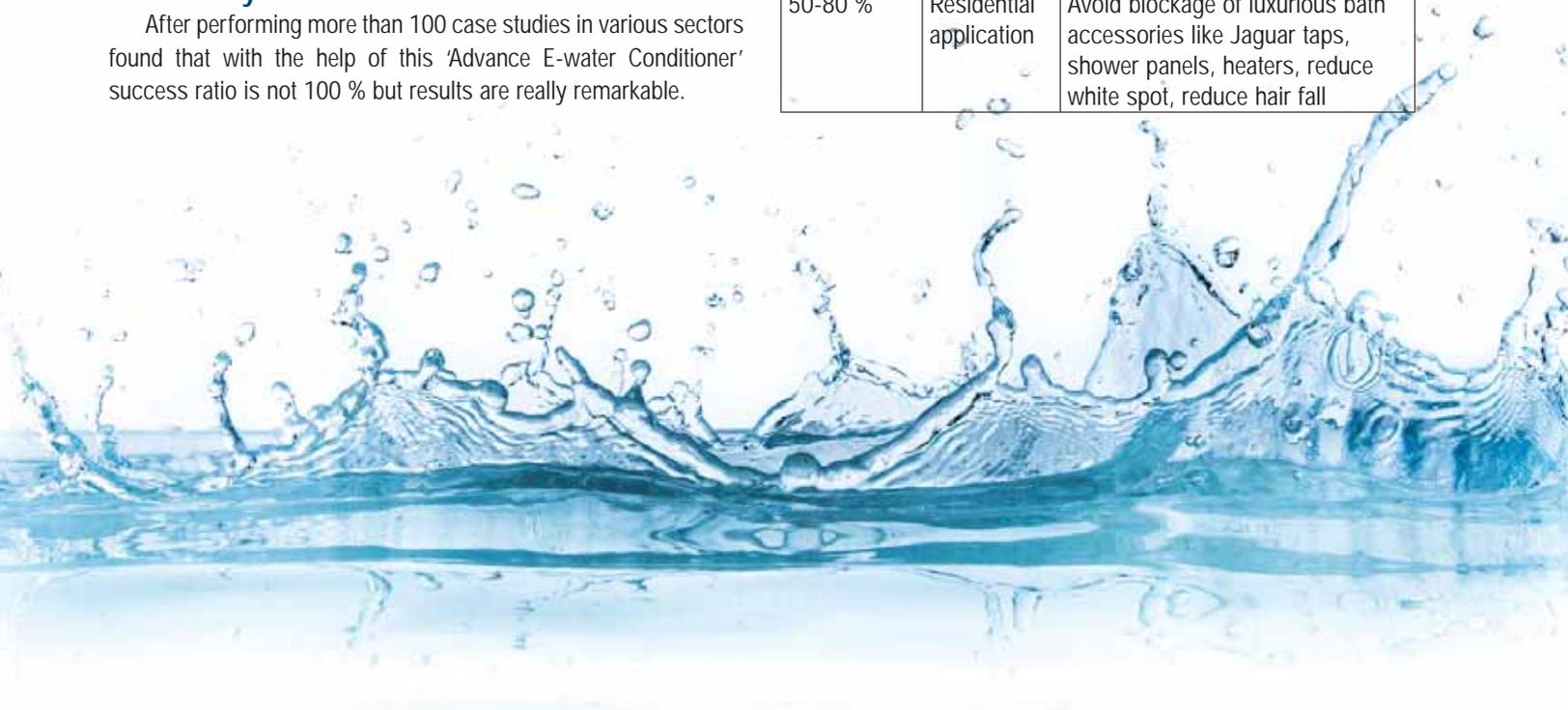
The water chain (water reserve, production, distribution, consumption, collection and treatment of water) play primary role of the urban system, influence all pillar of the metropolitan society and its functionality, sustaining populations, generating energy, supporting tourism and recreational activities, ensuring environmental and human health, and fuelling local economic development. Such increasing convergence promotes urban growth because as more than half of the world's population currently resides in urban areas.

Is your work place ready for adopting green technologies? If you implement 'Advance E-water Technology' at your place and even if you got 10-30% improvement in your existing water quality without RO plant and DM plants, then you are able to save lots of water and energy consumption.

Case Study and Results

After performing more than 100 case studies in various sectors found that with the help of this 'Advance E-water Conditioner' success ratio is not 100 % but results are really remarkable.

