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HVACR 2023:

WHAT'S NEW?

WHAT'S NEXT?

*Ten manufacturing thought leaders share insights on **what issues will be driving our industry forward** this year. Federal funding, regulations and challenges are among the key catalysts. See **pg. 16***

**Clark's Remarks:
Ancient Lessons for
GHG Emissions**

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Balancing Optimism and Realism

As the new year gains momentum and our wish lists of resolutions already include some early successes (we hope), it is hard not to feel at least some optimism now as we head toward spring.

Granted, the COVID-19 pandemic is not over, as ASHRAE's **Bill Bahnfleth** reminds us in this issue (p. 29), and most nations may not be moving fast enough to mitigate the global climate crisis, as USGBC's **Liz Beardsley** warns us online in the December episode of *HPAC 'On The Air'*. And, of course, the economy may or may not be on the verge of a recession.

But still... there are many reasons to feel encouraged this winter as AHR Expo returns to Atlanta, where attendance is expected to approach pre-pandemic heights.

Indeed, ingenuity will also be on full display there, as HVACR manufacturers from all over the world will showcase their wares. Ten booths will already

be boasting 2023 AHR Expo Innovation Awards, as highlighted on p. 38 of this issue, and another 20 will note their own honorable mentions. But virtually *all* exhibitors will be talking about how their products can help to make our lives, both at home and at work, healthier, happier, more productive and more sustainable.

That's a big change from the smoke-filled, (mostly male) exhibit floors of 50 years ago.

Meanwhile, across the halls from the expo, ASHRAE's Winter Conference will also be discussing our industry's biggest challenges and how to solve them. As noted by the 10 voices featured in our *What's New? What's Next?* cover story, some of that work this year will be driven by incentivized competitions like DOE's *Cold Climate Heat Pump Challenge* and EPA's *Clean Air in Buildings Challenge*. Both programs have prompted considerable industry action.

Similarly, just in December, Lawrence Livermore National Laboratory excitedly announced that six decades of research had just yielded the first controlled fusion experiment ever to achieve "scientific energy breakeven," a giant step toward clean fusion energy.

That's potentially a very big deal. And still more reason for informed optimism.

So often, as our mainstream news cycles and social media today are dominated by childish name-calling, we can forget that there are still plenty of very serious people working on very serious problems. And many are in our industry.

I recently heard radio host and author **Thom Hartmann** say on his nationally syndicated show, "If we can go from Orville and Wilbur Wright's first flight to landing a man on the Moon in just 66 years, then I truly believe we can solve just about anything."

Anyone who has listened to Hartmann before knows he is no Pollyanna. He is a realist who never sugarcoats history or current events, so I was really struck by his analogy. And his optimism. I had not thought of that extraordinarily compressed time span before in the brief history of aviation.

His mix of optimism and realism also reminded me of what former Carrier exec and USGBC co-founder **Rick Fedrizzi** had told me on one of our first podcasts in 2021. "I don't care how bleak things may look," said the current chair of the International WELL Building Institute (IWBI). "Come the day that we give up, we should all be ashamed of ourselves."

Agreed. At this moment in 2023, as we look ahead on a new year that promises more innovation, research, development, and much actual progress, that bleak day mercifully feels a long ways off.

CORRECTION: In our last print issue, we stated in this space that 24 global industry organizations had signed onto ASHRAE's new position document on Infectious Aerosols. Instead, those organizations had joined ASHRAE's recent public statement on Building Decarbonization. HPAC Engineering regrets the error and it has been corrected in the online version of that story.



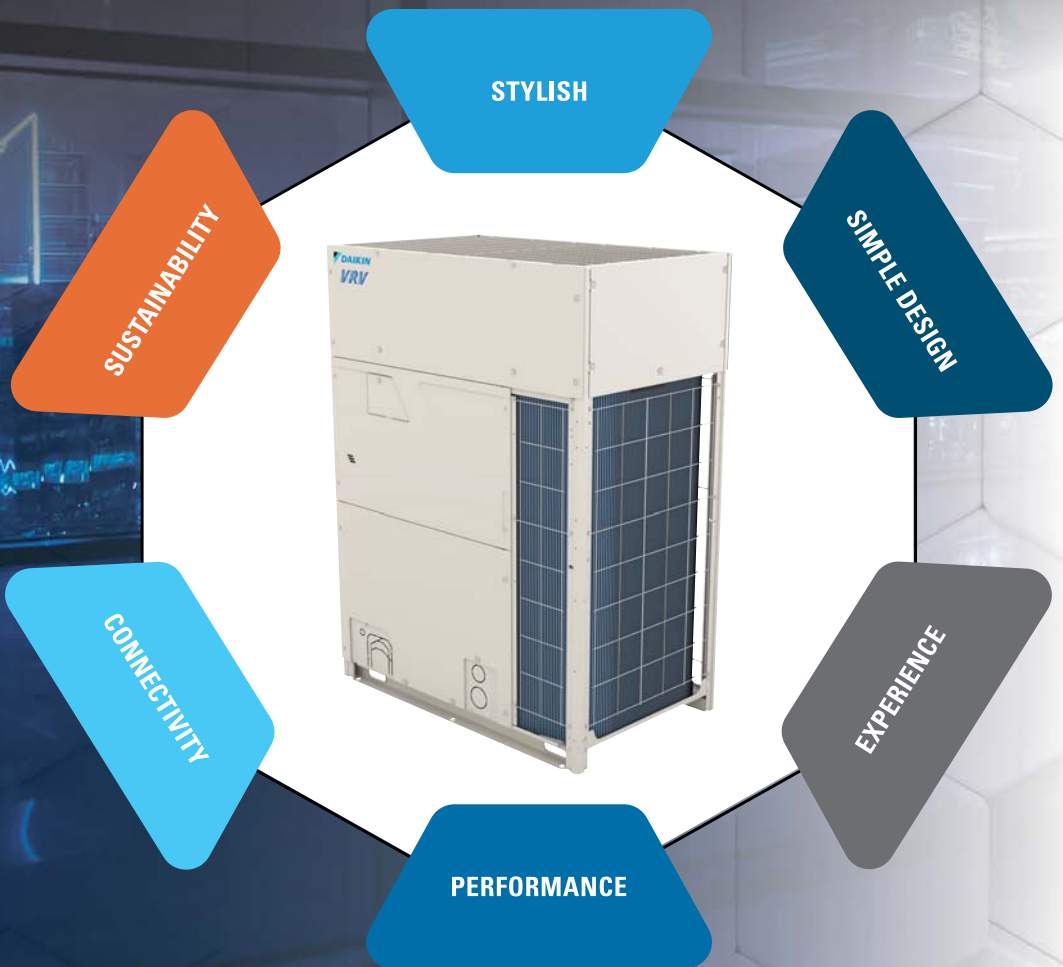
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Recession Fears Ebb, Optimism Makes Comeback

Rollercoaster year ends with economists, contractors and designers more confident that a steep downturn is not necessarily inevitable in 2023, after all.



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As doom and gloom still swirl constantly around the U.S. economy, exacerbated once more by partisan histrionics in Washington — now over the debt ceiling — most market indicators continue to trend defiantly well, especially for design and construction.

Even the runaway inflation that seemingly supplanted the pandemic last year as the economy's biggest nemesis had largely fizzled out as winter began. But few took note.

Tweeted economist **Paul Krugman** on Jan. 21: "One thing I've been noticing in my correspondence is how many people think inflation is still running wild. The big deceleration in the second half of 2022 hasn't broken through to public consciousness."

What is taking hold among economists who follow the AEC industry is the notion that 2023 may turn out to be much sunnier than expected.

Indeed, the American Institute of Architects (AIA) published its semi-annual Consensus Construction Forecast on Jan. 13, combining the annual outlooks of nine separate forecasting entities. (*See table, opposite.*) All told, the consensus foresees a 5.8% increase this year in nonresidential projects, led by a 9.5% surge in hotel construction and a 15.1% leap in manufacturing work. Overall activity is expected to flatten in 2024, but that would still mean a repeat of this year's expected strong performance.

"The U.S. economy will continue to face serious challenges as we move through 2023, dampening the construction outlook," said AIA Chief Economist **Kermit Baker**, Hon. AIA, PhD. "However, healthy architect and contractor project backlogs should ease the negative impact of an economic slowdown," he added.

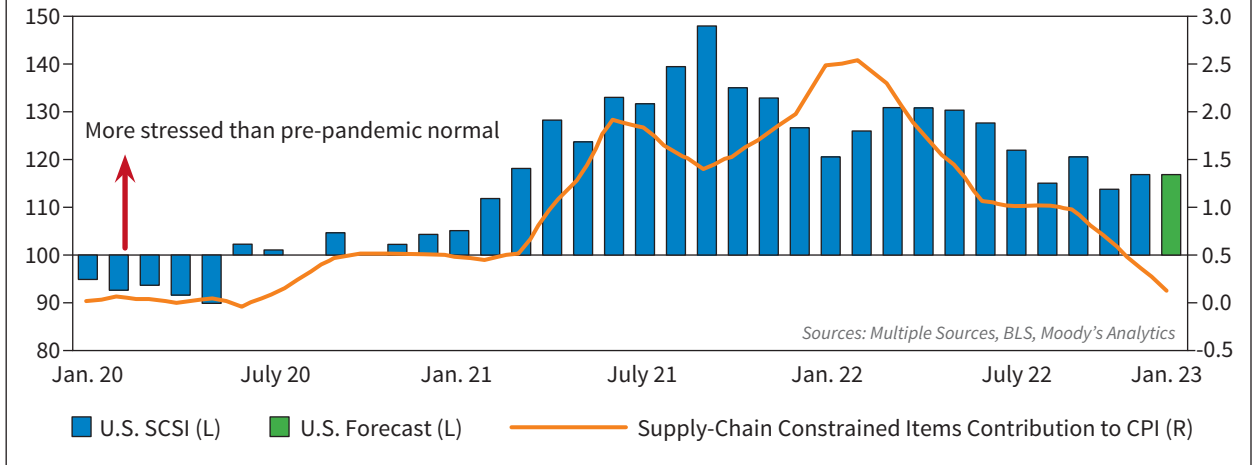
"Last year was a great year for the construction sector. One of the key

storylines for 2022 was the return of enthusiasm and optimism in prospects for nonresidential growth," said **Richard Branch**, chief economist for Dodge Construction Network. "While some of that will likely erode in 2023 as economic growth wanes, increased demand for some building types like data centers, labs, and healthcare buildings will provide a solid floor for the construction sector."

Of the group, Dodge's 2023 forecast is by far the rosiest, predicting a 13.7% rise this year in nonresidential construction put-in-place, led by expected large gains in industrial (32.3%), healthcare (21.2%) and hotel projects (20.5%).

Among the other forecasters, S&P Global (+8.2%), FMI Corp. (+7.9%), and Moody's Analytics (+7.7%) are the most bullish for nonresidential work this year. On the less sunny end of the scale, Associated Builders & Contractors (+1.5) and Piedmont Crescent

U.S. Supply-Chain Stress Index — 2019Q4=100



As inflation has slowed, many supply chain issues also were improving at year's end. Moody's Analytics' Supply-Chain Stress Index (SCSI) expects more improvement in 2023.

Capital (-0.5%) convey the most pessimism for activity in 2023.

"While we still see a narrow path to a soft landing, we fear the rolling recessions currently underway in the technology sector, housing, and commercial real estate will ultimately spread to the financial sector and pull the broader economy into recession later this year," said economist **Mark Vitner** of Piedmont Crescent Capital on his blog in early January.

"While 2023 continues to be filled with promise, contractors may soon show more concern," echoed ABC chief economist **Anirban Basu**. "Anecdotal evidence suggests that financing commercial real estate projects is more difficult, due in part to recession predictions. The general increase in the cost of capital has also jeopardized many projects, with certain contractors noticing an increase in postponements."

Even so, the Producer Price Index (PPI) ended the year falling, which was a welcome sight for owners and all project team members.

Specifically, construction input prices fell 2.7% in December compared to the previous month, according to the latest PPI data, released Jan. 18 by the U.S. Bureau of Labor Statistics (BLS).

AIA Consensus Construction Forecast, December 2022

Consensus		Estimated \$	Forecast % Change	
		2022	2023	2024
Dodge Construction Network	Nonresidential Total	—	5.8	0.8
S&P Global, Market Intelligence	Commercial Total	—	2.6	-1.4
	Office	—	-0.5	-0.7
Moody's Analytics	Retail & Other Commercial	—	3.0	-2.9
	Hotel	—	9.5	5.3
FMI	Industrial Total	—	15.1	0.4
ConstructConnect	Institutional Total	—	4.1	3.8
	Health	—	5.5	3.2
Associated Builders & Contractors	Education	—	3.0	4.6
	Religious	—	-0.4	0.2
Wells Fargo Securities	Public Safety	—	4.9	4.6
Markstein Advisors	Amusement & Recreation	—	5.3	2.4
Piedmont Crescent Capital				

Nonresidential construction input prices also declined 2.7% for the month.

