

# A CASE OF THE MARKET MOVING AHEAD OF POLICY



Has North America's history of advocating sustainability laid a firm enough foundation to ensure the momentum of energy efficiency in the built-environment, regardless of government incentives and targets? Has the market matured in such a manner that HVACR manufacturers' drive to innovate has shifted from the need to comply with changing, often conflicting, regulations to addressing the demand of more educated consumers and taking efforts towards gaining global competitive advantage? **Hannah Jo Uy** has the story...

**N**orth America generally does not shy away from participating in the dialogue on sustainability, with a number of well-known organisations, certification bodies and manufacturers paving the way for initiatives that promote greater energy efficiency within the built-environment, not only across the continent but worldwide.

James K. Walters, Vice President, International Affairs, Air-Conditioning, Heating, and Refrigeration Institute (AHRI), in identifying trends across North America, states that the work of standardisation bodies in this regard and the uptake of programmes, such as Leadership in Energy and Environmental Design (LEED) have helped moved the dial towards a more integrated approach in addressing building requirements. "We are supportive of climate change mitigation efforts," Walters states. "We are supportive of rational energy-efficiency standards and of approaching them holistically."

Mahesh Ramanujam, President and CEO, United States Green Building Council (USBC), believes that the trend towards

more efficient buildings will persist, despite the viewpoint of incumbent powers, emphasising that policy decisions are no longer the sole driver impacting the progress of "Green". As many as "88 of the Fortune 100 companies have mandated LEED as their global Green Building rating system," he says. "It is a market-driven tool and a voluntary management tool – it's not regulation." Ramanujam says this extends to government organisations, with 400 municipalities, 32 states and 15 federal agencies in the United States mandating and recommending LEED as a best guideline and practice protocol. "This means two decades worth of change management that has happened, globally," he says. "It has been integrated as part of the core strategy. Sustainability is no longer about being a nice thing to do."

Giorgio Elia, Vice President, UTC CCS Middle East, shares the company's history

with LEED in this regard. "Carrier was the first company to join the U.S. Green Building Council in 1993," Elia says, "and is the only company to be a founding member of Green Building councils on four continents, including in Argentina, China, France, India, Kuwait, Singapore and South Africa." Carrier in the Middle East, he adds, is licensed as an Education Partner to train in the LEED curriculum and has trained more than 500 people in the region. Carrier's Middle East headquarters in the UAE, he adds, is certified LEED Gold, while Carrier Saudi Arabia's Jeddah office is certified LEED Platinum.

Providing a manufacturer's perspective, Saad Ali, General Manager – Middle East and Africa, SPX Cooling Technologies,

says LEED certification is frequently a goal of designers of many North American buildings. He says: "Energy savings is a key driver for many companies, as well, so power consumption is declining. The impact of that will be evident in the next couple of years. Changes in government policies could impact these initiatives with fewer energy credits and subsidy programs available to companies for producing energy-efficient products for the market. But I think overall support for energy-efficient products will continue."

Regulations no longer seem to be a pre-requisite to encourage uptake and investment in energy-efficient technology, as James L. Connaughton, President and CEO, Nautilus Data Technologies, says. As an "ardent practitioner of free

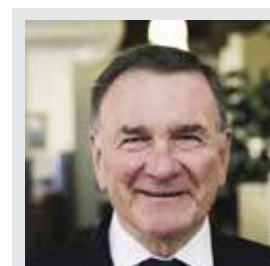
market environmentalism", he believes a better product will always win out in the end. Connaughton, however, believes while government policy is not needed to encourage acceptance and investment of better products and solutions, it can play a role in hindering its advancement. This, he says, can happen by taking too long to permit more efficient and environmentally friendly technologies [to enter the market] and subsidising inefficient competitors. "That," he says, "would not be helpful because government is providing our competitors with the economic advantage to improve their facilities." Connaughton adds that while energy-efficiency standards are helpful in driving consumers and investors, they tend to work in favour of the incumbent. Thus, he says, they have to be designed appropriately so they can drive faster investment in economically beneficial outcomes and accomplish its objectives.

Ali says that while the rollback of some EPA clean energy rules by the current administration has caused headlines, it hasn't deterred companies that develop HVAC products from continuing to pursue new technologies. "The recent paradigm shift in lighting serves as an example," he says. "The introduction of LEDs as

replacements for traditional incandescent light bulbs met with some consumer resistance. New technologies are often more expensive until they

gain traction and acceptance."

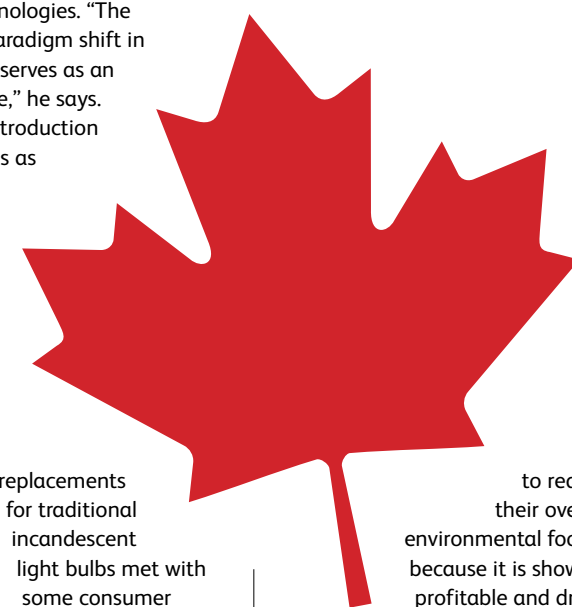
Kit Fransen, Director, Product Management, North America, Tecumseh, adds: "It's no secret that there has been a shift in how buildings operate, as well as how people live and work in them. The sustainability movement is becoming more mainstream every day and plenty of manufacturers, including Tecumseh, look



James K. Walters



Mahesh Ramanujam



to reduce their overall environmental footprint, because it is shown to be profitable and drives innovation." LEED and Green Globes, he says, are just a few programmes that were niche but now have become standard place in most building designs "as you can see with the continued integration of their requirements into ASHRAE or other international standards". Fransen adds: "To meet these needs, manufacturers and end-users are now making investments with natural refrigerants such as hydrocarbons that require significant investment to operate equipment efficiently and safely. Before



LEED or other 'Green Building' type standards, most people did not connect the dots regarding how much time we spend in commercial and industrial facilities that can impact our health as well as the world around us."