% Result Achieved in Saving of Water & Energy upto.	Sectors	Benefits
50-90 %	Industrial applications	Reduce maintenance upto 80 % in cooling tower, heat exchanger, chiller, ice factory, extrusion machine, boiler and process water.
80-100 %	Agriculture	More crop per drop. Plant growth rate increases upto 60-70 % more. 100 % guaranteed results. Reduce maintenance upto 90 % in cleaning of sprinkler nozzles, drip irrigation system and bore well water. Crop production increases and water wastage decreases.
80 %	Five star resort and hotels and kitchens and garden in public area and gram panchayat	Reduce water consumption in utility, sanitary. Reduce cleaning frequency and chlorine dosage in swimming pool applications. Without RO Plant –convert bore water to soft water for utilities, laundry, heating and cleaning of external areas, public drinking water, fountains etc.
50-80 %	Residential application	Avoid blockage of luxurious bath accessories like Jaguar taps, shower panels, heaters, reduce white spot, reduce hair fall



Process

100 % ideal as well as cost-effective solution does not exist in the world so why we should not adopt eco-friendly technology with fit & forget solution.

Advance E Water Conditioner -4M is a micro controller based electronic and electrical device. It contains multiple technologies in one single device for physical water treatment system for all purpose.

With the help of Advance E water conditioner, there are ample opportunities to increase energy efficiency.

- With very little one time investment & retrofitting gives 60-70 % improvement in your routine water consumption and maintenance with or without expensive water softener plant.
- Green HVAC & refrigeration system.

Eco-friendly system because indirectly reduce wastage of water

- Reduce rate of cleaning or replacing filters in heat pumps & membranes in RO system.

- Reduce rate of chemical dosage in cooling tower, water softener and swimming pool.
- Reduce maintenance due to improved water quality used in industries for various applications like heating, cooling, cleaning, steam generation, heat pump, feed water pump and many more applications.
- Improve health of human, cattle, chickens as well as luxurious equipment capital cost in buildings.
- Reduce maintenance as well as routine cost spent in resort, spa and hotels (i.e kitchen, laundry, toilet blocks, gardens, swimming pool, solar heater elements, PNG Consumption and waste disposal plant).
- Save money, manpower & machine.
- Reduce routine maintenance up to 60-70 % in esteemed resorts, hotels and industries.
- Solve hard water problem with very little one time investment for lifetime.

Actual Case Studies and Summary of Results Achieved within last three year

Case Studies Carried out at / Name of Organizations	Problems /Installation because of..	Benefits and Results Achieved ...
Multi-Plast – Vapi-Daman Manufacturing of plastic bags & packaging materials	<ol style="list-style-type: none"> 1. Cooling tower and chillers water jet blockage problem 2. Pipe blockage within 2-3 year and spent lacs of rupees in plumbing frequently in new fittings 	<ul style="list-style-type: none"> • Results achieved 99 %, maintenance problem zero • Blockage problem zero since last three years • Saves lacs of rupees which spent earlier in replacement of cooling tower, plumbing, cleaning and maintenance • Previously it was not solved by any other expensive foreign water conditioner devices also
Right Industries – Daman Mfg of plastic bags & packaging materials.	<ol style="list-style-type: none"> 1. Same problem even though 70 % success achieved till date because of very bad quality of bore well water 	<ul style="list-style-type: none"> • Results achieved 70-80 % after 4 month, maintenance problem reduces not zero • Blockage problem also reduce since last 4 months. • Saves lacs of Rs which was spent earlier in plumbing, cleaning and maintenance
Falcon Pumps & Pipes –Rajkot	<ol style="list-style-type: none"> 1. Problems in extrusion machine and cooling tower maintenance frequently 2. Extreme blockage problem 	<ul style="list-style-type: none"> • Results achieved 75-80 % • Maintenance problem reduces very significantly.
Tirth-Agro Pvt. Ltd. “Shaktiman”- Rajkot World’s Largest Manufacturer of Rotary Tiller	<ol style="list-style-type: none"> 1. Problems in blockage of admin office building and guest house building, bath accessories damage within 1-2 years. 2. Also damage solar water heater and geyser within 4-5 years due to scaling. 3. Very hard water not suitable for bath at guest house area 	<ul style="list-style-type: none"> • Results achieved -90 % • No blockage and scale Formation on TAPS and shower panels in bathroom which was continuously used • 50 % results in bathroom which was used once in a while
Shree Krishna Hospital & H M Patel Centre for Medical Care & Education	<ol style="list-style-type: none"> 1. Problem due to hot water –maximum scale formation on steam sterilization machines 	<ul style="list-style-type: none"> • Due to special design scaling formation reduces upto 80 % previously this was not solved by any other expensive foreign water conditioner devices
Madhubhan Resort & Spa Anand- Gujarat One of the Best Luxurious Resort in India	<ol style="list-style-type: none"> 1. Cooling tower and chillers 2. Water jet blockage problem 	<ul style="list-style-type: none"> • Results achieved 70-80 % after 4 month, maintenance problem reduces not zero • Blockage problem also reduce since last four months. • Saves lacs of Rs which was spent earlier in plumbing, cleaning and maintenance