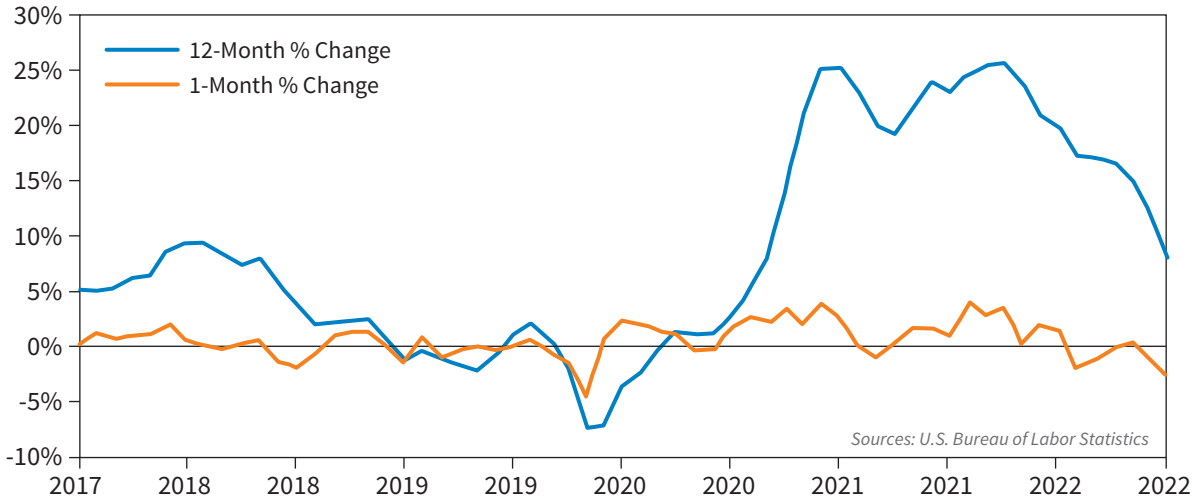
Still, overall construction input prices are 7.9% higher than a year ago, while nonresidential construction input prices are 7.6% higher. Crude petroleum prices fell sharply in December, down 14.9%, while natural gas prices surged 45.3%.

"This PPI data represents another positive development on the inflation front," said Basu. "However, this

is both good and bad news. Recent consumer and producer price releases indicate that inflation is fading, though it remains well above the Federal Reserve's 2% target. Should inflation continue to abate, the Federal may be able to stop increasing interest rates sooner than anticipated. Interest rate-sensitive segments like real estate and construction would be among the primary beneficiaries. Contractors are currently maintaining their longest

Producer Price Index Percent Change Inputs to Construction Industries

December 2017 Through December 2022



Construction Backlog Indicator

	December 2022	November 2022	December 2021	1-Month Net Change	12-Month Net Change
Total	9.2	9.2	8.2	0.0	1.0
Industry					
Commercial and Institutional	9.4	9.6	8.5	-0.2	0.9
Heavy Industrial	8.2	9.5	7.7	-1.3	0.5
Infrastructure	10.0	6.7	7.3	3.3	2.7
Region					
Middle States	8.1	7.8	8.2	0.3	-0.1
Northeast	8.9	8.6	7.5	0.3	1.4
South	11.5	11.5	9.0	0.0	2.5
West	7.2	8.3	8.4	-1.1	-1.2
Company Size					
< \$30 Million	7.9	8.5	7.6	-0.6	0.3
\$30-\$50 Million	13.1	9.8	8.7	3.3	4.4
\$50-\$100 Million	11.1	10.6	11.3	0.5	-0.2
>\$100 Million	14.2	12.7	10.7	1.5	3.5

© Associated Builders and Contractors, Construction Confidence Index

backlog since 2019, according to ABC's Construction Backlog Indicator."

Construction Employment Gains, Wages Climb

Meanwhile, construction hiring has remained strong. "It is difficult to separate real gains in construction activity from mere inflation in labor and material prices. However, one method

for disentangling the two is to look at construction employment levels, since increases in employment would strongly suggest an increase in output," notes AIA economist Baker. "Over the past year, nonresidential construction employment increased almost 4%, suggesting that a significant share of the increased spending resulted in increased construction output."

Hiring has continued to surge, along with wages, indicating that worker shortages remain a growing concern.

On Jan. 6, BLS reported that construction firms had added 28,000 employees in December and continued to raise wages for hourly workers more than other sectors, as the industry's unemployment rate fell to a record low for the month, according



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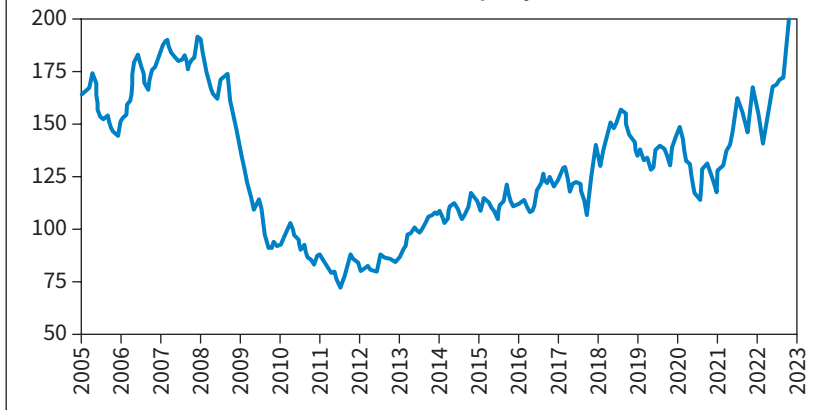


Producer Price Index — December 2022

	1-Month % Change	12-Month % Change	% Change Since Feb. 2020
Inputs to Construction	-2.7%	7.9%	36.1%
Inputs to Nonresidential Construction	-2.7%	7.6%	36.4%
Plumbing Fixtures and Fittings	-0.1%	9.2%	16.4%
Fabricated Structural Metal Products	0.1%	4.7%	52.7%
Iron and Steel	-0.8%	-24.4%	56.6%
Steel Mill Products	-2.7%	-28.7%	71.0%
Nonferrous Wire and Cable	1.0%	6.1%	48.1%
Softwood Lumber	-5.1%	-26.1%	23.6%
Concrete Products	1.0%	14.8%	26.3%
Prepared Asphalt, Tar Roofing & Siding Products	0.4%	11.7%	37.8%
Crude Petroleum	-14.9%	4.3%	51.1%
Natural Gas	45.3%	29.1%	315.6%
Unprocessed Energy Materials	9.5%	20.0%	123.5%

Source: U.S. Bureau of Labor Statistics

Dodge Momentum Index
(2000=100, Seasonally Adjusted)



to an analysis by the Associated General Contractors of America (AGC) of the new BLS data. AGC also noted that the new data align with a newly released member survey, which found the majority of contractors are optimistic about demand for most construction types, despite reporting difficulty filling positions.

“There are more people working in construction today than ever before, and those figures are likely to continue to increase,” said **Ken Simonson**, the

association’s chief economist. “But as optimistic as contractors are about 2023, they remain worried about their ability find enough workers amid record-low unemployment.”

Construction employment totaled a record 7,777,000, seasonally adjusted, in December, an increase of 231,000 or 3.1%, from a year earlier. Non-residential firms—comprising non-residential building and specialty trade contractors along with heavy and civil engineering construction

firms—added 17,900 employees in December. Residential building and specialty trade contractors together added 9,500 employees.

Pay levels in the construction industry continued to increase in December at a faster pace than in the overall private sector. Average hourly earnings for production and nonsupervisory workers in construction—mostly hourly craft workers—climbed by 6.1%, from \$31.25 in December 2021 to \$33.15 at the end of 2022. That increase exceeded the 5% rise in average pay for all private sector production workers. Such workers in construction now earn an average of 18.1% more per hour than in the private sector, says AGC.

The unemployment rate among jobseekers with construction experience declined from 5% in December 2021 to 4.4% a year later, while the number of unemployed construction workers fell by 11%, from 497,000 in December 2021 to 443,000. The 2022 year-end figures were the lowest ever for December.

Simonson noted that AGC’s new 2023 *Construction Hiring & Business Outlook* survey, conducted with Sage, found 69% of the more than 1,000 responding construction firms expect to increase their headcount in 2023, compared to 11% that foresee a decrease. But 80% of firms report having a hard time filling positions, compared to only 8% that have had no difficulty.

Cushioning the Blow When a Recession Arrives

AIA notes that whenever an economic recession does inevitably arrive, the impact on the U.S. design and construction industry will naturally be delayed. Most projects already underway as the slowdown hits are likely to continue to completion, and recent contractor backlogs, as noted by ABC, are at record highs of nine months.

So any industry pain felt this year should be deferred considerably. But designers will feel it first.

“Like construction companies, architecture firms are sitting on elevated backlogs of around seven months,” explains AIA’s Baker. “However, unlike construction companies, architecture firms have seen that backlogs can evaporate when business conditions weaken as clients may decide to delay or even cancel projects if they no longer make economic sense.”

Riding the Momentum for As Long As It Lasts

For now, though, the industry continues to exceed expectations.

On Jan. 24, Dodge reported that it’s total U.S. construction starts jumped another 27% in December 2022, to a seasonally adjusted annual rate of \$1.185 trillion.

During the month, nonresidential building starts increased 51%, nonbuilding starts increased 30%, and residential starts rose less than one percent.

Across 2022, total U.S. construction starts were 15% higher than in 2021. Nonresidential building starts rose 38% over the year, nonbuilding starts were up 19%, while residential starts were down 3%.

“December starts revealed where the current strength in the construction lies: manufacturing and infrastructure,” said Dodge’s Branch. “It is those segments that will provide insulation for the sector as the economy softens in 2023. Recession or not, higher interest rates will weigh on the economy and restrain construction starts in 2023. However, it’s encouraging to know that the new year is starting with a great deal of positive momentum.”

How long that momentum will last, however, remains a guessing game. But for now, and even for the foreseeable future, it would appear that, in spite of everything, the U.S. economy’s post-pandemic recovery is far from over.

And who knows? If and when the Fed stops raising interest rates this spring, as expected, we may yet see another surge in new work. [HPAC](#)



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USGBC at COP27

Green Cheers Muted, Council Urges More Action

Even with new agreements adopted, emission reductions, including those of the building and construction industry, still are not on track to reach net zero by 2050.

By DEISY VERDINEZ
U.S. Green Building Council

The U.S. Green Building Council (USGBC) is calling for greater action to address climate change following COP27. Even with the new COP27 agreements adopted in November, emission reductions, including those of the building and construction sector which accounts for 40% of energy-based carbon emissions, are not on track to reach net zero by 2050.

USGBC reiterated its commitment to accelerating efforts to transition and achieve a healthier future, leveraging all platforms to support the business, government, and finance sectors in decarbonizing the built environment.

“We respect the efforts from many nations to conclude COP27 with the

Sharm el-Sheikh Implementation Plan,” said **Peter Templeton**, USGBC President & CEO. “We applaud the inclusion of funding to help those countries most vulnerable to climate impacts. But we are distressed that the agreement fails to call for increased ambition and action,” he noted.

“It is incumbent upon all actors, including governments and business, to align their actions, investments and operations with net zero goals,” added Templeton. “USGBC is committed to working with the public and private sectors to take collective action to decarbonize at scale, with a focus on buildings and communities.”

Data released throughout the two-week conference pointed to the continued gap between actual emissions and needed reductions to cap global warming at 1.5°C, highlighting the need for further emission reductions.

USGBC is investing in efforts to accelerate progress towards decarbonization including its recently-announced program to drive green building at scale, which is critical to achieving global goals for sustainability and equity. USGBC has unique experience verifying sustainable new construction practices and existing building performance improvement.

With all this in mind, it has highlighted solutions for reducing GHG emissions from the building sector at the annual U.N. climate conference for more than a decade. At COP27, USGBC joined with the Business Council for Sustainable Energy (BCSE) delegation and sponsored the Buildings Pavilion, in collaboration with global partners and hosts the Global Alliance for Buildings and Construction (GABC) and the U.N. Environment Programme. [HPAC](#)

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HVACR 2023: WHAT'S NEW? WHAT'S NEXT?

In keeping with our annual tradition, we offer insights here from a host of manufacturing thought leaders on the trends that will be driving our industry forward this year.

By ROB McMANAMY
Editor-in-Chief, HPAC Engineering

In many ways, normalcy made a reassuringly strong comeback in 2022.

Of course, the broad societal and economic anxiety and uncertainty of the COVID Era have not completely disappeared. But hope is growing that 2023 will ultimately put the pandemic in the rearview mirror.

At the same time, however, the ever-present fear of the inevitable U.S. recession continues to gnaw at our collective confidence, even though many now believe that its actual arrival may be delayed by another year.

With all that in mind, we present here several industry viewpoints about some of the issues and innovations expected to drive change in our industry this year. From increased federal stimulus funding and incentivized national competitions to regulatory changes, advancing technologies and global decarbonization pressures, a host of factors will mix this year with continuing concerns over inflation, supply chain delays and workforce shortages. Here are 10 takes on what to expect from 2023...

David Budzinski

VP and General Manager
Residential and Light Commercial
Johnson Controls

After years of preparation, 2023 marks the launch of increased U.S. Dept. of Energy (DOE) standards for both residential and light commercial applications. It's critical that contractors understand which region they're located in – as specified by the DOE – and the types of products they can install based on the region's efficiency requirements. Regionality will also determine whether product compliance is based on date of installation or date of manufacture.