Ramanujam adds: "In the United States, Republicans and Democrats have disagreements on climate change and 'Green', but our growth was strong [even] during the Republican presidency. I'm hoping in the current trend we will grow more. Why? Because it provoked individual engagement, and that is what we are looking for." LEED, he says, is about taking responsibility and accountability in saying "I want to go further and beyond". Ramanujam says: "We don't want somebody to tell us a regulation. We are going to do it, because we believe in it and we are going to push the envelope further. In a subtle way, it's a good thing for the market, because people are going to do something about it."

#### BY POPULAR DEMAND

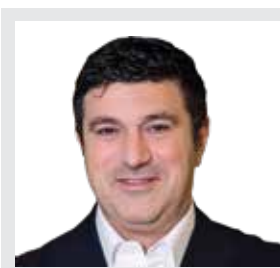
The market does, indeed, seem to be doing something about it, with manufacturers reporting an uptake in consumers showing more willingness to invest in a more efficient technology.

Ali emphasises that technological advancements owing to countries' efforts to reduce reliance on petrochemicals inevitably cascades to other industries, especially HVAC, which, he stresses, is a high priority for building owners, given that it consumes as much as 70% of energy in commercial buildings. "Every consumer is looking for efficient HVAC units, with the best coefficient of performance and the least energy cost," he says. "While environmental impact may not be their first consideration, some consumers want to balance energy efficiency with sustainability. Consumers are protected to some degree by regulations that restrict the use of refrigerants that damage the environment and so they know that available products must comply with a range of environmental standards."

Robert Presser, Vice President, Acme Engineering and GlobeOwl Solutions, also says that he has seen more focus being placed on high-efficiency motors and VAV fans. "Twenty-five years ago, people will look at an air-handling unit and ask, 'How many cfm?' Now they look at an AHU and

ask, 'What is my cost to operate this?' More than the acquisition, stakeholders are looking at life-cycle and operation." This, he says, comes from building owners paying more attention, as there would be no incentive to choose such products unless otherwise specified.

Rakesh Saxena, President, Trimac Inc., says there has been an increasing demand for proper sealing of ductwork from building owners and mechanical HVAC construction engineers in North America. The current ASHRAE standard No. 90.1, he says, notes the impact of duct leakage on energy consumption and IAQ. "ASHRAE standards require a duct to be sealed to the Sheet Metal and Air-Conditioning Contractors' National Association's Seal Class A regardless of pressure," he says. "This means that all seams, except spiral lock seams, joints and penetration in medium- and low-pressure, return and exhaust ductwork must be properly sealed."



Giorgio Elia



Saad Ali



Dean Wood



Stuart Engel

You may have a  
LEED-certified  
building with the  
latest equipment...  
without careful  
monitoring,  
regular inspection  
and diligent  
maintenance,  
the initial energy  
efficiency will decline  
dramatically over the  
next five years

Speaking on increasing emphasis for energy efficient equipment in new build specifications, Dean Wood, Sales and Marketing Manager, Envira-North Systems, says HVLS fans are a common inclusion in all commercial, industrial and institutional buildings. "More than anything local regulations and cost savings drive designs and purchasing decisions," he

says, adding that the company's products have gone from a "possible inclusion to an integral component of most specifications".

Stuart Engel, International Business Development, Fresh-Aire UV, says that owing to greater emphasis on energy conversation there has been an uptake in using UV to irradiate the cooling coils in HVAC applications. "Design engineers have realised that by including UV to irradiate cooling coils the end-user can benefit from

the fact that the coils will remain clean and not become blocked by biofilm growing," he says.

Walter Ellis, Executive Vice President and General Manager, RGF Environmental Group, echoes this. "Studies show the correlation of continuous UV treatment of coil surfaces to prevent microbial fouling of the coils," he says, "and how this technology, in turn, reduces the associated loss of heat transfer efficiency due to the bio-fouled coils. As well as energy-

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recovery systems specific for fresh air makeup systems. These are primarily focused on industrial and commercial markets, with some more progressive adoption in the consumer market.”

Engel says, “Depending on the cost of electricity, installing UV on cooling coils can save between 15 and 25 % of the annual HVAC energy cost and virtually eliminate having to manually clean the coils. Payback time for installing UV will depend in part on the cost of power, annual operating and cooling hours and will normally be between two and 11 months.”

Sean Holloway, National Sales Manager HVACR, RectorSeal LLC, says the company continues to see greater emphasis towards energy efficiency across North America, in particular, for variable-speed compressors for residential applications, variable refrigerant flow (VRF) technology for commercial applications, and mini-split applications for both residential and light-commercial applications. The company, he says, is aiming to address the demand by helping contractors with accessories to encourage building and homeowners to opt for mini-split and VRF/VRV systems. “More and more individuals,” he says, “are willing to pay more up front, for higher efficiency equipment in order to use less energy, and have less negative impact on the environment in the long run.”