<p>Rasal Beach Resort – Diu One of the top five beach resorts in India (UT)</p>	<ol style="list-style-type: none"> 1. Find alternative solution because of lots of money spent for maintaining softener plant and D M plant for making soft water and lots of wastage of water in routine use 2. Frequently blockage of guest house bath accessories and damage within 1-2 years due to costal area 3. Also damage solar water heater and geyser within 4-5 years due to scaling and rusting. 4. Very hard water not suitable for bath, laundry, kitchen and fountains 	<ul style="list-style-type: none"> • Wonderful results achieved –up to 90-95 % • For routine water application they totally bypass – softening plants so lots of saving in water achieved • No blockage and scale formation on taps and shower panels in bathroom which was continuously used • Kitchen dishwasher efficiency increases, laundry hot water efficiency increase so power consumption decreases significantly • Solar water heat exchanger efficiency also increases
<p>Surgen Hospital –Surat Laparoscopy Surgery and Maternity Care Hospital</p>	<ol style="list-style-type: none"> 1. Due to hard water hair fall problem was very serious in campus and doctors house. 2. They know disadvantages of RO Plants and avoid soft water because of health issues due to their own profession 3. Problems in blockage of admin building and hospital building bath accessories damage within 1-2 years 4. Also white layer and Algae forms around swimming pool area 5. Needs heavy dosage of chlorine and other chemical for cleaning and hygienic purposes of entire campus 	<ul style="list-style-type: none"> • Wonderful results achieved –up to 90-95 % • Hair fall problem due to hard water reduces 98 % • White layer formation around swimming pool has totally stopped since last two years • No need to do cleaning frequently with chemical and acids in toilet blocks, sanitation and swimming areas • Wonderful results achieved in doctor’s own houses and solved all problems without softener plants
<p>Akshardham – Gandhinagar</p>	<ol style="list-style-type: none"> 1. Find alternative solution because of lots of money spent for maintaining softener plant and D.M plant for making soft water and lots of wastage of water in routine use 2. Heavy maintenance in cooling tower and chiller plant 	<ul style="list-style-type: none"> • 50 % result Achieved in Borewell water because of storage and site practical limitations for installation of device • 85-90 % result achieved in cooling tower applications
<p>Akshar –Temple – BAPS Junagadh</p>	<ol style="list-style-type: none"> 1. Find alternative solution because of lots of money spent for maintaining softener plant and DM Plant for making soft water and lots of wastage of water in routine use for saint house, kitchen, agriculture campus and garden area 	<ul style="list-style-type: none"> • Achieved very good result even after just one month installation because of suitable design and plumbing without storage as per instructions of experts
<p>P B Patel - ELECON Engineering Co International Organic Farm</p>	<ol style="list-style-type: none"> 1. In search of advance, eco-friendly, clean & maintenance free solution 2. As a Multi-national company looking for benefits of green point rating due International Organic Farm in India 3. Very hard water due to bore well and ground water sources 4. Because of lots of water requirement for 100 acre farms and avoid blockage in drip irrigation, and prevent soil salinity and erosion well in advance 	<ul style="list-style-type: none"> • Achieved very good result even after just one month installation because of suitable design and plumbing without storage as per instructions of our experts • Found good progress in crop cultivation and growth in plant • Prevent blockage in sprinkler system
<p>House Hold and Residential: Application in many homes like Iskon Avenue Kanha Group River Side Bungalows Laksh Icon Ridhhi-Sidhhi and many more...</p>	<ol style="list-style-type: none"> 1. White spot formation due to scaling 2. Becomes tired for maintenance of softener charging with salt and resin mixture in townships luxuries bungalows 	<ul style="list-style-type: none"> • Found 60-80 % success in these problems • Hair fall problems reduce significantly. • Bath accessories scaling and white spot problems reduces. • Feeling fresh while taking baths • Detergent and soap consumption reduces • Found reduction in kidney stone problem and improve kidney function and blood circulation in some case. Remove old scaling within 3-6 months

<p>Farmers and Agriculture: Application- Perform case studies on more than 100 Farmers</p>	<ol style="list-style-type: none"> 1. Farmers always use borewell water and it is always having very high TDS 2. Growth of crop production is not up to significant due to hard water 3. Due to hard water found blockage in drip irrigation system, sprinkler nozzle 4. Due to hard water hard layer formed in soil due to salinity and erosion 	<ul style="list-style-type: none"> • Achieved 100 % success in farming applications • Improve soil softness after 1-2 year • Photo synthesis process increases due to de-cluster of water molecules • Crop growth and cultivation increases • 100 % utilization of fertilizers and pesticides due to improved water quality
<p>Poultry Farming Applications OM Poultry Farms – Bhavanipura- Sheetal Poultry Farm – Kunjrav</p>	<ol style="list-style-type: none"> 1. Blockage of drinking pipe nozzle used for chickens drinking purpose and vaccination purpose 2. Found less FCR (Food Conversation Ratio due to Hard water 3. Found e-coli problems in many broiler and layer farms 4. Lamless found in many farms 	<ul style="list-style-type: none"> • Archived 90-95 % success in these applications. • Reduces lamless problem • Reduces mortality rates • Reduces e-coli problems • Reduce maintenance of cleaning nozzles and pipe without use of any harmful chemical or acid