Heat pumps are positioned to make a significant impact as decarbonization efforts advance. For example,

the Johnson Controls commercial building *Energy Efficiency Indicator Survey* for 2021 revealed that more than a third of respondents had planned to replace fossil fuel heating equipment with heat pump technology by the end of 2022, which was a 7% increase from the previous year. Hydronic heat pumps are an energy-efficient alternative that can replace boilers to help reduce carbon emissions.

Within the residential market, the *DOE Cold Climate Heat Pump Technology Challenge* has inspired partnering manufacturers to develop technologies that can accommodate increased heating loads within colder climates. Advanced residential systems can achieve up to a 2.0 coefficient of performance (COP) or better, and maintain 50-80% heating capacity in outdoor temperatures as low as 5 degrees now, making heat pumps a viable option for many homeowners.

However, it's important to note that many air-source heat pump systems still need to include some form of backup or supplemental heat when building heating demands exceed capacity (when ambient outdoor temperatures drop too low to support optimal operation, for example). Supplemental gas heating may still be necessary to help maintain efficiency.

Justin Keppy

President, NA Residential & Light Commercial HVAC
Carrier

Carrier is ready for phase two of the *Cold Climate Heat Pump Challenge*, which is field testing its prototype heat pump in a harsh climate. This milestone comes on the heels of the Inflation Reduction Act (IRA), which provides \$370 billion for clean energy investments in the form of tax credits, incentives and rebates to improve energy efficiency.



Budzinski

The DOE's challenge aims to accelerate commercialization of heat pumps that meet comfort needs in cold climate regions of North America – thereby expanding energy-efficient and incentive-eligible heating and cooling options for consumers.

“We're pleased with the lab performance of our prototype heat pump and the final test results,” says Keppy. “Our team of dedicated engineers and product managers are hard at work continuing to develop next generation heat pumps to increase efficiency, save consumers money and benefit the environment. The federal incentives offered through the IRA are critical to the adoption of high-efficiency heat pumps, and Carrier is committed to delivering innovative climate-friendly technologies.”

To participate in the challenge, Carrier committed to producing a heat pump with increased cold climate performance, increased heating capacity at lower ambient temperatures, higher efficiency across a range of climate conditions, and advanced controls to adjust usage on demand.

“Heat pumps continue to rise in popularity as a result of decarbonization efforts of states such as California, Washington and New York and incentives by local rebate programs,” adds Keppy. “Additionally, the launch of Carrier's EcoHome™ program will make the transition from low-efficiency units to high-efficiency heat pumps cost-effective. Advancements in heat pump technologies are critical to supporting these initiatives and driving adoption.”

Miranda Berner

Director of Marketing
Berner Air Curtains

The green movement continues and Environmental, Social and Governance (ESG) goals are increasingly common for companies large and small, which means an even bigger commitment to sustainability.

An air curtain is one product that empowers engineers, facility owners and contractors to improve energy efficiency, IAQ, decarbonization and occupant comfort.

The technology trend continues for manufacturers to develop digital controls, internet operability with apps, and compatibility with building management systems through protocols like BACnet.

Attracting and retaining talent, continues to be a challenge and opportunity for the industry.



Keppy

There are a lot of bright people looking for work to be meaningful, not just a paycheck, and the cool thing about working in this industry, at any level, is that HVAC done well *directly* improves people's air comfort and health, as well as saves the planet. Energy conservation means greenhouse gas (GHG) reduction and building decarbonization.

Mark Bublitz

2022-23 President, Air Movement and Control Association International (AMCA)

Not to be overdramatic, but (current) regulatory efforts are the most significant events impacting the U.S. market for commercial and industrial fans and blowers in the history of the industry. In 2022, the California Energy Commission approved an efficiency regulation and the U.S. DOE published a draft test procedure for commercial and industrial fans and blowers.

Regulation of an industry for the first time is tremendously stressful and burdensome for manufacturers, especially small and medium-sized ones, the kind that comprise the majority of AMCA's membership. Classifying products into regulatory product classes, inventorying historical performance data of covered products, determining and administering supplemental testing, and certifying compliance into regulatory databases requires a massive commitment of staff time and information technology investment. Additionally, there are requirements to educate distributors and customers and update software and literature.

What's more, the industry has to adapt to maintain the ability to serve customers' needs with often unique solutions. We do not want to see solutions that have performed well and met customers' needs for years be miscategorized and removed from the market, and we have to continue to develop new products to meet our customers' evolving needs.

It's possible purchasers of fans and blowers will see traditional offerings become unavailable, and there will be differences in how sizing/selection software operates. This could be the result of certain products being removed from the market, as we've seen in Europe, or for certain areas of the operating range of a fan, becoming non-selectable.

Andres Caballero

President
Uponor North America

At Uponor, we enter 2023 with cautious optimism. Residential construction is (likely) going to be slow to recover, but



Bublitz



Berner

commercial construction is showing some positive signs. Where we see the greatest potential is in the remodel, service, and retrofit markets. How these three areas factor into a recession is indeterminate, however we are taking steps to position ourselves with the right people, products, and solutions in place to respond as the markets shift this year.

The current housing market is in a strange place, with many builders reporting huge backlogs, while at the same time seeing a decline in new housing starts. But we see tremendous opportunities in multifamily, hospitality, and other commercial sectors. We are focused on growing our core businesses, while introducing innovative new products and solutions — such as Smatrix Pulse, TotalFit™, AquaPort™, and Uponor Kitting Services — that will allow contractors to integrate productivity and high-performing systems into their projects.

Of course, we continue to expect pressure from high inflation, supply chain constrains, and some specialty raw materials. Our priority is to continue to provide the highest quality product for water solutions that customers in North America and around the world have come to expect from Uponor.

We will look into market dynamics proactively as we consider possible price actions while ensuring customers get the most value from our products and solutions.

Dan Jones

*President
UV Resources*

Commercial building engineers and facility managers are upgrading HVAC filter efficiency following public health and building scientists' (including the White House) clean and healthy air recommendations.

However, not all air handlers or packaged rooftop HVAC systems — particularly the large number of aging systems — can handle the high airflow restrictions or increased static pressure of MERV 13 or higher efficiency filters. Schools, especially, looking to leverage federal funding, are struggling to overcome this physical reality.

Adding a high-efficiency HVAC filter can reduce airflow—essentially starving the machine of air. Moreover,



Caballero

limiting airflow inhibits heat transfer, forcing HVAC engineers to compensate by increasing fan speed or lowering chilled water temperatures where possible, which raises energy consumption.

Independent, third-party testing found that facility engineers can exceed a MERV 13 filter's pathogen removal performance by combining UV-C disinfection with medium-efficiency (MERV 8) filters.

We think this layering of air cleaning technologies will enable thousands of building managers to meet or exceed federal indoor air quality recommendations without limiting airflow and obstructing HVAC system operation.

Just as no one would operate an HVAC system without air filters—the time is near when no one will operate HVACR systems without UV-C installed.

Aaron Engel

*VP of New Business Development
Fresh-Aire UV*

Returning to the fundamentals of indoor air quality is the key trend in HVAC today.

The industry has been so focused on disinfecting air and surfaces since the pandemic began 2020 that it has lost sight of IAQ fundamentals, such as maintaining clean and healthy HVAC systems, increasing energy efficiency and reducing odors.

When studies emerged later in 2020 that 254-nanometer UV-C light disinfection neutralized SARS-CoV-2, the virus that causes COVID-19, indoor air treatment efforts focused mostly on microbes.

Now that the pandemic is waning, we're seeing trends that embrace UV-C's original benefits of increasing HVAC coil and equipment performance and the resulting improvement in energy efficiency while reducing maintenance costs. Basically, contractors, consulting engineers and facility owners want to ensure HVAC systems aren't contributing to poor IAQ while maintaining peak equipment operating conditions.

Maintaining HVAC coils and AHUs free of mold, biofilm and particulates is best practices in an age where we have increased rates of asthma and other respiratory conditions. This trend also aims to prolong the useful life of residential and commercial HVAC coils by keeping them free of pressure-robbing mold and biofilm.

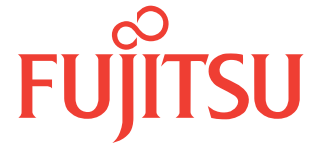
Ensuring the best heat transfer and system static pressure will benefit the bottom line of homeowners and facility owners not to mention improved IAQ.



Engel



Jones



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AIRSTAGE

Christian Geisthoff

*VP of Corporate Development
Viega*

Viega expects the multi-family housing, commercial, and industrial markets to remain healthy into 2023.

The biggest challenges for 2023 will be the continued tight labor market, inflation, and supply chain issues, which will have the biggest impact on completing projects on time. While the Inflation Reduction Act will offer opportunities for the industry, the concern or caveat would be whether or not we can get enough of the products needed for certain projects, to support hydrogen over natural gas, for instance.

We also expect to see more use of artificial intelligence (AI) and augmented reality (AR) influencing in the industry.

Automation of the installation process can also provide better control tools over the production side and how we manage between the different trades. There's also an emphasis on increased use of smart technology (particularly for monitoring) to identify problems before they become catastrophic.

Viega is generally optimistic heading into 2023 and, although we expect there to be some volatility ahead, when you look at the overall picture holistically, it's still positive.



Geisthoff

Laurie Conner

*President
The Detection Group, a WATTS brand*

With pipe infrastructure repairs now a funding priority nationwide, leak monitoring and detection systems have come of age. Today, water leaks within a building are a risk to any facility, 24-7-365. One trillion gallons of water is lost to leaks each year nationwide, causing \$10-15 billion in insurance claims.

Domestic water plumbing, HVAC or process liquid leaks occur daily in a broad range of facilities nationwide. Without some means of early detection, by the time a leak is discovered, it's often too late. There are risks to tenants, building infrastructure and data systems. Yet, the downstream threat of mold growth can be of greater concern. Sources of leaks may be a burst water



Conner

pipe, water-supplied appliance malfunction, corroded or frozen sprinkler systems, clogged drains, or leaking plumbing fixtures.

The best way to reduce potential damage is technology that detects and stops uncontrolled water flow, including water sensors, real-time notification systems, and automatic shut-off valves. System components now can be installed in hard-to-reach places to provide consistent, round-the-clock monitoring and notification of precise leak location.

Building managers, now more than ever, are turning to sensors and cloud systems for remote, actionable information. And modern technology can watch hundreds of locations within a single building or many buildings, and provide facility managers with the peace of mind that their buildings are protected.

Clark Zacaroli

*VP Sales and Marketing
Runtal North America*

Low-temperature heating systems have become widely accepted as state-of-the-art for a wide range of applications. Expect this trend to continue and to grow

The Europeans had it nailed decades ago, but it took some time and convincing for Americans to recognize the value of kinder/gentler warmth that dialed-in radiant systems provide – with delivery temps of 85 to 110°F for floors, and 100-120°F for panels.

Advantages to low-temp radiant heat abound. Plenty of HVAC tests have found that the greatest levels of human comfort stem from cooler supply temperatures. The other advantage to this is that fuel/energy is saved.

Industry experts have learned that the greater the area for distribution of heat (such as in-floor or in-wall systems), the lower the distribution temps can be to provide optimal comfort. But if floors or walls can't be used, the next best type of heat distribution are panel radiators.

With wall-mounted panel radiators, the primary heat transfer to the space is radiant vs. convective, so effective comfort levels are achieved at lower temperatures with a slight increase in the size of the panel radiator. It helps, of course, if all distribution piping is insulated.

If outdoor reset is coupled with indoor temperature feedback, comfort and efficiency are assured. If the building envelop is tight, indoor temperature feedback dials-in lower-temp distribution, as opposed to outdoor reset alone. **HPAC**



Zacaroli



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ACR COPPER PRESS FITTINGS



Precision Under Pressure: Tackling Clean Room Contamination

With today's heightened IAQ awareness, clean rooms may offer broader lessons for more traditional indoor spaces in how best to make their own environments not only healthier, but more productive, as well.



By DAVID SCHURK, DES, CEM, LEED AP, CDSM, CWEP, SFP, CIAQM, CHC

Clean rooms, along with other critical environments, require the precise control of temperature, relative humidity, air quality and its distribution that is not considered common in more traditional indoor spaces.

One highly important but often neglected aspect of achieving a successful outcome centers around an in-depth understanding of how to effectively control electrostatic charges in these spaces, which when accomplished in combination with the other specific design and application techniques mentioned earlier, allow these rooms to attain the ultimate level of cleanliness usually required.

But the use of electrical devices, synthetic materials or finishes, and low humidity levels can lead to the undesirable generation of high electrostatic charges within these indoor environments. While this occurrence is experienced in almost all spaces, its effect cannot be overlooked or underestimated in clean rooms as it can be extremely detrimental and even disastrous to its intended use and outcome.

David Schurk DES, CEM, LEED-AP, CDSM, CWEP, SFP, CIAQM, is national sales director for Innovative Air Technologies in Covington, GA. He is an ASHRAE Distinguished Lecturer and licensed designer of engineering systems with over 35 years of experience in the design and analysis of heating, ventilating, and air-conditioning systems for a variety of market sectors, with a special focus on critical environments, including aerospace and healthcare facilities. A graduate of the Milwaukee School of Engineering, Mr. Schurk can be reached at david@dehumidifiers.com.

