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- ✿ Air Balancing in Existing Buildings
- ✿ Optimizing Performance of Airside Systems
- ✿ Controlling Infections Due To HVAC System

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# Publisher's Letter



## Publisher's Letter

### Concept Of Retrofitting Is A Better Alternative

In this unpredictable economic scenario, every business runner or decision maker is thinking of reducing energy consumption in his/her commercial or factory premises. There are two ways of doing that for the old businesses. They can either go ahead with new devices replacing all old ones or they can think of retrofits. The first option, though is a better one in all senses, incurs a huge amount of investment. However, the second one is cheaper and reasonably serves the purpose.

According to the fan manufacturer ebm-papst, "For commercial office buildings, up to 70% of all energy use is attributed to the Heating, Ventilation, and Air Conditioning (HVAC) systems. Fan energy is typically the most significant consumer of energy within a commercial building. A significant amount of energy can be saved by replacing existing and inefficient AC belt-driven fans with high-efficiency EC (ultra-efficient) fans."

Considering the latest situation, last year ebm-papst A&NZ has opened their new EC Upgrades business unit. EC Upgrades focuses especially on EC fan upgrades and retrofit projects – in order to save facility managers and building owners energy and reduce noise emissions.

Yet another electric motor technology company QM Power also supports retrofitting. Last year they launched the Q-Sync Smart Synchronous Motor, which can reduce energy consumption up to 80%. As per the company, they improve the power quality and reliability of fan motors and provide businesses and OEMs with significant new energy savings retrofit opportunities for the same cost as legacy fan motors. These motors are available for refrigeration applications.

There are plenty of other such examples.

Thus, the business decision makers, who do not want to spend a hefty amount to rejuvenate their age-old HVAC systems with higher energy efficiency, lower carbon footprint and much more suppressed noise pollution, must consider retrofitting as the best alternative way. It not only offers a fairly good length of time to get prepared to install a completely new system (may be even with lower form factor!) but also helps in reducing present energy expenses considerably.

Please send your comments at [pravita@charypublications.in](mailto:pravita@charypublications.in)

**Pravita Iyer**  
Publisher & Director





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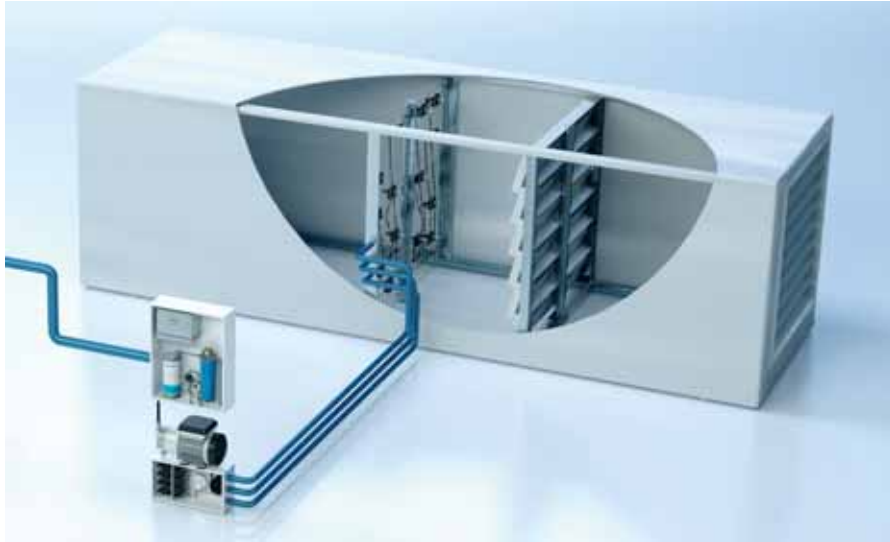


Image Courtesy: www.condair.com

Humidification is necessary in colder climatic conditions as there will be continuous heating, making the air drier that will result in cramped air quality and increased static electricity.

Photograph used on a cover is a Humidifier for HVAC project by Condair Group AG

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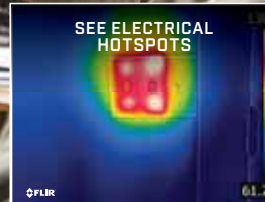
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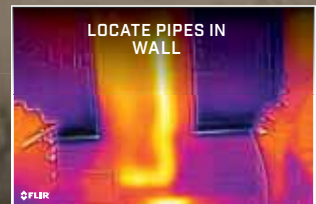
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**Editor: P K Chatterjee**



## Rising Demand For AHUs

As an obvious effect of climate change and global warming, the climate has transformed noticeably in all parts of the world leading to never-seen-before kind of heat during the working hours of the day. Under such circumstances, use of Air Handling Units (AHUs) is growing very fast. According to the latest market research report from Technavio, the global AHU market is expected to grow at a CAGR of close to seven percent until 2020.

As the rising energy (electrical) prices is making all business owners cut their energy utilisation, the business owners are leaning towards most energy efficient AHUs. Anju Ajaykumar, one of Technavio's lead industry analysts for engineering tools explains, "Benefits such as increased productivity and health of the employees that accrue from using advanced AHUs, coupled with enhanced energy efficiency, are attracting commercial space owners and tenants to these products. AHUs are an effective medium to manage rising energy prices, increase productivity, and reduce operating costs in commercial establishments. It can further help in increasing the value of assets and draw higher rental returns."

Anju also feels, "Employing high-performance AHUs results in significant energy savings. With the assistance of AHUs, commercial spaces can achieve a reduction of 10% in energy costs in a span of four to five years. The use of these units are anticipated to result in considerable energy, emissions, and cost savings of 10 to 40% till 2020."

Technavio's report further points out that the air handling unit sales in the Middle East recorded a rise of approximately 9.5% in 2015. EU countries grew at nearly 4% during the same period. Germany, which is still the primary growth driver in the region, accounted for close to 18% of the sales in 2015 that amounted to about USD 477 million. The market research firm expects that the AHU market will show an annual growth rate of approximately 10% in Germany over the next four years.

Focusing on the APAC region, the Technavio's report says the AHU market in APAC is expected to grow steadily till 2020. They feel that increased investments in real estate are one of the main reasons behind this. Thus, in our fast developing sub-continent the demand for AHUs will continue to grow in a healthy way.

Pl. send your views at [pkchatterjee@charypublications.in](mailto:pkchatterjee@charypublications.in)

*P. K. Chatterjee*



*Business owners are leaning towards most energy efficient Air Handling Units (AHUs)...*



## THE EMERSON CUP: REWARDING IDEAS THAT SHAPE THE HVACR INDUSTRY

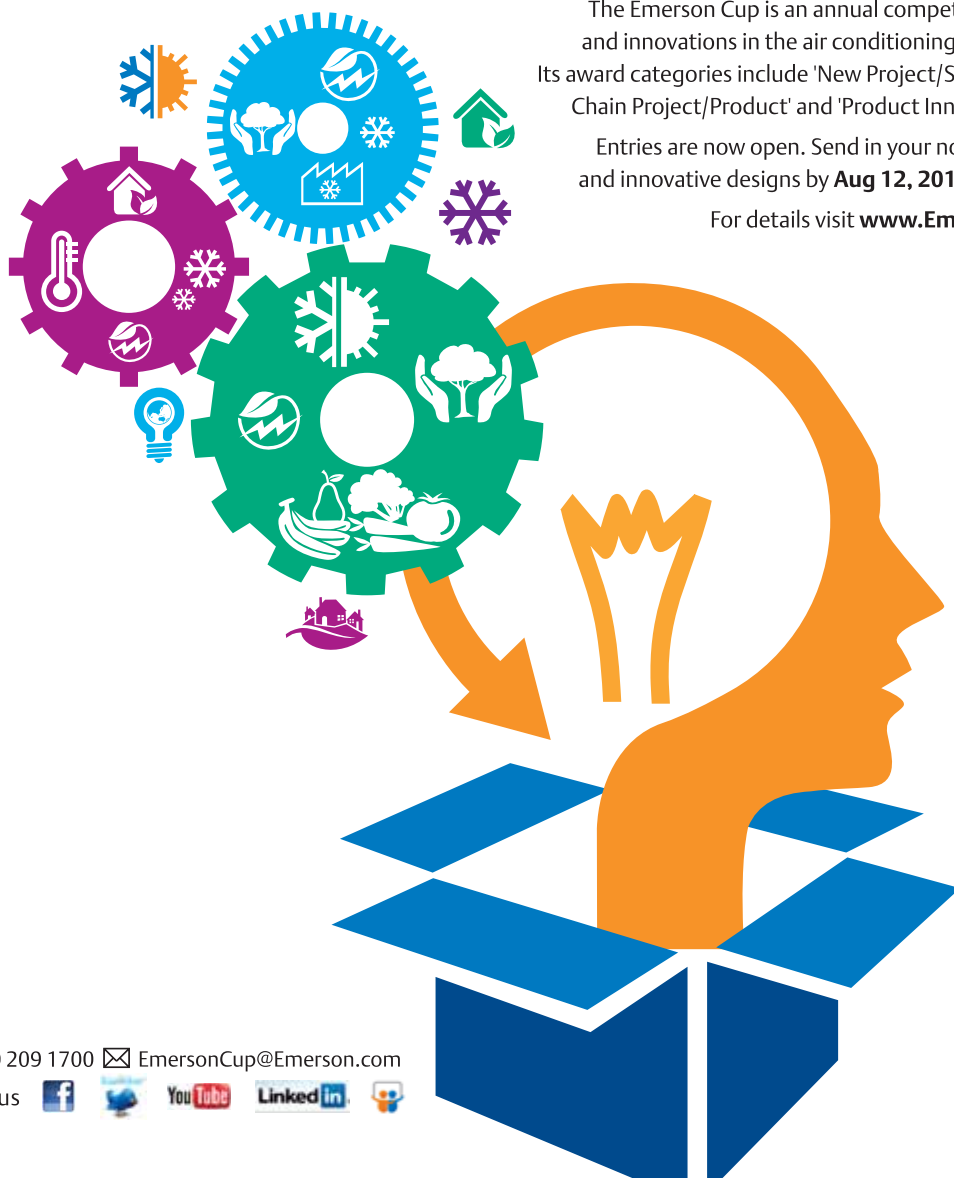
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## Airedale's new manufacturing facility witnesses a grand opening

Airedale International's new state-of-the-art manufacturing facility in Rawdon, Leeds was inaugurated by her royal highness, The Princess Royal on 10<sup>th</sup> May 2016. Due to a fire in September 2013, the British cooling systems manufacturer moved into the new 23,000 square meter purpose built premises in January 2016.

The Princess Royal took a tour of the plant to learn and understand the operations undertaken there. The chief importance of the visit was to highlight the significance of the manufacturing industry in the United Kingdom's (UK's) economy and encourage the plant employees.



The Princess Royal officially opened Airedale International's new state-of-the-art manufacturing facility in Rawdon, Leeds...

The tour included visit to the R&D centre, sheet metal production area, paint plant and coil assembly area, precision air conditioning production line, chiller area, CITB approved training school workshops and classroom.

Among the dignitaries for the royal opening of the new facility, there were Stuart Andrew, MP for Pudsey, Horsforth and Aireborough; Judith Blake, Leader of Leeds City Council; and Tom Riordan, Chief Executive of Leeds City Council.

## BSRIA introduces its new business-focused maintenance guide

For the built environment industry to utilise the maintenance budgets more effectively, the business-focused maintenance guide by BSRIA provides an appropriate methodology. Not only assets critical to the business are maintained but also the less critical assets are well taken care of within the obtainable budget.



Catherine England

Basically, this guide is proposed for those who set up or execute maintenance policies or strategies. On the other hand, it serves great purpose to those who acquire the services of maintenance contractors.

Catherine England, BSRIA Marketing Officer, said, "The component risk assessments included in the 2004 version have also been updated. They provide a set of typical failure modes, consequences and preventative actions for a range of building services assets – and should be utilised when reviewing maintenance task content to ensure that maintenance activities address typical failure modes."

## EPA rewards Carnegie Mellon University

Environmental Protection Agency (EPA) of the US honoured Carnegie Mellon University with \$10 million as a reward amount. With this huge



grant the university is launching a multidisciplinary and multi-institutional research centre. The prime idea behind the launch of the centre is that it will measure and map air pollutant concentrations across the nation to perk up the health of vulnerable populations like children, the elderly and those suffering from cardiac, respiratory and other medical conditions. Hence, this centre has a unique way towards integrated management of air quality, climate and energy.

Allen Robinson, the new centre's director and head of the Department of Mechanical Engineering said, "Issues like shale gas development, electric car subsidies and power plants of the future are interconnected issues that require integrated thinking."

## Rodda's recognises Carrier Transicold Xarios 500 units

Rodda's, a Cornish clotted producer has reorganised its fleet with four new 7.5-tonne Isuzu 'Forward' N75.190 trucks mounted with insulated bodies and Carrier Transicold Xarios 500 refrigeration units. Carrier Transicold, UK is a part of UTC Climate, Controls and Security, a unit of United Technologies Corp.

Rodda's 18-strong refrigerated fleet is joined by four new trucks and their Xarios 500 systems, including a mix of 15 7.5-tonne Isuzu, Iveco, Mitsubishi Fuso and Volkswagen vehicles, plus three 18-tonne MAN rigid trucks.

To help transport up to 220 million portions of clotted cream produced at Rodda's creamery each year to hotels, restaurants and supermarket regional distribution centre's throughout South West England, the new vehicles will be used intensively six days a week. The four new arrivals are projected to remain in service for five years and cover 90,000 miles annually. Carrier Transicold Cornwall, a local network service partner provides service and maintenance to Rodda's refrigerated fleet.



The Carrier Transicold Xarios range is ideally suited to Rodda's application as it's capable of maintaining a set point of between -20 and +30 degrees Celsius in vehicles with box volumes from 8-40 m<sup>3</sup>. To ensure high reliability and a long product lifetime, the units' ultra slim evaporators increase the available load space and on the other hand, the advanced electronic controller and brushless fans reduce the chance of vehicle downtime.

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## New CIBSE Code to enhance heat pump technology

The Chartered Institution of Building Services Engineers (CIBSE) of UK has launched a new Code of Practice for surface water source heat pumps, in a proffer to help the UK meet targets to reduce its carbon emissions.

The first Code of Practice relating to surface water source heat pumps is a new publication that is produced in association with the Heat Pump Association (HPA) and the Ground Source Heat Pump Association (GSHPA).



Image Courtesy: www.cibsejournal.com

Phil Jones

Phil Jones, Chairman of the CIBSE Energy Performance Group, said, "This new Code is exactly what is needed to give developers and investors the confidence to recognise the potential of surface water heat pump technology, ensure that they do what it says on the tin, and give a serious boost to the UK's carbon emissions aims."

He further said, "The technology has long shown its usefulness as a way to reduce the cost of heating and cooling, save space and cut emissions, but its historically low profile has often seen it overlooked."

Now, as a result of this comprehensive Code setting out best practice and minimum requirements, we have a strong case for the potential benefits based on clear standards that investors can have confidence in."

The Code of Practice is available for download/purchase from [cibse.org/CP2](http://cibse.org/CP2). It is free to CIBSE, HPA and GSHPA members (electronic copy). ■

## Danfoss secures the Ice Hockey World Championship

The Ice Hockey World Championship 2016 in Russia was completely safeguarded by Danfoss technology. This technology kept the ice cool and the addressees warm during the championship.

The VTB Ice Palace, Russia's biggest skating rink measures an impressive 70,300 m<sup>2</sup> and has three ice rinks. Danfoss provides numerous refrigerant systems to keep the ice at an ideal temperature – between -2 and + 4 degrees Celsius.



Image Courtesy: www.danfoss.com

Danfoss provides numerous refrigerant systems to keep the ice at an ideal temperature – between -2 and + 4 degrees Celsius...

At the sports complex, refrigeration accounts for half of the total energy consumption. The excess heat from the systems is utilised to heat the viewer seating areas – and to melt the ice, when it is required to be converted. In order to prevent system breakdown in the ice skating arenas, all refrigerant systems are connected to a single monitoring system, which monitors temperatures.

Danfoss is globally well known for their highly innovative and unique HVACR solutions. ■

## NZEB Puzzle is available online

With individual member states responsible for defining their Nearly-Zero Energy Building (NZEB) Puzzle regulations, many of which are not yet fully-defined, many firms are wondering what products they should offer under an implemented NZEB policy in the various EU new build heating markets. Thus, Delta Energy & Environment is offering NZEB puzzle for the heating, building and utility sectors, which is available on their site: [www.delta-ee.com](http://www.delta-ee.com). ■

## Americans could save more than \$1 billion in annual energy costs

LG Electronics USA, (the North American subsidiary of LG Electronics, Inc.) ENERGY STAR Partner of the Year encourages consumers in a nationwide retail promotion "Flip Your Fridge" that offers attractive discounts on ENERGY STAR certified LG refrigerators.

Chiefly, Flip Your Fridge encourages patrons to reliably salvage their old energy-wasting refrigerator and promote to a new ENERGY STAR (today, ENERGY STAR is the most widely recognised symbol for energy efficiency in the world) certified model.

John Riddle, Senior Vice President, Home Appliance Sales, LG Electronics USA said, "Flipping your fridge can have a positive impact on your pocketbook and the environment."

He further said, "With these spring promotions from LG, there's never been a better time for consumers to upgrade to an ENERGY STAR certified refrigerator and responsibly recycle their old one."

National retailers those who are participating include Best Buy, The Home Depot, Lowes, Sears and others, while regional dealers to name a few include Abt, Conn's, Brandsmart and RC Willey.

According to the US Environmental Protection Agency (USEPA), Americans could save more than \$1 billion in annual energy costs and prevent more than 13 billion pounds of greenhouse gas emissions annually, equivalent to the emissions from more than a million vehicles if all 15 years or older in the United States were replaced with ENERGY STAR certified refrigerators. ■



John Riddle

### Corrigendum

Dear Readers,

In page no. 48, of the May 2016 issue of Cooling India, the company name was wrongly mentioned as 'LB VENTILATOREN.' Mr. Gaurav Vasudev is the Managing Director of LTI Ventilatoren (INDIA) Pvt Ltd.

On behalf of Cooling India, I sincerely regret the mistake.

PK  
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## Mobile Science Lab transfigures rural education in India

In order to launch a Mobile Science Lab in Ghaziabad, India, Ingersoll Rand has partnered with Agastya International Foundation. The Mobile Science Lab is an extremely dominant and innovative mechanism to transfigure rural education and make it more accessible. It is basically, a guide that is designed to elevate awareness among disadvantaged children and teachers the importance of knowledge focusing on science.

This Lab would help, economically disadvantaged government school children in rural areas – and also benefit the teachers as training will be provided to them. This science centre was inaugurated at the Government Inter College, Nandgram, Ghaziabad.

Geetanjali Bhatia, Leader Corporate Relations & CSR, Ingersoll Rand India said, "With our long term successful partnership with the Agastya Foundation, we are taking steps to provide quality education to the economically disadvantaged in remote areas and further science literacy in the bright minds of this country. Through our programs, we aim to challenge rote-based classroom learning and spark curiosity, creativity and build leadership among these children." Through their innovations and dedication to corporate citizenship and sustainability, Ingersoll Rand seeks to create a positive impact on societies throughout the world.

Ratish Pandey, Director North Region, Agastya International Foundation said, "Agastya in partnership with Ingersoll Rand is committed towards spreading this science revolution to demonstrate to children that learning can be Fun, Useful and Accessible."



## AIRAH forms Resilience Special Technical Group

AIRAH's promise to channel specialist technical facts from niche areas back into the institute continues with the introduction of its latest Special Technical Group (STG) that focuses on resilience. The Resilience STG joins others devoted to ESD, solar cooling, backflow prevention and refrigeration. This group basically aims at increasing awareness of resilience as a design principle, gathering knowledge of resilient design approaches, generating resilient design tools and strategies and filling in resilience knowledge gaps specific to the HVAC&R industry.

AIRAH CEO Tony Gleeson, Affil.AIRAH said, "The Resilient Design Institute defines resilience as the capacity to adapt to changing conditions and to maintain or regain functionality and vitality in the face of stress or disturbance."

"AIRAH aims to be the leading independent voice for the industry on resilience, sustainability, compliance, innovation and the transition to low-GWP refrigerants. The formation of the Resilience STG fits right in with our strategic focus in this area," he further added.

The newest STG of AIRAH started off with a workshop earlier this year.

## Nortek amasses its portfolio with acquisition of Nuiku

Nortek, Inc., an internationally diversified industrial company, has acquired Nuiku, which was founded in 2012 by Sean Thomson and Bill Baker. Nuiku, which was established in Redmond, Washington is a strong, data driven platform and cloud based Application Program Interface (API) that enables flawless Natural Language Processing (NLP) across applications and devices. Its patented integration engine basically, connects voice commands with back-end user information to analyse commands and perform actions based on requests.

Michael J. Clarke, President and CEO of Nortek said, "Nuiku is a leader in natural language processing and a terrific addition to our home automation capabilities. The acquisition of the Nuiku technology adds key software capabilities to our portfolio of technology solutions, as well as seasoned engineers that are aligned with our focus of driving innovation across our businesses. We believe this acquisition will result in new, innovative combinations of our products that advance our position in the markets we serve."

## WIKA evolves as an industry leader

WIKAI, the global measurement and controlling devices manufacturer, has become 'Industry Leader' of the 2016 EUROVENTSUMMIT. The company, as the main partner of the event, underlines its strong ambition to become a leading provider of high quality components for the industry. Since its inception in 1946, it has been developing into a global market leader in pressure, temperature and level measurement technology.

It develops measuring equipment for the



WIKAI is proud to be the industry leader of this year's EUROVENT SUMMIT... Its product line 'air2guide' is designed to meet requirements of ventilation systems for industrial and administrative premises, and for manufacturers of ventilation and air-conditioning equipment.

Markus Best, WIKAI's Global Market Segment Manager, Ventilation and Air Conditioning, said, "WIKAI is proud to be the industry leader of this year's EUROVENTSUMMIT. Sustainable association works to reach technical progress and to improve the political and social framework are attributes WIKAI can identify with entirely."

He further added, "As a reliable measurement and controlling devices supplier, we consider the EUROVENTSUMMIT as a unique platform to connect with manufacturers, building engineers, contractors, politicians, component suppliers and other stakeholders of the HVACR industry."