Applications

ICE-PLANT, Cold storage, Cooling Tower, Farming and Agriculture, Drip Irrigations, Swimming Pool, Showers and Bath Accessories

Installation Methods

			
For Bore well water	Drip Irrigation		Garden and Process water for Village
			
Drip system	Hotels and Residential	Hospitals	Solar pumping water
			
Sprinkler and Drip Systems			Cooling Tower sump

Conclusion

Adopt smart technology with existing water purification methods, 100 % perfect technology does not exist in any engineering field, implements new technology for your application, bypass your conventional methods and observed if you achieved minimum 30-80 % saving in maintenance cost & efficiency increases 10-20 % then also it is worthwhile because it leads to big savings in routine water consumption. ■

Save water, save environment and Reduce wastage of water.

K M Sharma
Rtd Principal & Chief Executive Officer
in Emerging R & D Institute, AM Group



D A Suthar
Chief Project Executive
Advance Magntronics



India Home Automation Market to be USD 79.57 bn by 2022

The key driving factors for the growth of the home automation system market are the growth in the Internet of Things (IoT), cost reduction measures, large number of manufacturers widening their product portfolios, and increasing importance of remote home monitoring...

The home automation system market is expected to be valued at \$79.57 billion by 2022 and is expected to grow at a compound annual growth rate (CAGR) of 11.3 percent between 2017 and 2022.

The key driving factors for the growth of the home automation system market are the growth in the Internet of Things (IoT), cost reduction measures, large number of manufacturers widening their product portfolios, and increasing importance of remote home monitoring; however, since many products are reaching maturity level and the home automation system market is more of a convenience-driven market than necessity-driven, the growth of this industry might be limited to some extent.

The market for lighting control is expected to grow at a high rate because it reduces the electricity consumption in homes as sensors adjust the intensity of artificial light according to the intensity of natural light. Lighting control provides flexibility with respect to the lighting operation, which improves the ambiance, interior decoration, and productivity.

The proactive segment is expected to hold the largest size of the home automation system market during the forecast period. Proactive solutions are specifically designed to enable consumers to understand energy patterns and take effective measures to reduce their consumption. Proactive solutions are more beneficial as they can also send recommendation signals to end users for



taking necessary energy reduction actions and can then control the electronic devices based on the user's actions.

The Asia-Pacific market is expected to grow at the highest CAGR during the forecast period, owing to the presence of a significant number of new residential projects and strengthening of the building infrastructure. The presence of a huge end-user base in advanced economies such as Japan and South Korea and the growing demand for energy management systems are further expected to drive the home automation system market in this region.

Home automation is a science which deals with a residence equipped with computing and information technology devices that anticipate and act in response to the needs of the residents; working towards enhancing their comfort, convenience, security, and entertainment through the upgradation of technology within the home. Home automation integrates all the devices in the house and gives its access to a single control pad which allows energy efficiency and ease to the people residing. Home automation is a luxury statement and is at a very emerging stage in India. Builders are now giving option of either automated homes or normal ones which makes sure of the soon emerging trend of the automated homes in India. Home automation comes out to be of a great help to the aged people, handicapped people and the families with small children. This report is about the market size of the home automation market in India and how because of the people following the western lifestyle and culture and more number of people in the upper middle class section of India, home automation is expected to penetrate faster. There are many features that are provided by the home automation companies. Different companies use different technology for deploying the same. The report also reveals the trend in this industry is shifting to people becoming more conscious about the energy efficiency involved home automation. The further division of technology into networking technology and the communicating technology is also discussed in the report.

Metro cities like Delhi, Mumbai, and Hyderabad are some of the most potential cities where penetration has reached and is expected to increase further. The trend is followed by the mega cities like Bangalore, Ahmedabad. Some of the major players in the home automation market are L&T, Schneider Electric, Johnson Control, AMX and Crestron. The home automation market is just



at a start with only the luxury oriented people approaching for automation. But with the reducing prices for automation and the energy efficiency affecting the people the home automation is soon going to be a market for all the segments of the people. The organized market accounts for more than half of the market and its share is expected to increase with major organized players investing in home automation market in India.

According to "India Home Automation Market Outlook, 2021", the market for home automation market in India is at a nascent stage and is expected to reach new heights. Lighting, Security, Audio/video and HVAC are some of the applications that are involved in the home automation. Security dominates the market and is expected to be the same in the future as data thefts, burglary are increasing continuously in India. Technology is one major plus in this market and with the leading brands spending most of their time and revenue in the R&D of the product, the home automation market is expected to witness a surge in the coming years.