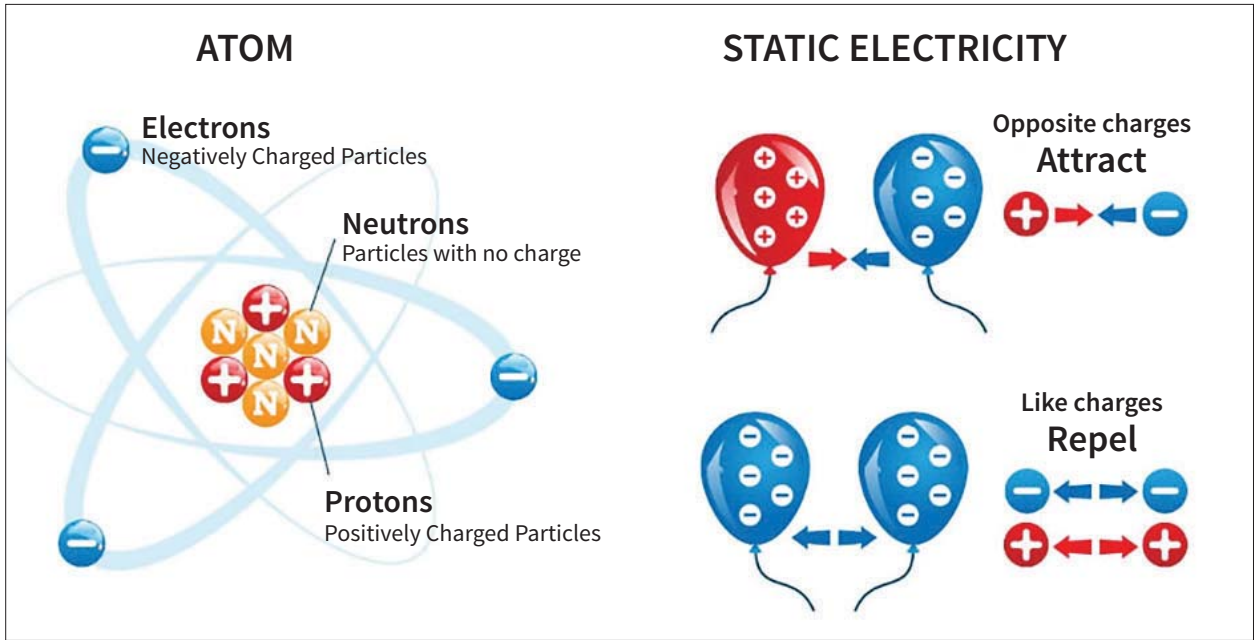


Figure 1. Static Electricity

Static electricity is produced by the action of contact and separation of dissimilar materials. The technical explanation that has long been accepted describes the interaction of electrons between two surfaces as they come into contact. Upon separation, the electron will attempt to return to its source material, and the speed of separation of the two surfaces results in the electron remaining predominantly with the more resistive material. The more resistive material then has a surplus of electrons and is called negatively charged. The other material, being less resistive, now has a deficiency of electrons or is positively charged.

A clean room, because of the many non-conductive surfaces, is inherently an area susceptible to high static generation which can significantly disrupt processes. When static charge that is stored on one surface transfers to another, it results in an electrostatic discharge event (ESD). Because most ESD events are indiscernible to the naked eye, cleanroom workers are not aware that it is occurring. Happening quickly and invisibly, this can permanently damage sensitive electronics and prevent samples from being weighed accurately.

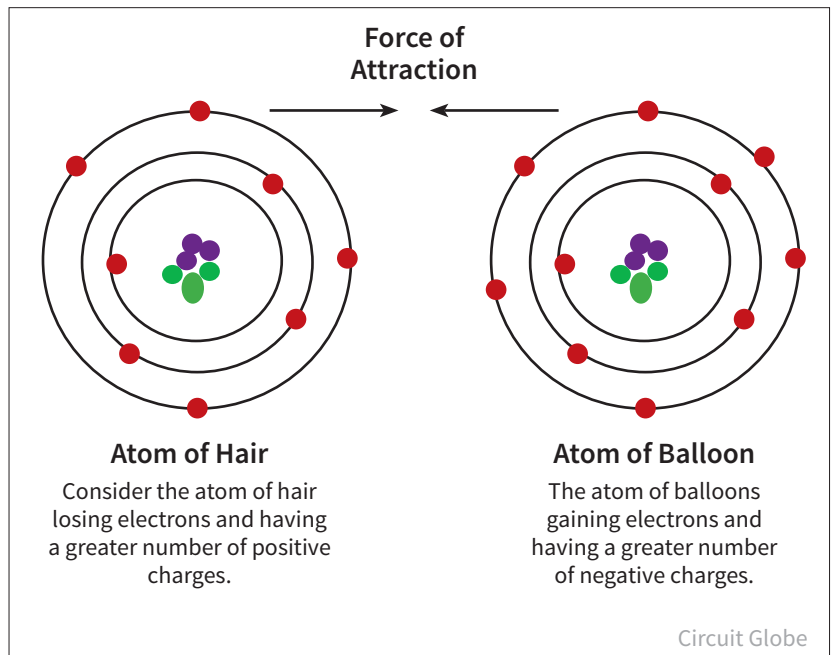


Figure 2. Force of Attraction

ESD can also vaporize metal lines on semiconductors, melt silicon and cause device failures; damage masks, reticles, wafers, and disk drive heads, cause random defects on flat panel displays, along with producing equipment failures. Additionally, ESD events can generate Electromagnetic Interference (EMI) and while most equipment is

designed to tolerate a certain amount of EMI, if it exceeds specific limits it can result in malfunctions and errors.

Surface-borne contaminants like dust (and many others) are generated due to various space activities and processes. It's generally understood how dust particles will fall from the air under gravitational influence and

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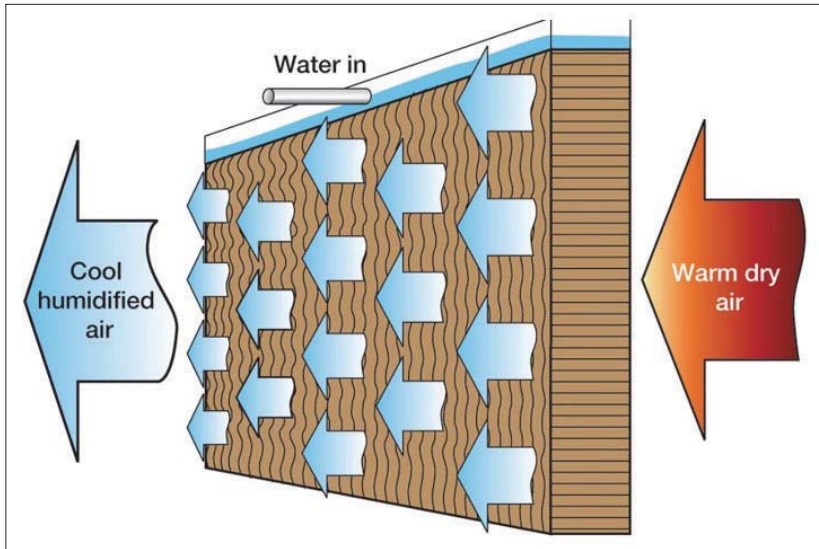


Figure 3. Humidification

land on top of any horizontal surface it contacts. When this occurs, it requires these accumulations be physically removed through some type of manual cleaning intervention. But most of us have also noticed how other surfaces (not in the particles' direct vertical fall plane) like ceilings, walls, computer screens, etc., can also collect airborne contaminants. Electrostatic Attraction (ESA) is an occurrence that results in the attraction of airborne dust and contamination on surfaces of all types, in any orientation, and is something that must be controlled within the environment.

Adsorption is viewed as a surface phenomenon and is the process by which one substance is attracted to and held on the surface of another. It is usually described in terms of surface energy per unit area of a solid. Atoms and molecules are held together in a solid by physical forces as strong as valance (chemical) bonds and as weak as van der Waals (physical) attractive forces. Molecules in the interior of a solid are surrounded by identical molecules and are subjected to equal attractive force on all sides. Surface energy is caused by molecules in the surface layer which are subjected to unbalanced external forces.

However, these attractive forces do not stop abruptly at the surface.

Instead, they extend outward from the surface, and when this surface energy is strong enough to overcome the kinetic energy in a passing molecule, that molecule is adsorbed by the solid. Adsorption can occur whenever a material has sufficient attractive force to overcome the kinetic energy of another molecule. For instance, the adsorption of cigarette smoke on the interior of an automobile or on a person's clothing is one example of how widespread this process is.

Molecular attraction helps keep dust particles attached to a surface, and the bond between the surface and

particle depends on several forces of attraction. Most molecules, even when they carry no charge, have a dipole moment. This happens when there is more of a concentration of electrons at one point or end of a molecule than there is at the other. This is especially true of large molecules.

As a result, when a particle (even when its charge may be electrically neutral) encounters a surface, it tends to align itself so the more negatively charged side of the particle is adjacent to the more positively charged sector of the surface. Neither the particle nor the surface must be charged for this to occur. Another consideration is van der Waals force, which is the same force of molecular attraction that helps keep a dust particle attached to an air filter fiber.

This phenomenon results in the "plating" of particulates from the air, on to various surfaces, and results in an array of concerns within environments of all types, particularly those requiring that product or processes be maintained at pristine levels of cleanliness to achieve a proper outcome.

As a single but serious example, think of bacterial-laden skin squames (skin flakes sluffed off by humans) that become suspended in the air of a hospital operating room during a procedure (viral and fungal

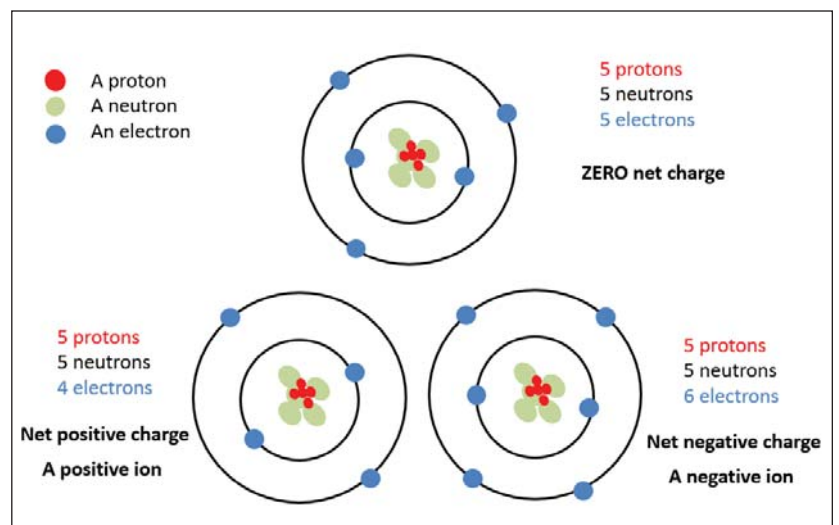


Figure 4. Bipolar Ionization

contamination also can be present in these skin scales). These pathogens can then plate-out onto sterile surgical equipment, instruments, or devices, which are then inserted into the body of a patient.

Even the garments worn by staff are susceptible to this unwanted accumulation of contaminants which can easily be transferred to the patient. Clinical trials carried out in Britain, Europe, and the U.S. have confirmed that between 80% and 90% of bacterial contaminants found in the wound after surgery come from colony-forming units (cfu) present in the air of the operating theatre.

Effective grounding provides a path for static electricity to discharge safely, and in many cases proper grounding solves the bulk of problems. But bonding of personnel and surfaces as a means of static control in a clean room is very difficult to accomplish. As well, the average clean room facility is not equipped with static measuring devices, and the clean room operator usually does not recognize that static precipitates dirt (dust) like a magnet, and that it is virtually impossible to eliminate without preventative measures.

Space humidity control, typically to achieve a relative humidity of 40% to 60%, offers balanced levels that safeguard against overly moist or dry conditions, protecting against unwanted issues such as ESD, shrinking, cracking and other forms of product damage. As a result, clean room product quality is increased and maintained more consistently. Humidifiers have been used in less sensitive environments to help drain off static charges by coating surfaces with a thin layer of moisture.

But the growing requirement and specific demands from various industries may require extremely low environmental moisture levels, often necessitating dew point temperatures far below the freezing point to prevent damage to sensitive components which might corrode in storage or where moisture might condense on

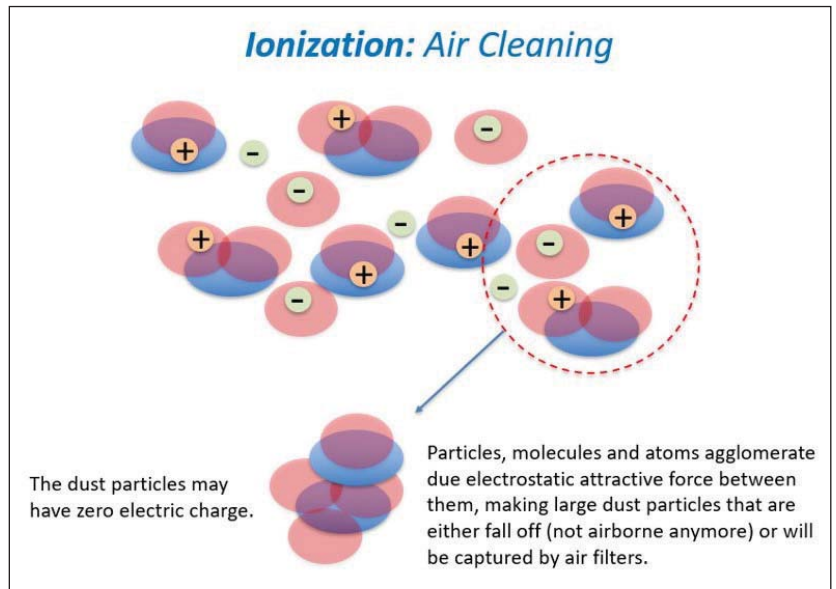


Figure 5. Particle Agglomeration

these parts, for example, those used in space vehicles operating at cryogenic temperatures.