Fransen says that while the past decade has seen Energy Star, LEED, and other programmes push for lower energy use intensity (EUI) in all building types, reduction in energy use for commercial refrigeration has only begun “due to the tackling of “low-hanging fruit” in energy consumption such as lights, HVAC, and process loads.” This, however, is beginning to change. “Recent governmental regulations, such as requirements for walk-in coolers and freezers from the US Department of Energy with a mandated performance level of Annual Walk-In Energy Factor (AWEF) is just the first of many requirements where energy performance will become more regulated in the commercial refrigeration market place,” he says. “Technologies, such as variable-speed components, including fans and compressors, in addition to control strategies such as floating head pressure control will become more common in refrigeration system design.” Fransen adds that in staying abreast with upcoming standards to develop new products surrounding mandated and voluntary programmes, Tecumseh sees variable speed compressors and systems as well as low-GWP refrigerants transitioning



Walter Ellis



James L Connaughton



Kit Fransen



Robert Presser

over to the commercial market “once energy standards and regulations become more prevalent across the globe”.

#### INDUSTRY 4.0

Another key trend Walters identifies in North America is the growing move towards the use of air conditioning and water heating equipment that are connected and able to talk to the grid and electricity supplier, relative to adjusting supply with demand. “It’s not an on-and-off switch,” he says.



Fransen echoes this, adding that the Internet of Things (IoT) and connected devices are quickly changing the way consumers use products, and that the company sees a similar trend in the commercial refrigeration market. “More and more components are connected, which helps end-users with a variety of different tasks, to simplify their work,” he says. “Regarding refrigeration components, some examples could be a means to show diagnostics for quick servicing or a web-based predictive analysis tool that would show when components in a system may potentially fail based on specific parameters.”

Presser adds that LEED certification also plays a role in this. “When you choose to get LEED certification for a building,” he says, “you incorporate a lot of intelligent energy controls.” However, he says, no one is dictating the backbone communication architecture to be used, whether it is an HVACR standard or an industry open standard. Presser says that the adoption of LEED certification will promote greater building intelligence and technology, but that the industry still has a long way to go.

The industry, Presser says, is currently promoting a standard that does not interface with technologies coming into buildings and devices and that he sees a move towards an international standard of communication in the HVACR space. “My feeling,” he says, “is that eventually product developers are going to take a look at the HVACR space and come with an open standard product that will ensure lower cost and ease of connectivity, which will displace proprietary technologies. You also have to realise you have a huge installed space, the opportunity will be when you look at existing buildings and you want to add intelligence. Who will win?”

Ali says that being one of the biggest retrofit markets, North America may be a little ahead of the rest of the world, in terms of planning for maintenance. “Along with

new development and construction, there is a lot of renovation, where older buildings are updated and using the latest technologies,” he says. “Predictive maintenance comes into play here. You may have a LEED-certified building equipped with the latest equipment with IoT technology to communicate building conditions 24/7. Without careful monitoring, regular inspection and diligent maintenance, the initial energy efficiency will decline dramatically over the next five years.”

Maintenance, Ali stresses, is an essential component to successful energy management. He adds that though North America is a huge continent with diverse climates and with each state having its own mindset, regulations, capabilities and budget to maintain infrastructure, building owners are more or less aware of the important role that maintenance plays in ensuring



Rakesh Saxena



Sean Holloway

a healthier environment, better indoor air quality and better, energy-efficient buildings. “If you are a building manager or owner of commercial real estate,” he says, “that would be in your mindset in order to compete in the marketplace.”

Ali adds that building owners and equipment suppliers need to work together to conduct energy audits and implement ongoing maintenance programmes. “Right now,” he says, “follow up is often lacking, whether it’s in North America, Asia or in the Middle East.”

While HVACR manufacturers in North America navigate the demands of the local market, most operate in a largely international market and grapple with the changing winds of an increasingly globalised and inter-connected consumer base. **ccme**



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**T**he Natick Phase One vessel was operated on the seafloor, approximately one kilometre off the Pacific coast of the United States, from August to November 2015. Thereafter the Phase Two vessel of Natick, deployed at the European Marine Energy Centre in Orkney Islands, United Kingdom, in June 2018, aims to demonstrate that you can economically manufacture full-scale undersea data centre modules and deploy them in under 90 days from decision to power on. Could you give us an insight into what prompted the company to launch Project Natick?

Project Natick reflects Microsoft's ongoing quest for cloud data centre solutions that offer less resource-intensive options, rapid provisioning, lower costs and high agility in meeting customer needs.

Essentially, the project is focused on bringing about a cloud future that can help better serve customers in areas that are near large bodies of water, where nearly 50 % of society resides. The vision of operating containerised data centres offshore, near major population centres, anticipates a highly interactive future, which will require data resources located close to users. Deepwater deployment offers ready access to cooling and a controlled environment and has the potential to be powered by co-located renewable power sources.

**From what we understand Natick data centres consume no water for cooling or any other purpose. Could you speak a little bit more about what makes this possible without compromising critical data components?**

Seawater flows through heat exchangers within the data centre. The heat exchanger is like a car's radiator, which uses cool air to cool the hot water flowing through the car's engine. We're the same, but we use water to cool air. Very little cooling is due to the walls of the vessel.

## Is Microsoft's underwater data centre the future?

**Ben Cutler, Manager, Project Natick, speaks exclusively on Microsoft's move to build an underwater data centre, as part of its efforts to look into the benefits of a standard and deployable undersea data centre for cloud users worldwide. Excerpts from the interview with Hannah Jo Uy...**

Modern building cooling systems, including data centres, use city tap water for cooling. This use of water greatly reduces the electricity required for cooling, but this water use can be significant. Natick puts no pressure on city water supplies and instead uses seawater, which is then returned directly to the ocean, unchanged.



Microsoft's Project Natick team L-R: Mike Shepperd, senior R&D engineer, Sam Ogden, senior software engineer, Spencer Fowers, senior member of technical staff, Eric Peterson, researcher, and Ben Cutler, project manager. Photo by Scott Eklund/Red Box Pictures.