Division by the end users in this market comes with residential, commercial and hospitality sector. Home automation was primarily used in the commercial establishments like offices and institutions, but with the increasing awareness and the increasing lifestyle among the people, the home automation is dominated by the residential segment and is expected to demonstrate the fastest growth in the hospitality sector.

As home automation is an emerging market, and India being the country with the highest potential for this market, the global players are expected to extend their business in India thereby leading to higher penetration.

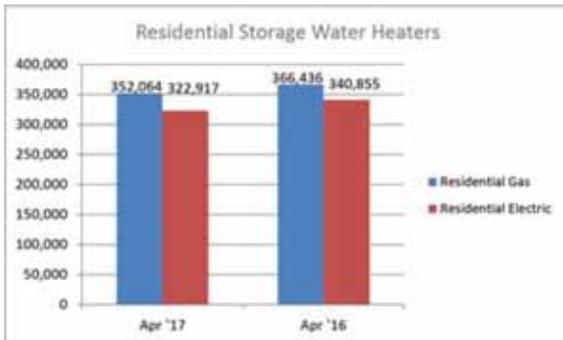
In India, the trend is moving from wired connection to wireless connection. Different communicating technologies are used in the home automation market like Zigbee, Z-Wave, X10, Wi-fi, Bluetooth etc. Zigbee dominates the market and is expected to remain the same till 2021. ■

AHRI Releases April 2017 US Heating & Cooling Equipment Shipment Data



Residential Storage Water Heaters

US shipments of residential gas storage water heaters for April 2017 decreased 3.9 percent to 352,064 units, down from 366,436 units shipped in April 2016. Residential electric storage water heater shipments decreased 5.3 percent in April 2017 to 322,917 units, down from 340,855 units shipped in April 2016.



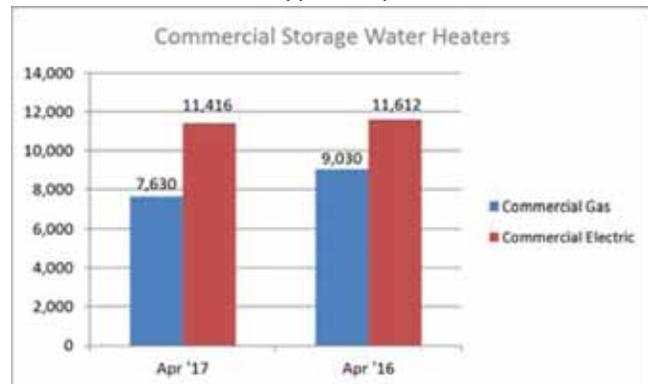
For the year-to-date, US shipments of residential gas storage water heaters increased 4.0 percent to 1,508,708, compared to 1,450,197 shipped during that same period in 2016. Residential electric storage water heater shipments increased 6.1 percent year-to-date to 1,420,475 units, compared to 1,339,227 shipped during the same period in 2016.

Year-to-Date	Apr '17 YTD	Apr '16 YTD	% CHG.
Storage Water Heater			
Residential Storage Gas	1,508,708	1,450,197	+4.0
Residential Storage Electric	1,420,475	1,339,227	+6.1

Commercial Storage Water Heaters

Commercial gas storage water heater shipments decreased

15.5 percent in April 2017 to 7,630 units, down from 9,030 units shipped in April 2016. Commercial electric storage water heater shipments decreased 1.7 percent in April 2017 to 11,416 units, down from 11,612 units shipped in April 2016.



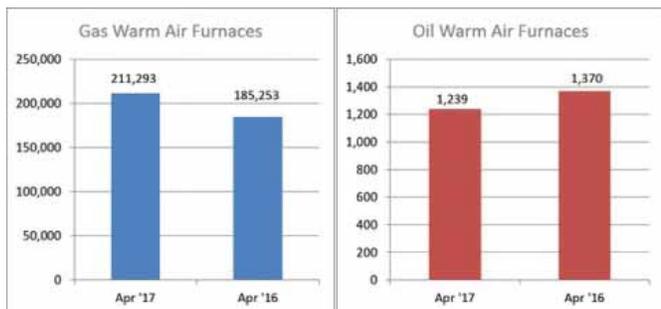
Year-to-date US shipments of commercial gas storage water heaters decreased 3.1 percent to 33,391 units, compared with 34,451 units shipped during the same period in 2016. Year-to-date commercial electric storage water heater shipments increased 14.8 percent to 45,838 units, up from 39,918 units shipped during the same period in 2016.

Year-to-Date	Apr '17 YTD	Apr '16 YTD	% CHG.
Commercial Storage Gas	33,391	34,451	-3.1
Commercial Storage Electric	45,838	39,918	+14.8

Warm Air Furnaces

US shipments of gas warm air furnaces for April 2017

increased 14.1 percent to 211,293 units, up from 185,253 units shipped in April 2016. Oil warm air furnace shipments decreased 9.6 percent to 1,239 units in April 2017, down from 1,370 units shipped in April 2016.