A grim future awaits us.  
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HVAC&R accounts for 50 to 70 percent of the energy consumed in various industries. INSUshield provides unfailing thermal insulation that can help save a considerable amount of energy.

INSUshield is a non-fibrous fire retardant closed cell, tri-dimensional chemically cross-linked polythene foam. An ideal environmental friendly insulation material with a perfect solution for ducts, roofs, pipes, vessels, etc., helping conserve energy.

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Ducting Insulation



Piping Insulation



Flooring Insulation

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**INSUreflector (Reflective Insulation):** Fire retardant polyethylene bubble material encased with Aluminium foil on both sides that reflect 96 to 99 percent of radiant heat beneath slated roof

**INSUflex (Nitrile Foam Tubing):** Fire retardant, closed cell elastomeric Nitrile foam product for pipe insulation

**INSUmelfoam (Melamine foam):** Unique, flexible, non-fibrous open cell foam, possessing a combination of low weight, a Class '0' non-flammable fire specification and good sound absorption properties



## Mahle Cool Air and Heating innovates its operations

Mahle Cool Air and Heating; a family owned and operated HVAC company in Venice, Florida; has introduced a novel and innovative duct cleaning service. This service basically helps in removing mold, reducing bacteria, and eliminating odours. The company presently offers a fogging service for its customers and residents of Sarasota and Charlotte Counties.

The inventive fogging process cleans the ducts of one's HVAC systems to eradicate odours not counting the use of masking perfumes. For the residential and commercial use, the fogging product is a bacteriostat, fungistat, mildewstat and a deodoriser.

Denny Mahle, owner and operator of Mahle Cool Air (a Bryant factory authorized dealer with technicians having over 28 years of experience), said, "While most people are primarily concerned about maintaining a cool and humidity-free air in their home, many do not realise how much mold, fungi and other biological contaminates can build up in their air ducts."

"The new fogging system allows our certified technicians to safely control these harmful agents. By fogging the air ducts, home owners can expect improved air quality free of airborne mold and bacteria. Having clean fresh air indoors is especially important for those with respiratory issues or who are sensitive to allergens," he added further.



Mahle Cool Air and Heating introduced a novel and innovative duct cleaning service...

## Rinnai receives recognition for its popularity in the market

The well known selling brand of tankless water heaters in the United States and Canada, Rinnai, was included in 'Top Products of 2015,' according to Plumbing & Mechanical magazine. Based on the product's high number of views on the publication's website, Rinnai's Ultra Series RUR condensing tankless line was selected.

The RUR98i and RUR98e models attribute recirculation, with or without a devoted recirculation line, provided by thermal bypass technology that includes an integrated pump, internal bypass line and thermal bypass valve, which means less wait time for hot water. The Ultra Series also attributes Rinnai's highest hot water capacity per BTU, providing the ability to support multiple, simultaneous hot water demands and more venting solutions on the same unit.

Susan Mittelbrun, Vice President of Marketing at Rinnai America Corporation said, "Being recognised by Plumbing & Mechanical and its readers is a significant acknowledgment of Rinnai's commitment to innovation and to providing the industry with the latest technologies in water heating."

## Powers of Arkansas witnesses promotion in its hierarchy

Commercial HVAC company, Powers of Arkansas, has promoted two key leaders who contributed leadership and vision to the growth of the company as the industry leader in commercial HVAC equipment, air distribution and controls in Arkansas.

Scott Smith, a former Director of Air Distribution Sales, who was a key component of the strong growth of Power's Air Distribution system sales over the last two years, has been promoted to Vice President of the Air Distribution Division. Scott was influential in sales growth, market penetration and the growth of market share, and strengthening client relations.

Chase Ransom, who was a key member of the Powers team as an Account Manager and Sales Engineer for the last two years, has been promoted to Vice President, Northwest Arkansas.



Scott Smith and Chase Ransom

## Daikin acquires Italian manufacturer, Zanotti S.p.A

Daikin Industries through its subsidiary has decided to acquire an Italian manufacturer of refrigerators and freezers (for commercial-use), Zanotti S.p.A.

The acquisition is worth 98 million Euros. Daikin would obtain all company shares from the asset management company owned by Zanotti executive officers.

After completion of all the necessary procedures, finalisation of the transaction will be scheduled. Daikin intends to make the most of the merger to expand its refrigerator and freezer trade in Europe – while enduring to enhance its business foundation as a complete air conditioning and refrigeration manufacturer.

Daikin with this acquisition could provide a varied product line for all aspects of the cold chain in the European market for low temperature and refrigeration equipment.

As it expands its refrigerator and freezer business in Europe, it has also been enhancing its business foundation, including applied systems, as a comprehensive air conditioning and refrigeration manufacturer. Establishing itself in Europe, eventually Daikin will advance forward in expanding its refrigerator and freezer business in Asia, the United States and China where noteworthy market growth is projected.



# Frick India Fully Automatic Rotary Twin Screw Compressor Packages

**Indigenously Made Screw Compressor Block with FULLY AUTOMATIC VARIABLE VOLUME RATIO CONTROL**

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2290 m<sup>3</sup>/hr.

Power Saving  
upto  
**15%**

**SIMPLE  
CHOICE**

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Fully Automatic Screw Compressor package with Space Saving Vertical Oil Separator

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Ania Hampton

She was unanimously elected President by her fellow Directors...

## Ania Hampton takes over as the President of AIRAH

Ania Hampton, who is the Director of Edefice, her own engineering practice, is planning to lead a collaborative and consultative Board and to engage with AIRAH members after she has been named the new AIRAH President. Most significantly, she is the first female President in the storied 95-year history of the Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH).

Hampton was unanimously elected President by her fellow Directors at the recent AIRAH board meeting. She takes over from Nathan Groenhout, F.

AIRAH, who served three years in the national leadership role.

"Ania is an experienced professional with HVAC in the genes as a second-generation building services engineer. While she will put her own unique stamp on the role – like all of us before her – I know that she will continue to enhance our member value. I believe she has a great strength in connecting to people across our membership, and will shape a future-focused Institute that delivers real value to members," said Groenhout. ■



Kurt Parriott

He started his career with Gilbane through an internship...

## Kurt Parriott becomes Project Manager for Gilbane

Kurt Parriott has been named the Project Manager II for the Reno, Nevada area for Gilbane Building Company. As an eight-year veteran with Gilbane, Kurt will serve in this leadership role throughout all facets of construction including field operations, quality control, scheduling, while continuing to build lasting client and subcontractor relationships.

Kurt started his career with Gilbane through an internship while completing his degree in Civil Engineering from The University of Nevada Reno. He is well versed in a variety of collaborative building methods including design-build and CM at-risk – and is the recipient of the 2015 Chairman's Excellence Award for the Western Region of the firm.

"I have worked with Kurt since his first day with the company as an intern and it has been extremely rewarding for me to watch him grow in his career and into his new position as Project Manager II. Kurt embodies the Gilbane Core Values and I am proud to have him represent our company," said Jeffrey Park, Project Executive.

Gilbane Building Company provides a full slate of construction and facilities-related services – from preconstruction planning and integrated consulting capabilities, to comprehensive construction management, close-out and facility management services – for clients across various markets. ■



Michala Faulkner

"She is a tremendous asset to our members....," said Nick Benton...

## M Faulkner is the new HEAT.U e-learning platform Administrator

HARDI (Heating, Air-conditioning and Refrigeration Distributors International) has hired Michala Faulkner as the new Administrator for the HEAT.U e-learning platform.

As HEAT.U Administrator, Faulkner will work directly with HARDI members, assisting them with their HEAT.U reporting needs, enrollments and troubleshooting course issues, among other responsibilities.

"Michala is a tremendous asset to our members in their pursuit of successful learning outcomes," said Nick Benton, HARDI Manager of Professional Development. "She fills a critical role by ensuring that all of our members have positive, painless and valuable

experiences with HEAT.U," he added with great confidence and satisfaction.

"I've always been drawn to helping people solve their problems. In past positions and in this position, I have and will pride myself on owning and resolving our customers' problems," said Faulkner, who comes to HARDI from a customer-facing role in the financial industry.

In the past year, HARDI's HEAT.U e-learning platform has improved the user experience by quadrupling its number of courses, introducing position-specific course bundles and launching a completely redesigned interface. ■

# Big Smart Fan

High Volume Low Speed ( HVLS)



## An European Product

### Benefits

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### Recommended Applications

- Places with maximum air movement required e.g. Farms, Animal Husbandry Facilities etc.
- Big buildings with high ceilings e.g. warehouses, Hangers, Industrial facilities, Malls, Shopping centres, Sports Halls etc.
- Intensively used areas where people come together e.g. Entertaining centres, Cafeterias, Libraries, Museums, Mosques, Temples, Gurdwaras, Theatres, Opera, Concert halls, Exhibition Centres, showrooms etc.



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## Todd Young receives HARDI Small Business Champion Award

The Small Business Champion Award is given to elected officials who promote and protect the interests of small businesses, which represent more than 80% of HARDI wholesalers...

US (Ohio)-based HARDI (Heating, Air-conditioning and Refrigeration Distributors International) is the single voice of wholesale distribution within the HVACR industry. Its members market, distribute and support heating, air-conditioning and refrigeration equipment, parts and supplies.

The organisation has recognised U.S. Rep. Todd Young, of Indiana's 9<sup>th</sup> district, with the HARDI Small Business Champion Award. The Small Business Champion Award is given to elected officials who promote and protect the interests of small businesses, which represent more than 80% of HARDI wholesalers.

"On multiple fronts, I'm honoured to receive this award. First and foremost, it's validation that our approach to helping small businesses cope with over-burdensome regulations is the right approach. When small businesses can grow unimpeded, jobs and wages can grow along with them. And as the son of a small business owner in the HVAC industry – and as someone who learned the value of hard work doing janitorial work there as a kid – it's particularly rewarding to be

named the Small Business Champion by HARDI," said Rep. Young.

"Representative Young is a tremendous defender of small businesses. As someone whose entire life has

revolved around a small business, I have complete faith in Representative Young to lead Indiana and our nation in a way that encourages the growth of small businesses," said Karen Madonia, Chief Financial Officer of ILLCO, Inc., which runs a branch in Hammond, Ind., and who serves as Co-Chair of HARDI's Government Affairs committee. ■



Todd Young

## Epicor Software wins 2016 American Business Award

The American Business Awards are the nation's premier business awards program. All organisations operating in the USA are eligible to submit nominations...

Epicor Software Corporation, a provider of industry-specific enterprise software to promote business growth, has announced that the latest version of its Enterprise Resource Planning (ERP) business software, Epicor ERP has been named a 2016 American Business Awards winner in the New Product – Project Management Solution category.

Epicor ERP is a global solution that delivers the choice, flexibility and agility to drive growth and opportunity throughout business without the complexity of legacy technology platforms.

A single, end-to-end software solution for business, Epicor ERP is deployed in the cloud or on-premises.

The American Business Awards are the nation's premier business awards programme.

All organisations operating in the U.S.A. are eligible to submit nominations -- public and private, for-profit and non-profit, large and small. More than 3,400 nominations from organizations of all sizes and in virtually every industry were submitted this year for consideration

in a wide range of categories, including Startup of the Year, Executive of the Year, Best New Product or Service of the Year, Marketing Campaign of the Year, among others.

"The judges were extremely impressed with the quality of entries we received this year.," said Michael Gallagher, President and Founder of the Stevie Awards. "The competition was intense and every organization that has won should be proud." ■



Michael Gallagher

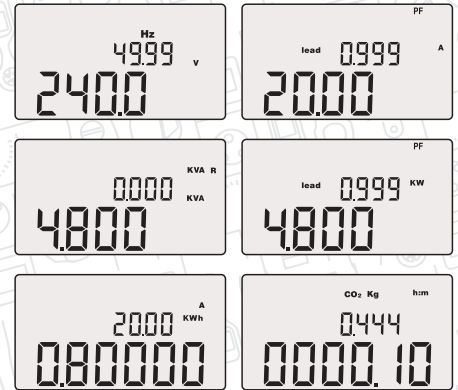


MECO supports Bureau of Energy Efficiency (BEE), Govt. of India's mission to institutionalize certification of Electric / Electronic goods for ECOMARK under Gazette of India



PG09 - 20A  
PG09 - 5A  
PG09 - 1A

### Display Pages



POWERGUARD is a simple to use and easy to handle product which can be widely used because of its portability and light weight

### Measures

- TRMS Voltage (V)
- Frequency (Hz)
- TRMS Current (A)
- Power Factor (PF)
- Apparent Power (KVA)
- Reactive Power (KVAr)
- Active Power (KW)
- Energy Consumption (KWh)
- Energy Usage Time (EUT)
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### Features

- Three Pin Socket & Plug Suitable for Indian Socket & Annunciator
- Large Dual Row LCD Display with Backlight
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- Simple, Easy & Accurate
- Continuous Measurement
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### General Specifications

- Accuracy : Class 1.0
- Power Consumption : Less than 2W (with backlight)
- Working Temperature : -10°C to +55°C, <70% RH
- Dimensions : 156 x 78 x 48mm (approx.)
- Weight : 300gms (approx.)

### Specifications

Function	PG09 - 20A	PG09 - 5A	PG09 - 1A	Accuracy
RMS Voltage (V)	240V AC (Nominal) (195V ~ 265Vrms)			±0.5% of FS
RMS Current (A)	(0.110 ~ 20.00) Arms	(0.100 ~ 6.000) Arms	(0.020 ~ 1.200) Arms	±0.5% of FS
Active Power @240VAC (KW)	(0.026 ~ 4.800) KW	(0.024 ~ 1.440) KW	(4.800 ~ 288.0) W	±1.0% of FS
Apparent Power @240VAC (KVA)	(0.026 ~ 4.800) KVA	(0.024 ~ 1.440) KVA	(4.800 ~ 288.0) VA	±1.0% of FS
Reactive Power @240VAC (KVAr)	(0.026 ~ 4.800) KVAr	(0.024 ~ 1.440) KVAr	(4.800 ~ 288.0) VAr	±1.0% of FS
Power Factor (PF)	(0.026 ~ 0.120) KW (0.120 ~ 4.800) KW	(0.024 ~ 0.096) KW (0.096 ~ 1.440) KW	(0.021.6 ~ 0.048.0) W (0.048.0 ~ 288.0) W	>0.03 PF <0.03 PF
Line Frequency (Hz)	45.00 ~ 55.00 Hz			±0.2 Hz
Active Energy (KWh)	000000 ~ 999999 KWh			Class 1
Energy Usage Time (EUT)	Hours / Minutes			NA
Carbon Emission (CO <sub>2</sub> in kg)	CO <sub>2</sub> (Kg)			NA

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# High Heat Foam Market To Touch USD 11.37 Billion

Emerging technologies are likely to fuel the growth of the foams market in future...

According to a recent research by Research and Markets, the market size of high heat foam is estimated to reach USD 11.37 Billion by 2021, at a CAGR of 8.2%, driven by energy efficiency and insulating properties.

The market growth is attributed to the increasing demand from developing countries coupled with growing manufacturers' preference in automotive and industrial applications. The demand for high heat foam from the industrial and automotive application is notable in key countries such as China, India and Brazil at global level.

Emerging technologies are likely to fuel the growth of the foams market in future. Among all regions considered, Asia-Pacific and RoW are estimated to witness high growth in the next five years. In addition, the demand across these regions is reinforced by the emerging markets, namely, China, Brazil and India.

Asia-Pacific was the largest market for high heat foams, in terms of value and volume, in 2015. The region is also expected to witness high growth rate in the high heat foam market, between 2016 and 2021. Rising investments by foreign companies; growing production facilities; strong industrial base for construction, packaging, and automotive sectors; and rise in standard of living are the other major factors contributing to the growth of the high heat foam market in this region. The growing demand for energy-efficient, good insulator and recyclable foam in automotive, railway, industrial, aerospace and others has led to the growth of the high heat foam market in this region.

Price and availability of raw materials are key factors for foam manufacturers for determining the cost structure of their products. Raw materials used by the foam industry include resins, inorganic chemicals, and refined petroleum products. Most of these raw materials are petroleum-based derivatives and are vulnerable to fluctuations in commodity prices, thus hindering the growth of the market. ■

Image Courtesy: CEFEP

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# Thermal Images As If Painted

A painting specialist in Lower Saxony takes advantage of thermal imaging for indoor and outdoor applications...

**M**eyer Malereibetrieb GmbH ([www.malermeistermeyer.de](http://www.malermeistermeyer.de)) is a specialized painting company originally founded in 1960 by the grandfather Johannes Lange in the town of Lehrte in Lower Saxony. Today the company employs 13 people. Its main services include work on interiors (painting, lacquering, wallpapering, staircase renovation and design) and exteriors (facade insulation and design). Martin Meyer, grandson of the company's founder, uses modern technology to be able to show problem areas to property managers and owners. The technical equipment of this innovative painting company includes an E50bx thermal imaging camera and a MR77 humidity meter from FLIR.

## Camera selection

Martin Meyer first became aware of the possibilities of thermography in 2006 at various local company presentations, during which even a chimney sweep presented his thermal imaging camera. "At that time, the devices were simply still too expensive," explains master painter Martin Meyer. And thus it took quite a while before investing in a thermographic camera became a reality. In 2014 the time had come. Martin Meyer contacted FLIR and had two thermal image camera models demonstrated: the compact Ebx series and the convenient T series with its swivel lens. Even though he was quite interested in the T series with its higher resolution and larger range of features, he decided on the FLIR E50bx for rational and economic reasons.

Martin Meyer opted for the smaller model, which would pay for itself quickly even when used only occasionally. The master painter particularly liked features such as image-in-image or the patented MSX feature of the FLIR E50bx, in which structures of the visual image are added to the thermal image.

## Facade insulation

His company has been offering thermographic inspections using the FLIR E50bx since January 2015. Thus, building weaknesses and insulation errors can be localized quickly and precisely.

"I used to explain to property managers and owners where the heat losses occurred and which savings we could achieve with insulation. But I was not always able to convince them using these arguments alone. Today we make the need for improvement really visible to the customer, by using a thermal image of the facade. This way, we can clearly show the sources of error and provide comprehensive consulting with regard to energy savings." And the best part for customers is: If they decide to have Malereibetrieb Meyer insulate their facade using a thermal insulation system following such an examination, then they are not charged for the thermography.

## Mildew problems following restoration

But Martin Meyer not only uses his E50bx in the external insulation area. "Our focus is on interiors and we work for several local property managers in this area. Problems with mildew have become more common in the past few years." He sees the habits of tenants as one of

the main reasons for this: "Older buildings often don't have the most modern windows and sometimes tenants leave the heater off in some rooms due to increased energy costs," explains Martin Meyer. But some mildew problems are also the result of insulation that is too good without appropriate ventilation concept.

## Leaky underfloor heating system

The thermal imaging camera has also served him well in the investigation of underfloor heating systems.

Prior to interior restoration of a building, Martin Meyer insisted on examining the over 20-year-old underfloor heating system.

On the upper floor, he did in fact find problems. "The heating system was not performing correctly, so we conducted further tests." In addition to his thermal imaging camera, Martin Meyer also used the non-invasive moisture meter MR77 from FLIR. He is impressed with the compact device: "I place it in the room and it automatically transfers the relative temperature and humidity data to the thermal image." This way he was able to locate a spot on the wall affected by moisture. He could also show the heating contractor exactly where to open the wall. And sure enough, there was a small leak in the underfloor heating there, which could then be professionally repaired.

## Software and training

To evaluate his thermal images, Martin Meyer uses the FLIR Tools software included with his camera, as well as the FLIR Reporter software, which allows for individual settings including creating reports with his own logo and presettings. An introductory course was also included in the purchase price of his camera. "But actually I should have taken the course before buying the camera," says Martin Meyer. "By exchanging information with other participants and taking the course, I learned which thermal image resolutions are useful and required for which applications."

## Conclusion and outlook

"For us the investment in a thermal imaging camera has definitely paid off," says Martin Meyer. "We are the only painting specialist in the area, who can offer these services." ■

Write to us at [flirindia@flir.com.hk](mailto:flirindia@flir.com.hk)





With advance of green buildings in the country, need for BMS has also grown; and for 8 to 10 years, lot of 'open protocol' field instruments and back-office systems (such as BACnet MS/IP or BACnet IP network) have evolved...

**I**n the quest of providing thermal and visual comfort to the users, to individuals or to a group, energy is often consumed. This energy consumption cost is measurable and need to be paid to the service provider at regular intervals; however, comfort is intangible and would vary from person to person and satisfaction is not guaranteed. In the commercial buildings, more than 75% energy cost is attributed to air-conditioning and lighting systems.

In India, the growth of air-conditioned buildings has mainly followed the growth of IT/ITES sectors and other services sectors. The construction sector has grown rapidly in the last 10-15 years and is expected to grow more rapidly in the coming years. This growth can only be sustained, if two major segments, viz. Infrastructure (rail, roads etc...) and Power keep pace with the growth in Construction segment. It is being quoted as 'half the India is yet to be built,' and if all the growth needs to be maintained, sustainability in the construction industry has to be maintained.

The buildings are not only the design statements for the creators (architects), but should also reflect the values and culture of the users and often it has been seen that, by merely copying the building looks from the western or developed countries, the buildings do not fulfil the needs of the users and often there is a gap between the 'needs' of the users and the availability of the services.

Usually while designing, the Architects and Owner spend the time in deciding looks of the building and the other requirements of users and services, such as HVAC, for providing the thermal comfort, Lighting and other amenities such as reliable and secure power often take a backseat. These user requirements, if not attended at the design stage, would surface soon after the building is handed over to the users.

This many a time, result into either 'provisions not meeting the needs' or 'exceeding the needs in some cases', for most of the projects. The end-result is always, the buildings do not perform as

designed, and often the running costs are higher than anticipated; leaving users grossly dissatisfied.

### Need for change

In India, we are still constructing most of our air-conditioned buildings in the same manner, as we used to construct the unconditioned buildings, and this needs to be changed. Most of the first generation centrally air-conditioned commercial buildings were uncomfortable to work in and still used to consume more energy. The building operational teams had no clue on where the energy was being consumed; which reflected on cost of operations and in the leased buildings, this extra burden was passed on to the users, for whom the operational costs were very high; which prompted them to look at shifting to other premises or to look at cutting corners by way of switching off the loads and shutting fresh air ports etc... These random practices had large impact on the indoor air quality and left users unhappy (and unhealthy) most of the times. In a nutshell, to kill demon of increasing energy costs, a new demon of poor indoor environment was created.