**Could you comment on the unique challenges that come with cooling large-scale electronics in this context and how the company addressed them?**

Today, each land data centre is subject to local environmental conditions, such as temperature, humidity, particulate matter, building materials and electricity supply, which differ significantly across data centres and across seasons. Natick uses the same computers used to deliver our cloud services from land-based Microsoft data centres today and, as previously mentioned, because Natick data centres provide a sealed environment, we can use a nitrogen atmosphere, with no oxygen and very little water vapour. This reduces problems such as corrosion and allows us to provide the computers with the same operating environment, regardless of where in the world we deploy.

**How could subsea data centres contribute to the growing dialogue of optimising resources in operations in a sustainable manner?**

The project represents Microsoft's investigation in the numerous potential benefits that a standard, manufacturable, deployable undersea data centre could provide to cloud users all over the world. If successful, we are on the quest for a future, where cloud data centre solutions offer less resource-intensive options, rapid provisioning, lower costs and high agility in meeting customer needs.

Natick requires no footprint on land, which is a significant issue in some locations. Being offshore allows us to bring the cloud close to customers even without this footprint.

Because Natick is more energy efficient, we put less pressure on the electric grid. We are investigating the idea of co-locating Natick with its own locally generated renewable energy. In this kind of configuration, we would be off-grid. The Energy Information Administration says long-distance transmission typically costs five per cent of electrical power, so this reduces energy use while eliminating the need for long-distance transmission, including the transformers required in this process.

As noted earlier, Natick uses seawater and, hence, doesn't require city water. Drinking water is likely the most valuable resource in the 21st century. [ccme](#)



### HAVE YOUR SAY!

We welcome your views on the Q&A. Write to [editor@cpi-industry.com](mailto:editor@cpi-industry.com)



## 'NO DOUBT, THE NEXT DATA CENTRES WILL BE WATER COOLED'

**James L. Connaughton, President and CEO, Nautilus Data Technologies, speaks exclusively with Hannah Jo Uy on the company's patented water cooling technology and the future of data centres...**

**What drove the company to pursue this approach?**

The company was formed five years ago by a group of engineers and information technology executives with a proposition that current methodology for air conditioning data centres is utterly unsustainable, when it comes to the future computing that lies ahead. You have to rethink the right building envelope for the cooling of thousands of servers. Our design criteria was how do you accomplish direct water cooling at the lowest capex with the lowest opex and with the smallest environmental footprint. And to do it in a way that can be applied anywhere in the world. I say this because there are some clever niche applications that are specific to particular geographies. The other piece of our mission was to do this in a way that could help accelerate access to modern data services by people in emerging economies.

**Can you highlight the operational benefits of these solutions? In your opinion, why are current data centres inefficient?**

We improve the energy efficiency of the cooling system by 40–80 %. The industry average power usage effectiveness (PUE), according to the U.S. Department of Energy, is about 1.7. New data centres are doing

better. We are 80 % more efficient than the industry standard and about 30 % more efficient than some of the newer designs. We are also able to accomplish this at about half the possible expense. The more efficient data centres accomplish that at a higher capex. Our solution also uses a lot less material. That is just the energy efficiency of the cooling system, which means our net energy efficiency for the whole data centre is 30–40 %.

Secondly, we don't rely on potable water to run an evaporative cooling system. We lower consumption and eliminate the burden on waste water treatment systems. Next, we don't need to abuse any chemical refrigerants, greenhouse gases and ozone-depleting substances.

Finally, because we are efficient in our cooling, we can handle three times, or more, the number of computers and servers in the same space, hence, our real estate efficiency is better. Also, we want quiet and cool; it's an attractive environment for data centre operations.



James L. Connaughton

Ironically, air conditioning is very inefficient and imposes a big burden on public water systems. Water cooling doesn't consume water. The great advantage of our systems is that its pumps and pipes, the atmospheric intrusion is significantly diminished as opposed to air-handling units. Water cooling by any measure, is a lot more energy efficient than evaporative air cooling systems. The hardest places to cool data centres are in the equatorial region. The Middle East is hot and dry, the Pacific like Singapore is hot and wet. Water cooling is ideally suited for cooling data centres in the region compared to air conditioning methods currently being used.

In a place like the Middle East, we have an advantage. Our cooling system can efficiently generate hot water that can lower the cost of desalination, or other industrial applications. We have the advantage of co-location with other industrial infrastructure to improve efficiency. We are designed to be mega modular, in that we pre-fabricate what we do and assemble it on site, systems are simpler

and the process of building a data centre is faster.

**Water cooling for heat exchange has been used for over 100 years. Why did data centres not follow this methodology?**

Several of our team, including me, come from other sectors. Water cooling is traditional for heat exchange. When we came to bring expertise to data centre cooling, we were surprised that data centres did not employ that technique. Data centres became an arm of real estate development. Techniques adapted for data centres worked and innovation stopped. It worked for a lot of engineering and vendors that are heavily invested in the approach, and now everyone uses it.

We classically are entering the market with a much more effective product that takes engineering skill and production skill and does it at a scale and reliability that data centres require. We made the investment to figure all that out. What's interesting is, as indicated, the system's much simpler and more reliable to operate. It delivers a very reliable cooling regardless of the load in the server rack. We can support configurations of 120 kilowatts of load, which means we can have high performance computing, [which is] widely commercially available and affordable.

**Do you need regulations to encourage uptake of this solution in the market?**

I am an ardent practitioner of free market environmentalism. I believe if you can invent a technology that delivers the same or better performance at the same or lower cost in terms of environmental impact, you can accomplish a lot more, faster. We are an example of that. We make sense economically, operationally and environmentally. We don't need help from the government, because we have a better product.... There is no doubt in my mind that the next data centres will be water cooled.