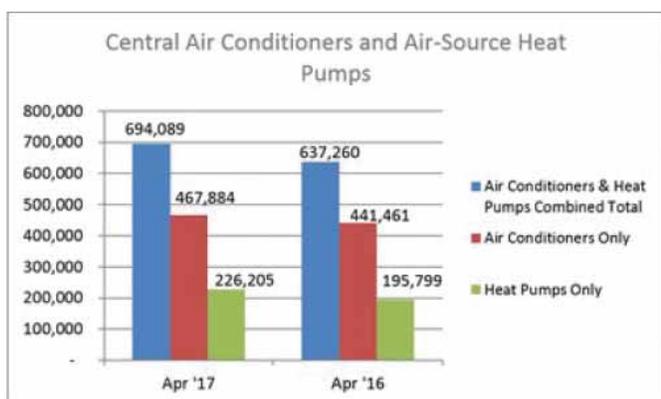


Year-to-date US shipments of gas warm air furnaces increased 8.4 percent to 869,833 units, compared with 802,243 units shipped during the same period in 2016. Year-to-date US shipments of oil warm air furnaces decreased 3.4 percent to 9,136 units, compared with 9,455 units shipped during the same period in 2016.

Year-to-Date	Apr '17 YTD	Apr '16 YTD	% CHG.
Gas Warm Air Furnaces	869,833	802,243	+8.4
Oil Warm Air Furnaces	9,136	9,455	-3.4

Central Air Conditioners and Air-Source Heat Pumps

US shipments of central air conditioners and air-source heat pumps totaled 694,089 units in April 2017, up 8.9 percent from 637,260 units shipped in April 2016. US shipments of air conditioners increased 6.0 percent to 467,884 units, up from 441,461 units shipped in April 2016. US shipments of air-source heat pumps increased 15.5 percent to 226,205 units, up from 195,799 units shipped in April 2016.



Year-to-date combined shipments of central air conditioners and air-source heat pumps increased 8.4 percent to 2,406,068, up from 2,218,866 units shipped in April 2016. Year-to-date shipments of central air conditioners increased 7.5 percent to 1,549,802 units, up from 1,442,124 units shipped during the same period in 2016. The year-to-date total for heat pump shipments increased 10.2 percent to 856,266 units, up from 776,742 units shipped during the same period in 2016.

Year-to-Date	Apr '17 YTD	Apr '16 YTD	% CHG.
Air Conditioners & Heat Pumps	2,406,068	2,218,866	+8.4
Air Conditioners only	1,549,802	1,442,124	+7.5
Heat Pumps Only	856,266	776,742	+10.2

US Manufacturers' Shipments of Central Air Conditioners and Air-Source Heat Pumps

Size Description (000) BTUH	Month		YTD	
	Total	% Change from 2016	Total	% Change from 2016
Under 16.5	16,642	-2	76,460	0
16.5 - 21.9	83,662	+8	300,544	+14
22 - 26.9	129,700	+11	456,731	+10
27 - 32.9	108,287	+11	358,476	+6
33 - 38.9	143,120	+9	482,794	+8
39 - 43.9	55,117	+12	177,305	+8
44 - 53.9	75,410	+7	254,728	+8
54 - 64.9	60,195	+10	207,689	+7
65 - 96.9	7,214	+6	33,307	+5
97 - 134.9	6,064	+7	24,969	+12
135 - 184.9	4,099	+3	15,770	+9
185 - 249.9	1,879	-1	7,328	+21
250 - 319.9	1,352	+19	5,131	+40
320 - 379.9	353	+34	1,235	+12
380 - 539.9	400	+44	1,372	+17
540 - 639.9	231	+13	972	+28
640 - 799.9	106	+100	406	+100
800.0 - 899.9	50	+100	214	+100
900.0 - 999.9	66	+100	213	-100
1,000.0 - 1,199.9	50	+100	147	+100
1,200.0 & Over	92	+100	277	+100
TOTAL	694,089	+9	2,406,068	+8

BTUHs of 64.9 and below are for residential units; 65.0 and above for commercial.

NOTE: A shipment is defined as when a unit transfers ownership; a consignment is not a transfer of ownership. Industry data is aggregated from the information supplied by AHRI member companies that participate in the statistics program and can be subject to revision. Published year-to-date data is inclusive of all revisions. No other AHRI data (e.g., by state or region) is available to the general public other than that published. AHRI does not conduct any market forecasting and is not qualified to discuss market trends. For previous monthly shipment releases and historical data, please see <http://www.ahrinet.org/statistics>.