Electrical phenomena can act as major transport and removal mechanisms for submicron particles. Over 90% of airborne particles indoors may be less than 1 micrometer (μm) in size, a size-range occupied by many potential pollutants, carcinogens, pathogens, and other potentially harmful contaminants. The behavior of the smaller particles within this range is greatly influenced by their electric charge. Along with more passive approaches, artificial means of ionizing the clean room air has been used for decades to help control space electrostatic issues.

Ionization technology works by making air (normally an excellent insulator) conductive. Bipolar Ionization (BPI) creates large quantities of both positively (+) and negatively (-) charged air ions that are attracted to the opposite polarity charge located on product, equipment, or a materials surface. It effectively neutralizes the charge on surfaces of insulating materials, dissipating existing charge and limiting the potential of charge generation.

Electrical ionizers generate air ions by intensifying an electrical field on a

high-voltage tube (corona discharge BPI), on emitter pins, or carbon fiber brushes (needlepoint BPI). This energy causes electrons to separate from the nucleus of the air molecules. It's important that concentrations of air ionization within the space be precisely controlled to include an equal number of positive and negative ions, providing an intrinsically balanced output that is then distributed in a relatively homogeneous manner throughout the area of the clean room.

While not only serving to help defuse surface-related ESD issues, ionization also assists in helping remove particles from the air. This can drastically reduce the quantity of airborne particulate available to plate-out on surfaces, devices, and even on to occupants, helping eliminate potential contamination concerns.

Agglomeration of small airborne particles occurs in an environment with moderate to high levels of bipolar air ionization, whether imparted by nature or artificially generated by ionizers. When ions are artificially generated, they can be released and distributed throughout the space to mix with air and attach electrostatically to airborne particles. In similar fashion to how magnets of opposite polarity are

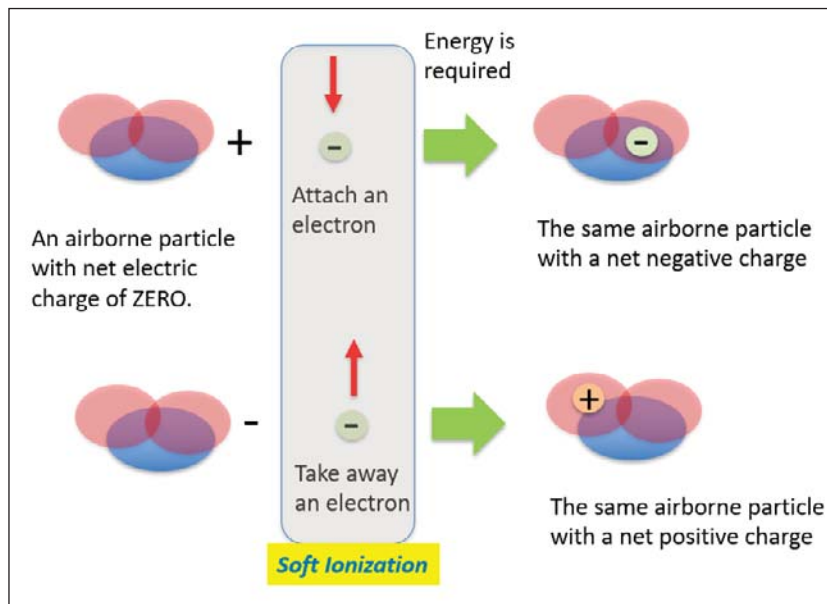


Figure 6. Soft Ionization

attracted to each other, these charged particles are then increasingly attracted and joined to one another. Their size and weight is increased to the point where they are larger, and heavy enough to be more easily and quickly transported out of the space, with the ventilation system's airflow.

They can now be more effectively removed from the air to be exhausted, filtered or treated. Air filters are more successful at removing these larger particles from the air, while internally mounted ventilation system air purification devices (if installed) can now address the pollutants they have been tasked with remediating, those which before had been difficult to remove and had remained in the space as an issue of concern.

Bipolar ionization of the air has been used in cleanroom applications to help reduce airborne particle counts and create cleaner indoor environments for critical pharmaceutical, healthcare, semiconductor, food processing, and various manufacturing processes for decades. Studies have demonstrated that air ionization is effective at removing aerosols and particles from the environment, providing significant reductions in indoor particulate concentrations. Bipolar

ionization has also been tested and shown to be effective at both increasing the filtering rate of aerosolized pollutants, as well as increasing the decay of certain viruses and pathogens as verified in BSL3 laboratory testing.

Even so, it should be cautioned that the high voltage production of ionization (known as hard ionization) can create ozone which has human health hazard concerns. Equipment used therefore should be a form of electric ionization which incorporates relatively low voltage levels, yet produces high levels of bipolar ionization. In combination with proper air velocities, this can create a maximum ionization effect without the generation of harmful byproducts. Technologies which work on the principle of "soft ionization" are perfect for these applications.

As described by Hartley and Kanik, in their paper entitled "A Nanoscale Soft-Ionization Membrane: A Novel Ionizer for Ion Mobility Spectrometers for Space Applications," soft ionization mechanisms do not fracture the target molecules, which could result in secondary byproducts such as ozone.

Clean room technology has proven effective in virtually eliminating human and process-driven

particle contamination, vastly improving product yields in the manufacturing industry. While it's understood that the aerospace, defense contracting, pharmaceutical, semiconductor, food processing, and laboratory industries may all require the sensitivity that a clean room environment offers, cost-effectively applying any of the design and application techniques described here might also help to make even those more traditionally built indoor environments cleaner, healthier, and more productive for the occupants inhabiting these space.

With that in mind, it may make sense for society to place the same value on the air a building occupant breathes as it does on the products and services manufactured for their use and consumption.

HPAC

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Pandemic Update, with ASHRAE's Bill Bahnfleth

As the new year begins, we speak with the former Epidemic Task Force chair to get his best advice on staying healthy this winter. "The pandemic is not over," he cautions.

As 2022 drew to a close, our *HPAC On The Air* podcast welcomed back its first returning guest, Dr. William Bahnfleth, P.E., former chair of ASHRAE's recently ended Epidemic Task Force, and current vice chair of its ongoing Environmental Health Committee.

Dr. Bahnfleth updated us on the latest pandemic-related guidance for indoor air quality (IAQ) and reflected on the state of our industry as it still strives to make both new and existing buildings healthier for occupants.

What follows is an edited transcript of our discussion. To listen to the full episode, visit www.hpac.com.

HPAC (Rob McManamy): Bill, welcome back to 'HPAC On The Air'.

Dr. Bahnfleth: Thanks very much, Rob. Glad to be here.

HPAC RM: We last spoke with you here in September 2021, when the Epidemic Task Force (ETF) was right in the middle of everything. Much has happened since then. Please update us on where the work of the task force stands today, after its sunset last summer.

Dr. Bahnfleth: Sure. The first thing I should say is that when we formed the task force, the intent was never for it to become a standing committee of ASHRAE or to go on indefinitely. We, at the time, mistakenly thought that maybe in a year, the whole pandemic would be over and we would've generated some guidance quickly and then we would move on to trying to do things to prepare for the the *next* pandemic or epidemic. And of course, the pandemic is still going on here,



now in its third year. But we felt that we had done what we set out to do in terms of producing guidance by the end of 2021, and that the main thing left to do was to try to look inward to get ASHRAE to start doing the things that (ETF) had been doing for the longer term through the committees that already existed.

And we pushed out guidance in a lot of areas where ASHRAE has standards, for example. And at some point, the standards committees have to be the place where that kind of further development takes place. So I would say right now we're in that transitional mode of trying to engage with the rest of the society and to get them to pick up some of this work.

And we're doing that through the Environmental Health Committee (EHC). We had discussed whether or not we should go on for another year with the incoming leadership, with ASHRAE President Farooq Mehboob

and others. They agreed that the best thing to do was to sunset the ETF and to assign responsibility for what it had been doing to the Environmental Health Committee. So I'm the vice chair of EHC now.

I've been a member of it before and know it very well. And it's actually the body that's supposed to coordinate health-related issues through the whole society. So it's a very good place to send that work. And we're now working on some transition plans, a final report that we hope to deliver in in mid-year (2023). We'll see if it gets done on schedule. But that's the plan.

I should say that there are things going on that are still engaging the leadership of the ETF. We started a lot of external relationships going and those have to continue. So, a lot of advocacy is in progress. We are working with the World Health Organization (WHO), of course, as

well as with the White House, EPA, NIOSH, AHRI, and others, on things that we hope will follow on from what we've learned during the pandemic.

ASHRAE, for example, has been providing some support to the White House and EPA as they spin out the White House's *Clean Air in Buildings Challenge*. And we also helped Rep. **Don Bey** (D-VA) in the development of the Airborne Act (H.R. 7671), which is a piece of legislation introduced last May that's sitting in the House, waiting to be acted upon. It would provide tax incentives for doing IAQ assessments and for doing projects to bring up buildings to meet ASHRAE Standard 62.1. So there's all of that.

And internally, over the last year, quite a bit of stuff has happened that is relevant to the pandemic response that was in some way related to the work of ETF. One was the publication a year ago of the Indoor Carbon Dioxide position document (PD). There's been a tremendous amount of interest in the use of CO₂ as a metric for IAQ and for infection risk.

So that committee was chaired by **Andy Persily** from NIST, and we produced that document earlier in 2022, several months ago. And that was followed just within the last few weeks by the publication of a completely revised Infectious Aerosols position document, as well. You may remember that that was maybe the first piece of pseudo-interim guidance that we had from ASHRAE.

We had hurried that to publication in April of 2020, and until the ETF could start putting out guidance, that was the place that people would look to. But that's really not a document you should be using now, though. So I want everyone to know that the new PD is now on the ASHRAE website and is worth reading.

In terms of standards, the IAQ procedure for Standard 62.1 has been approved. That's a big step forward in IAQ for a number of reasons.

And I just noted that for 62.2, the residential standard, they've done two big things recently. An addendum was approved to require air cleaners to meet the same UL 29 98 ozone standard that is in 62.1. And very interestingly now, the minimum filter efficiency required for all residential buildings at 62.2 is MERV 11. So it's now actually better than 62.1, which is currently still sitting at MERV 8. And I hope that they're encouraged to raise the bar there, as well.

The final thing I would note here is that we just had a global HVAC summit in Istanbul that had a two-day meeting about indoor environmental quality and wellness. So there's a lot of activity going on, and the remnant of the ETF, if you will, is plugged into a lot of it, I would say.

HPAC RM: Looking back now, and I know we are not totally out of the woods yet, but what specific lessons or even surprises came from the pandemic regarding indoor air quality practices that you would like to see carry forward now?

Dr. Bahnfleth: That's a really intriguing question. Maybe I have more observations than lessons. One of the more worrisome ones is I think we've seen that people have short attention spans. We really just want the the pandemic to be over. And to some extent, a lot of society has declared that it is over, and we've gone back to "normal."

Even within ASHRAE, I've seen a big swing back to the emphasis being all on energy efficiency and decarbonization, even though we're just getting started with raising the bar for indoor air quality. That worries me because it's going to take some resolve and investment to really change things. And it's a warning that we really need to keep pushing, those of us who think that, because it truly needs to be done.

Another observation. "You can lead a horse to water, but you can't make it drink," as they say.

A lot of money was made available early on through (federal funding) to facilitate improvements in IAQ in schools. And a lot of that money has gone unspent or been used for other things. And you have to wonder why?

Why is the uptake not there for some of this technology when the case for doing it ought to be pretty clear, and the resources are there? The only thing I can speculate is that maybe there are other things for which that money is seen as being a higher priority that also need to be done in schools. After all, we know that schools have bad infrastructure problems. On that note, I would also observe that you can't make up for decades of underinvestment in solutions overnight.

People would like us to have a lot of answers for things that have to do with technology. Like, do air cleaners work? Are our air cleaners safe? And what should ventilation rates be? Well, if we had been investing in those things, like investment has gone into vaccines, tens of billions of dollars in the last three years, maybe we'd be a little closer to having confidence in the answers we can produce.

So, going forward, I hope that those who have the resources to support such research and development will really put significant effort into that. At ASHRAE, there's a lot of work going on now to address air cleaner standards. And AHRI is working on that, too. So, it's a very good opportunity now for industry partnerships with organizations like ASHRAE.