We have had a high level of interest from all the major players, who are waiting the construction of our first facility to look at the commercial operability of what we are doing and that includes a number of entities that will be customers in the first production. We do have to educate on an enterprise-to-enterprise basis. [ccme](#)



### HAVE YOUR SAY!

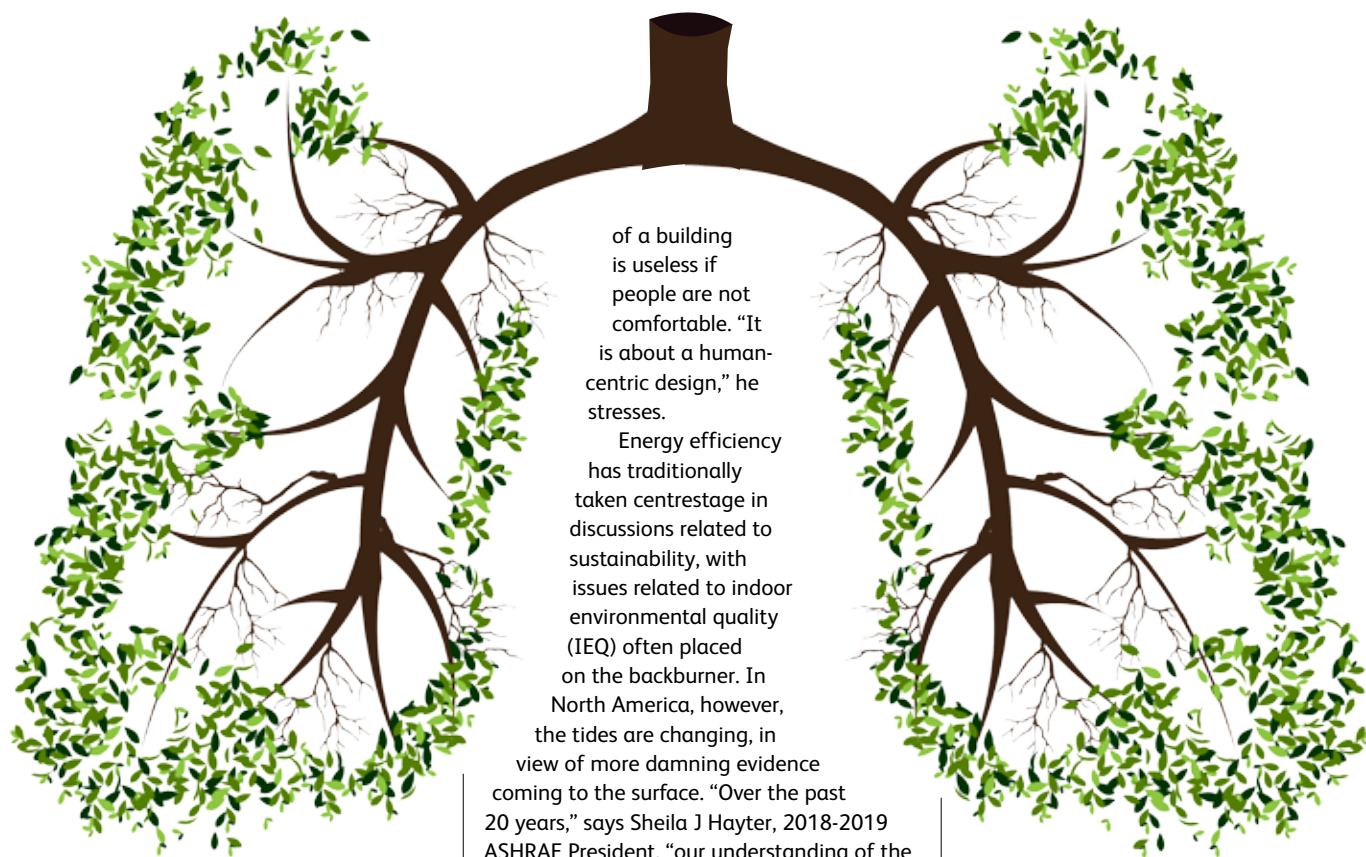
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# 'A HUMAN-CENTRIC DESIGN'

How is IEQ viewed by stakeholders across North America? Has it been granted as much importance as energy efficiency, which has steadily attracted investment and recognition in the move to reduce opex and emissions? Are decision-makers truly aware of the impact of indoor and outdoor air quality on inhabitants? **Hannah Jo Uy** has the story....



of a building is useless if people are not comfortable. "It is about a human-centric design," he stresses.

Energy efficiency has traditionally taken centre stage in discussions related to sustainability, with issues related to indoor environmental quality (IEQ) often placed on the backburner. In North America, however, the tides are changing, in view of more damning evidence coming to the surface. "Over the past 20 years," says Sheila J Hayter, 2018-2019 ASHRAE President, "our understanding of the relationship between IEQ and the health, productivity and comfort of occupants has advanced substantially. Employers recognise that healthy buildings not only play a significant role in the reduction of operating costs but also result in reduced absenteeism and healthcare-related costs."

Giorgio Elia, Vice President, UTC CCS Middle East, weighs in: "A follow-on study in the US found that the indoor environment

previously associated with a doubling of cognitive function test scores can be achieved at an energy cost between USD 14 and USD 40 per person per year and result in as much as a USD 6,500 equivalent in improved productivity per person per year. When energy-efficient technologies are utilised, the study found the energy costs to

“A Green Building, at the heart, is about people.” This is a statement

Mahesh Ramanujam, President and CEO, US Green Building Council, makes with utmost sincerity, emphasising that the efficiency

be between USD 1 and USD 18 per person per year, with a minimised environmental impact equivalent to approximately 0.03 cars on the road per building per year. This is yet another way that the higher initial investment in green buildings is offset by long-term savings.”

Dr Joseph G Allen, Assistant Professor, Harvard T H Chan School of Public Health, and Director, Healthy Buildings, Harvard Center for Health and the Global Environment, can certainly attest to this, being one of the pioneering minds responsible for the COGfx Study. Providing an example, Dr Allen points to a study carried out in New York State. "They looked at test scores for 10 years in New York state," he says. "It turns out when kids took a test on a day that [meets] ASHRAE's thermal comfort parameters versus a day that was very warm, they were 12% more likely to fail the test when they took it in hot conditions in the building. To me that's in line with everything we know and see about how



Mahesh Ramanujam



Sheila J Hayter

thermal conditions of buildings affect adults and workers.”