FLIR DM90 – True RMS Multi-Meter with K Type

The FLIR DM90 is an affordable true RMS digital multi-meter with a type-K thermocouple—an ideal tool for electricians, service technicians and HVAC professionals. Equipped with rich features, including LoZ, VFD mode, and μA current measurement capability, the FLIR DM90 gives you trusted readings to troubleshoot and repair a wide range of electrical and electronic systems.

Key features:

- Built-in worklight to help you access difficult locations with



lighting issues.

- Non-contact voltage detector.
- Intuitive and simple-to-operate user interface.
- Durable and drop tested to 3 m (9.8 ft.).
- IP54 splash-proof rated.

18 functions, including DC voltage, AC voltage, DC current (including μA), AC current (including μA), resistance, type-K thermocouple contact temperature, capacitance, frequency, diode, continuity. ■

Email: flirindia@flir.com.hk

SC-ST-x - Smart Temperature Controllers

The new range of Smart Temperature Controllers offer tight control of heating, cooling and ventilation demand in modern building control systems such as hotels or office buildings. Depending on the chosen model, operation is either as a conventional thermostat or a P+I controller, with relay output switching or modulating 0-10V control



signals for modern EC fans and actuators.

Additional inputs include energy saving, configurable for either window contact or occupancy detector, and remote temperature sensing into the built in control strategy. The respective control parameters are available via the cost efficient 2-wire RS-485 bus, using the BACnet MS/TP protocol. This allows centralised supervision of

HVAC systems, with defined local access into the control strategy which makes this range ideal for large building projects aiming for high energy efficiency and smart user interaction.

Features

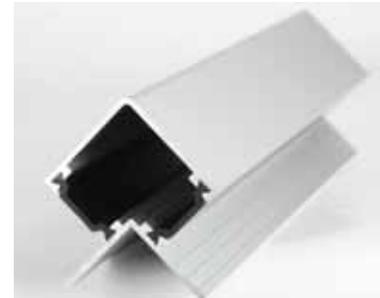
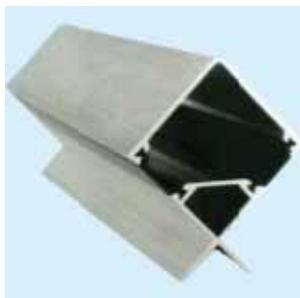
- BACnet MS/TP over RS-485 communication
- Control signal options: SPST relays on/off or 0-10Vdc modulating
- Implemented control strategy
- Input options for PIR sensor, window contact, remote sensor and more ■

Website: www.sontay.com

Thermal Break Profiles from Technical Solutions & Engineers

Technical Solutions & Engineers is introducing new 'Thermal Break Aluminium Profile' for 25mm, 43, 45 & 60mm panel.

New design with or without screw assembling of AHU enclosure, these profiles have passed through knurling process which provides more grip to thermal barrier. At the end, profiles become more rigid this process gives even and perfect sealing



and this ensures zero leakages.

The Thermal Barrier has an insulation K value of 3-3.2 W/M deg C and sale as per class 2.2 in compliance with Din 4108/4 rules, as the impact strengths of

30Kg/MQ the sturdiness and rigidity of the profile has been rated excellent by all the AHU manufacturers / contractors / consultants. ■

Website: www.tse.net.in

Forthcoming Events At A Glance

Building Simulation 2017

Venue: San Francisco
Date: 7th to 9th August 2017
Website: www.buildingsimulation2017.org

DairyTech India 2017

Venue: BIEC, Bengaluru
Date: 2th to 30th August 2017
Website: www.dairytechindia.in

FoodPro 2017

Venue: Chennai Trade Centre, Chennai
Date: 7th to 9th September 2017
Website: www.ciifoodpro.in

India Cold Chain Show 2017

Venue: Bombay Exhibition Centre, Goregaon, Mumbai
Date: 12th to 14th December 2017
Website: www.indiacoldchainshow.com

2018 AHR Expo

Venue: Chicago
Date: 22nd to 24th January 2018
Website: ashrae.org/AHRExpo2018

ACREX 2018

Venue: BIEC, Bengaluru
Date: 22nd to 24th February 2018
Website: www.acrex.in

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Bangkok RHVAC 2017 and Bangkok E&E 2017	9
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Cooling India invites HVACR professionals and industry experts to write articles on their area of expertise and interest.