The building services, such as chillers, pumps, cooling towers, AHUs, and lighting are static in nature whereas, the building load is dynamic and depends upon various factors, such as occupancy, climate, micro-climate within the building and activities or functions by the occupants etc...

In order to strike a right balance between static services and dynamic loads, a monitoring mechanism along with controls is necessary. The building sizes have become big for effective manual control, thus, building management system comes into existence.

Most of the building management systems (BMS, as it is popularly known), include energy metering, cooling load measurement (BTU-meters), water metering for drinking water and other non-potable

applications, fire alarm and security applications, such as access control, PA system, alarms etc...

### An issue of non-functional BMS

Unfortunately, even after 15-20 years being in use, BMS are not popular and are mostly seen as burden on the project cost (CAPEX investment) and recurring costs (OPEX). In majority of cases, these BMS become non-functional or redundant, as the users never customised their requirements.

There are two main reasons for this issue. The most prominent was, when the BMS is being designed, the probable end-user requirements are never considered fully and the other is, when BMS is being commissioned, buildings are never fully occupied, thus, all field trials and commissioning tests are never carried out to confirm its performance, as intended and designed.

The other reason for unpopularity of the first generation BMS, was use of proprietary softwares developed by the BMS providers. These softwares could communicate with field instruments, if they were of same brand and could not accept any other makes or brands of field instruments. This led to monopoly of BMS providers, as the users were compelled to use all instruments of their make. Later it was observed that, apart from signing of annual maintenance contract, the BMS providers also started charging for software upgradation in short time span of less than 5 years and the users didn't find any value addition in this bargain and slowly a huge lot of unhappy customers gave a bad reputation to BMS.

Now, in many of the commercial buildings across country, which were built a decade ago, such redundant BMS can be found and these buildings are either functioned with manual intervention or with no controls at all.

### Challenges to meet

As the cost of energy is growing at least by 10% on annual basis and in many states, there is severe shortage of power during peak hours, managing energy and judicious use of available energy has become necessary for sustaining the commercial activities. Today in Indian markets, BMS systems are competing with technical man-power as cheap technical man-power is available in abundance and at lower costs. Thus, in most of the commercial buildings where BMS are non-functional, the building owners or operational teams are considering man-power as more reliable source of information and control than BMS. This needs to be changed.

With advancement of green buildings in the country, need for BMS has also grown and for 8 to 10 years, lot of 'open protocol' field instruments and back-office systems (such as BACnet MS/IP or BACnet IP network) have evolved.

These new 'open protocol' systems allow various makes of instruments to communicate without being from the same brand. A monopolistic market of BMS is slowly diminishing and a new 'open system' market has evolved.

The issue of full customisation of BMS has still not been addressed and need to be sorted out by entering into a long-term and performance based contract with BMS suppliers.

### Why BMS will be essential in future

Today though technical manpower is available in abundance, there are issues associated with their competence, as most of them are either fresh engineers or have no prior exposure to BMS and to building controls. They need to be trained thoroughly to be fully functional.

Other issue is of retaining the trained manpower. Once this technical man-power is trained and has hands-on exposure to BMS and controls, vast overseas market opportunities open up for them. With huge difference in the salaries, this trained manpower is not available in the domestic market. For more than a decade, Indian building industry has been used as a stepping stone by these professionals, which has also put a question mark on the pool of trained manpower in the country.

As FSI available for construction is going up constantly, the building sizes are becoming bigger and bigger, and it is becoming commercially not profitable to construct smaller buildings in the growing cities. Thus, for future growth in the building segments, BMS need to be relied.

### Government intervention

The Government of India looked at the commercial building very seriously and has included them in the list of designated energy consumers along with the large sector industries.

Under aegis of Bureau of Energy Efficiency (BEE), in May 2007, launched Energy Conservation Building Code (ECBC) for the commercial buildings have connected load of 600 kVA or 500 kW.



Soon it was realised that, in the tier-2 cities as well as in tier-1 cities and metros, the large population of commercial buildings would be below the above mentioned loads and would escape from ECBC mandates.

It is clear that, once a commercial building has been constructed, at least for next 40 years, it would continue to function and that to in an inefficient manner. Thus, in 2010, an amendment was issued to reduce threshold limit for the ECBC complaint buildings to have connected load of 120 kVA or 100 kW.

BEE, alongwith USAID and BEEP programs of multilateral funding agencies, is propagating building energy efficiency – and has mandated all states to make ECBC mandatory in their respective states.

The ECBC has emphasised on continuous monitoring of energy use in the buildings – and has made mandatory provisions for metering in the building.

As the cost of energy is going up and building energy consumption need to be controlled, lot of performance contracts are being signed – and to prove that the energy cost has been reduced over baseline energy consumption, continuous energy monitoring is essential component of these performance contracts. These contracts depend on monitoring systems without manual interventions and have boosted use of BMS in the buildings.

### Conclusion

The Indian BMS market has gone through full cycle of market maturity and now is poised for growth. It needs to be always understood that, BMS cannot save energy, but is necessary for proving, that, energy is being saved or can be saved. ■

**Shirish Deshpande**  
Green Building and Energy  
Consultant



## 4 Indications Of Capacitor Malfunctioning In AC Systems

Capacitors mostly start getting damaged due to repeated voltage fluctuation (exposure to higher voltage)...

**P**resence of multiple capacitors in any HVAC system multiplies the chance of capacitor failure. Under such an event, the capacitance of one or more capacitors either goes down or completely disappears. Generally, Compressor Motor Run Capacitor, Outside Fan Motor Run Capacitor, Indoor Blower Motor Run Capacitor and Start Capacitor are used in an ordinary air-conditioning system. Capacitors mostly start getting damaged due to repeated voltage fluctuation (exposure to higher voltage).

Although, it is always suggested to call an authorised person to service the air-conditioning system, it is always helpful to have an idea of the possible fault in the system. The following four observations may help you to guess whether the AC set' malfunction is due to capacitor failure.

1. Listen whether there is any clicking sound coming from the AC cabinet, if so probably some capacitor inside is failing.



Image Courtesy: www.havells.com

2. If the compressor motor capacitor malfunctions, the AC will not produce cooling effect.
3. If the outside fan capacitor is not working properly, then also the compressor may fail to produce the cooling effect.
4. When the indoor fan capacitor fails, air will not come out through the ventilation grill.

Once again the above points are just suggestions for the user's basic understanding, it is always suggested to take assistance from an experienced authorized person. ■

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# Advances In Air Handling

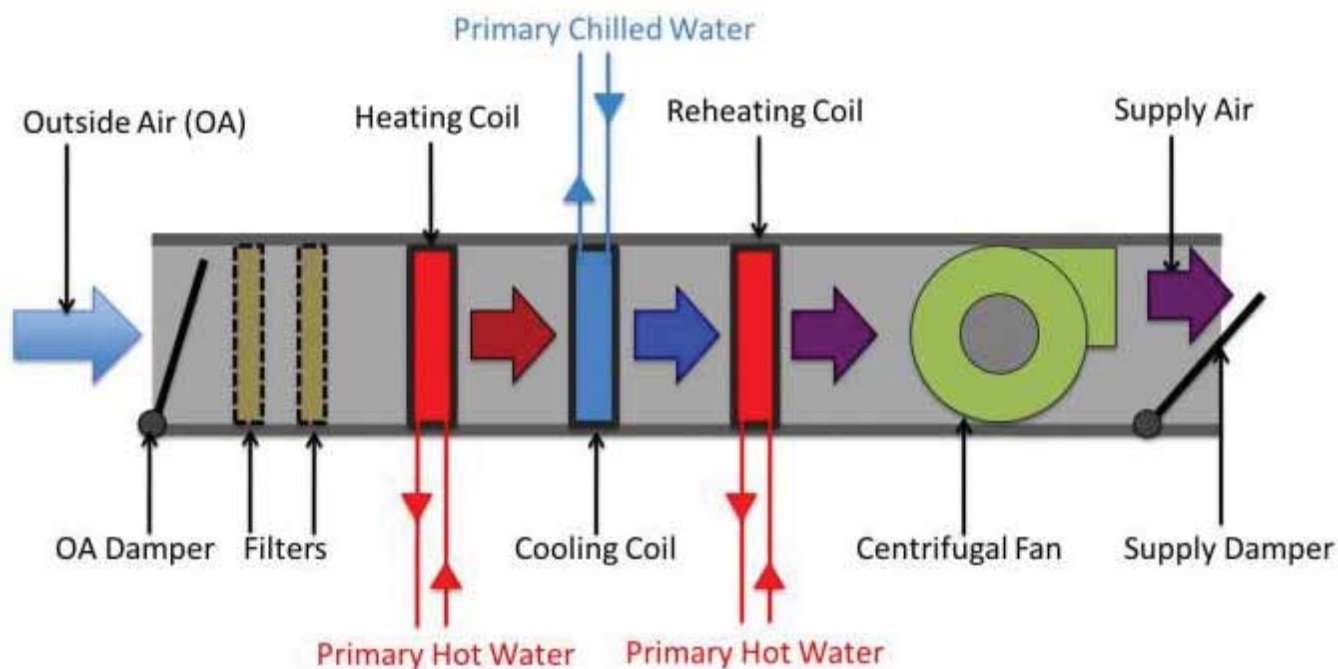


Image Courtesy: © ArcelorMittal Durlange 2016

In buildings, where the hygienic requirements for air quality are lower, some of the air from the rooms can be re-circulated by a mixing chamber, and that results in significant energy savings...

Air handling means that the air will be delivered into a space with desired thermo-hygrometric parameters and quality. With the growing levels of industrialization in different fields like comfort applications, agriculture, horticulture etc., air handling is playing an important role. It is no exaggeration of facts to say that technological advances in air handling have really enabled to enhance reliability, efficiencies and profitability in various sectors.

When looking at comfort applications, i.e., applications designed for the comfort of people, livestock, etc. and not the protection of computer-based electrical systems or other process operations requiring close control of the environment, the temperature should ideally be between 20 and 24°C. Various energy efficient and advanced air handling devices are surfacing in the market every day. All of air handling units will allow considering the main aspects of indoor air quality for the application. These include particulate and odour filtration, temperature, humidity, noise, draught and fresh air supply. Equally are the requirements for service and maintenance as well as the sizable pressures of capital and operational cost.



An air handler, or Air Handling Unit (often abbreviated to AHU), is a device used to regulate and circulate air as part of a Heating, Ventilating, and Air-Conditioning (HVAC) system. An air handler is usually a large metal box containing a blower, heating or cooling elements, filter racks or chambers, sound attenuators, and dampers. Air handlers usually connect to a ductwork ventilation system that distributes the conditioned air through the building and returns it to the AHU. The basic function of the AHU is take in outside air, condition it and supply fresh air to a building. All exhaust air is discharged, which secures an acceptable indoor air quality. Depending on the required temperature of the conditioned air, the fresh air is either heated by a recovery unit or heating coil, or cooled by a cooling coil. Sometimes AHUs discharge (supply) and admit (return) air directly to and from the space served without ductwork. Small air handlers, for local use, are called terminal units, and may only include an air filter, coil, and blower; these simple terminal units are called blower coils or fan coil units. A larger air handler that conditions 100% outside air, and no recirculated air, is known as a Makeup Air Unit (MAU). An air handler designed for outdoor use, typically on roofs, is known as a Packaged Unit (PU) or Rooftop Unit (RTU). The accuracy of the air treatment will depend from the specificity of each project (offices, schools, swimming-pools, laboratories, factories with industrial processes, etc). This means, the AHU treats air by filtering, cooling and/or heating, humidifying and/or dehumidifying.

There are several types of air handling units: compact, modular, residential, DX integrated, low profile (ceiling), packaged, rooftop mounted (typically on the roofs of buildings, with special weather protection), etc. Usually the air handling units have a casing (also known box) constructed by a framing system and double skin insulated panels (also known as insulated sandwich panel). The most common framing materials are galvanized steel, AluZinc or aluminium.

Regarding the panels skin, the most common materials are galvanized steel and AluZinc. In hygienic AHU's the inner skin usually is made from stainless steel or AluZinc with a special painting finishing. The materials used to insulate the panels are 99% of the times mineral wool (also known as stone wool or mineral fiber) or PU (Polyurethane). Some manufacturers choose the mineral wool and some the PU, it all depends on the compromise between thermal characteristics, acoustic attenuation, mechanical strength and production costs that each one is looking for the final product. All the components will be installed inside the casing. The casing is installed on top of a base (or chassis).

### Efficiency measures

- In buildings, where the hygienic requirements for air quality are lower, some of the air from the rooms can be re-circulated by a mixing chamber, and result in significant energy savings. A mixing chamber has dampers for

controlling the ratio between the return, outside, and exhaust air.

- A heat/cooling recovery exchanger is normally fitted to the AHU for energy savings and increasing capacity.
- A heat recovery device heat exchanger of many types, may be fitted to the air handler between supply and extract airstreams for energy savings and increasing capacity. These types more commonly include for:

*Recuperator, or Plate heat exchanger:* a sandwich of plastic or metal plates with interlaced air paths. Heat is transferred between airstreams from one side of the plate to the other. The plates are typically spaced at 4 to 6 mm apart, they can also be used to recover coolth. Heat recovery efficiency up to 70%.

*Thermal Wheel, or Rotary heat exchanger:* a slowly rotating matrix of finely corrugated metal, operating in both opposing airstreams. When the air handling unit is in heating mode, heat is absorbed as air passes through the matrix in the exhaust airstream, during one half rotation, and released during the second half rotation into the supply airstream in a continuous process. When the air handling unit is in cooling mode, heat is released as air passes through the matrix in the exhaust airstream, during one half rotation, and absorbed during the second half rotation into the supply airstream. Heat recovery efficiency up to 85%. Wheels are also available with a hygroscopic coating to provide latent heat transfer and also the drying or humidification of airstreams.

*Run around coil:* Two air to liquid heat exchanger coils, in opposing airstreams, piped together with a circulating pump and using water or a brine as the heat transfer medium. This device, although not very efficient, allows heat recovery between remote and sometimes multiple supply and exhaust airstreams. Heat recovery efficiency up to 50%.

*Heat Pipe:* Operating in both opposing air paths, using a confined refrigerant as a heat transfer medium. The heat pipe uses multiple sealed pipes mounted in a coil configuration with fins to increase heat transfer. Heat is absorbed on one side of the pipe, by evaporation of the refrigerant, and released at the other side, by condensation of the refrigerant. Condensed refrigerant flows by gravity to the first side of the pipe to repeat the process. Heat recovery efficiency up to 65%.

## Problems to be tackled

- Un-balanced fans wobble and vibrate. For home AC fans, this can be a major problem: air circulation is greatly reduced at the vents (as wobble is lost energy), efficiency is compromised, and noise is increased. Another major problem in fans that are not balanced is longevity of the bearings (attached to the fan and shaft) is compromised. This can cause failure to occur long before the bearings life expectancy. Weights can be strategically placed to correct for a smooth spin (for a ceiling fan, trial and error placement typically resolves the problem). But for a home / central AC fan or big fan are typically taken to shops, which have special balancers for more complicated balancing (trial and error can cause damage before the correct points are found). The fan motor itself does not typically vibrate.
- Controls are necessary to regulate every aspect of an air handler, such as: flow rate of air, supply air temperature, mixed air temperature, humidity, air quality. They may be as simple as an off/on thermostat or as complex as a building automation system. Common control components include temperature sensors, humidity sensors, sail switches, actuators, motors and controllers.
- The blowers in an air handler can create substantial vibration and the large area of the duct system would transmit this noise and vibration to the occupants of the building. To avoid this, vibration isolators (flexible sections) are normally inserted



into the duct immediately before and after the air handler and often also between the fan compartment and the rest of the AHU. The rubberized canvas-like material of these sections allows the air handler components to vibrate without transmitting this motion to the attached ducts. The fan compartment can be further isolated by placing it on a spring suspension, which will mitigate the transfer of vibration through the floor.

## Selecting an air handler

Air handling unit selection is as much an art as it is a science. Air handling units come in all shapes and sizes. It is important to learn to balance and prioritize all of the choices related to performance, efficiency, maintainability, and space constraints. It's important to realise that there will not be a 'perfect' selection for any AHU as many competing criteria, not the least being cost, will force compromises. It is the engineer's job to balance and prioritize all of the decisions related to performance, efficiency, maintainability, and space constraints to select a unit that has the lowest lifecycle cost for a given application. One must start with the

desired – or calculated – capacity of air conditioning and heating the air handling unit must provide. Then select which air handling unit manufacturer to base the design and specification. It is prudent to compare the dimensions and weights of several manufacturers to ensure the installed unit fits within its allotted space. Select which options, accessories, modifications, etc. the unit must have to meet the desired performance, maintenance, and control. And finally, schedule the unit – or units – on the construction document plans and in the specifications. Simultaneously during the design and selection, coordinate size, weight, configuration, duct and piping layouts with the Owner, Architect, Electrical Engineer, Plumbing Engineer, and Structural Engineer. Coordination with all the other design trades and buy-in by the owner are essential to the successful design and installation of an air handling unit system. ■

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S.L.I.E.T.





# High Efficiency Heat Pump

Heat pumps are available in both Vapour Absorption cycle as well as Vapour Compression cycle. The Vapour Compression systems are mostly electrically driven whereas the Vapour Absorption cycle is thermally driven...



In most of the industries substantial amount of energy is consumed in generating hot water and refrigeration effect. If these process operations of heating and chilling are made more efficient, then significant amount of energy consumption can be reduced. Thermax Ltd with the aim of providing energy efficient and environment friendly solution for such applications has come up with a Heat Pump using its Vapour absorption technology.

As the name suggests, a Heat Pump is an equipment which pumps heat from a lower temperature heat source to a comparatively higher temperature heat sink. As the direction of the heat flow is against the natural course, external work has to be supplied to achieve the required pumping.

Heat Pumps are available in both Vapour Absorption cycle as well as Vapour Compression cycle. The Vapour Compression systems are mostly electrically driven whereas the Vapour Absorption cycle is thermally driven. Thus, the Vapour Absorption based Heat Pump essentially operates with three utilities:

1. Low temperature Heat source – from which Heat is absorbed
2. Driving Heat source – which supplies work for the pumping
3. Product Hot water stream – to which Heat is added in the Heat pump

## Vapour Absorption CYCLE Based Heat Pump

The heat balance across the Heat pump remains the same as that of a vapour absorption based chiller i.e., heat is absorbed in the Evaporator and Generator and the absorbed heat is then rejected in the Absorber and Condenser. Depending on the relative temperatures of the Low Temperature Heat Source, Driving Heat



Image courtesy: www.thermaxglobal.com

Source and Desired Hot water temperatures, the Heat Pump is operated using different cycles to cater to the altered requirement.

Thus, Heat Pump can be classified into:

1. Heat Pump Type I
2. Heat Pump Type II (Heat Transformer)

### Heat Pump Type I

- In Type I heat pump, a Low-Grade Heat Source (40°C - 35°C), typically cooling water is circulated in the Evaporator.
- A High-Grade Driving Heat Source (180°C - 160°C) is utilised in the Generator by means of which heat rejection is done to a medium grade heat medium (60°C - 90°C).
- That is, the heat absorbed in the Evaporator from the Low-Grade Heat Source & the heat absorbed in the Generator from a High-Grade Driving Heat Source is rejected to medium grade heat medium circulated

in the Absorber and Condenser.

- TYPICAL HEAT BALANCE:
  - Heat Balance equation:  $Q_1 + Q_3 = Q_2$
  - Co-efficient of performance,  $COP = \text{Heat output} / \text{Heat Input} = Q_2 / Q_3 = 1.7$

- That is, For every 1.7 kcal of heat added to the hot water by Heat Pump, 0.7 Kcal is absorbed from the low temperature Heat source (waste heat source), and hence, Fuel consumption for a given Heating requirement reduces by 40%.
- As 0.7 kcal Heat is absorbed from the Cooling water, the Cooling tower Heat duty is also reduced.
- Correspondingly, evaporative losses in the tower also reduce.