Elia highlights the progress that Dr Allen and his team have made over the past few years. "In 2015, COGfx Study 1: Indoor Environmental Quality set the methodology," he says. "In 2016, Study 2: Buildingomics took the research out of the lab, connecting Green Buildings with occupants' health and productivity. Now, Study 3: Global Buildings has scaled the research globally."

Highlighting the critical role research plays quantifying the relationship of IEQ to health and productivity, defining acceptable IEQ parameters, and determining the best methods and costs of improving IEQ, Hayter stresses that "increased knowledge in these areas will lead to our ability to create and maintain wellness in the built-environment". "The most effective research in this field," she says, "will be multidisciplinary, involving building design, construction, commissioning, maintenance and operation...."

Understanding occupant behavior will






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help our industry improve designs, reduce energy use in buildings, and better meet occupants' needs."

### A NEW BREED

It would seem that historical research and new data have significantly contributed to cultivating a new breed of building occupants, all of whom, Ramanujam says, are spurring innovation and becoming the driving force for a variety of changes based on their expectations of what the built-environment should be. "This is pushing the boundary on products, design, construction and operations," he comments.

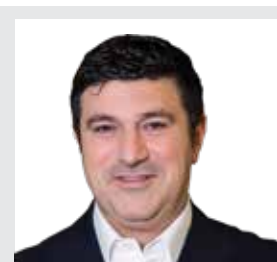
Walter Ellis, Executive Vice President and General Manager, RGF, echoes this, stressing that in certain situations, such as problematic buildings, with specific complaints from a portion of its occupants, companies or institutions are now using resources to a higher degree to directly address specific IAQ issues. "There is now a general acceptance that these complaints must now be taken more seriously and acted upon," he says.

Observing a similar trend, Stuart Engel, International Business Development, Fresh-Aire UV, says consumers in North America are becoming more aware and demanding of indoor air quality (IAQ) in their homes and workplaces. "Hospitals are addressing Hospital Acquired Infections (HAIs) much more aggressively as governments have placed the burden of these HAIs squarely on the Hospitals," he says. This, Engel says, has resulted in consumers moving towards cloud-based monitoring of their indoor environments with equipment that can detect and act on volatile organic compounds (VOC) contaminants to improve their air quality and keep them abreast of the temperature, humidity and VOC levels, remotely.

Also using the uptake in demand for certain products as a means to track interest and awareness towards IAQ, Robert Presser, Vice President, Acme Engineering and GlobeOwl Solutions, shares macro and micro level insights with regard to air quality monitoring from the perspective of both his companies. "When you want carbon monoxide diesel fume and VOC detection, that's ACME," Presser says, as the sales of the product line is directly related to large multi-level buildings with large vehicular



Dr Joseph G Allen



Giorgio Elia



Stuart Engel



Technology and increased use of renewables will probably be the biggest drivers of the movement towards balancing energy efficiency goals with the need for good indoor environmental quality

spaces. "When a city wants a greater idea of general levels of pollution and wants to model the data as you accumulate concentration of gases at different times of day and model dispersion, that's GlobeOwl," he says, as it addresses the demand of public authorities to see the profile of pollution in the outdoor environment to measure the effect of policy.

As to whether there has been an uptake or downturn in demand for monitoring systems from public authorities in one country over another, Presser stresses that it's not about Canada versus the United States. "I don't think there is a border divide in this issue," he says. "It's about which cities have the financial means to undertake this investment. I think only bigger cities that have the intelligence infrastructure will invest. If you are looking at legislation, green initiatives from central government, there will be a diversion. I don't think Trump will impose environmental regulations in the cities; if anything the cities will adopt these programmes on their own, in response to local demand for cleaner environment."

In Canada, Presser says, there is heavier emphasis on provincial jurisdiction. "The Canadian government can fund environmental and green initiatives," he says, "which it does, but it does so in a province-to-

province and case-to-case basis. It's for them to put forward to their own initiative."

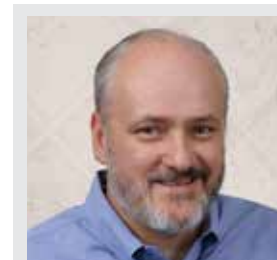
### THE COST OF COMFORT

As to whether this is translating to greater willingness to invest in more sophisticated technologies, Ellis maintains that while RGF has seen greater awareness on implementation of more IAQ-conscious design and operations, there is still room for improvement. "We typically see the implementation of IAQ systems for air treatment in either troubled environments or in new facility construction with involvement from more progressive clients and architect/engineers," he says. "Best IAQ practices are not yet universal in implementation; there is still a cost basis that is very much in consideration."

Ellis adds that tight building envelopes resulting from modern building construction techniques have necessitated a growth in fresh air makeup systems, he says, which are increasingly being looked at as a way to



Robert Presser



Walter Ellis

improve indoor air quality. "However, these are typically a very costly option," he says, "as bringing in very hot or very cold outside air, directly necessitates additional energy to heat or cool this introduced air. Energy-recovery systems can help reduce this cost, but these systems are also very expensive. Utilising an integrated IAQ treatment system within an HVAC system can greatly reduce and, in some cases, eliminate the costly expense of fresh air make up systems."

Presser says that while the cost considerations vary greatly between new and existing structures, noting that the vast majority of the developments are "Class B or C office spaces, with older buildings", the two things have to happen to increase uptake of IAQ across the built-environment. "You have to ask as a building owner to invest in better HVAC technology," he says, "and that tenant is going to have to be willing to pay for it; nothing is free. If the tenant is willing to pay 5-10 % per square metre, the owner can invest in better IAQ. The whole



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thing is an exercise in economics; if IAQ is important to a tenant, they are a class A office space renter, where they can move to the latest building with the best HVAC."