Dubai Opera Becomes Smart Concert Space

Dubai Opera is one of the world's smartest and most energy-efficient performance spaces thanks to an extremely powerful building management platform from Siemens. The dhow-shaped building is a multi-format performing arts center which accommodates up to 2,000 spectators. An innovative feature of Dubai Opera is the ability to switch between three usage modes: from a theater to a concert hall to a 'flat-floor' mode, which automatically folds away seating to allow the space to be used as a banquet or event hall. The Siemens technology is able to automatically switch the cooling logic of the air conditioning system to maximum visitor comfort and



energy efficiency. The day-to-day operations of the iconic building are monitored and controlled by Siemens' most advanced building management platform, Desigo CC. The intelligent system generates significant resource savings by integrating the management of energy, air conditioning, ventilation and water consumption into a fully customized, graphical 3D interface. Desigo CC also integrates 14 additional subsystems, including access control, video surveillance, lighting control, elevators and escalators, the emergency central battery system and an uninterrupted power supply, giving operators total control over Dubai Opera's operating performance. ■

The Building That Interacts With People

Agnelli Foundation in Italy has had its historic headquarters in Turin transformed into an advanced Internet of Things (IoT) office building, demonstrating how digitalization is transforming conventional workplaces into the smart workplaces of the future. The new office featuring 3,000 m² of co-working space was opened in mid-June. The project implemented the concept of Carlo Ratti Associati architects for the landmark site of the Agnelli Foundation: creating optimal working conditions in the building in real time through geo-localization of people moving inside the complex. This means more efficient management of the building systems as well as greater comfort for people in terms of heating, cooling, shading, lighting, access, and space availability. "Intelligent devices generate huge amounts of data every day, every hour and every second. With the right digital tools it is



possible to leverage the data and interact with the environment as never before. The concept of Carlo Ratti Associati for Agnelli Foundation is an ideal concept for us," says Federico Golla, President and CEO of Siemens Italia. ■

Johnson Controls' Headquarters Asia Pacific Gets LEED Platinum

Green Business Certification Inc (GBCI) announced that Johnson Controls' new headquarters Asia Pacific has achieved both LEED Platinum and EDGE green building certifications. Johnson Controls is among a select group of projects to receive both LEED and EDGE certifications for a single project and is helping to drive market transformation through the adoption of green business practices. The new headquarters is integrated with Johnson Controls building technologies, including the entire premium portfolio of security solutions, sophisticated building controls, HVAC solutions, and its vision for the future of smart, sustainable buildings. Built with all the green features incorporated and a predicted energy savings of 45 percent, water savings of 42 percent and embodied energy savings of 21 percent, the project is a symbol of Johnson Controls' investment in the region, a living laboratory for its products and solutions. The



building also adheres to national green building standards. "Achieving both LEED and EDGE certifications demonstrates Johnson Controls leadership in sustainable development and a strong commitment to the health, comfort and well-being of the employees at its headquarters Asia Pacific," said Mahesh Ramanujam, President and CEO of USGBC and GBCI. ■

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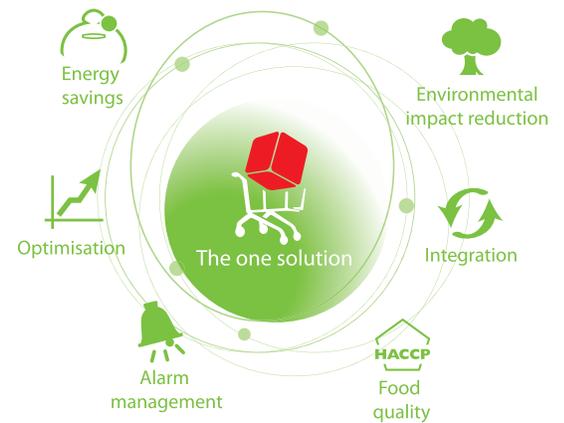
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CAREL ACR Systems India Pvt. Ltd.

Mumbai: Office No.s 402 & 403, Vikas Commercial, Bhakti Marg, Next to Tridev Apartment, Mulund (West) 400 080, India, phone (+91) 22 4119 2929 - fax (+91) 22 4119 2930

Delhi: CAREL ACR Systems India Private Limited, 312, Prakashdeep, Tolstoy Marg, Connaught Place, New Delhi 110001, India, phone (+91) 11 43629500

Chennai: Office No. 728, 'AMARA SRI', Situated at Old No. 313, New No.455, Block No.75, 7th Floor, Anna Salai, Teynampet, Chennai 600018, India, phone (+91) 44 4904 8300


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Key Features

- Continuous Display of Flow Rate
 - LCD Display
 - Optional Fail-Safe Power Storage Feature
 - Communication with BMS thru RS- 485
 - BACnet Compatible
 - 51 Different Maximum Flow Rate Settings
 - 100% Valve Authority
- ◆ Pressure Independent Control Valves
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 - ◆ Differential Pressure Controller
 - ◆ 3 Way By-Pass Modules
 - ◆ Actuators
 - ◆ Automatically Balanced Temperature Control Valves
 - ◆ Externally Adjustable Automatic Balancing Valves
 - ◆ Pre-set Automatic Balancing Valves
 - ◆ Thermostatic Control Valves



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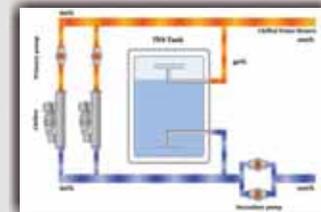


Electrostatic Precipitation System

Key Features

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