#### Waste heat source

- 40°C - 35°C,
- Typically cooling water

#### Driving heat source

- 180°C - 160°C

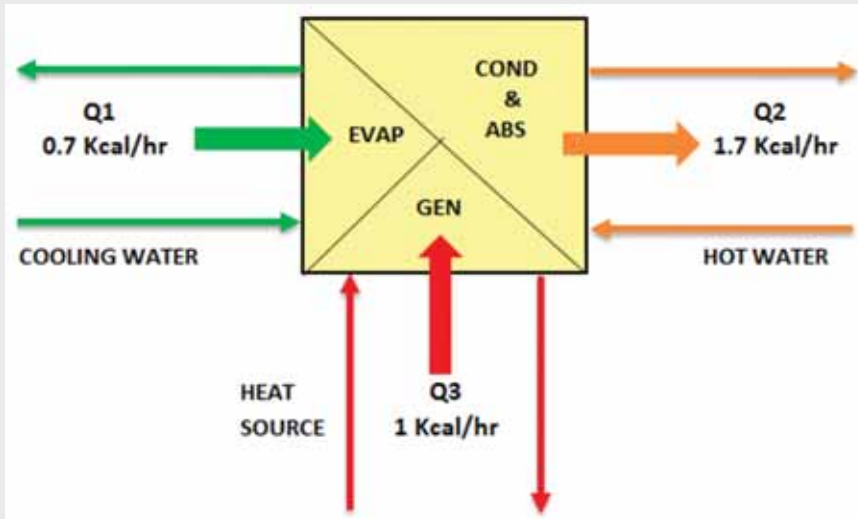
#### Product hot water

- 60°C - 90°C

**For every 1.7 Kcal of heat added to the hot water by heat pump 0.7 Kcal is free**

i.e. 40% savings in Heating

**Reduction in Cooling tower heat duties**



## Heat Pump Type I APPLICATIONS

### Heat Pump For Paint Booth Heating Application

- Heating Capacity :2.34 MW
- Heat pumped from Waste heat source (cooling water) = 0.965 MW  
= Fuel consumption reduced by 89 kg/h of HSD  
= 40% Savings
- Cooling tower Heat duty reduced by = 0.965 MW

#### OPERATING PARAMETERS

Waste Heat source water (Cooling water)		
Inlet temperature	°C	36
Outlet temperature	°C	34.6
Flow	m <sup>3</sup> /h	598
Driving Heat source		
Fuel		HSD
Flow	kg/h	127
Output Hot water		
Inlet temperature	°C	70
Outlet temperature	°C	83.7
Flow	m <sup>3</sup> /h	150

### Heat Pump For Wort Heating Application

- Heating Capacity : 458 kW
- Heat pumped from Waste heat source (cooling water) = 181 kW  
= Steam consumption reduced by 272 kg/h  
= 40% Savings
- Cooling tower Heat duty reduced by = 181 kW

(Referring to Heat pump Type II)

#### Waste heat source

- 80°C - 150°C,

#### Heating Output

- Dry Saturated Steam (1 – 8bar.g)
- Hot water (110 – 175°C)

#### Reduction in Dry coolers/fin fanned cooler heat duties

45% conversion of waste heat to useful heat

#### OPERATING PARAMETERS

Waste Heat source water (Cooling water)		
Inlet temperature	°C	34
Outlet temperature	°C	33.1
Flow	m <sup>3</sup> /h	180
Driving Heat source		
Fuel		Steam, 8kg/cm <sup>2</sup> (g)
Flow	kg/h	416
Output Hot water		
Inlet temperature	°C	60
Outlet temperature	°C	76
Flow	m <sup>3</sup> /h	25

### Heat Pump For Hot Air

- Heating Capacity : 8 MW
- Heat pumped from Waste heat source (cooling water) = 3.1 M  
= Steam consumption reduced by 4700kg/h  
= 39 % Savings
- Cooling tower Heat duty reduced by = 3.1 MW

#### OPERATING PARAMETERS

Waste Heat source water (Cooling water)		
Inlet temperature	°C	38.5
Outlet temperature	°C	34
Flow	m <sup>3</sup> /h	605
Driving Heat source		
Fuel		Steam, 5 kg/cm <sup>2</sup> (g)
Flow	kg/h	7416
Output Hot water		
Inlet temperature	°C	60
Outlet temperature	°C	80
Flow	m <sup>3</sup> /h	350

## Heat Pump For District Heating Application

- Heating Capacity: 8 MW
- Heat pumped from Waste Heat source (Exhaust Gas) = 3.29 MW  
= Steam consumption reduced by 5050 kg/h  
= 40% Savings

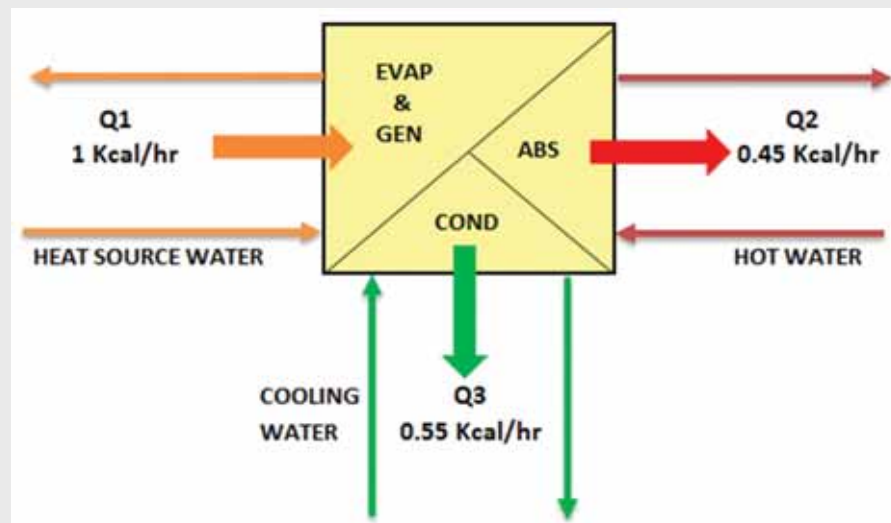
#### OPERATING PARAMETERS

Waste Heat source water		
Inlet temperature	°C	26.1
Outlet temperature	°C	16.3
Flow	m <sup>3</sup> /h	290
Driving Heat source		
Fuel		Steam, 2 kg/cm <sup>2</sup> (g)
Flow	kg/h	7213
Output Hot water		
Inlet temperature	°C	48
Outlet temperature	°C	57.1
Flow	m <sup>3</sup> /h	765

- Here, the 16.3°C Water leaving the Evaporator is made to exchange Heat with Gas turbine exhaust so as to cool the Exhaust to temperatures as low as 70-80°C to increase the recovery. Due to the absorbed heat, the same water returns to the Heat pump at 26.1°C.

## Heat Pump Type II

Heat Pump Type II is better known as Heat Transformer. This type of Heat Pump transforms a waste heat source to a more useful heat source by raising its temperature. A medium grade heat source(110°C - 100°C) is circulated in Evaporator as well as



## case study

Generator, where Heat is absorbed into the Heat pump. Part of this absorbed heat is rejected to a higher-grade heat medium (150°C - 160°C) in the Absorber which is the actual output of the heat pump, and the remaining heat is rejected to cooling water (30°C) circulated in the condenser. That is, Medium grade Waste heat is added to High-grade heat utilising Medium grade Waste heat source.

### TYPICAL HEAT BALANCE

- Heat Balance equation:

$$Q_1 = Q_2 + Q_3$$

- Co-efficient of performance,

$$\text{COP} = \frac{Q_2}{Q_1} = 0.45$$

- That is, 45% of waste heat that was initially rejected to atmosphere can be pumped to a useful heat source (Product Hot water/ steam), thus enhancing overall process efficiency greatly.
- The Heat pump output will always be hot water, which can be flashed in a flash tank to provide steam as per the desired pressure, thus, when steam is required as an output, heat pump – flash tank circuit and related accessories will become a part of the solution offered.

## Heat Pump Type II APPLICATIONS

### Heat Pump Used In Poly Film Manufacturing Company

- The plant manufactures poly film for photovoltaic cells
- The manufacturing process requires 100°C water
- During the process this water temperature increases to 110°C
- For reutilisation, the 110°C water leaving the process was cooled to 100°C in a dry cooler where the heat was simply rejected to the atmosphere
- Using Heat pump Type II, the available heat was utilised for generation of 4 barg steam, which finds use within the manufacturing process.

### OPERATING PARAMETERS

Heat source water		
Inlet temperature	°C	108
Outlet temperature	°C	100
Flow	m³/h	1000
Cooling water		
Inlet temperature	°C	28
Flow	m³/h	615
Hot water		



Image courtesy: www.thermaxglobal.com

Inlet temperature	°C	152	6.5 TPH 4 Bar(g) Steam
Outlet temperature	°C	157	
Flow	m³/hr	765	

- As can be seen, addition of Type II Heat pump not only reduces the boiler load by 6.5 TPH but also reduces the power requirement of the dry cooler, as the heat rejection to atmosphere is reduced to half and is done in a cooling tower, which consumes substantially less power as compared to a dry cooler.

### Heat Pump Used In Food Industry

- In this application, Gas engine's jacket

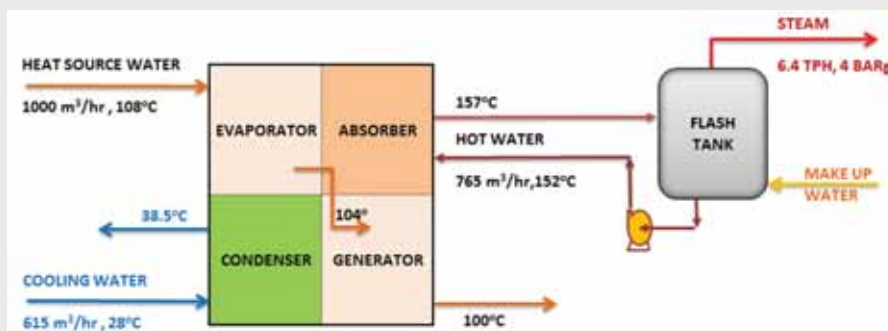
water is cooled in the Type II heat pump.

- Using the 93°C jacket water as heat source, hot water of 125°C is heated to 135°C.
- This hot water of 135°C is then used in a pasta manufacturing process.

### Operating Parameters

Heat source water		
Inlet temperature	°C	93
Outlet temperature	°C	75
Flow	m³/hr	127.3
Cooling water		
Inlet temperature	°C	24

### Scheme:



Flow	m <sup>3</sup> /hr	238
Hot water		
Inlet temperature	°C	125
Outlet temperature	°C	135
Flow	m <sup>3</sup> /hr	108.6

### Heat Pump Used In Refineries and Petrochemicals

- The product streams of many processes in refineries are at elevated temperatures, these have to be cooled before taking to filling & storing on account of high volatilities to avoid evaporation losses.
- Also, high temperature heat sources i.e. steam @ 4-8 bar are required in substantial quantities for innumerable processes.
- Here, Heat pump Type II can be used to

pump heat from the medium temperature streams to higher temperature, to provide steam @ desired pressure.

- This will not only reduce steam costs but also reduce the costs incurred for product cooling which may include use of dry coolers or any other such indirect heat exchangers where effectively the heat is rejected to the atmosphere.

#### Advantages Of Heat Pumps:

- 40% savings can be attained in external heat source consumption for generating hot water as compared to conventional hot water generator.
- If the cooling water is being used as a low temperature heat source, the heat rejections in the cooling tower will reduce correspondingly by 40%. Thus, the

evaporating losses will also reduce.

- There is reduction in Carbon Dioxide (CO<sub>2</sub>) emissions due to lower fuel consumption. The report elucidates the concept and technology of Thermax's Heat Pump Type I and Heat pump Type-II. ■

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Anindya Lahiri

## “Our technology is unique”

The HMX business unit of A.T.E. Enterprises Private Limited is a part of the **A.T.E. group**. HMX provides application oriented cooling solutions based on two-stage evaporative cooling. It has its manufacturing and R&D facility together with its all India sales, marketing, projects and service set up in Bengaluru. The A.T.E. group is a 75 years old group with expertise in the textile engineering, flow technology, machine-to-machine, cooling, wastewater treatment, energy efficiency, and print and packaging verticals. **Anindya Lahiri, Business Head – HMX**, is talking to **Cooling India** team on their technologies. Excerpts...

**You have had excellent experience in the energy and environment sectors. How are they inter-related from the viewpoint of significance in the HVAC industry? Also, do you think indoor air quality is a big challenge?**

Energy-intensive equipment increase CO<sub>2</sub> emissions contributing to the climate change phenomenon. This is true for the HVAC sector as well. In fact, the countries; such as India; are the fastest growing contributors to electricity consumption – and hence to greenhouse gases. This is growing because of cooling through air conditioning. Energy efficient cooling is hence critical to greenhouse gas abatement.

Maintaining good Indoor Air Quality (IAQ) is definitely a challenge to all concerned – manufacturers and end-users. Higher quantities of fresh air and more filtration to ensure better IAQ have the potential to raise capital and operating costs for the end-user – and greenhouse gases.

The challenge for the manufacturer, therefore, is to provide most cost-effective solutions that in many cases mean retrofits. However, better indoor air quality has significant positives too.

A growing number of studies in the education, healthcare, and manufacturing industries have shown an increase in productivity with higher fresh air content. In a peer-reviewed study in 2003, operators at a call centre in a tropical climate zone performed nearly 9% better when fresh air levels were increased. Offices and dormitories with higher fresh air content have reported lower incidences of flu and respiratory tract infection. A similar study published in 2004 showed investments to upgrade ‘unhealthy’ buildings in Europe had a payback period of less than two years with an improvement in productivity by just 0.5%.

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**A growing number of studies in the education, healthcare, and manufacturing industries have shown an increase in productivity with higher fresh air content...**

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**Please tell us in detail about the HMX business unit and your role?**

HMX is one of the 8 business units of the 75 year old A.T.E.

group, provides end-to-end solutions in comfort cooling to both industrial and commercial sectors. We manufacture unique, energy-efficient products based on our highly successful DAMA (Dry Air Moist Air) technology.

I head the HMX business unit overseeing production, sales, marketing, projects, and service. I am entrusted with the responsibility of growing the business through customer satisfaction, market expansion, product development and expansion of application. My experience in leading a start-up business in renewables as well as an established businesses in heating and cooling segments in the past is turning out to be very handy in pushing the frontiers of the business of HMX.

### **What is the product range and what are the cooling solutions under the ambit of the HMX business unit?**

The HMX product range includes our well-known brand Ambiator that provides fresh and cool air for both space and spot cooling applications for people comfort and process needs. Based on a combination of indirect and direct evaporative cooling, the Ambiator works on 100% fresh air and has become a popular name in sectors where people comfort is key to productivity and which are focused on consistent product quality. Major multinationals and leading Indian companies in automobile, engineering, and food and beverage sectors in India have opted for this innovative cooling technology for factory cooling to get the best out of their workforce, and also for storage and process areas where treated fresh air is a must. An optional addition of a 3rd stage with chilled water or a DX coil reduces the humidity at our machine outlet wherever required.

The HMX Pre-Cooling Unit (PCU) are now expanding their base in industry as well as commercial sectors for pre-cooling of fresh air for large, conditioned spaces. Remote monitoring systems from our group business unit EcoAxis installed in our installations such as IT buildings have generated performance data to that – to show huge energy savings compared to other conventional technologies that are being used for the purpose.

### **HMX provides application oriented cooling solutions based on two-stage evaporative cooling and HMX-Ambiator is a next-generation two-stage evaporative cooling solution. What are the advantages, besides its prominent features?**

Foremost is the 100% fresh air that the HMX-Ambiator provides. Equally significant is its capability to give better cooling

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**Based on a combination of indirect and direct evaporative cooling, the Ambiator works on 100% fresh air and has become a popular name in sectors where people comfort is key to productivity and which are focused on consistent product quality...**

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compared to conventional single-stage air washers that are mostly used to provide fresh air ventilation in the industry. With an innovative design of the heat exchanger that is used in the indirect portion of the two-stage machine,

it achieves better cooling than the other two-stage machines available in the market, e.g., those based on other designs such as coil. Apart from better cooling, a lower humidity level at the outlet of the two-stage Ambiator compared to that at the outlet of the single-stage design is yet another advantage of this product.

### **What is the strategy that puts you on cutting edge against other companies manufacturing a similar line of products? What do you envision for increasing business?**

The foremost key to our success is and will be satisfied customers. We are happy that much of our business comes from repeat orders. Our technology is unique and that has put us in a distinct position as far as the competition goes. Apart from technology, we have a multi-pronged strategy to drive our business.

We focus on people comfort where the skill level of workers is key to higher productivity. We also target niche segments with customised applications.

Commercial applications for PCU are the other areas identified for growth. We have already ventured out in the middle-eastern market – and getting a good response. Product upgrading, manufacturing scale-up and automation, team development and marketing collaterals will be the key strategies to sharpen the cutting edge against competition.

### **What are your vision and plans in the next two years?**

Scale-up of business by focusing on our strong application areas, working on new cooling applications like in pharmaceuticals, defence, FMCG and residential with people comfort, energy saving and higher level of

indoor air quality are the major points of focus.

After tasting success in the GCC market, we plan to further penetrate the international market.

Development of present product range to higher efficiency levels with lower energy band operation, operational efficiency with scale-up, and developing service business to garner higher customer satisfaction will be the major areas of concentration for our management team.

In the process, we expect the business volumes to grow at a CAGR of around 30% in the next two to three years. ■

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**Remote monitoring systems from our group business unit EcoAxis installed in our installations such as IT buildings have generated performance data to that – to show huge energy savings compared to other conventional technologies...**

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## New Generation Fans

There are 3 things  
that are done  
to improve the  
efficiency of fans in  
super efficient fans

In modern world electrical appliances have become basic need. It is difficult to imagine life without electrical appliances. Most commonly used electrical appliance in house is ceiling fan. It is used for circulating air in the room, thereby giving cooling effect due to breeze around us. Some of the ceiling fan myths are: a) It cools the air- fact is that it gives feeling of cooling due to breeze b) It is not useful in winters- fact is that if it is rotated in opposite direction, it can be used to keep room warm. Table, wall mounted, exhaust and pedestal are the other types of fans used at home. Based on power consumption electrical home appliances are classified as a) high power appliances such as room air-conditioners, heaters and refrigerators b) medium power appliances such as fans, lamps, washing machine, mixers etc c) low power appliances such as television set, music system, LED lamps and other electronic appliances. In the race of cost, size and weight reduction, lot of advancement have been achieved in further power reduction of low power appliances. While most people target only heaters, room air-conditioners and refrigerators when they think about electricity savings, but fans contribute much more to the electricity bills and could be close to about 30% of the electricity bills. Compared to lights that are switched on only in the evening, ceiling fans are on for most part of the day and even during night time. Their number is also high and could be close to one per head. Ceiling fans consume more electricity than conventional tube light. Thus lot of energy can be saved through improvement in ceiling fan.

In only 2006, Bureau of Energy Efficiency (BEE) launched its standards and labeling program. Since then most of the electrical appliances are being rated on a scale of 1 to 5 on their efficiency. Most appliances are labeled and sold as BEE star rated appliances. The level of efficiency of appliances in India has not reached the level of efficiency established in most efficient appliances in technically advanced countries. A rapid market transformation is done to only three appliances: Heaters, room air conditioners and refrigerators. In view of this, BEE has launched a new scheme to promote manufacturing of BEE 5 star rated fans and super efficient ceiling fans.

Most people believe that BEE 5 star rated fans deliver less air and using the same may not give similar comfort as a regular fan. BEE 5 star rated fans have minimum air delivery of about 210-220 CMM whereas regular fans have the value of 250 CMM. Air delivery depends on blade pitch, blade shape and size, speed and power of motor used in fan and height of fan from ceiling. Regular fans are rated at 75 Watts, but the new fans are rated at 50 Watts (30% savings). In fact some BEE 5 star rated fans are also rated at about 45 Watts. Thus there is clear cut saving. Super efficient fans are the further advancement in ceiling fans. Tata Power and Reliance Energy are promoting user to go for these kinds of energy efficient fans. As ceiling fans contributions to the total electricity bill is significant for most of electricity bills, the interest in super efficient fans is inevitable. Comparison of normal fan, BEE 5 star fan and super efficient fans is available in literature on fans. It was decided to do

Table 1: Comparison of regular fan super efficient fan

Fan Speed	Power Consumption(Watts)			Air Delivery(%)		
	Regular fan	Super efficient fan 1	Super efficient fan 2	Regular fan	Super efficient fan 1	Super efficient fan 2
1	46	6	2	60	25	45
2	56	9	4	75	50	65
3	62	12	6	85	70	80
4	65	19	15	90	85	90
5	75	35	28	100	100	100

analysis of super efficient fan operation in slightly different manner.

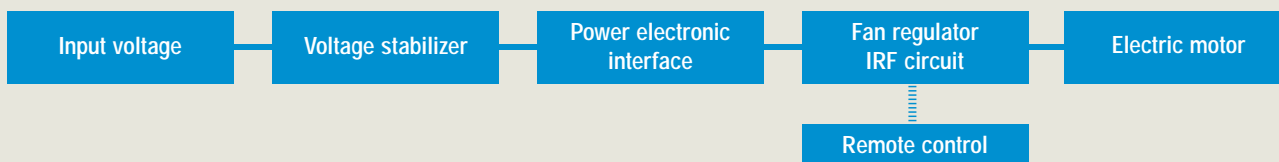
The new super efficient fans that are available in the market use a different type of electronic motor, which is also called Brushless DC (BLDC) motor. Conventional ceiling fan consumes about 75 Watts of power for 1200mm sweep. This new technology with efficient blade designs makes ceiling fans far more efficient, and the fans consume 28-35 Watts of electricity, which is about 50% less than the old regular fans. Some of such ceiling fans have air delivery of about 230 CMM that makes them almost the same in performance as compared to the regular ceiling fans. They use advanced composite materials which is light in weight and with better surface look

extended to table fans, pedestal fans, wall mounted fans and exhaust or ventilation fans. Currently various manufacturers of these super efficient fans are superfan, Luxaire, gorilla fan and orbit green fan. Block diagram of super efficient fan is shown in Fig1. On the face of it, the price of the super efficient fans look high, but if we look at current and rising electricity costs, opting for super efficient fans makes a lot of sense especially to replace the high usage fans. The current specifications of these super efficient fans look really good, and if there is good response from the market, there will be significant savings of electricity for the consumers as well as nation in the future. Looking at the high costs for buying a super efficient fan, most people would be interested

1. Higher air flow at full speed;
2. Low noise through the use of better quality blades;
3. In order to be more suitable for Indian conditions:
  - a. Very low degradation in performance at lower voltages;
  - b. Reliable even under high ambient temperature;
4. Lowest power consumption reasonably possible.

Power consumption of regular fan and super efficient fans of 2 companies is compared at various speed positions of speed regulator. Power consumption of super efficient fan at various speed positions and air delivery corresponding to it is given in Table 1.

Fig 1: Block diagram of super efficient ceiling fans



coming in variety of color combinations. The one downside of a super efficient fan is that the power factor of such fans is 0.9 as compared to 0.95 of regular fans with induction motors. It may impact commercial connections with demand charges in their tariff plan. Lot of electronics has come in fan systems. Now, fan speed regulators are remote controlled. Concept of rheostatic fan regulator or power electronic devices based regulator has gone. Today these super efficient fans work with remote control for its functional operations. Timers and auto speed reduction features has come to these super efficient fans. In built LED lamp has become feature of these fans. In future concept of super efficient fans will be

in comparing numbers before making a buying decision. A super efficient fan will pay back for itself in about three and half years. Also it offers a 5 year warranty.


There are 3 things that are done to improve the efficiency of fans in super efficient fans:

1. Performance is improved by improving the induction motor.
2. Use of BLDC (or Brushless DC technology).
3. Improving the design of the blades.