### **CLEAN ENERGY PAVING THE WAY FOR IMPROVED IEQ**

With cost very much a concern, could a move towards clean forms of renewable energy ease the burden posed by IEQ products and solutions? Hayter believes that the direction North America is taking towards renewables could help address the IEQ and energy efficiency conundrum. "Technology and increased use of renewables will probably be the biggest drivers of the movement towards balancing energy efficiency goals with the need for good indoor environmental quality," she states.

Ellis believes that while renewables are increasing, it is not at the same rates as adopted in many other countries. "Integrating renewable energy in the design of buildings, such as greater adoption of solar systems, both grid-operated or building-specific, continues to rise," he says. "The mainstream acceptance of the benefits of these technologies and their adaptation is becoming the reality, though as an environmental company, we do wish its implementation and adoption in the United States was much more accelerated."

Hayter believes that technology could help play a role in this regard, as innovations continue to impact the industry at the design, construction and manufacturing levels. "New technology will create new forms of energy in the United States," she says, "that can translate into new opportunities for the developing world. Instead of developing 20th century grid infrastructure, areas without electricity may be able to leap into new technology."

ASHRAE, she says, aims to play a key role in accelerating the use of innovative technologies. "As we consider the changes taking place in both the electricity and buildings sectors, the challenges and the opportunities, we must not lose sight of the fact that buildings are built for people," Hayter says. "The best building design, construction and operation will achieve two important goals: To ensure occupant safety, wellness and comfort and to become an active partner in a new electricity sector."

While the 'energy efficiency-IEQ' debate continues, it would seem that the possibilities being offered by new and emerging technologies and the growing emphasis on renewable energy could help address both requirements, in the move for industry stakeholders to develop the ideal "healthy building". [ccme](#)

**Giorgio Elia, Vice President, UTC CCS Middle East:**

"Many countries in the Middle East have steadily improved and implemented minimum energy-efficiency standards by adopting the latest technology trends in response to a growing demand for energy efficiency. New regulations and standards have, in turn, led to an increased demand for higher efficiency air conditioning solutions from end-users, consultants and contractors in the region. Historically, chillers were evaluated on cooling capacities. Now, they are evaluated on system part load value, or SPLV, which looks at efficiency during actual operation versus at a theoretical point.

Upcoming projects in the GCC [region] are focusing on higher SPLV plants in an attempt to lower annual energy consumption. District cooling plants are popular in the Middle East, because they provide higher efficiency and diversity when compared to air-cooled systems. Thermal energy storage systems are also being implemented to shift demand from peak to off-peak (mostly night-time). At Carrier, we have sustainability at the core of our engineering philosophy, and we pride ourselves on providing energy-efficient products at competitive prices. We are starting to see our HVAC customers look at the total cost of ownership rather than the transactional product price, which we expect will drive increased demand for innovative energy-efficient products."

**Saad Ali, General Manager – Middle East & Africa, SPX**

**Cooling Technologies:** "We are pursuing modularisation – compact, energy-efficient pre-assembled components. We are also studying water consumption. We continue to believe in the value of product certification by organisations like the Cooling Technology Institute (CTI). The selection of products we offer here [in the Middle East] are marketed based on what is suitable. While our preassembled modular cooling towers are preferred in areas with high labour costs, here in the Middle East labour is not an issue. Labour is cheaper here, while in the United States it is high. The appeal of modularisation is currently more the exception than the rule here. But modularisation also offers advantages like faster delivery to the job site, shorter construction duration and safer erection techniques – important considerations for project managers."

## **VOICES:**

# **HOW ARE NORTH AMERICAN MANUFACTURERS ADDRESSING THE MIDDLE EAST MARKET?**

**Dean Wood, Sales and Marketing Manager, Envira-North Systems:**

"While competitors have traditionally moved the discussion from performance to appearance, we've streamlined our HVLS fans to improve their appearance, while maximising air velocities and minimising energy consumption. Any decision to purchase a fan should be based upon the fans' capabilities to circulate air while reducing energy consumption and providing comfort to occupants. Educating end-users drives our sales and creates an environment where customers are happier and more likely to become repeat customers."

**Walter Ellis, Executive Vice President and General Manager, RGF Environmental Group:**

"On average we launch 2-3 new products a year. We have several projects in R&D now, some are still too early for us to comment on. Some that we are very close to launching, that include the adaption of new low wavelength UV LED technology to our products. This technology will offer increased life, and higher energy efficiencies. In addition, we have a brand new photocatalyst, with higher conversion efficiencies that will soon replace our existing catalysts. Our current IAQ technology is very effective in this market; however, both materials of construction, as well as specific component designs are sometimes specifically designed to suit applications within these markets."

**Kit Fransen, Director, Product Management, North America, Tecumseh:**

"We see variable-speed compressors and systems as well as low-GWP refrigerants transitioning over to the commercial market once energy standards and regulations become more prevalent across the globe. A great example of our innovation in this area is VTC, a variable-speed compressor that works with R-290 refrigerant meant for light-commercial refrigeration applications. Tecumseh's unique experience and expertise in commercial refrigeration have been developed over many decades through our global footprint of manufacturing and local teams. Having four global technology centres strategically located around the world gives Tecumseh a clear advantage to design and develop optimal solutions that are tailored to local needs. Those capabilities have enabled Tecumseh to develop products, such as AW compressor series, HTA condensing units, RK2 and RN2 rotary compressors and electronically controlled compressor and system solutions, that are particularly suitable for the high-ambient conditions in the GCC region."