Another observation: It's really quite a big project to try to integrate public health with building science.

I think it's wonderful to see the White House getting on board through its COVID Response Working Group supporting air quality improvements as a way of mitigating risk of COVID. But, you know, remember the pandemic

started in 2020, and we got this substantial new show of support from the White House, really around the beginning of 2022, not much before that. So we were more than two years into the pandemic before the public health officials really picked up on that.

And I think we still have a ways to go now with getting a good understanding, between those who do building science and those who do public health, about how the two fit together. But it's something that has to be done.

Another thing I might mention is this... I hear so much from all sides about what's going on, and I think some people are a lot better at pointing out weaknesses than they are at developing solutions to overcome them. You know, there's a huge outcry from some that we really ought to be able to change standards right now, and that we know how to do that properly. And I think we should try, of course. But it's not an easy task, and I don't see the answers (for speeding things up) coming from any of the critics.

HPAC RM: *That reminds me of Teddy Roosevelt, I think, who talked about the man in the arena, as the one who receives the barbs. That it's easier to be in the audience than on center stage.*

Dr. Bahnfleth: Yes, in other words, that it's better to be engaged than to be sitting in the stands.

HPAC RM: *When you mentioned the recent increase in federal involvement before, were you referencing the new Clean Air in Buildings Challenge?*

Dr. Bahnfleth: Yes. And that the White House has now put indoor air quality into the COVID action plan, which I think is terrific, and I really commend them for that. I just wish we had started back in the previous administration to do this. ASHRAE had sent an outreach letter to the previous administration saying they really ought to

have building science expertise on the COVID response team. And it finally happened, but it took a long time.

HPAC RM: *Speaking of COVID, like so many of us now, you now have personally experienced it, unfortunately. How would you describe your experience and how has it changed your approach, if at all, to your work with ASHRAE now?*

Dr. Bahnfleth: Well, let me say, it hasn't really changed my approach as much as it's convinced me that all of this effort was worthwhile and that we should keep going.

I had a pretty bad case. I contracted COVID at a conference in Rotterdam last spring that was advertised as having good air quality. The thinking was "nobody needs to wear a mask because all the restrictions have been dropped." I'd been vaccinated four times already, but I was so sick.

If I had gotten much worse, I would've been in the hospital. So I was very thankful to have antivirals, because that really made all the difference for me. I tested positive for two weeks. I've got a child who has had it twice within three months, even though she and her husband (a physician) are both vaccinated and know what to do, and she works at home. My wife has had it, too.

In fact, everyone I know has had it, and I've met more people that I know who've gotten it recently than I did in the first two years of the pandemic. So it's still very much amongst us.

Maybe what this has shown me is that even if we're vaccinated and we have a building with good air quality, that still may not be enough for a virus that's highly infectious. That doesn't mean that we shouldn't do those things. But I think the reality is that we need to think of these engineering controls of ventilation and filtration and UV as a way of expanding the envelope within which we don't have to do things like social

distance and wear masks, and we can take other measures.

I think, at some point, when there's enough incidents of a disease in the population, that's just what we're going to have to do if we really want to try to protect ourselves from it, instead of just letting it kind of roll over us. I think letting COVID run rampant through the population, as we can see, is really a horrible thing to do, especially with the long COVID consequences that some people are experiencing.

HPAC RM: *As we all now battle another winter, I think I can speak for many when I say that I'm still wary, even confused, about how best to interact with others safely at this stage of the pandemic. From someone with your experience and informed perspective, what's your best advice for how to safely navigate the months ahead?*

Dr. Bahnfleth: My advice, based on everything the task force has done and on everything I know, is to make sure your vaccinations are up to-date: meaning COVID vaccinations, the influenza vaccine, whatever you can get.

Two, if you've looked at the early season influenza data this year, it's scary. It's peaking like Omicron did earlier (in 2022). It's a season like we haven't had in a long time. So we need to be worried about that, too. And I'm reading that respiratory sensorial virus, RSV, is really wreaking havoc. I remember hearing recently about ICUs full of kids in Canada.

So there's a lot of stuff going around, but vaccinations are important, as well as COVID testing. You know, I can get eight rapid tests a month free, and my wife can, too. So, we get 16 tests through our insurance every month. So there's never any question about, you know, should I use a test or not? We've got plenty of them to go around now. So, if you're going to go out and be in a social family situation, test before you go, and test when you come

back. Make sure that everyone is as sure as they can be that they're not infected before you get together.

And masks are still *de rigueur*. I wear a mask everywhere I go in a public situation. I was at a basketball game with probably 6,000 people the other night, and the only two people I could see who were wearing masks were my wife and myself.

But it makes a difference. There's nothing you can do, in terms of controls, that's nearly as effective as, as wearing an N-95 mask. And then you're just agreeing to expose yourself to much higher risk if you take it off. So if you worry that things are going around that could be bad for you, and if you want to help break the chain of transmission, wearing a mask is still a good thing to do. And I would do it at conferences, and I would do it as much as possible in public during the holidays. And certainly, any time you're on public transportation. I put on an N-95 when I get to the airport and I don't take it off until I leave the airport at my destination.

You get used to it, and it's really not bad if you wear high quality stuff, which I try to do. The masks are very comfortable, and I don't even think about having them on anymore.

Getting back to the ETF recommendations, keep spaces well ventilated. Crack windows if you're at home, if you have a CO2 monitor, which is nice to have, it can tell you if things are getting too stuffy. So I use mine all the time, and if I see it's getting up over 700, 800 ppm, I make sure I open a few more windows. And I also recommend having portable air cleaners at home. I got mine a long time ago at the beginning of the pandemic. But I now pretty much have them room by room. HEPA air cleaners that will do four or five air changes per hour, and you can turn them on and off, as needed.

So those are are things that I would recommend that you can do yourself. And for those who are putting on

events, just run them responsibly. If you're doing a conference or having a wedding or some kind of a party, encourage people, or even insist, that they are vaccinated and tested before they come. And don't be wishy-washy about promoting the use of masks at meetings. Many have been, and there have been many significant outbreaks of COVID because of that, at meetings that I've been to.

HPAC RM: *I just saw a headline a few days ago, about another cruise ship that had reported 800 infections or so. I think that was in Australia?*

Dr. Bahnfleth: Yes. I forgot to mention cruises. What were they thinking? I don't know. I'm not really the type to go on cruises, anyway. But now I'm really not very interested in doing that for the foreseeable future.

HPAC RM: *Finally, the last time we spoke, you had referenced an article then that you had co-authored for Science magazine with a number of other experts that talked about the need for a broader paradigm shift to combat indoor respiratory infections. You were hopeful then that architects and engineers would take up the gauntlet and start being more proactive in designing healthier building environments. Of course, that relies on owners being more open to that, as well. But now here we are, 20 months later or so from that article. How far along would you say we are on that 'paradigm shift'?*

Dr. Bahnfleth: Now? Well, there are different places where that change can happen. The 'paradigm shift' article itself was really written to encourage changes in standards, which haven't really come to pass yet. But I think they are going to happen. The group that wrote it, 36 of us that **Lidia Morawska** (of Queensland University of Technology) put together, is actually working

on another article that's more detailed on standards. But I think that there's certainly been a lot of discussion, and you can already see it in ASHRAE standards. It's a small start, but the changes in Standard 62.2, are pretty much coming directly out of the overall response to the pandemic.

As for what professionals are already doing, my own anecdotal evidence is that a lot of designers and owners are thinking more now about improving air quality and doing more than they had been doing in the past.

So, I think the signs are all good. Today, we have LEED and we have WELL standards for buildings, providing some guidance for those who want to do better. But if you think about the startup of LEED, it took a long time for it to really catch on and have this kind of exponential growth. You couldn't see much for a while at the beginning, and I think we're really on that path now again (with IAQ). It's going to take a while for it to really add up.

Of course, the big prize will be doing something about existing buildings. All of these great ideas for new buildings are going to change the landscape very slowly. What we really need are things that we can go in and do in existing buildings that are cost-effective. And that's one reason I like Rep. Beyer's legislation a lot, because it's working on the buildings we already have and that we know are deficient.

HPAC RM: *Well, Bill, hopefully 2023 will see more progress on that and on all the areas you mentioned. Thanks so much for your time here, and for the update on everything. Take care and we'll see you in Atlanta, sir.*

Dr. Bahnfleth: Yes, I hope so. And thank you for this opportunity, Rob. Always a pleasure. [HPAC](#)

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ABMA Elects New Officers, Revamps Strategy, Mission

Meeting in Carlsbad CA, trade group elevated Mark Colman to board chair and Nancy Simoneau to vice chair. Board also set course for ambitious year ahead.



Doug Wright, President & CEO, Superior Boiler

At its 2023 Annual Meeting, held this January at the Park Hyatt Aviara in Carlsbad, CA, the American Boiler Manufacturers Association (ABMA) elected new officers and adopted a three-year strategic plan through fiscal 2025-26.

Mark Colman, President & CEO from RENTECH was elected Chair of the ABMA board of directors and **Nancy Simoneau**, President & CEO from Groupe Simoneau was elected Vice Chair. **Dave Reinink**, President & CEO of Johnston Boiler remains as Treasurer/Secretary, while **Doug Wright**, President & CEO of Superior Boiler concluded his term as Board Chair and transitioned into the role of Immediate Past Chair.

“I am proud and pleased to be taking on the leadership of ABMA at this crucial time in our history,” said Colman. “Most people are not aware that boilers touch every part of our daily lives. I am looking forward to helping the Association achieve its vision of boilers being recognized for advancing energy sustainability and powering people’s lives.”

ABMA President & CEO **Scott Lynch** stated, “I am very excited about Mark’s ascension to the role of chair and look forward to partnering with him to advance ABMA and the boiler industry.”

For her part, Simoneau becomes the first female elected to the role of Vice Chair and also brings a unique perspective on the North American market as a Canadian manufacturer.

In addition to the officers, the following individuals were elected to their first or second term on the ABMA Board of Directors: **Rocky Bahramzad**, Cleaver-Brooks; **Tom Garbarino**, BFS Industries; **Phil Griggs**, Honeywell; **Steve Kemp**, Autoflame; **Paul Ingham**, Thermogenics; **Bryan O’Toole**, Burnham; **Tricia Staible**, Robinson Fans; **Mark Wehmeier**, Webster Combustion Technology.

The balance of the board includes **Larry Day**, Nationwide Boiler; and **Rich Simons**, Laars Heating.

New Strategy, Mission and Vision Adopted

Also at the annual meeting, the ABMA Board adopted a three-year strategic plan that will run through the 2025-26 fiscal year. In addition, ABMA revised its mission, adopted a new vision, and incorporated organizational values to align its new direction and focus.

This process had begun with engaging McKinley Advisors, a well-respected consulting firm in the association community. Their team was led by **Allana Tievsky McKee** and **Ankur Ponda** and their methodology aligned perfectly with ABMA’s goals and objectives.

To ensure a comprehensive voice in the development process, ABMA surveyed each member company and conducted targeted interviews with members of various tenure, members both past and prospective, supply chain partners and other key influencers.

Then, with survey and interview insights in hand, ABMA brought



Nancy Simoneau, Groupe Simoneau

together the leaders in the boiler industry from the membership this past October for two days of dialogue and building consensus.

In the end, four major focus areas became apparent and are now the overarching goals for the association over the next three years:

- Become the Home for the Boiler Supply Chain;
- Innovate the Boiler Technology Expo to be THE Industry Destination for Community and Learning;



Connor Lokar, ITR Economics

- Invest in Workforce Development Initiatives to Ensure a Thriving Industry;
- Establish the Boiler Industry as an Integral Part of Society and Environmental Sustainability.

With consensus around the new goals, it was evident that ABMA also needed a refresh of its mission and the adoption of a new vision. The revised mission now is “to lead, advance and provide solutions to the boiler industry.” The new vision is “to see that boilers are recognized for advancing



Mark Colman, RENTECH

energy sustainability and for powering people’s lives.”

In addition to its new mission and vision, ABMA was also excited to set new organizational values. These values now become its north star and share what makes us unique. They are:

- **Anticipatory:** We stay ahead of the curve;
- **Impactful:** We are mission-driven and results oriented;
- **Inclusive:** We welcome everyone to be a part of our community;
- **Innovative:** We embrace outside-the-box thinking and don’t settle for the status quo;
- **Passionate:** We love what we do and the industry we serve.

Over the coming months, ABMA staff will work closely with the team at McKinley Advisors and our new slate of officers to craft a work plan for implementing the new strategy that will include goals and initiatives prioritization and estimating resource allocation. This work plan will be adopted alongside the budget and scope for the 2023-24 fiscal year. **HPAC**

For more information on the annual meeting and all things boiler-related, go to www.abma.com.



Manufacturer Reps Panel, moderated by Scott Lynch. From left: Scott Carberry, PBBS; Steve Graves, Campbell-Sevey; ABMA's Lynch; Jim McDonough, Delval Equipment; Kyle Stell, Gulf Coast Boiler.

ABMA to Host, Moderate Boiler Panels at BIOMASS Conference

Focus of group discussions will be ‘optimization’ when burning biomass fuels.