The above implementations involve replacing some electrical components with electronic components thus allowing for a smoother control of the fans. As per BEE specifications, these changes should allow super efficient fans to give:

Air delivery of super efficient fan is @ 70% to 80% for fan speed positions 4 to 3. In these positions, power consumption is very small. In fact, lowest power consumption of regular fan at speed at regular position is higher than highest power consumption of super efficient fans. Most of the time, we operate fan at lower speed settings. At these positions, power consumption is extremely small. Thus, even though it has rotating parts, its power consumption is comparable to LED power consumption. Thus, super efficient fan is the latest change in fan technology and it will replace all regular fans in coming decade. ■


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# Indoor Environmental Chamber



Effect of air pollutants on cultural heritage buildings has been an emerging issue in the recent years. Conducting field tests to investigate the same has many social, economic and technical constraints. Alternatively, the environmental chambers can easily help us in serving the purpose of testing the construction materials under variable meteorological conditions and identify reasons to take necessary actions. This article focuses mainly on estimation of effects of air pollutants on building materials using 'Environmental Control Chamber' and its design...

The Indoor Air Quality (IAQ) not only affects the human health but also the building materials. Earlier main concern of improving air quality was to prevent the human from dangerous health issues, but in recent years the focus has been made on the degradation of building materials due to environmental pollutant like SO<sub>2</sub>, NO<sub>2</sub> and VOCs (Arizzi et al 2012; Haneef et al, 1992). This shift in focus has taken place in order to safeguard the cultural heritage buildings, ancient temples, cathedral (churches) and ancient buildings, where the damage is impossible to recover.

This damaging effect of air pollution on building material have been known from a long time and in the western countries. Moreover, the United Nation Economic Commission (UNEC) has also initiated the assessment of effect of air pollution on material deterioration including monuments and heritage buildings. In order to address this problem, a tubular type environmental chamber has been designed and

Table 1: Types of environmental chambers...

Sr. No.	Type	Approximate Size	Application
1	Small environmental chambers	2 Liters	Used for testing materials on pollutants whose reactions are sensitive to environmental parameters
2	Medium environmental chambers	300 Liters	Used for testing materials on pollutants for variable environmental and flow conditions
3	Large environmental chambers	30 m <sup>3</sup>	Prototype testing

fabricated. The chamber has a facility to vary the flow parameters as well as the meteorological parameters. Test samples are exposed by placing them on a sample stand, which is arranged in such a way that the uniform flow strikes the samples.

Thus, the behaviour of test samples exposed to different environmental conditions are studied over a period of time (Ausset et al, 1996; Ausset et al, 1999). Further, the exposure of the pollutants is estimated by gravimetric and microscopic techniques.

### Types of indoor environmental chambers

Depending up on the objectives of the research, the environmental chambers are classified under various categories. Table 1 shows the various categories and types of the Environmental Chambers.

### Features

Figure 1 shows the environmental chamber and its equipments. The environmental chamber is of medium size and having volume of 350 liters approximately. It is made up of Acrylic sheets and it is equipped with good, durable, inert, more accurate measurable equipments. The features of the chamber are:

- Speed regulating mechanism
- Uniform flow designed by perforation plates
- Sample placing assembly
- Concentration monitoring
- Temperature monitoring
- Humidity control and monitoring
- Annular design for achieving streamlined flow
- Recirculated/one time flow configurations

### Design

The test facility consists of an air tight annular chamber, sampling manifolds, gas inlet and outlet probes. Temperature, humidity, and air exchange rate are monitored and controlled by individual devices. Material samples in cuboid shape have been used as test species. The samples are then analysed gravimetrically and by using XRD techniques to check the absorption and reactivity of the pollutants on to the material surface. Environmental parameters were chosen to reflect typical urban hot spot conditions.

### Methodology

The pollutant gas can flow and recirculate inside the annular chamber by the help of fan (which is fixed inside the chamber). The flow velocity inside the chamber can be controlled by the help of a regulator. In order to ensure



Figure 1. Environmental Chamber and its Equipments... Fig (a) is the Flue Gas Analyzer, (b) Thermostat (Temperature controller), (c) Rotameter, (d) The SO<sub>2</sub>, NO<sub>2</sub> Aluminium Cylinders, (e) Outlet, (f) Probe of Flue Gas Analyzer, (g) Relative Humidity & Temperature Traceable Instrument, (h) Hot Wire Anemometer.

that the flow is uniform, perforated plates have been designed and installed within the chamber.

These plates help in diffusion and mixing the pollutant gas homogeneously towards downstream to ensure all exposed test samples receive same concentration of pollutant gas.

The perforated plates and their performance has been validated by using a CFD based tool COMSOL (COMSOL, 2013). Figure 2 shows the velocity magnitude within the chamber before and after the perforated plates. It has been found that the turbulence has been decreased significantly at the downstream side.

## Applications

Environmental chambers were extensively used for testing building materials (McGhee, 1992; Martinez et al, 1998; Zappia, 1998; Massey et al 1999).

Experiments have been conducted using Cement Mortar (M), Cement Fly-ash Mortar (F A M) and Lime mortar by exposing them with the pollutant gases  $SO_2$  and  $NO_2$ .

Figure 3 shows the average absolute percentage change in the weight of the test samples when exposed to  $SO_2$  and  $NO_2$

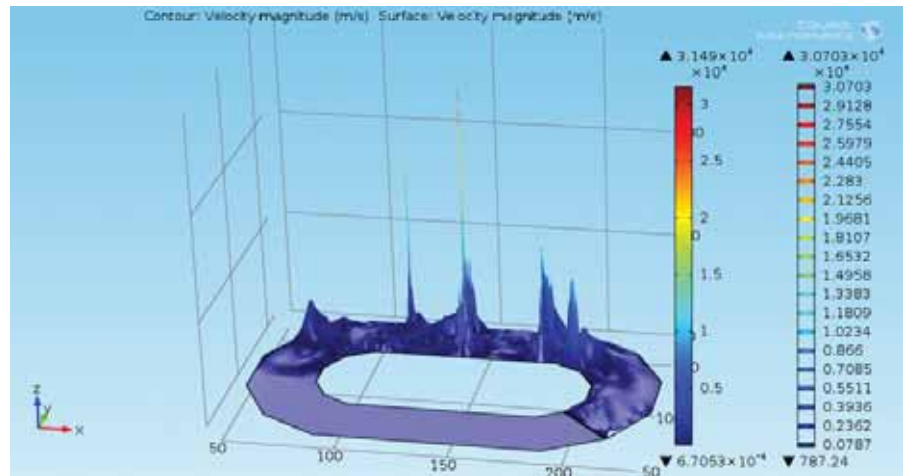


Figure 2: Velocity magnitudes inside the chamber modelled using COMSOL...

respectively. It has been observed that the exposure of  $NO_2$  is more when compared to the exposure of  $SO_2$ .

Further it has also been observed that the Lime mortar is more reactive when compared to cement mortar and hence it can be concluded that the lime mortar may deteriorate at a faster rate when compared to the cement mortar.

## Summary

Environmental chambers are extremely useful in developing source emission factors, which can be used in developing indoor air quality models. However, the results have to be validated by performing full scale testing in large chambers for more accurate results.

The facility is currently being used at Indian Institute of Technology, Delhi to investigate the effect of VOC's on the materials.

The testing of the materials like marble and redstone are also been considered. Since the facility can simulate the effect of variations in environmental parameters, it can be extensively used in testing the long term effect of the pollutants on the building materials which has archeological importance. ■

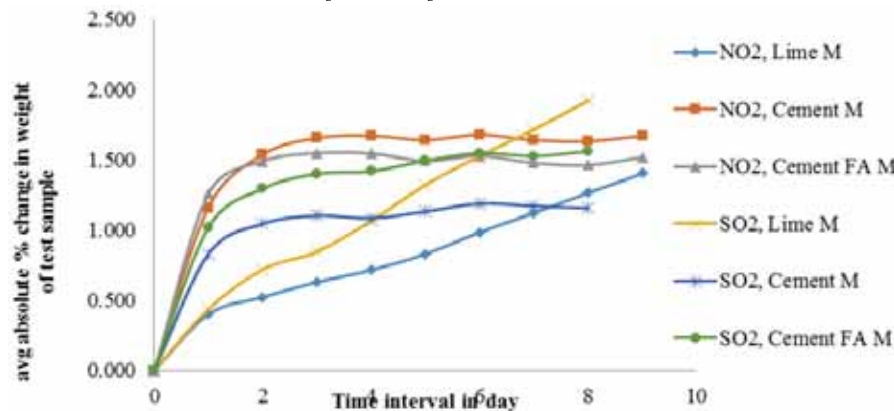


Figure 3: Variation in average absolute % change in weight of test samples with time due to  $SO_2$  exposure...



# A Boon For The Field Technicians

The Sporlan app includes a guided mode and expert mode to aid the different skill levels of technicians...

Modern Software are easing our jobs at every quarter of life. They are also helping us to reduce the time for completion of jobs. Thus, ultimately they are instrumental in leading to savings in terms of man-hours, material inventory and tools occupancy and so on. The trend has come to the HVACR industry too.

Recently, Sporlan Division of Parker Hannifin Corporation, which is globally well known in motion and control technologies, has launched the Sporlan Refrigeration Troubleshooting App. It has been designed to assist field technicians of all skill levels with troubleshooting components of a

**D**irect  
**E**xpansion  
**( D X )**  
refrigeration system. Now its full version has been released and available for download for both Apple and Android devices.



The app includes a guided mode and expert mode to aid the different skill levels of technicians. For the less experienced technician, the guided mode in the app walks the user through a series of questions with only 'Yes' or 'No' answers leading the user the correct action required. The questions follow flow diagrams that were created to cover all aspects of a direct expansion refrigeration system. For the more experienced technician, the expert mode breaks down troubleshooting into 6 sections to quickly get to the root cause of the problem. The app allows users to go through the troubleshooting process, get to a corrective action and capture any notes including pictures, videos, voice memos and text.

The app received the 2016 AHR Expo Innovation Award Honorable Mention for the Software Category. The annual awards competition honours the most inventive and original HVACR products, systems and technologies showcased at each year's AHR Expo. Winners are selected by a panel of third-party ASHRAE member judges – who evaluate all award entries based on innovative design, creativity, application, value and market impact.

Steve Schuster, Food Retail Market Manager, commented, "Service companies spend countless hours troubleshooting refrigeration systems. By reducing the amount of misdiagnosed problems, time and money can be saved, helping the service company's bottom line. Users can become more efficient and accurate with their troubleshooting skills by acquiring the information that will help reach a diagnosis quicker and more accurately."

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Proposed\*



# Air Balancing In Existing Buildings

The most common approach of circulating air across the work spaces is by way of ducting, usually mounted from the ceiling and concealed by the false ceiling for aesthetic reason. Ducting thus is an important component of air conditioning systems and a lot of emphasis is laid to the ducting system during the design stage...

**H**uman comfort is the primary reason for air conditioning of office buildings. In cold countries, the air is heated, while in the hot countries, the air temperature is brought down to a level that makes it comfortable for the occupants of the buildings to perform the work that the building is intended for. Conditioning of the air also includes control of the humidity, quality, direction and velocity, which are all important in terms of human comfort.

The most common approach of circulating air across the work spaces is by way of ducting, usually mounted from the ceiling and concealed by the false ceiling for aesthetic reason. Ducting thus is an important component of air conditioning systems and a lot of emphasis is laid to the ducting system during the design stage. The performance of the air conditioning plant is closely linked to the air distribution systems in central plants, and hence it's critical from the operating cost perspective as well.

Air circulation via the ducting system is designed for a specific work space arrangement, which is planned at the design stage. Air balancing of the system is the process by which the commissioning team ensures that the right quantity of the air reaches the work space so as to maintain the desired comfort level of temperature of the space.

This is a complex task, as there are many variables to consider such as heat load of the space, location, size of the work space (Cabins, open spaces, work stations etc.), noise levels etc. Due to the multi system interaction of the ducting, the process of air balancing often takes up a considerable amount of time.

Improperly balanced systems, despite the focus provided to the process at the time of commissioning are not uncommon. Last minute changes, in the layout, loads etc., impact the ducting design and ultimately lead to uneven distribution of air. The impact that an unbalanced air delivery system can have are many, such as hot and cold spots, poor thermal comfort, condensation on ducting etc.,

which ultimately will have an effect on employees' productivity.

There is also the related increase in operating costs as the system operates off design. The issues that effect air balancing at the start of the building's life get compounded as the building ages and have an even more detrimental impact on the occupants.

There is thus a need to assess the health of the ventilation system – and the review the air balance periodically to give the occupants the best possible environment.

### Air balancing overview

To provide healthy air to the occupants and also to provide a positive pressure inside the building, fresh air from outside is introduced to the workspace through the Air Handling Unit (AHU). The positive pressure helps in keeping out non air-conditioned air from entering the building. The fan of the AHU delivers a specified flow rate to the workspace and develops a positive pressure through centrifugal force. This pressurised air is directed to different areas of the floor through the ducting and exits through diffusers. The air from the work spaces returns to the AHU on the suction side of the fan and the circulation continues. There are thus two aspects of air distribution that air balancing takes care of:

- Overall building envelope static pressure
- Air flow at multiple locations within the building for occupants' comfort

Air balancing or as the process is referred to in practice as Testing, Adjustments and Balancing (TAB) of new buildings is governed by industry standards such as National Environmental Balancing Bureau (NEBB) or Sheet Metal and Air-Conditioning Contractor's National Association (SMACNA). Standard procedures are defined and reporting formats are specified. Air balancing of existing buildings does not have standards as the condition of the work space and building envelope changes and it is not possible to isolate the building for considerable periods of time as required by the new build standards. The balancing of such buildings is then done based on the requirements and a base line that is referenced from the original commissioning reports.

Air balancing is carried out by collating data about the various components of the air distribution system, and undertaking measurements of pressure or/and air flow at various points of the work space. The system is considered as 'balanced' if the measurements are within +/- 10% of design operation points.

### Why is air balancing important?

Any system working off design is a cause of concern to the building operations' team. As the system is designed to cater to specified operational requirements such as heat load, area etc., if there is a significant deviation; the operational requirements will not be met. Some of the detrimental effects of inadequately balanced work spaces are as follows:

- **Poor Indoor Air Quality (IAQ):** If the static pressure is not adequate, outside, untreated air will enter the work space, leading to poor indoor air quality problems, which will ultimately affect the productivity of the work force using the space.
- **Poor comfort levels:** Due to air flow imbalances, certain sections of the work space will receive more than the desired air flow while others will consequentially be supplied with less air flow. This results in creation of 'hot' and 'Cold' spots in the work environment leading to more complaints from the employees as well as inefficient operations due to the frequent changing of the AHU set points to address these issues if not diagnosed correctly.
- **Higher operating costs:** Poorly balanced air delivery systems result in more frequent running of the AHU, and also operations at higher speeds. This combination of more time and speed results in higher energy usage by the AHU.
- **Noise levels:** Higher noise levels in the system are often linked to imbalances in the system that creep in due to changes in the ducting that occur over the period of use in a building. The higher noise levels impact employees predictably, as well as have long-term health effects.

Air balancing can thus be said to have direct impact on the health of the employees as well as their productivity and hence it is of utmost importance.

### Causes of air imbalance

The air balance is certified at the time of building commissioning, so one would naturally ask why should there be any change in the air circulation as the air distribution system (AHU, Ducting/diffusers etc.) is not

Table 1: System Defects Effecting Air Balance...

Deterioration of AHU fans, system fans	Lower air flow
Leakages across ducting	Reduction of air flow, noise
Worn out belts of AHU	Incorrect speed resulting in lower air flow
Dampers not adjusted properly/not working	Noise, turbulence resulting in poor flow rate
Dirty AHU coils impeding air flow	Reduced air flow
Choked Filters	Lower static pressure, reduced air flow

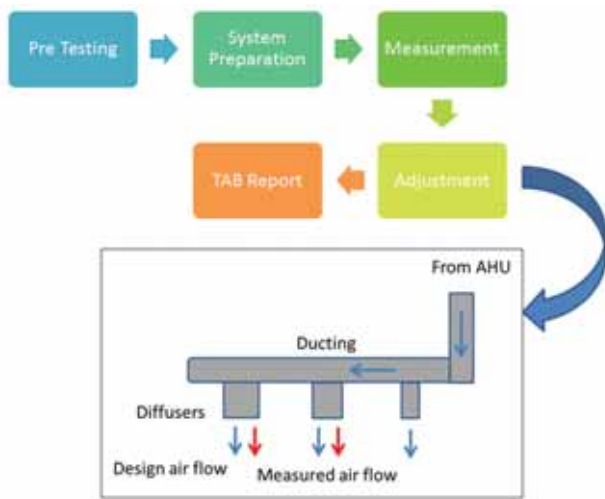


Figure 1: TAB Process...

disturbed during the course of the building operations. Unfortunately, the situation is very different when the building becomes operational. Many factors impact the original design intent and lead to the system operating far away from the desired operation points. Some of the operational factors that impact the air balance are mentioned below and the system related causes are listed in table 1.

- **Changes in office layout:** This is the most common cause of system imbalance. Cabins and meeting rooms getting converted to open spaces or the opposite, addition of partitions etc., lead to changes in the air flow patterns resulting in variations in the air flow parameters.
- **Closing of diffusers:** It is not uncommon to see diffusers covered by paper in many office spaces because the occupants are feeling too cold. While the cause of the lower air temperature may be many such as wrong set points at the AHU, blocking off the diffuser results in distortion of the air flow and impacts air balancing.
- **Inadequate air conditioning discipline:** When a system is designed for only minimal openings of the entrance doors, if it is operated when the door opens more frequently or is left open, the positive pressure is lost – and that impacts the air balancing of the whole space.
- **Increase load:** This is another common problem in office spaces, where there is a densification of the workspace as office work increases. More people in the same space lead to higher heat loads – and also mandating higher air flows that in many cases are tackled by enhancing speed of the AHU. While this approach increases flow, the ducting may not be designed for

the changed flow characteristics leading to deterioration of air balance

- **Deterioration of ducting:** Fouling of the ducting over a period of use leads to higher friction losses in the ducting, leading to lowering of the air flow at many locations.

## Air balancing process

Air balancing of existing buildings can be a difficult and complex process as the work space has occupants working, and there is a constant change in the

system operating conditions. Air balancing is however critical, especially when there has been a major change in the office layout or other design changes. The typical process for air balancing (For constant volume system) in existing buildings is shown in figure 1. It is also recommended to carry out air balancing at least once in 5 years to assess the health of the system. The key steps involved in the air balancing process are listed below.<sup>1</sup>

- **Pre air balancing:** The TAB team first assess the current state of the air distribution system by obtaining data of the various equipment such as motors, fans, AHU characters, duct dimensions etc. These can be obtained from the commissioning data wherever available. In case the original documents are not available, a lot of data can be obtained from OEM data sheets that are available from public sources.
- **System walk through:** Basic system defects and deviations can easily be identified by walking the floor and observing changes made to the system such as new outlets or blocked diffusers.
- **System readiness for testing:** Prior to testing the distribution network, the TAB team ensures that the system operation is as per the original design as far as possible. This involves opening all Grills, Registers and Diffusers (GRD), Setting dampers to the design points, removing all temporary covers of diffusers etc.
- The total system volume is obtained using air flow measurement at the fan outlet and compare with design values, fan curves etc.
- With the fan at the design rpm, measure the air flow at each of the GRD/Outlets of

a branch. Calculate the total air flow of the branch and compare with the design air flow. This process is followed for all branches.

- To carry out the adjustment, the air flow is varied by adjusting the dampers in the system. The process starts by identifying the branch with the lowest percentage of design flow. No change is made to the damper adjacent to this branch. The next damper with the second lowest percentage variation is adjusted till the two dampers have the same deviation from design. These two dampers and branches are in balance with each other.
- This process is continued and dampers with reducing deviations are adjusted till all have nearly the same percentage variation in design flow.
- Once all dampers have been adjusted, the air flow across all GRDs on a branch is similarly adjusted to achieve branch level balancing.
- On completion of the adjustments, the air flow across all GRDs is measured again to verify correct balancing.

## Conclusion

HVAC systems consume the major portion of the energy of a building. Within the HVAC systems, the ventilation components are in use constantly, and hence this is an important aspect of the operations. Air balancing is usually undertaken at the time building commissioning is done under the TAB process.

There is however a number of factors that can lead to the original air distribution design points to change due to changes in the work space and nature of work as well.

A ventilation system working off design will lead to not only discomfort to the occupants, but also higher operating costs. Thus, air balancing should be undertaken once in 5 years at a minimum – and adjustments should be made to accommodate the new load and occupancy requirements. ■

Reference: <sup>1</sup> Procedural Standards for Testing, Balancing and Adjustments of Environmental Systems, NEBB



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# Thailand Adopts New Air Conditioner Technology

The new refrigerant known as R-32 does not deplete the stratospheric ozone layer – and also cuts greenhouse gas impacts in residential air conditioners by one-third...

In partnership with the World Bank Group and the Montreal Protocol Multilateral Fund (MLF), Saijo Denki, a Thailand manufacturer, has launched a new technology for air conditioners that is friendly to the ozone layer and reduces greenhouse gas emissions and saves energy.

The new refrigerant known as R-32 does not deplete the stratospheric ozone layer – and also cuts greenhouse gas impacts in residential air conditioners by one-third. If similar air conditioning technology were widely adopted in other markets, it could help countries in significantly meeting their climate goals.

“We welcome the initiative of the Thai private sector in turning the challenges of protecting the global environment into business opportunities. The success of re-designed R-32 air conditioners is testament to the strong policy and leadership of the Thai Government to protect the environment and strengthen private sector innovation. Countries, such as Thailand, can consider adopting a procurement policy that demands or favours the use of ozone and climate friendly products, in order to promote the further development and use of such products,” said Ulrich Zachau, World Bank Country Director for Thailand.

Karin Shepardson, World Bank Montreal Protocol Program Manager, added, “The shift by the Thai air conditioning industry to bringing more climate friendly equipment to consumers can provide a model for other businesses and industries.”

Redesigned R-32 air-conditioners are 5 to 10% more energy efficient and have a cooling capacity that is 10% higher than older models, according to Saijo Denki. With this technology breakthrough, the Thai company is in a good position to develop higher energy efficient and cost competitive products, while consumers will benefit from reduced energy costs when using these new products. Most importantly, the new models do not consume ozone depleting substances and do not adversely affect the climate.