**Stuart Engel, International Business Development, Fresh-Aire UV:**

"We have developed unique and proprietary computer generated sizing programs for HVAC coil and air as well as room and surface disinfection applications that allows us to customise the equipment to the specific application, whether it is in the GCC, North America, or anywhere else. Freshaire UV is the only leading UV manufacturer that except for the UV lamp, carries a lifetime warranty on all parts."

**Rakesh Saxena, President, Trimac Inc:**

"The key of meeting the low-leakage requirement is to use a quality sealant that is flexible during application and stays flexible over time, without cracking, to handle mechanical vibrations and expansion or contraction due to pressure and temperature cycling. Carlisle Hardcast's rolled mastic sealants and water-based Spray Seal offer an efficient means to provide good metal adhesion and prevent air loss at the point of sealing. Carlisle products have also been used at iconic projects in the Middle East, such as Midfield Terminal, Abu Dhabi Airport and Qatar Rail."



### **HAVE YOUR SAY!**

We welcome your views on the article.  
Write to [editor@cpa-industry.com](mailto:editor@cpa-industry.com)





Jocelyn Argibay, Department of Natural Resources, Canada

# 'CANADA TO SET ENERGY-EFFICIENCY STANDARDS AT THE HIGHEST LEVEL POSSIBLE'

**Jocelyn Argibay**, spokesperson for the Department of Natural Resources Canada, shares the government's strategy to accelerate the adoption of more energy-efficient products, embed more stringent regulations in building codes and move towards net-zero-energy buildings, with *Climate Control Middle East*. Excerpts from the interview with **Hannah Jo Uy**...

**C**ould you provide us with an update on how the government is taking action on climate change, especially in terms of green building codes for new homes? Are there any updates on retrofit initiatives?

In response to a call to action from Canadians on climate change, the federal and provincial governments developed Build Smart, Canada's Buildings Strategy, to help Canadians and Canadian businesses realise the many benefits of making homes and buildings more energy efficient.

Through the Build Smart Strategy, we are working with provinces, territories and industry on energy-code development, data sharing, research and development and market transformation strategies for the building sector.

We are working closely with our provincial and territorial governments, industry partners and the National Research Council to develop model national codes for provinces to adopt. For new buildings, federal, provincial and territorial governments are committed to developing a net-zero-energy-ready model code by 2022, for adoption by provinces and territories by 2030. For existing buildings, retrofitting makes sense. In addition to reducing greenhouse gas emissions, retrofits save homeowners' money by lowering energy bills while increasing the value and comfort of their home.

**What is being done in terms of regulating and enforcing minimum-energy performance of appliances, especially in the field of HVAC?**

Canada's Building Strategy calls for new standards for high-efficiency equipment, including market transformation measures to accelerate adoption of next-generation, low-carbon technologies. With effective use of technology, we can make our homes and buildings work for us — ensuring our physical comfort while lowering our energy costs and our environmental impact.

The Government is updating Canada's Energy Efficiency Regulations for appliances, equipment and products. We will set energy-efficiency standards at the highest level that is technologically and economically possible. Canada has proposed more stringent standards for residential gas furnaces and residential and commercial gas boilers to condensing levels. The forward regulatory plan is available here: <http://www.nrcan.gc.ca/energy/regulations-codes-standards/18318>. We are taking action to help transform the market for higher performance, energy-efficient equipment for homes, including windows, space- and water-heating equipment.

This will help overcome barriers to mainstream adoption of energy-efficient equipment, like availability and affordability, and accelerate its uptake.

Canadians are also well aware of the ENERGY STAR symbol. It is the internationally recognised and trusted mark of high efficiency. By looking for this symbol, Canadians can easily identify products, new homes and buildings certified as energy efficient.

**What is being done to educate stakeholders in the built-environment to ensure compliance with and awareness of the latest environmentally friendly building codes?**

Sub-national authorities will ultimately determine how homes and buildings are constructed in their respective jurisdictions in keeping with commitments agreed to under the Pan-Canadian Framework. Accordingly, we are working closely with government stakeholders to come up with solutions that work for all Canadians. While model energy codes are developed at the national level, they must be adopted by a province or territory to have force in law.

NRCan is also working closely with building and construction industries and conducting public consultations as part of the code-development process, which is collaborative and consensus-based. Together, we are researching, developing and demonstrating projects to lower the cost of building to higher standards and undertaking energy retrofits in existing buildings. Development of codes for both new and existing buildings will consider cost-effectiveness and affordability and will benefit from evidence-based research.

**How is Canada striking the balance when it comes to meeting its environmental goals and protecting the economic interests of local manufacturers and industries? Could you comment on the role of incentives – tax credits, grants or subsidies – in spurring innovation and best practices among manufacturers?**

To ensure we created objectives that work for Canadians, in the lead up to the Pan-Canadian Framework we consulted with the federal, provincial and territorial Energy Implementation Group, along with provincial and territorial ministries of energy and environment. We also consulted industry stakeholders, such as the Canadian Green Building Council, BOMA Ottawa, and the PEMBINA Institute. A target date of 2030 was set to provide time for a gradual transition to net-zero-energy-ready model code for new buildings, deployment of new construction practices and market transformation strategies for high-performance equipment, all of which will lead to decreased consumer costs.

NRCan is already working with the construction industry through research, development and demonstration projects to lower the cost of building to higher standards and undertaking energy retrofits in existing buildings. We are also supporting proposals from a wide number of applicants, including builders, developers, provinces and territories to target real-world demo projects in all climate zones across the country. These Research, Development and Deployment (RD&D) projects will help reduce costs to meet new building codes while increasing knowledge and skills in the construction industry.

As we move forward with the five-year process to develop the new model energy codes to meet the commitments under the Pan-Canadian Framework for new and existing homes, we will be conducting extensive public consultations. We will be looking at ways to engage homeowners and building owners more extensively on key questions in order to gauge how best to apply model energy codes, particularly for existing buildings. We expect to do this in tandem with the provinces, territories and industry to ensure we have codes that work for Canadians.

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