The 16th annual International BIOMASS Conference & Expo will take place February 28 thru March 2, 2023, at the Cobb Galleria Centre in Atlanta, GA. This dynamic event unites industry professionals from all sectors of the world’s interconnected biomass utilization industries—biobased power, thermal energy, fuels and chemicals.

The Biomass Conference will bring together current and future producers of bioenergy and bio-based products along with waste generators, energy crop growers, municipal leaders, utility executives, technology providers, equipment manufacturers, project developers, investors and policymakers. It is truly a one-stop shop – the world’s premier educational and networking junction for all biomass industries.

This year, ABMA has partnered with the BIOMASS Conference to host and moderate boiler panels in the Biomass Power & Thermal track, which will consist of multiple ABMA members as panelists.

Details on the expert panels:

WEDNESDAY, MARCH 1, 2023

1:30 pm - 3:00 pm

Considerations for Boiler Optimization When Burning Biomass Fuels

Moderator: **Scott Lynch**, American Boiler Manufacturers Association.

- **Rich Clasby**
Detroit Stoker Company
Fuel Distribution Upgrades for Biomass-Fired Boilers;



In December, Tim Portz of the Pellet Fuels Institute, Bob Langstine with Zeeco, Rich Clasby with Detroit Stoker, Jim Monette of Nooter/Eriksen, Dustin Divinia with Vector Systems, Ted Older of New York Blower, and Mike Valentino, Shaunica Jayson, and Scott Lynch with ABMA joined on a video conference call to plan topics and presentations.

- **Bob Langstine**, Zeeco, Inc.
Practical Considerations for Aux Fuel Burners on Biomass Boilers;
- **Jim Monette**
Nooter/Eriksen.Inc
Boiler Design Considerations for Solid Fuel Types;
- **Doug Jones**
New York Blower Company
Centrifugal Fan Selection for Biomass Boilers.

WEDNESDAY, MARCH 1, 2023

3:30 pm - 5:00 pm

Considerations for Boiler Optimization When Burning Biomass Fuels II

Moderator: **Shaunica Jayson**, American Boiler Manufacturers Association.

- **Dustin Divinia**
Vector Systems

- Avoiding Downtime with an Environmental Catalyst;*
- **Jacob Halasowski**
AMETEK Land
Temperature Measurements for Boiler Optimization;
- **Ravi Jethra**
WIKA
Effect of Operating Parameters on Boilers Tube Skin Temperature Measurement Accuracy & the Development of new improved Tube Skin Thermocouple;
- **Ed Verderose**
Miura America Company
Biogas Quality for Burners and Boilers.

To learn more about the International BIOMASS Conference and Expo, go to www.2023-ibce.bbiconferences.com.

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Our monthly Podcast series offers unique and compelling industry insights for engineers in the HVACR market. Each month, we talk with engaging thought leaders and practitioners like ASHRAE President Farooq Mehboob and USGBC ambassador Elizabeth Beardsley. Produced by *HPAC Engineering* magazine and hosted by Editor-in-Chief Rob McManamy, this series is just one of several exciting **Members Only** features, designed to enhance your HPAC multimedia experience.

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HPAC
Engineering



AHR Expo Names Annual Innovation Awards Winners

When the industry gathers in Atlanta, the show will honor innovators in 10 HVACR categories for developing new cutting-edge products and technologies.

The AHR Expo (International Air-Conditioning, Heating, Refrigerating Exposition) this February will honor the winners of the 2023 AHR Expo Innovation Awards. Each year, winners are chosen in 10 industry categories to represent the most innovative products and technologies set to hit the market in the year ahead.

“The awards program experiences growth year on year,” said Show Manager, **Mark Stevens**. “This is a direct correlation to just how fast our industry is growing through innovation. The awards are a key indicator of how HVACR is being called upon to solve worldwide issues at a rapid pace. We aim to highlight this innovation trajectory and honor those that are pushing the bar to create real solutions to difficult problems.”

The Innovation Awards draw hundreds of manufacturers who are designing new and never-before-seen solutions and/or improvements upon existing products and technologies, launching into the marketplace in the coming year. They encourage exhibitors to submit new products and technologies for recognition via review and selection by a panel of third-party judges comprised of distinguished ASHRAE members. Entrants are evaluated based on overall innovative design, creativity of the product or service offered, product or technology real-world application, as well as overall potential market impact.

“We are thrilled to celebrate this year’s winners as well as to continue to champion innovation among our industry professionals,” continued Stevens. “In the last few years, HVACR has taken on a wider audience outside of our direct industry stakeholders. It is refreshing to welcome an understanding of the value HVACR brings to the world in essentially every factor of daily life. Manufacturers on the AHR Expo show floor are challenged to continuously innovate and adapt as the built environment around us changes, and you’ll see them meet-

ing this charge head-on in Atlanta.”

The Innovation Awards program serves as an annual metric for year-to-year industry development and growth, as well as a forecast of the marketplace in the upcoming year. While the Awards officially recognize only a select few, the show floor is a robust example of how manufacturers are growing the industry in exciting ways.

“AHR Expo would like to formally congratulate each of our 2023 award winners, as well as our finalists and all our entrants, for their continued leader-

ship and contribution to HVACR,” said Stevens. “We look forward to seeing each of you on the show floor in Atlanta, as well as where you’ll lead us in the future!”

The 2023 AHR Expo Innovation Award Winners and finalists were selected in 10 industry categories, including building automation, cooling, heating, indoor air quality, plumbing, refrigeration, software, sustainable solutions, tools and instruments, and ventilation.



BUILDING AUTOMATION

Winner: Cielo WiGle Inc.

Booth #C6700

Innovation: Cielo Breez Max

Cielo Breez Max is the industry's first true smart thermostat for mini-split, window, and portable air conditioners. It is loaded with next-gen features and takes a giant leap in the HVAC industry with its AI based Comfy Max mode which offers the true thermostat-like smart experience for



all ductless air conditioners. It is also equipped with an auto detection algorithm that automatically detects any AC brand or model making it universally compatible with 200+ brands and 5000+ air conditioner models. Breez Max is backed by AWS IoT cloud. It works with a 5V adapter or can be hard-wired through 12/18/24 volts AC or DC. All Cielo Breez Max are secured with TLS1.2 to authenticate and encrypt data securely when transferred over a network. Max is compatible with Amazon Alexa, Google Home, SmartThings, IFTTT and Siri shortcuts.

Finalists in this category include Falconair Inc., Booth #B132 and Automated Logic Corporation, Booth #B1519.

COOLING

Winner: Chemours

Booth #C6425

Innovation: Opteon™ XL41 Refrigerant

Opteon™ XL41 is a non-ozone depleting, low global warming potential refrigerant replacement for R-410A in residential and light commercial air conditioning, and scroll chiller applications. This innovative product maximizes the benefits of the transition to HFO refrigerants while minimizing the impact of the transition. Opteon™ XL41 provides a 78% reduction in GWP from R-410A, while remaining compatible with all R-410A residential and commercial applications and lubricants. This greatly



reduces the re-design effort for OEMs, and reduces the learning curve for the technicians in the field.

Finalists in this category include Copeland™ HVAC Compressors, Booth #B1839, #B1849, and Fujitsu General American, Inc., Booth #B1455.

HEATING

Winner: Copeland™ HVAC Compressors

Booth #B1839, B1849.

Innovation: ZPSK7 Scroll Compressor

Built on the award-winning ZPSK6 platform, Emerson's ZPSK7 scroll compressor is the most efficient two-stage compressor developed in the 100-year history of the Copeland™ brand. The Copeland™ ZPSK7 scroll compressor is a product line of 1.5 – 5-ton two-stage compressors ideally suited for residential and light commercial HVAC applications. These compressors can operate at 100% capacity or as low as 65% capacity based on heating/cooling demand. When a partial load is needed, bypass ports inside the compression chamber open which partially unload the compressor.

This allows the compressor to achieve 65% capacity, thereby consuming less energy at light loads and avoiding costly stops and starts which use more energy. When demand increases, the modulation control valve



is activated, sealing the bypass, and shifting capacity to 100%. The ZPSK7 two-stage compressor can run at lower capacity without stopping, ensuring air continues flowing over the coil and the filter. This yields important benefits in humidity reduction and air quality. In addition, this two-stage modulating compressor also gives systems the ability to adjust capacity to match the load, resulting in longer run times at higher efficiency to maximize comfort.

Finalists in this category include Dorin USA, Booth #B1546, and Mikrofill by Stuart Turner, Booth #B3881.

INDOOR AIR QUALITY

Winner: BELIMO Americas

Booth #B315

Innovation: Room Sensor

Belimo room sensors accurately measure temperature, humidity, dew point, and CO2 with or without an ePaper touch display. Integrated Near Field Communication (NFC) provides easy field adjustability, commissioning, remote display capabilities, and troubleshooting even without power. These sensors are maintenance-free and provide long-term

reliability for a more comfortable room environment. Non-powered configuration allows customers to set these room sensors up before being installed in the field, eliminating technician frustration as the sensors can arrive on site fully configured

and ready to communicate. Select models offer BACnet, Modbus, or MP-Bus, which enhances communication and reduces installation, cables, and terminal connections.

Finalists in this category include AirGreen, Booth #C6102, and Particles Plus, Inc., Booth #BC1808.



PLUMBING

Winner: Caleffi Hydronic Solutions **Booth #B3317**

Innovation: Caleffi 536 Series

PresCal HP Piston-type Pressure Reducing Valve

The only direct-acting pressure regulating valve in North America with true piston operation, the PresCal™HP family ensures stable, high-precision water pressure control while withstanding severe inlet pressure or punishing downstream water hammer. It's perfect for staged pressure control or demanding applications that are often fraught with truly extreme pressure fluctuations. Being the bridge between a building's water main and its distribution piping, a PRV experiences pressure fluctuations on both downstream and upstream sides. These fluctuations can be of sufficient magnitude to cause premature fatiguing and resulting failure of a rubber diaphragm design, the industry standard (including Caleffi).



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The higher the incoming pressure, the more severe the fluctuations and their effects frequently are. This is because higher-pressure applications often involve commercial buildings containing quick-acting devices. They are also interconnected with other similar buildings. Controlling pressure reliably in such applications requires either a robustly designed PRV, a two-stage PRV arrangement, or both. These are the demanding conditions the Caleffi Pres-Cal HP family of PRVs is designed for. Instead of using a flexible, rubber diaphragm separating the high-pressure and low-pressure chambers inside the PRV, the PresCal HP uses a durable piston design. The high-range model serves as a first-stage PRV in a two-stage application. The low-range model serves as a second stage, or as a stand-alone PRV for punishing pressure spikes.

Finalists in this category include EasyFit Isolator, Booth #B145, and Viega LLC, Booth #B4027.

REFRIGERATION

Winner: Copeland™ Refrigeration Compressors
Booth #B1839, B1849

Innovation: ZFW variable speed scroll solution for low-temperature refrigeration applications.

The Copeland™ ZFW variable speed scroll solution includes brushless permanent magnet (BPM) motor-based scrolls and variable frequency drives (VFDs) targeted for low-temperature, stationary refrigeration applications. The variable speed scroll provides better efficiency, precision, flexibility and reliability, while Copeland variable frequency drives, EVM/EVH Series complement Emerson compressors and controls. It has double the capacity of a fixed-speed compressor of the same size while providing a 20–30% efficiency improvement. With vapor injection technology and a speed range of 1,000–7,000 rpm, it offers unparalleled levels of control, while reducing cycling rates and greatly improving reliability. Optimized for use with new Copeland EVM variable frequency drives, the combination offers cutting-edge levels of performance.



While intended for compression, EVM drives are also universally applicable for fans, pumps and other electric motors. With Bluetooth capability, commissioning is more streamlined than ever. To optimize ease of use, the Copeland EVM has been preconfigured for Emerson controls (iPro, E2, E3, Site Supervisor) and can be integrated universally with any controller. Available today with A1 refrigerants and moving toward A2L approval by 2024, the platform offers a robust design option for complying with current and future commercial refrigeration regulations.

Finalists in this category include Danfoss, Booth #B3231, and MATELEX, Booth #3561.

SOFTWARE

Winner: cove.tool

Booth #B4561

Innovation: loadmodeling.tool

Built for mechanical engineers, the loadmodeling.tool quickly and automatically establishes peak cooling and heating loads to design and right-size the mechanical system using the EnergyPlus engine. This web-based tool

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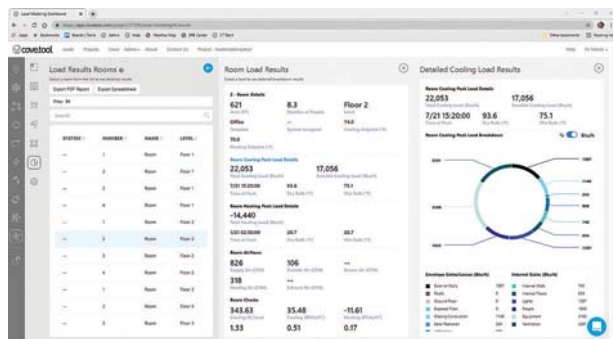


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supports cove.tool's goal of providing the solutions needed for the AEC industry to unlock productivity and solve the climate crisis. One of the most revolutionary aspects of the loadmodeling.tool is that it is web-based, which presents a new opportunity for mechanical engineers as the majority of their tools are only available via desktop platforms that haven't evolved much in the last few decades. As it is web-based, mechanical engineers can access the tool anywhere, including results, which means large files aren't having to be transferred or shared manually. Another important function of the tool is that multiple engineers can work simultaneously on the platform, which is a fundamentally



new function that other tools don't and can't have. Multiple people can log into the project and work on various tasks at the same time, increasing team efficiency. Finally, this is the first tool that thinks about the engineer first – loadmodeling.tool fits current workflows and gives engineers the answers they need in the way they work. We're thinking about the tool from the user experience standpoint and giving them something innovative and beautiful to work with every day because they haven't had that before.