“This air conditioning project, which is financed by the Multilateral Fund for Implementation of the Montreal Protocol through the World Bank is consistent with the Government’s policy to promote technical research and development to support the economic development of Thailand. The Ministry of Industry is also advocating a specific policy to support the Thai industry to innovate and assimilate new manufacturing technologies in order to improve productivity, and new technologies that are social and environmental friendly as part of our strategy to strengthen our industry competitiveness in the global market,” said Dr. Atchaka Sibunruang, Minister for Industry.



evaporative

# DRY ^ COOLING

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# Optimising Performance Of Airside Systems



The difference between AHU and FCU is that the latter is usually used for small product categories handling smaller air volume (up to 3,500CMH). FCUs are usually powered by a single phase permanent split capacitor motor and the inefficiency of the motor is often the limiting factor for maximum airflow that can be achieved...

Airside systems distribute air for heating, ventilating or cooling a building. By driving the efficient flow of air through the entire building, such systems help deliver healthy, comfortable and visually appealing environments that increase productivity and comfort. To increase the performance of Heating, Ventilating, and Air Conditioning (HVAC) systems, a more complete and holistic approach to designing the complete air path is required. Fixtures along the air path upstream or downstream of Air Handling Units (AHU) or Fan Coil Units (FCU) - which are part of the HVAC system – play an important role in determining the performance of the entire setup.

The difference between AHU and FCU is that the latter is usually used for small product categories handling smaller air volume (up to 3,500 CMH). FCUs are usually powered by a single phase permanent split capacitor motor and the inefficiency of the motor is often the limiting factor for maximum airflow that can be achieved. However, the emergence of higher efficiency motors and fans for FCU have redrawn the boundaries which will be covered in this article.

The discussion here will focus on how to achieve further energy savings in AHU and FCU by optimising the performance of the motor and fan. Some areas we will be touching on include:

- Forward Curved (FC) Fans vs. Backward Curved (BC) Fans
- Double Inlet Double Width (DIDW) Fan vs. Plug Fan
- Electronic Commutated (EC) Plug Fan
- Brushless DC (BLDC) Electric Motors / Electronic Commutated (EC) Motors

### FC Fans vs. BC Fans

The common assumption propagated within the industry is that BC fans always

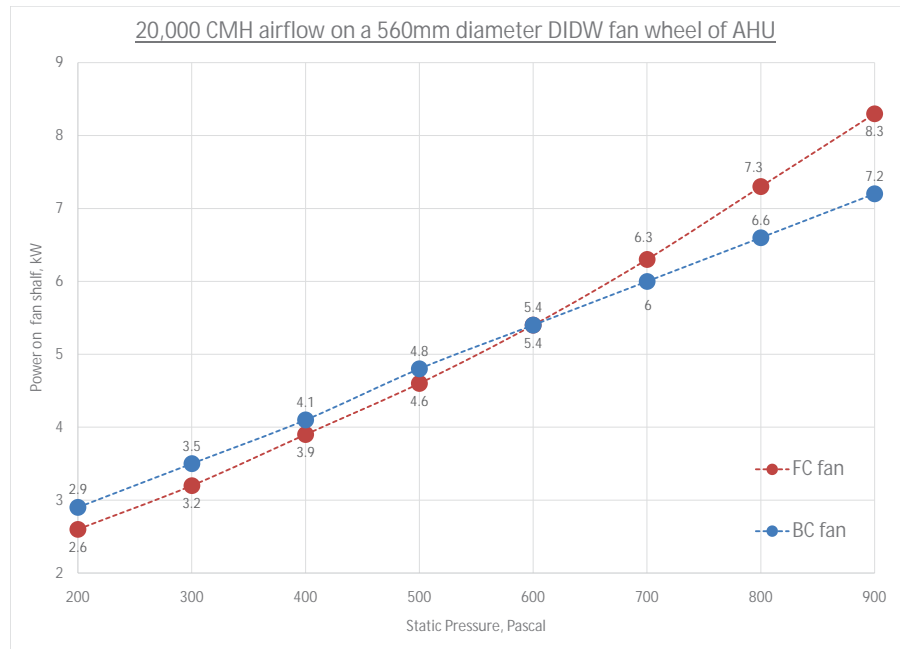


Figure 1: Performance of an FC Fan measured against a BC Fan...

deliver higher efficiency than FC Fans. However, this claim is debatable.

There are two key parameters that affect the performance of airside systems are airflow and static pressure. In general, there is a direct correlation between the two. When the required AHU or FCU is to deliver small air volume, the demand of static pressure is likely to be low as well.

The underlying reason for this is that small air volume serves small areas and as such does not need to go through great lengths of conduit to distribute the air.

In such a situation, FC centrifugal fans are the better choice as they are made of large quantities of machine stamping fan blades best suited to the application and delivers the best efficiency at low air pressure demand. It is for

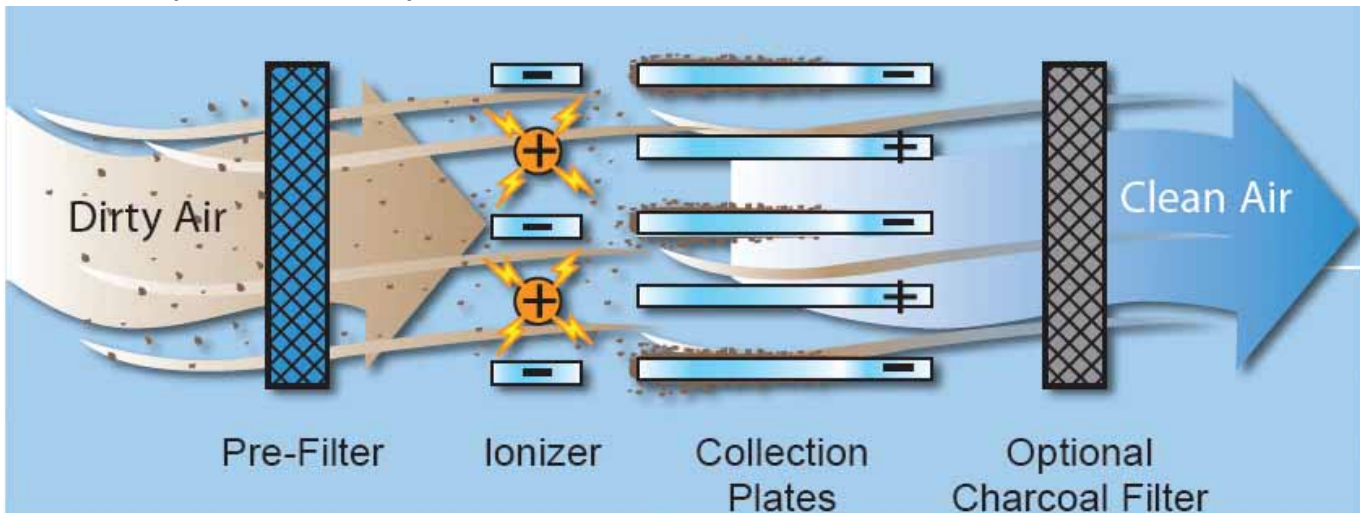
this reason that most FCUs use FC centrifugal fans as their primary workhorse.

In addition, it is imperative to note that FC fans can deliver airflow far more efficiently than BC fans if the application is for low static pressure. The chart above, plotted on a blower size of 560mm fan wheel diameter of DIDW fan normally used in AHU, demonstrates this point.

As shown in the Figure 1, the FC fan outperforms the BC fan below 600 Pascal total static pressure, with the margin increasing when total static pressure decreases.

This brings up an interesting question: could a whole air system be designed in such a way that the overall static pressure demand is lower for the AHU?

If this is achieved, a cheaper FC fan that delivers better efficiency, and also benefits from



Electronic filter working principle...

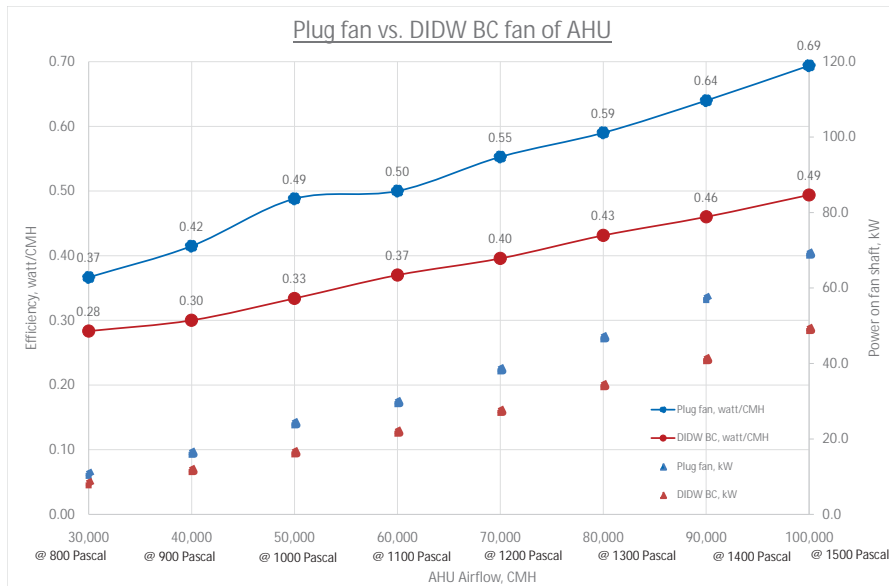


Figure 2: Performance of DIDW BC Fan in AHU application measured against a Plug Fan...

increased efficiency from lower air resistance design, could be used.

Beyond that, the adoption of the latest low air resistant electronic filter to replace the traditional high air resistant filter media in AHU would help greatly in reducing the overall static pressure demand.

This opens up the possibility of using cheaper FC fans to reduce the cost of AHU, in addition to energy savings for the air system design.

### Double Inlet Double Width (DIDW) Fan vs. Plug Fan

Another misconception is with regards to using plug fans in AHU applications for better efficiency. By meticulously running through the AHU rating software on the various airflow at various static pressure, we can see that a traditional DIDW BC fan outperforms the plug fan by almost 30% in term of efficiency.

Figure 2 shows that the AHU with the DIDW BC delivers approximately 30% better

efficiency from the baseline compared to an AHU unit with the fan plug.

Some may argue that direct driven plug fans allow for the avoidance of the cumbersome belt and pulley drive for hygiene reasons, and others while varying fan speed via Variable Frequency Drive (VFD). A simple way to resolve these would be to set it up such that the DIDW BC fan is directly driven via direct shaft coupling.

Furthermore, the DIDW BC fan is more suitable for AHU applications as it allows the overall AHU unit design length to be kept shorter while keeping the overall AHU casing design in negative air pressure. This is in contrast to the

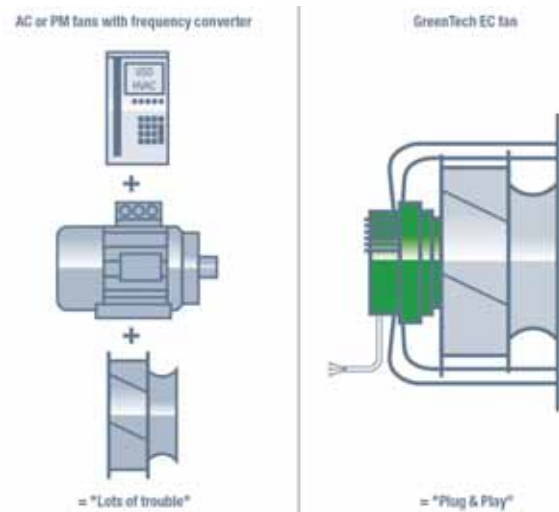
need to generate positive pressure in the fan chamber when using a plug fan which is no easy feat.

The example below shows a 60,000CMH AHU installed with a DIDW BC fan and plug fan. With the DIDW BC fan, the length of the AHU is kept at 3,842mm where else the use of a plug fan means that the length of the AHU stretches to 4,182mm. The difference is significant as it impacts plant room space as well as an increase in other associated costs.

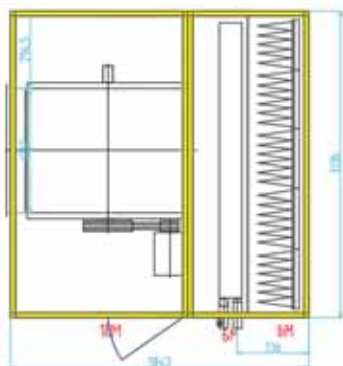
However, using a plug fan in an AHU does allow for the supply air duct to be connected to any position of fan chamber capitalising on the positive pressure being generated.

### Electronic Commutated (EC) Plug Fan

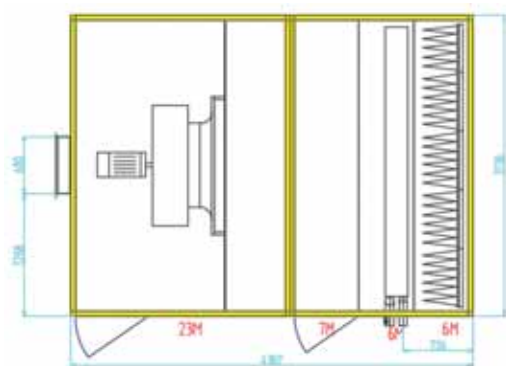
The use of EC direct driven plug fans to improve performance was boosted by the efforts of German fan manufacturers who through some ingenious design managed to integrate a BLDC motor, plug fan and VFD into a single piece, allowing for ease of installation.



'Integrated' EC Plug Fan...



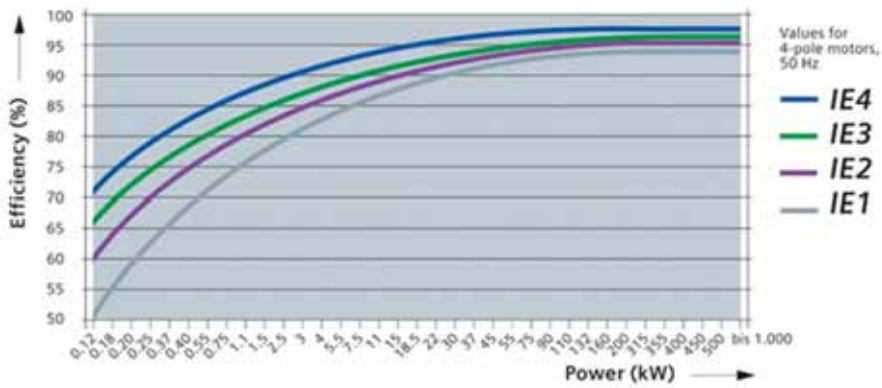
AHU with DIDW Fan...



AHU with plug Fan...

The EC plug fan draws its efficiency from two fronts: the motor and the fan. By using a permanent magnet in the BLDC motor, the efficiency of the motor jumps to above 95% at full load for a 3kW motor model, even higher than IE4, the highest possible efficiency class reserved for future for cage induction motor under unifying worldwide efficiency classification, IEC60034-30 standard.

By taking advantage of engineered plastic mouldable capability, the EC plug fan can further eke out efficiency by having aerodynamic plastic plug fan blade design – to enable smoother airflow while reducing air turbulence. This can be fully simulated in



IEC motor efficiency graph...



AHU with EC Plug Fan...

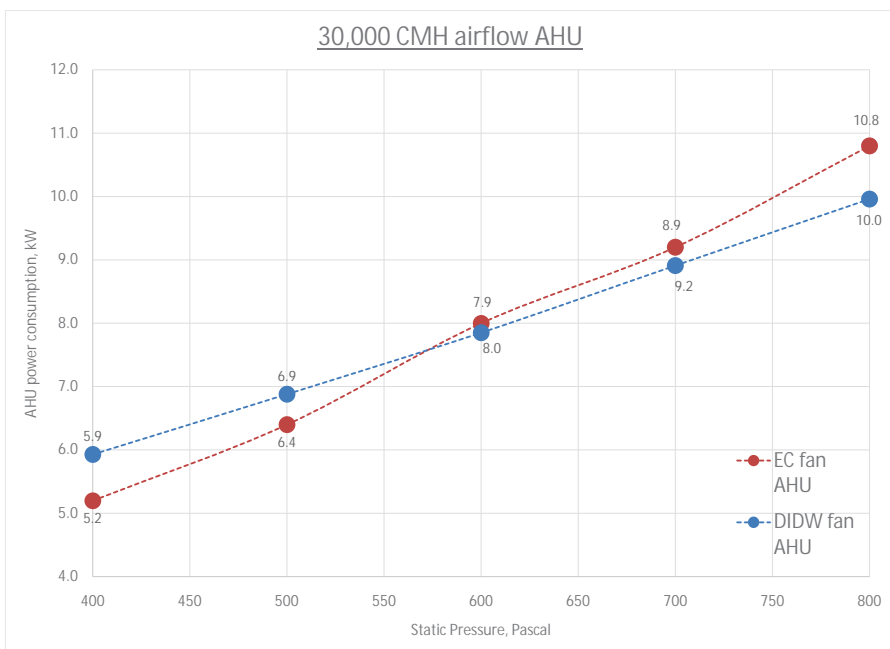


Figure 3: Performance of EC fan in AHU application measured against a DIDW Fan...

Option 2 - Fan system Input Power  
 Baseline: ASHRAE 90.1:2010 Clause 6.5.3.1 and as prescribed below:

Baseline Air Distribution System Type	Allowable Fan System Input Power*	
	kW/M <sup>3</sup> /s	(W/CMH)
AHUs/FCUs ≥ 4kW (Constant Volume)	1.5	0.42
AHUs ≥ 4kW (Variable Volume)	2.1	0.58
Fan systems with nameplate motor power < 4kW		

\*Applicable pressure drop adjustments can be considered based on ASHRAE 90.1

advanced fluid dynamic software before any production starts.

All in all, by applying an EC plug fan into an AHU application, a 30,000CMH airflow AHU power consumption can be plotted as shown in figure 3.

However, a point to note would be that even with all the advancements for EC fans, a 30,000CMH AHU with EC fan is only more efficient at the total static pressure below 600 Pascal; above that, a DIDW fan is more efficient for AHU.

There is limit for the economically viable size of EC plug fans to be moulded with engineering plastic and hence, multiple EC plug fans are adopted in AHU design for achieving the required airflow. This does come with a cost however; if redundancy is in play then the multiple fan array design could become the critical feature for clients such as datacenter, or for healthcare applications which eschews single point of failure.

### Brushless DC Electric (BLDC) Motors/ Electronic Commutated (EC) Motors

The adoption of higher efficient FCU is slower than desired but this may soon change when more and more countries embrace Green Mark or LEED (Leadership in Energy and Environment) standard to push for building efficiency and environment responsibility. The Singapore Green Mark push is unprecedented by formally enacting it into law for buildings to comply with pre-determined standards before being certified fit for occupation. The current baseline requirement on FCU efficiency is 0.17watt/CMH fan system input power.

The adoption of BLDC motor into FCU may come sooner as we think as the industry continues to raise the bar of baseline efficiency

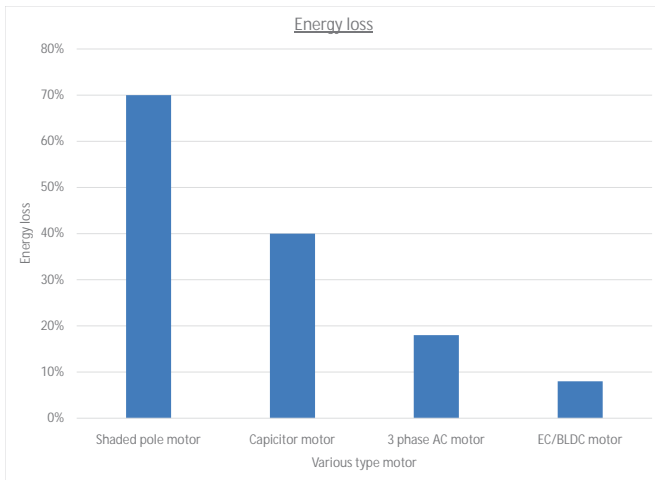
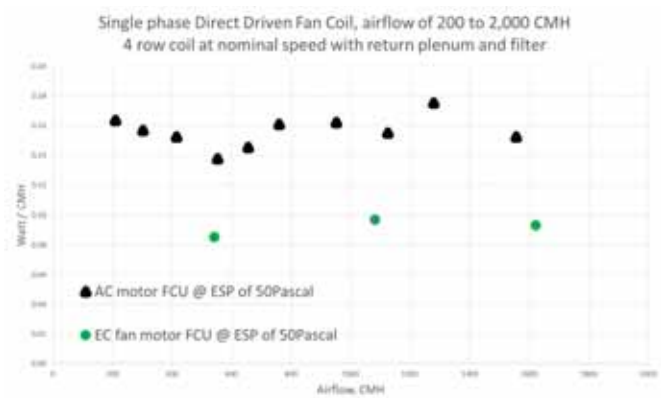
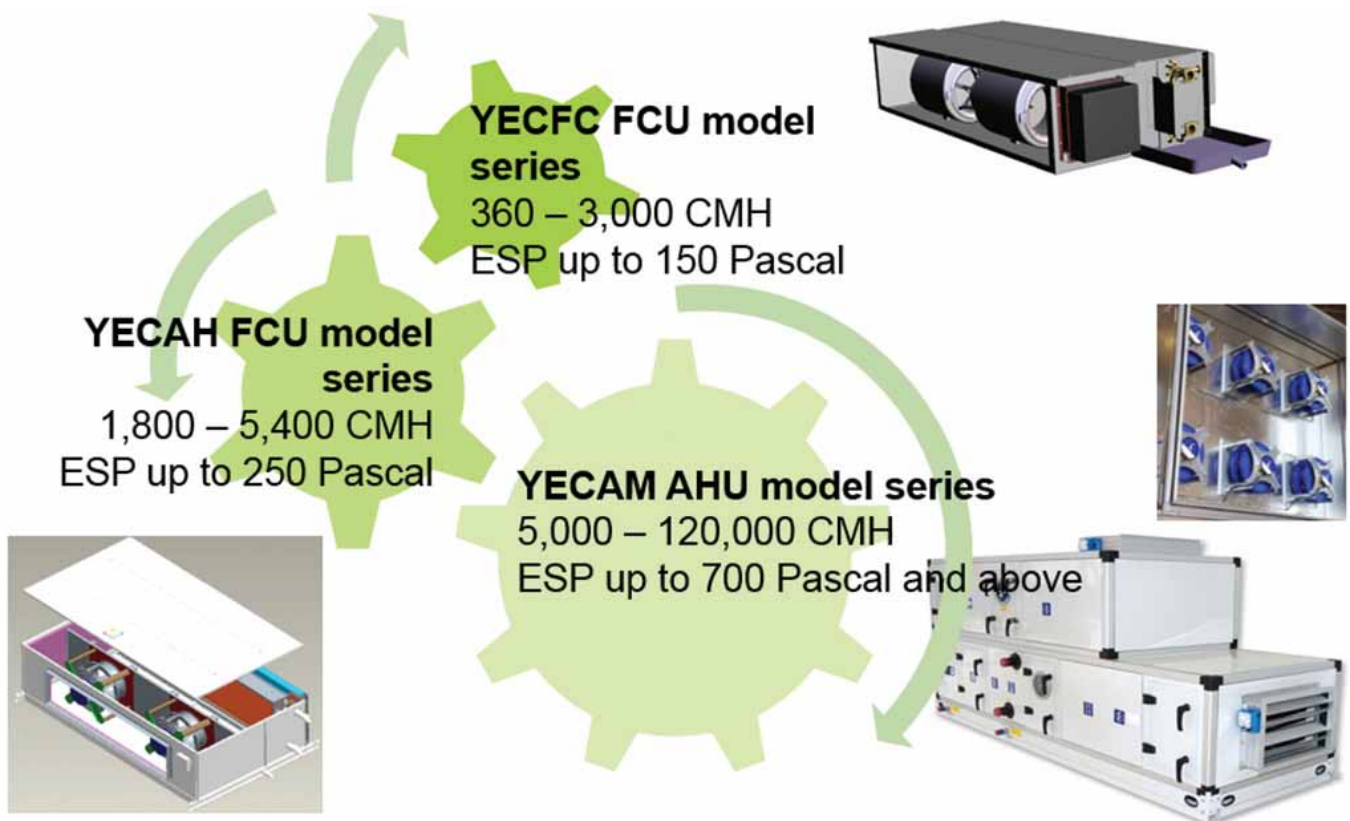


Figure 4: Energy loss graph on different types of motors...