Finalists in this category include HVAC Solution, Inc., Booth #C5500, and Rep Order Management (AccuQuote), Booth #B4523.

SUSTAINABLE SOLUTIONS

Winner: Taco Comfort Solutions

Booth #B1639

Innovation: System M

The ultra-efficient System M consists of a sleek, whisper-quiet, inverter-driven outdoor heat pump that can be up to 4 times more efficient than a gas furnace. The outdoor heat pump seamlessly integrates with Taco's exclusive indoor HydroBox to provide a complete system with just 6 pipe connections needed. System M is a radically innovative air-to-water heat pump system that provides comfortable, efficient heating, cooling, and plenty of domestic hot water. A true plug-n-play appliance, its packaged design makes installation

less intrusive; no refrigerant or gas lines are needed. System M seamlessly integrates with almost any high-efficiency heating and cooling system and is perfect for both new construction and existing HVAC systems. The installation time is half of a typical air-to-water



heat pump by eliminating the work to design, procurement, and installation of all the required hydronic components. Just 6 connections needed; 2 connections to the heat pump, 2 connections to the domestic hot water tank (DHW) and 2 connections to the heat and cooling system.

Finalists in this category include Mitsubishi Electric Trane HVAC US, Booth #C6805, and Trane, Booth #B3217.

TOOLS & INSTRUMENTS

Winner: NAVAC Inc.

Booth #C6364

Innovation: BREAKFREE® POWER FLARING TOOL

NAVAC NEF6LM BreakFree® Power Flaring Tool yields accurate, hassle-free tubing flares in a fraction of time compared to traditional flaring methods. Designed to perform reliably in harsh environments, NEF6LM also allows one-button, one-hand operation. The tool is equipped with a high-performance rechargeable battery that makes over 100 flares per charge. Manual flaring is rough and inconsistent, very much depending on the operator's experience level. As a result, distorted flares are made all the time, which causes leaks in connections. Refrigerant leak is a major service issue, especially for ductless VRF systems with many flared connections. NAVAC BreakFree® Power Flaring Tool NEF6LM delivers a fully automatic flaring operation and provides the ultimate quality of flares that an excellent experienced technician could achieve



in years to be delivered simply by pressing a button. This greatly improves the efficiency and accuracy of tubing works and greatly reduces the refrigerant leaks in HVAC systems.

Finalists in this category include Airthings, Booth #C5952, and Onset - HOBO Data Loggers, Booth #B1104.

VENTILATION

Winner: SmartD Technologies

Booth #C5948

Innovation: SmartD Clean Power VFD

SmartD's Clean Power Variable Frequency Drive changes the motor control landscape. By delivering a clean, sinusoidal signal it reduces motor system losses by up to 40% and extends motor lifetime in a compact footprint that can be deployed without ancillary filters.

The SmartD VFD does this by integrating wide-bandgap (WBG) semiconductors into its multi-level inverter architecture and combines them with patented modulation algorithms to produce a pure-sine wave electrical signal without the need for external filters. WBG semiconductors have intrinsic characteristics that make them more efficient: on-state losses are 10-80% lower and switching losses are 9 to 30 times lower than standard IGBTs.

While the benefits of WBG are clear, they are but a piece of the SmartD innovation equation. By combining a single-carrier harmonics-canceling modulation, with a multilevel architecture and the high frequency switching of the WBG transistors, SmartD is able to integrate filters 400 (four hundred!) times smaller than auxiliary filters normally required to achieve a comparable signal quality.

The integrated miniature-filters not only reduce the overall footprint and simplify wiring, they also reduce filter losses while improving motor efficiency. Combined, this results in an overall system efficiency improvement and system-loss reduction of up to 40%.

Finalists in this category include ECM PCB Stator Technology, Booth #B4108, and Lennox International, Inc., Booth #B1861.

Funds raised from the entry fees of the Innovation Awards competition this year will be donated to the Atlanta



College and Career Academy (ACCA), an Atlanta-based technical high school. For more information on AHR Expo's work with ACCA, and our other investments into the future workforce of HVACR, please visit ahrexpo.com. Registration for this year's show is free through Feb. 4, and can also be completed online.

ABOUT THE AHR EXPO

The AHR Expo is the essential event for HVACR professionals, attracting the most comprehensive gathering of the industry from around the globe each year. The show provides a unique forum where manufacturers and suppliers of all sizes and specialties come together to share ideas and showcase the future of HVACR technology. Since 1930, the AHR Expo has remained the industry's best place for OEMs, engineers, contractors, facility operators, architects, educators and other industry professionals to experience everything new in HVACR and build relationships. The AHR Expo is co-sponsored by ASHRAE and AHRI and is held concurrently with ASHRAE's Winter Conference. Next year's show will take place January 22-24, 2024, in Chicago.

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TTS Synergy Series Tankless Rack System

The TTS Synergy Series tankless rack system from Facilities Resource Group features a turndown ratio of 66:1 that will provide more than 1,600 gal. of hot water per hour, yet is compact enough to fit through a standard mechanical room doorway. The standard package consists of an aluminum frame rack holding from two to six commercial condensing water heaters with maximum inputs of 199,900 Btu/hr. and maximum flow rates of 11.1 gal. per minute. Also included are controllers, manifolds, valves, expansion tank, recirculation pump and breaker box—all pre-installed and pre-piped to the attached water heaters. **AHR Booth No. B3361**
Facilities Resource Group/Noritz



FieldPro Installation App

Aquatherm's free FieldPro mobile installation app provides all the resources required to ensure fast, easy, accurate polypropylene piping installations. Users have searchable access to all Aquatherm parts, the Installer Manual, technical bulletins and the Aquatherm Design & Planning Guide. It allows users to log and access multiple projects. Features include a fusion timer that incorporates multiple timers, pressure times and logging capabilities; a hanger spacing calculator that provides easy in-field access to all hanger spacing information; and a pressure-test assistant that provides step-by-step guides, timers, system integrity checks, and allows submission of test results directly to the manufacturer. **AHR Booth No. B125**
Aquatherm

Vision SVT Air Handler

Daikin Applied's Vision air handler will be enhanced with Sorbent Ventilation Technology (SVT) from enVerid Systems. The integrated SVT system improves IAQ by removing CO₂, volatile organic compounds such as formaldehyde, and other contaminants using sorbent filtration that captures pollutants while allowing oxygen and water to pass through freely, resulting in cleaner air. The integrated system allows engineers and building owners to right-size the ventilation for each zone in a single, integrated air-handling unit — with one set of ducting and one mechanical space. The use of SVT will reduce outdoor air loads, resulting in smaller chillers, and less peak and lifecycle energy consumption. **AHR Booth No. B3338**
Daikin Applied Americas



Coil-Cure Liquid Disinfectant

RectorSeal introduces Coil-Cure Liquid, an EPA-registered disinfectant that kills up to 99.9% of bacteria and viruses, including coronavirus. protects HVAC coils, drain pans, and non-porous surfaces when properly applied. The self-rinsing, nonabrasive disinfectant cleaner functions as a cleaner, fungicide, mildew inhibitor, virucide and deodorizer — a safe and effective way to clean HVAC coils. As a mild foaming disinfectant, it is ready for use right from the bottle. Available in quart spray size and gallon-size refill jugs. **AHR Booth No. B2029**
RectorSeal



intelliGen Refrigeration Controller

Heatcraft introduces its intelliGen Refrigeration Controller reduces temperature fluctuation, brings the system to optimal temperature faster and optimizes cooling time through the fan cycling. Additionally, it detects when the system needs defrosting, which automates the defrosting cycles. Users can monitor their refrigeration system remotely or locally on any smart device, and can receive alerts via the web, BMS, text or email to notify them of any potential refrigeration system issues. For operators with multiple cooling units in a system, up to eight unit coolers can be chained together and controlled as a single system. **AHR Booth No. B1861**

Heatcraft Refrigeration Products

Heat2O Commercial Heat Pump Water Heater

The Heat2O commercial heat pump water heater from Mitsubishi Electric Trane HVAC US is an all-electric domestic water heating system designed to improve sustainability and reduce energy consumption in multifamily buildings and large-scale commercial facilities. The unit uses CO₂, an environmentally friendly refrigerant with a global warming potential of one and an ozone depletion potential of zero. The system includes pre-assembled and pre-plumbed components designed and selected to ensure installation quality and ensure optimal performance of the heat pump. Components include hot water storage tanks, swing tanks, secondary heat exchangers and variable-speed secondary circuit pumps. **AHR Booth No. C6805**

Mitsubishi Electric Trane HVAC US



TechnoForce HVAC Packaged System

Bell & Gossett's TechnoForce HVAC packaged system provides a turnkey solution that simplifies specification, installation, operation and maintenance. Features include flow ranges from 200 to 3,400 gallons/minute; lower total installation cost due to reduced labor costs and time savings; single jobsite delivery ready for immediate installation; and easy to install for new construction or retrofit. Also includes 40 stock-part-numbered HVAC skids, consisting of two to three end suction pumps, controls, valves and headers. **AHR Booth No. B3889**

Bell & Gossett/Xylem

Electron Commercial Tankless Heat Pump Water Heaters

Intellihot introduces the Electron family of tankless heat pump water heaters, designed and built for commercial applications. They use electric heat pump technology with CO₂ as the refrigerant paired with a specially designed thermal battery. Units include the iE1, an integrated unit with a thermal battery that can be installed indoors or outdoors; and the iE6, a larger modular heat pump that installs outdoors and pairs with the iB3, a thermal battery that installs indoors. They are connected to the grid to maximize off-peak electric usage (aided by self-learning) and offers 24/7 factory monitoring to ensure endless volumes of water up to 170° F. **AHR Booth No. B4185**

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- Precise flow channeling through Patent Pending head design
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Ancient Lessons For Reducing GHG Emissions

Why does concrete today not last like it did in Ancient Rome? Researchers now think they know the answer and it may help us to build more sustainably.



Larry Clark

A regular contributor to HPAC Engineering and a member of its editorial advisory board since 2012, the author is a principal at Sustainable Performance Solutions LLC, a south Florida-based engineering firm focusing on energy and sustainability. Email him at larry@sustainflorida.com.

Not surprisingly, construction was a topic at the recent COP27, UN Climate Change Conference in Egypt last November.

According to experts, the construction and real estate sectors, by themselves, are responsible for 40% of global greenhouse gas (GHG) emissions worldwide. The production of cement, alone, a key component of most construction projects, emits 7% of global CO₂.

Adding insult to injury, we recently learned why modern concrete (a composite of cement bonded to aggregate) doesn't last as long as the concrete used by the Roman Empire in the era "before Christ" (B.C.). Both the Colosseum and the Pantheon – which boasts the world's largest reinforced dome – have survived for more than 2,000 years, while here in Florida we require periodic inspections, beginning at 25 or 30 years, of concrete buildings due to structural failures caused by concrete breakdown. (Full disclosure: SPS, my consulting firm, owns a 50% interest in a general contractor that specializes in concrete restoration projects).

Cracking and spalling in concrete are caused primarily by carbonation and chloride contamination of the concrete. Both of these lead to corrosion of the embedded rebar which expands and exerts pressure on the concrete. Here in coastal South Florida, with our salt-laden air and hurricane events, chloride corrosion is a very real problem.

So why was the Roman concrete so superior to ours, even in wet and earthquake-prone locations?

Now a team of researchers from the U.S., Italy, and Switzerland believe they have found the answer. They analyzed samples from the city wall at the Italian archeological dig site in Privernum, a city near the Appian Way that was conquered and occupied by the Romans in the late 4th century B.C. Those samples, typical of concrete found throughout the Roman Empire, had white fragments in them. The fragments, or

clasts, were limestone and apparently gave the concrete the ability to self-repair its cracks by dissolving and recrystallizing after becoming wet.

Lime clasts had been previously identified in ancient Roman concrete, but had been attributed to poor workmanship or materials, not to *intentional* compounding.

Today, if our concrete lasted longer, we would arguably need to produce less, since it would be primarily for new construction and not for repair projects. Less concrete would equate to less cement production, and a resultant decrease in GHG emissions.

For those inclined to eliminate concrete entirely, some architects and builders are turning to alternatives such as compressed



earth blocks. These blocks are composed of clay, sand, and a small amount of cement. In addition to a smaller carbon footprint during production, earth blocks have natural cooling thermal properties, absorbing heat during the day and releasing it at night. Of course, mud bricks have been used for thousands of years throughout the world and sun-dried brick, known as adobe in North America, was used by indigenous Americans for centuries.

With all that in mind, perhaps we should study the texts of ancient engineers as carefully as we read today's peer-reviewed papers. [HPAC](#)

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