Performance of EC Fan in FCU application measured against AC motor...



requirement year on year. The efficiency gain of switching over to BLDC/EC motor from single phase permanent split capacitor motor is significant – as it is notoriously difficult for permanent split capacitor motor to achieve above 60% efficiency.

Figure 4 shows that just by embracing BLDC/EC motor over the rest will enable an efficiency gain of 25 to 30%. However, the main gain of BLDC/EC motor is not purely at the full load efficiency play. The capability of not tapering too much in the motor efficiency during part load brings in more savings in spite of being capable of providing exact airflow requirement at all times via step-less speed modulation.

The further boundary push is made possible by improving on fan design. Improving airflow fluid dynamics through engineering plastic moulding capability would allow the overall FCU efficiency to reach below 0.10 watt/CMH – a level never seen before.

Taking advantage of superior EC plug fan efficiency, the maximum ampere drawn by single phase electricity power supply can be well below the range the maximum general single phase electrical wire can accommodate, while delivering airflow up to 5,000 CMH at the external static pressure of 150 Pascal and beyond. This whole new category of large air flow single phase power supply FCU would not

be possible if not for the superior efficiency of EC plug fan.

In conclusion, improving the performance of airside systems can often be achieved by optimising the yield of components. Hence, it is critical that the industry to adopt a holistic approach at the design stage to obtain the desired efficiency and performance from the entire system. ■

**Chai Hwei The**  
Regional Manager  
Johnson Controls



# Controlling Infections Due To HVAC System



In a hospital environment, there tend to be high concentrations of harmful microorganisms. From an infection control perspective, the primary objective of hospital design is to place the patient at no risk for infection while hospitalised...

**H**VAC design for health care facilities is all about providing a safer environment for patients and staff. The basic difference between air conditioning for healthcare facility and that of other building types stem from:

1. The need to restrict air movement in and between the various departments (no cross movement).
2. The specific requirements for ventilation and filtration to dilute and reduce contamination in the form of odour, airborne micro organisms and viruses, and hazardous chemicals and radioactive substances. Ventilation effectiveness is very important to maintain appropriate indoor air quality.
3. The different temperature and humidity requirements for various areas and the accurate control of environmental conditions.
4. The design sophistication to minimise the risk of transmission of airborne pathogens and preserve a sterile and healing environment for patients and staff.

These requirements demand very high quantities of outside air along with significant treatment of this ventilation air, including cooling, dehumidifying, reheating, humidifying and filtration.

## Infection Control

In a hospital environment, there tend to be high concentrations of harmful microorganisms. From an infection control perspective, the primary objective of hospital design is to place the patient at no risk for infection while hospitalized. The special technical demands include hygiene, reliability, safety and energy-related issues.

Infections, which may result from activities and procedures taking place within the facility, are a cause for great concern. Three main routes responsible for infections are contact, droplet, and airborne transmission, which are quite affected by room design and construction factors.

## Contact Transmission

Contact transmission is the most important and frequent mode of transmission of infections (nosocomial). It can be subdivided into direct-contact transmission and indirect-contact transmission.

- a. Direct-contact transmission involves direct body to body contact for the transfer of micro-organisms from an infected person to a susceptible host.

- b. Indirect-contact transmission involves the contamination of an inanimate object (such as instruments or dressings) by an infected person.

## Droplet Transmission

Droplet transmission occurs when an infected person generates droplets containing microorganisms which are propelled at a short distance through the air and deposited on the conjunctivae, nasal mucosa or mouth of a host. Droplets do not remain suspended in the air, so special air handling and ventilation are not required to prevent droplet transmission. (Do not confuse droplet transmission with airborne transmission.) A person's coughing, sneezing and talking generate droplets. Other procedures such as suctioning and bronchoscopy are also a source of droplets.

## Airborne Transmission

Airborne transmission occurs when either airborne droplet nuclei or dust particles disseminate infectious agents.

- a. Droplet nuclei - The high velocity with which coughing and sneezing expel droplets from the respiratory tract results in large numbers of bacteria or viruses entering the air in smaller droplets. These droplets rapidly evaporate in the air leaving a residue of typically 5 μm or smaller in size. These droplet nuclei settle so slowly that they remain airborne in occupied spaces and circulate on air currents until mechanically removed by the ventilation system. Control of environmental factors (such as special air handling and ventilation) is necessary to prevent nosocomial airborne transmission of microorganisms.

- b. Dust - Dust contaminated by viable infectious agents may build up as a reservoir capable of causing an outbreak of infection, even after the departure of the infectious patient from whom the pathogens originated. Dust may become contaminated when dried sputum and other infectious secretions suspended in the air as dust particles mix with environmental dust.

## Isolation Rooms

The infected patient can contaminate the environment. A single room with appropriate air handling and ventilation is particularly important to prevent direct or indirect contact transmission and also for reducing the risk of airborne transmission of microorganisms from a source patient to susceptible patients and other persons in hospitals. This is often termed 'Isolation Room' in medical terminology.

There are two types of isolation rooms:  
1) airborne infection isolation (AII) rooms and  
2) protective environment (PE) rooms.

1. Airborne Infection Isolation (AII) refers to the isolation of patients infected with organisms spread via airborne droplet nuclei <5 μm in diameter. These include patients suffering from measles, chicken pox and tuberculosis. Other areas include: the emergency department, intensive care units (adult, paediatric, newborn) and procedure areas such as bronchoscopy suites or sputum induction rooms.
2. Protective Environment (PE) is a specialised area for patients who have undergone allogeneic Hematopoietic Stem Cell Transplant (HSCT). The patients whose immune mechanisms are

## Sample data: MRSA...



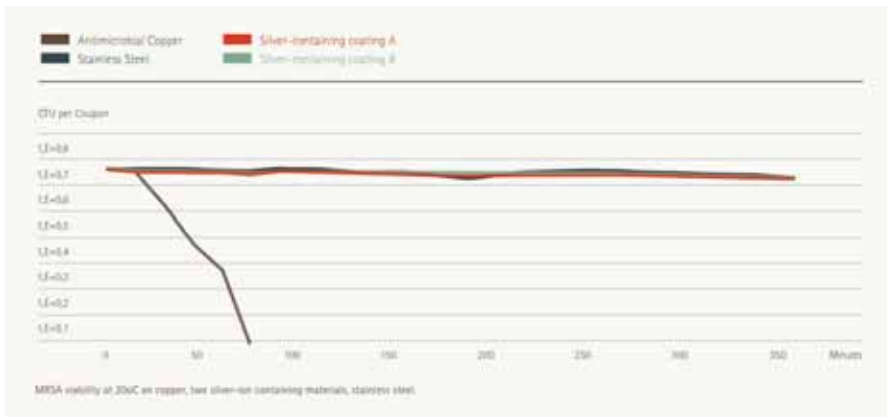


Figure 1: MRSA viability on Antimicrobial Copper, stainless steel, and two silver-containing coatings at 20°C...

deficient because of immunologic disorders (e.g., Human Immunodeficiency Virus [HIV] infection or congenital immune deficiency syndrome), chronic diseases (e.g., diabetes, cancer, chemotherapy, emphysema, or cardiac failure), or immunosuppressive therapy (e.g., radiation, organ transplant, cytotoxic chemotherapy, anti-rejection medication, or steroids) are also placed in protective environment.

**How does above classification affect HVAC designer?**

The differentiating factor between ‘All’ and ‘PE’ rooms is the pressure relationships.

- The Protective Environments (PE) are set at POSITIVE air pressure relative to adjoining spaces. These areas require frequent air exchanges (>12 per hour) and require all supply air passing through High Efficiency Particulate Air (HEPA) filters.
- The isolation rooms housing infectious patients (All) must be maintained at NEGATIVE pressure. These areas require frequent air exchanges (>12 per hour) and require all supply air to be exhausted without recirculation.

Both these areas require inline monitoring to ensure that they remain under set pressure. Doors to the rooms should be self-closing, and the walls, windows, ceiling, floor, and penetrations well sealed.

**Copper: The Most Effective Touch Surface Material**

Antimicrobial Copper is the most effective touch surface material in the fight against pathogenic microbes, killing greater than 99.9% of bacteria\* within 2 hours of exposure. No other material, such as silver-containing coatings, comes close. Laboratory research on the efficacy of Antimicrobial Copper has

been carried out and verified at institutions around the world, including the UK (Aston University, University of Southampton, Kingston University), US, South Africa, Germany and Japan. Results have been peer reviewed and published.

Kill times vary according to organism, strain, level of challenge, copper content of alloy and temperature - being more rapid at 20°C but still with a considerable effect at 4°C. Copper exhibits efficacy under typical indoor conditions (humidity and temperature). Silver-containing materials (from two manufacturers) and triclosan behaved as the stainless steel control i.e., showed no antimicrobial efficacy under these conditions.

Efficacy against the following pathogenic organisms has been shown:

- Acinetobacter baumannii
- Adenovirus
- Aspergillus niger
- Candida albicans
- Campylobacter jejuni
- Clostridium difficile (including spores)
- Enterobacter aerogenes
- Escherichia coli O157:H7

- Helicobacter pylori
- Influenza A (H1N1)
- Legionella pneumophila
- Listeria monocytogenes
- Methicillin-resistant Staphylococcus aureus (MRSA, including E-MRSA)
- Norovirus
- Poliovirus
- Pseudomonas aeruginosa
- Salmonella enteritidis
- Staphylococcus aureus
- Tubercle bacillus
- Vancomycin-resistant enterococcus (VRE)

**EPA Registration Test Data**

In the US, antimicrobial products marketed with public health claims must be registered with the Environmental Protection Agency (EPA). Copper is the first solid material to be registered. Outside of the US, this registration represents an independent, official recognition of the laboratory data presented and supports quantified efficacy claims applicable to all registered alloys for the organisms tested.

Antimicrobial Copper is the only touch surface registered by the US EPA to continuously kill greater than 99.9% of bacteria\* that cause infections.

Stainless steel may look clean, but deadly bacteria can thrive on this material for days.

Silver-containing coatings claim to be effective, but in fact, no silver-containing coating has been registered by the EPA with public health claims.

Extensive laboratory testing is required to make public health claims. Products must prove that they effectively kill bacteria that pose a threat to human health and safety.

Silver-containing coatings rely on a treated article exemption. This form of EPA registration only permits products to claim that the active ingredient protects the product itself from

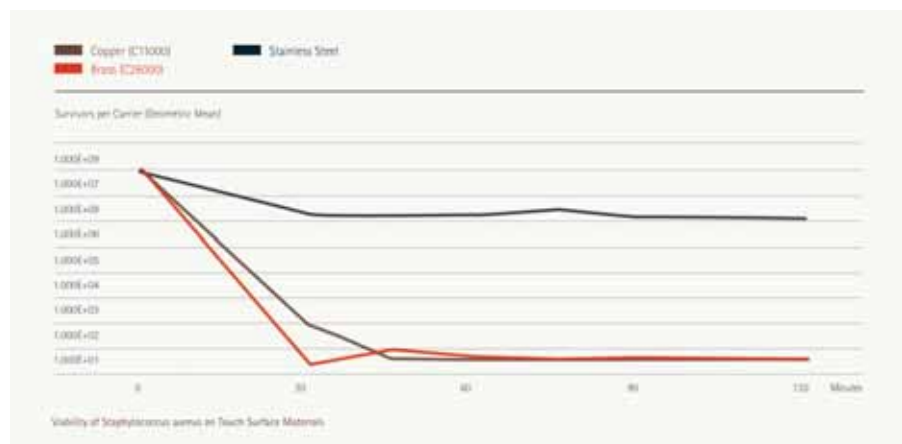


Figure 2: Effectiveness of an Antimicrobial Copper surface...



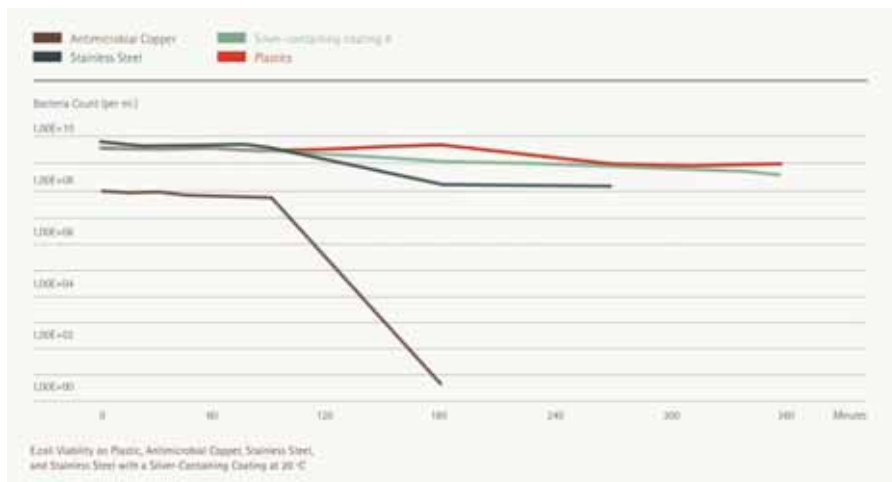


Figure 3: Viability of *E. coli* O157:H7 on plastic, Antimicrobial Copper, stainless steel, and stainless steel with a silver-containing coating...

degradation and odour caused by non-specific organisms. No scientific data on antimicrobial efficacy is required to obtain this registration.

Antimicrobial Copper has passed the tests, is registered by the EPA to make public health claims and is the most effective touch surface.

Antimicrobial Copper's efficacy against the 6 registered bacteria is summarised below.

### Methicillin-resistant

#### *Staphylococcus aureus* (MRSA)

Antimicrobial Copper provides an additional defence against MRSA. Copper is an excellent material for frequently touched surfaces because of its ability to kill MRSA in between regular cleanings. The graph below illustrates the survival of MRSA on Antimicrobial Copper, stainless steel, and two silver-containing coatings. Within two hours, the number of live MRSA colony forming units is reduced by 99.9% on Antimicrobial Copper. Almost no reduction is observed on stainless steel and both silver-containing coatings after six hours.

#### *Staphylococcus aureus*

Infections caused by *Staphylococcus aureus* are commonly found in healthcare settings, but are also present in fitness facilities, schools and assisted living facilities. Antimicrobial Copper kills 99.9% of this bacterium within two hours in between routine cleanings and touches. Figure 2 shows the effectiveness of an Antimicrobial Copper surface.

#### *Escherichia coli* O157:H7

Antimicrobial Copper kills 99.9% of *E. coli* O157:H7 within two hours adding an additional level of protection to good hygienic practices. Figure 3 demonstrates that Antimicrobial Copper kills *E. coli* O157:H7 while stainless steel, plastic, and even a silver-containing coating have virtually no effect after six hours.

#### *Enterobacter aerogenes*

Figure 4 (the graph below) shows Antimicrobial Copper's intrinsic ability to kill this resilient bacterium. Within two hours, more than 99.9% of *Enterobacter aerogenes* colony

forming units is killed on copper and brass, two Antimicrobial Copper alloys, while very little reduction is observed on the stainless steel.

#### *Pseudomonas aeruginosa*

Antimicrobial Copper surfaces effectively kill this pathogen while other surface materials are relatively inert. U.S. EPA tests confirmed that 282 Antimicrobial Copper alloys kill 99.9% of *Pseudomonas aeruginosa* within two hours under 3 test protocols.

#### Vancomycin-Resistant

#### *Enterococcus Faecalis* (VRE)

The US Centers for Disease Control and Prevention (CDC) report that VRE is responsible for 4% of Healthcare-Associated Infections. VRE is resistant to several antibiotics and is easily spread by touch throughout the healthcare environment. Antimicrobial Copper surfaces kill greater than 99.9% of VRE within two hours of exposure providing added protection against this resilient organism.

\*Peer reviewed scientific publications show Antimicrobial Copper to be effective against bacteria, viruses, fungi and moulds, including MRSA, Influenza A (H1N1), *Clostridium difficile* and VRE.

Antimicrobial Copper is the only touch surface material to have efficacy data independently verified through the US Environmental Protection Agency (EPA) registration, which supports the claim to continuously kill more than 99.9% of the bacteria that cause HCAs within two hours of contact. Organisms tested are MRSA, *Staphylococcus aureus*, *Enterobacter aerogenes*, *Pseudomonas aeruginosa*, *E. coli* O157:H7 and Vancomycin-resistant *Enterococcus faecalis*.

Further work has demonstrated that Antimicrobial Copper outperforms two commercially available silver-containing coatings under typical indoor conditions. A study on a busy medical ward at Selly Oak Hospital showed a 90-100% reduction in contamination on Antimicrobial Copper surfaces compared to surfaces made of conventional materials. Trials in the US and Chile confirm these results. Antimicrobial Copper surfaces are a supplement to, and not a substitute for, standard infection control practices and have been shown to reduce microbial contamination. ■

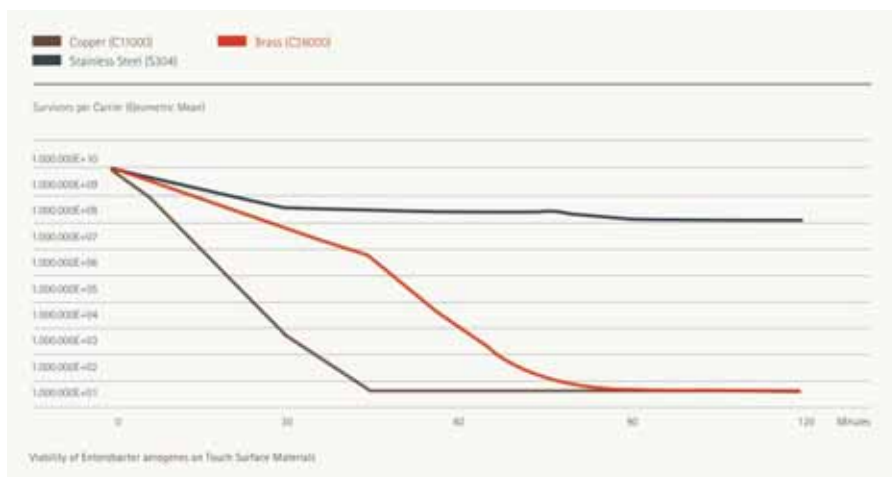


Figure 4: Viability of *Enterobacter aerogenes* on touch surface materials...

Dr. Omprakash G. Kulkarni  
Scientist, Mentor, Adviser,  
Technology Provider and  
Consulting Engineer  
Renewable Energy and Others...



# Significance Of The CE Mark

A CE mark is not a mark of quality but, rather, an acknowledgement that the manufacturer has declared the 'essential characteristics' of that product. The properties that must be declared and the rules for declaring them are defined in a series of European standards...

**M**anufacturers have been obliged to guarantee that their products conform to the requirements of the Construction Products Regulation (CPR) since the legislation was first introduced. Among other requirements a manufacturer must issue a declaration of performance. This is an integral part of the CE marking process.

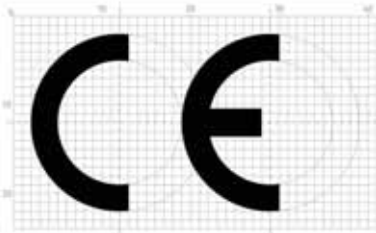


Image Courtesy: CEFEP

The members of CEFEP routinely affix the CE marking to their technical insulation materials after issuing a declaration of performance. Once a construction product bears this marking, it can be marketed in all member countries of the EU...

'CEFEP', strongly supports CE marking. CEFEP also promotes harmonised standards and provides a definitive source of information from the FEF/PEF insulation industry.

CEFEP was founded in the year 2013 and the ideal of replacing older conflicting, country specific, standards with harmonised European standards has always been close to the heart of the organisation. Today all members produce technical insulation materials which are approved for use in Europe and bear the CE mark.

With the CE mark in place, manufacturers such as Armacell, Kaimann, L'isolante K-Flex, NMC, Steinbacher Dämmstoffe, Thermaflex and Union Foam confirm that their products meet the relevant EU regulations.

## The principal standards for FEF and PEF insulation

A CE mark is not a mark of quality but, rather, an acknowledgement that the manufacturer has declared the 'essential characteristics' of that product. The properties that must be declared and the rules for declaring them are defined in a series of European standards.

Two standards are of fundamental importance: EN 14304 is applied for thermal insulation materials that are made of Flexible Elastomeric Foams (FEF) for building equipment and industrial installations. EN 14313 refers to insulation products consisting of polyethylene foams (PEF).

Only CE marked products can be marketed in the European trading area. The leading manufacturers of technical insulation materials made of Flexible Elastomeric Foams (FEF) and Polyethylene Foams (PEF) ensure that their products display the CE mark.

The European FEF/PEF Interest Group,

In the case of technical insulation materials, a further distinction is made between flat products (insulating panels) and linear products (hoses).

Information on the thermal conductivity ( $\lambda$ -value) and the fire behaviour is obligatory in both categories. Data on the water vapour diffusion resistance ( $\mu$ -value) and the release of corrosive substances also play a role for the assessment of the materials and these are often included in the declaration of performance.

Both product standards require inspection methods for Factory Production Control (FPC) and Preliminary Technical Determination (PTD).

## Inspiring confidence for users

The CPR and the introduction of harmonized European product standards represents a fundamental change for the construction sector. With the introduction of CE marking it is now necessary to use the same methods of inspection and assessment throughout Europe, removing a potential barrier to international trade within the EU.

For consultants, wholesalers and installers, CE marking makes it easy to compare a wide range of products from different manufacturers. CEFEP members aim to provide all of the information required by EN 14304 and EN 14313 in an unambiguous way to a high level of precision.

## Uniform European fire classification

The new European fire classes (A to F), defined within EN 13501-1, are a mandatory part of the EN 14304 and EN 14313 product standards. A European fire classification must be declared for a product as part of the CE marking process.

To classify flammable insulation materials, EN 13501-1 specifies that the SBI (Single Burning Item) testing method should be used. This assesses the contribution that the construction product in question makes to the development of a fire.

Linear products (tubes) are additionally marked with a subscript 'L'. Another new feature is the testing of the smoke development using the abbreviation 's' (for 'smoke') and 'd' (for 'droplets') in the case of burning droplets. European class E is tested by means of the ignitability test according to EN ISO 11925-2.

In order to offer its customers the greatest possible clarity when selecting technical insulation materials, the members of CEFEP all provide declarations of performance. "With regard to the declarations of performance for our products, we want to create as much transparency as possible and thus achieve a high degree of security in product selection. We are glad to support dealers, planners and users with our advice," confirms Georg Eleftheriadis, Chairman of the 'Gütegemeinschaft Hartschaum' and Chairman of the CEFEP. ■

# Climaveneta introduces TECS-FC to its line of free-cooling units

Climaveneta has recently widened its line of free-cooling units. The company is known for providing high efficient HVAC and HPAC solutions. It has come about introducing **TECS-FC: a high performance air cooled chiller range with magnetic levitation compressors, flooded evaporator and EC fans.** Devoted to IT-cooling and process cooling applications where cooling demand is constant throughout the year, the new free-cooling chillers make the most of the cold outdoor air for cooling the indoor environment, fully harnessing the savings potential contained in this precious renewable source.

TECS-FC characteristics a smartly managed free-cooling system. The chiller automatically switches between total free-cooling, hybrid free-cooling and mechanical cooling mode, according to the outdoor air conditions and operating water temperature. As the outdoor air temperature drops 1 degree below the returning water temperature the unit starts using outdoor air to cool water (hybrid free-cooling), partly benefitting from the free-cooling effect. The free-cooling capacity grows with lower air temperatures, until it covers the entire cooling demand and the compressors are completely switched off (total free-cooling), thus achieving extraordinarily high operating efficiency (**EER values around 220**).

But best performance results are just not delivered for the period of

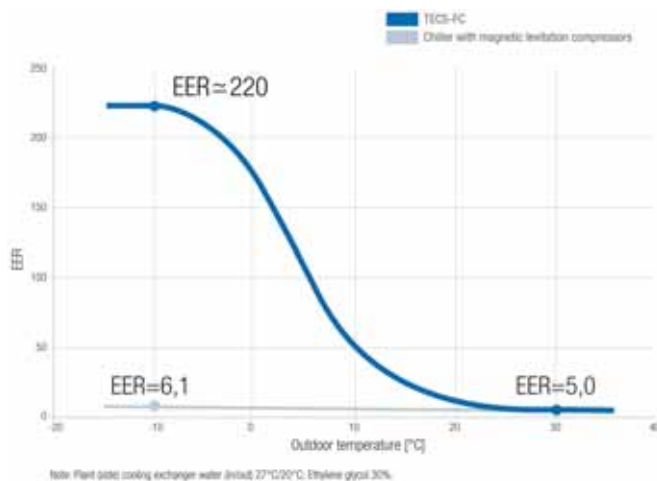


the total free-cooling mode. In the hybrid and mechanical operations, the top level technology of the compressors with magnetic levitation brings massive benefits in terms of performance, adjustment, vibrations and weight, keeping the unit EER efficiency values all the time above the competitive technologies.

Every particular aspect is manufactured according to the **finest quality standards**, from the well-built and durable structure to the optimised geometry of the flooded evaporator (manufactured entirely in-house); from the enthusiastic and limited design of the air heat exchangers, made of both refrigerant and water tubes located in one single coil, to the EC fans on the air management side, selected for their accurate adjustment of the rotational speed and its exceptionally silent operation.

There is an **advanced controller** with proprietary settings, at the core of the TECS-FC that is devoted to the precise management of all the unit's different dynamics and operating modes. Moreover accessible with the touch screen display, the controller boasts an intuitive and user-friendly interface with LED icons, designed to ensure a clear reading of all the variables and immediate view of all circuits.

Delivering cooling capacities from **302 to 1649 kW**, the new chiller is now available in both the standard (K) and high efficiency (CA) versions. As an alternative, the unit can be chosen with the No-Glycol configuration and with the new green HFO 1234ze refrigerant, providing customers with a vast array of design possibilities aimed at fulfilling even the most challenging project needs. ■



## Nortek rolls out new high performance fans

**N**ortek Air Solutions (a subsidiary of Nortek) has released new fan wheel and motor options for its FANWALL air handling units. As per the company, these designs offer enhanced benefits while continuing their industry-leading innovations such as optimised airflow efficiency, redundancy and minimised turbulence.

The improved aerodynamic shaping of the blades, shroud and cones, as well as the dampening effect of the polymer material, reduce sound tones from the impellor and motor, resulting in a typical sound reduction of 5 dB of fan blade passage frequencies on inlet and discharge.

The new High Performance Fan (HPF) wheel is available in seven sizes and in two configurations on FANWALL air handling units from all Nortek Air Solutions brands: Governair, Huntair, Mammoth, Temtrol, Venmar CES, Ventrol, Webco.

The HPF-P200 fan wheel and cone can be used with the standard induction motor or with the permanent magnet motor for optimised performance and efficiency. ■

Website: [www.nortekair.com](http://www.nortekair.com)



## Dwyer supplies SMART Air Hood

**D**wyer Instruments supplies the SMART Air Hood. According to the company, it is the most innovative air balancing instrument for the HVAC industry.

For HVAC contractors and those specialising in air balancing, Dwyer has reinvented the traditional air flow hood with a new ergonomic design that boasts several patented performance technologies. The resulting SMART Air Hood is the most accurate hood on the market. Lightweight and easy to maneuver, the Hood delivers single-user ability with less physical stress while speeding up the balancing process and reducing costs.

"The goal was to develop a game-changing performance instrument to meet the needs of the HVAC community, both domestically and in the global marketplace.," said Roger Mountford, Director of Sales and Marketing. To stand apart from the competition, Dwyer created a technologically advanced air hood, with new features, such as Predictive Balancing. The innovations in the SMART Air Hood will save test and balancing companies time and money, provide building owners and engineers the confidence that their systems are tested accurately, and will change the way contactors view air balancing. ■

Website: [www.dwyer-inst.com](http://www.dwyer-inst.com)



## Spirax Sarco automatic blowdown control system

**A**s steam is produced the TDS level of water in a boiler increases. If left uncontrolled TDS levels can exceed recommended levels and carryover of boiler water along with steam output will occur into steam and condensate return systems, causing waterhammer, corrosion and deposits on heat transfer surfaces.

Accumulation of deposits in control valves, steam traps and on heat transfer surfaces will adversely affect their performance resulting in decreased productivity and reduced efficiency. The Spirax Sarco automatic blowdown control system is designed to maintain the TDS at an optimum level keeping blowdown to a minimum, thus maintaining a healthy steam and condensate system and conserve water and energy.

All products are CE marked and comply fully with the European Pressure Equipment Directive 97/23/EC. The valve body can also be provided with certification to EN 10204 3.1 if requested at the point of order placement. ■

Website: [www.spiraxsarco.com/us](http://www.spiraxsarco.com/us)



### Johnson offers high pressure - flow proportional valve

The VSO MAX HP is a non-thermally compensated, 2 Way NC high flowing proportional valve that provides flow greater than 200 slpm @ 45 psi (3.10 bar), at less than 2 watts of power. It is ideal for applications that require low hysteresis and rapid response.

The VSO MAX HP is a miniature high flow proportional valve that provides maximum flow capabilities greater than 200 slpm @ 45 psi (3.10 bar), while consuming less than two watts of power. The valve delivers a high range of controllable flow while consuming 25% less power than comparable miniature proportional valves.

In today's medical device industry, size is an important element. VSO MAX HP's operating pressure of up to 120 psi (8.27 bar) eliminates the need for an inlet regulator. This translates to a smaller, sleek medical device design and offers potential savings and features three standard control voltage ranges (5, 12 and 24 VDC). ■

Website: [www.johnsoncontrols.com](http://www.johnsoncontrols.com)



### Schaffner provides filters to protect AC motors

New FN5060 dv/dt filters from Schaffner protect AC motors from destructive effects of peak voltages and inrush amps, increasing service life and system reliability. This patented technology protects motors and adjacent equipment without capacitors or resistors, making them simple to install.

They efficiently reduce high output dv/dt from IGBT motor drives and eliminate over-voltages caused by line reflections on motor cables, per IEC 60034-17/25. Typical dv/dt reduction is a factor of 8 to 12. These filters are ideal for loads up to 760 VAC, 30 to 1200A and motors up to 60 Hz. They are ideal for moto drives with short to medium cable lengths, servo or torque motors, submersible or irrigation pumps, HVAC equipment including pumps, fans and compressors, elevators, hoists and cranes, process equipment and applications where sine wave filters are not suited (such as high dynamic operations).

Their compact, resistor-less design saves floor mounting space and installation easy. With minimum power loss and low voltage drop, they maximise system efficiency. They are ideal for applications with frequent braking, danger of flash-over voltage, and motors running at high temperatures. ■

Website: [www.schaffner.com](http://www.schaffner.com)



### Aeroproduct offers compact Air Handling Units

AEROPRODUKT Zrt. manufactures compact air handling units for small ventilation systems and for basic air handling tasks. The units are suitable for heating, cooling, filtering and heat recovering, dehumidification and need small installation space.

These devices are a cost-effective solution for ventilating premises where people would like to enjoy controlled, quality air in an energy-efficient way.

There are different types such as: AP-KV - horizontal design - just fan, AP-KC - horizontal design - without heat exchanger, AP-KL - flat, suspended under ceiling with side by side heat recovery section, AP-KS - vertical design with top and bottom heat recovery section (optional: heating and cooling sections). ■

Website: [www.aeroproduct.hu](http://www.aeroproduct.hu)



## Honeywell unveils new pressure sensor solution

**H**oneywell has recently released a new series of heavy duty pressure transducers for facility Heating, Ventilation And Air Conditioning (HVAC) and Refrigeration equipment. The new PX3 Series transducers enable industrial HVAC and refrigeration equipment manufacturers to better monitor system pressure and performance, which can potentially help in reducing energy costs associated with these systems.

Customers benefit from durable sensors that remain accurate and reliable even in harsh conditions found in refrigeration systems. With an external freeze/thaw resistance from -30 to 50°C (-22 to 122°F), the PX3 Series transducers provide rugged environmental specs, including insulation resistance, dielectric strength and freeze-thaw resistance. The sensors perform reliably in the presence of electro-magnetic fields such as near wireless signals, Radio Frequency (RF) communication and electrical devices.

Featuring a tight total error band (TEB) of  $\pm 1.0$  percent full-scale span, the PX3 Series transducers help to improve a system's uptime and efficiency. The TEB accuracy specification provides comprehensive, clear and meaningful indications of the sensor's true measurement performance over a specified temperature range in HVAC and refrigeration equipment. ■

Website: [www.honeywellaidc.com](http://www.honeywellaidc.com)



## Thermaltake launches Riing Silent 12 CPU cooler

**T**hermaltake, well known in computer chassis, thermal solutions, and power supply units, has unveiled the latest Riing Silent 12 CPU cooler, designed for use with high-end RAM and motherboards.

Riing Silent 12 is with PWM function, which allows the motherboard to run the fan precisely at its necessary speed. This guarantees the required cooling and minimises the noise level. A 120mm fan fitted to enhance the airflow produces impressive cooling performance with an optimised 11 fan-blade design.

Hydraulic bearings for silent operation guarantee ultra-low noise. The patented LED ring maintains colour and brightness uniformity, and the lighting effect is visible from all sides and angles. Available in two models: Riing Silent 12 Blue CPU cooler and Riing Silent 12 Red CPU cooler. ■

Website: [www.thermaltake.com](http://www.thermaltake.com)



## Emerald offers advanced Air Handling Units

**E**merald presents a new and wide range of low noise Double Skin Air Handling Units manufactured in its Faridabad works with world class capability. The doubled skin air handling units are compact in design vibration free resulting in low noise, sturdy construction and better thermal insulation.

These are available from 1200 CFM to 60000 CFM. These are designed to meet the most modern necessity of installation, to facilitate better maintenance, easy transportation and installation. According to the company, Emerald AHUs are designed to meet most modern necessity of installation, these are also designed to facilitate better maintenance and ease of transportation. ■

Website: [www.emeraldproducts.in](http://www.emeraldproducts.in)





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### Testo offers automatic multimeter

The testo 760 digital multimeter family comprises three models for all important electrical measuring tasks. Function keys replace the traditional dial on all three instruments, which means easier operation and greater reliability.

Incorrect settings are now impossible, because the measurement parameters are detected automatically via the assignment of the measuring sockets and also shown by the illumination of the appropriate function keys.

The testo 760-1 model is the standard version for virtually all daily measuring tasks. The testo 760-2 is differentiated by a larger current measurement range, the true root mean square measurement – TRMS – and a low-pass filter.

The testo 760-3 is the model with the highest specification and, in addition to the features of the other two models, it has a voltage range of up to 1,000 V, along with higher measuring ranges for frequency and capacitance. ■

Website: [www.testolimited.com](http://www.testolimited.com)



### New device rolled out to measure thermocouples and alarms

TC VersaLog thermocouple data loggers support a wide sampling interval range from every 20 milliseconds to every 12 hours. These data loggers record information and save measurements onto a non-volatile 4MB flash memory for quick retrieval. This amounts to up to 2 million measurements with the choice to stop or overwrite logging on a full memory.

All VersaLog data loggers feature a built-in USB port for configuration and downloading data via PC connection. These temperature recorders offer users their choice of connection options, supporting modem or Ethernet connections with an auto baud rate of up to 115 kbps.

Users can configure the TC's two programmable alarm control outputs with low or high limits to activate a relay, switch on a light, trigger an audible alarm, or signal a PLC or other device. Two configurable alarm thresholds are available per channel, and the ALARM1 & A2/EXT terminal strips can be configured as alarm outputs so users can stay on top of sudden changes in their data. ■

Website: [www.DataLoggerInc.com](http://www.DataLoggerInc.com)



### Delta presents transit loggers for monitoring temperature

DeltaTrak's FlashLink USB In-Transit Loggers are ideal management tools for monitoring temperature sensitive and perishable commodities as they travel through the cold chain, from produce and prepared foods, to chemicals and pharmaceuticals.

This single-use data logger is equipped with a USB connection to easily upload data to the PC and provides temperature history information ranging from -40°F to 122°F (-40°C to 50°C).

The data logger can be purchased in 5, 15, 45, and 75 day temperature data logging periods, and its patented Shadow Log feature guarantees that trip temperature is available even if the operator fails to start the temperature data logger. ■

Website: [www.deltatrak.com](http://www.deltatrak.com)



## Infrared Thermometers

**M**ECO Infrared Thermometers are used to measure the amount of heat present in the measuring object from a distance.

MECO Infrared Thermometers are available in three models, IRT380P, IRT550P, IRT1050P.

**IRT380P:** Temperature ranges from  $-50^{\circ}\text{C}$  to  $380^{\circ}\text{C}$  with the accuracy of  $\pm 1.5^{\circ}\text{C}$  and emissivity 0.95. Temperature can be measured with the Distance to Spot ratio of 12:1. It has seven special functions namely Max function, Min function,  $^{\circ}\text{C}/^{\circ}\text{F}$  Selection, Laser Switch, Auto Power Off, Low Battery Indication and Backlight Display.

**IRT550P:** Temperature ranges from  $-50^{\circ}\text{C}$  to  $550^{\circ}\text{C}$  with the accuracy of  $\pm 1.5^{\circ}\text{C}$  and emissivity 0.95. Temperature can be measured with the Distance to Spot ratio of 12:1. It has seven special functions namely Max function, Min function,  $^{\circ}\text{C}/^{\circ}\text{F}$  Selection, Laser Switch, Auto Power Off, Low Battery Indication and Backlight Display.

**IRT1050P:** Temperature ranges from  $-50^{\circ}\text{C}$  to  $1050^{\circ}\text{C}$  with the accuracy of  $\pm 1.5^{\circ}\text{C}$  and emissivity 0.10 – 1.00 (Adjustable). Temperature can be measured with the Distance to Spot ratio of 50:1. It has special functions namely Max function, Min function,  $^{\circ}\text{C}/^{\circ}\text{F}$  Selection, Laser Switch, Auto Power Off, Low Battery Indication, Backlight Display, DIF Function, AVG Function, Data Storage and High / Low Temp. Alarm Setting Function. ■

Website: [www.mecoinst.com](http://www.mecoinst.com)



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## ITC Sankhya, Bengaluru becomes India's LEED Platinum certified data centre



Image Courtesy: [www.usgbc.org](http://www.usgbc.org)

The centre began its functions in February 2015 and now it's considered as one of the most energy efficient data centres...

ITC Sankhya Data Centre-the major data centre, for all operations of the company, is situated in the ITC campus Cox Town, Bengaluru. It has been awarded by the US Green Building Council (USGBC). In the 'Data Centre Category', it has been certified as the highest LEED Platinum data centre. The centre began its functions in February 2015 and now it's considered as one of the most energy efficient data centres across the sphere. It is a 4-storeyed building measuring 30,000 sq ft with a footprint of 7,500 sq ft.

As it is situated within the campus, the centre is powered by renewable energy. In order, to cater to the residents needs a separate distinctive building is designed to meet heating and cooling requirements. Generally, the data centre provides massive cooling power for its servers. The usage of water will be considered the prime area for the centre if it consumes water for cooling purpose. Hence, for procuring LEED certification for data centres, these are the explicit building needs, built into the specifications. ■

(Source: [www.itcportal.com](http://www.itcportal.com))

## University receives award for excelling in energy management



Image Courtesy: [www.jkuat.ac.ke](http://www.jkuat.ac.ke)

JKUAT was examined in a number of areas, and it proved efficient in its energy policy, planning and execution...

Jomo Kenyatta University of Agriculture and Technology (JKUAT) has been declared the top public institution in energy management in Kenya, by the Centre for Energy Efficiency and Conservation (CEEC). The CEEC happens to be an arm of the Kenya Association of Manufacturers (KMA). This credit to JKUAT was recently announced during the Energy Management Award (EMA), 2016.

Jomo Kenyatta University of Agriculture and Technology (JKUAT), was examined in a number of areas, and it proved efficient in its energy policy, planning and execution of different energy aspects – and the adoption of energy saving innovations. Anthony Gitahi, the Energy Manager of the university believes that their victory was due to their strategy that supported them to promote energy awareness amongst communities through capacity building and policy orientation. JKUAT has developed an evaluation matrix to monitor consumption of various energy aspects like electricity, diesel, firewood and Liquid Petroleum Gas.

On the other hand, the university has also instituted an advisory board to assist and guide implementation of various energy management programmes. JKUAT is also leveraging on renewable energy to further cut down reliance on conventional power through the Institute for Energy and Environmental Technology (IEET). Prof. Robert Kinyua, an IEET Director mentioned that the institute was partly using biogas generated from research activities and JKUAT, in collaboration with Loop Inc, had completed installation of solar panels, which would supply three kilowatts to power research laboratories at the university. ■

(Source: [www.jkuat.ac.ke](http://www.jkuat.ac.ke))

## Everyman Theatre receives CIBSE performance champion award



Image Courtesy: [www.liverpoolpicturebook.com](http://www.liverpoolpicturebook.com)

Waterman Building Services is the company behind the theatre that bagged the performance champion award, 2016...

Liverpool's Everyman Theatre was founded in 1964 in an area which was well known for its bohemian environment and political edge. This theatre was completely re-built and re-opened in 2014. The new theatre was admired for its sympathetic design and for its sustainability credentials as 90% was re-used from previous structure's material. In the evaluation of the judges, Waterman Building Services-the company behind the theatre, which bagged the performance champion award, 2016 proved to be the most extraordinary contributor.

It demonstrated the ability to squander over 115kW of internal gains while maintaining internal air quality, limiting noise from the busy city-centre environment and curtailing noise within the theatre. Hence, the judges were highly impressed at the technical skills that they displayed to maintain ease in an exigent environment. In the year 2014, they were also the winners of Stirling Prize. ■

(Source: [www.cibse.org](http://www.cibse.org))

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Sr. No.	Parameter	Cooling Tower (Induced Draft)	LTMCS
1	Wet Bulb Temperature	29°C	29°C
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	<b>ΔT for Chiller</b>	<b>28°C</b>	<b>25°C</b>
6	Chilled Water Compressor Motor Kw for 1200 TR	720	643
7	Energy Saved in %	-	10.7%
8	<b>Energy Saved in Kw</b>	-	<b>77 Kw/Hr</b>
9	Total Running Hours per Annum	8640	8640
10	<b>TOTAL POWER SAVED PER ANNUM</b>	-	<b>6,65,280 Kw</b>



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