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JULY/AUGUST 2022
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# REFRIGERANTS TIME CRUNCH

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*Read more on* ***pg. 22***

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**JULY/AUGUST 2022**
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***By Rob McManamy***

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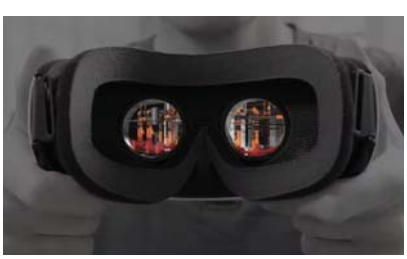

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# Our Time of Consequences

Earlier this summer, I stumbled on the old Simon & Garfunkel song *Bookends*, which starts, "Time it was, what a time it was. A time of innocence. A time of confidences…"

Wait, what? Hearing that made me stop to call up the lyrics on my phone. I had always thought that last word was "consequences." After all, the song was written in 1968, arguably the most consequential year in modern U.S. history, at least before Covid. But sure enough, I was wrong.

Even so, it caused me to ponder the truly consequential time in which we now live.

**Rob McManamy**
Editor-in-Chief

The ongoing pandemic, of course, has been extraordinary and life-altering in so many profound ways, all around the globe. And this summer, as blistering heat reminds us everywhere that global warming was already an existential crisis even before the Coronavirus came calling, we are challenged anew to raise that alarm again, amid a cacophony of other still-blaring sirens.

But even as heated political and societal debates flared bitterly, and tragically, across the U.S. in June and July, the climate crisis still managed to grab its share of alarming headlines. Indeed, it was especially hard *not* to notice the unusual news this summer that London's Heathrow Airport had temporarily had to close… *because one of its runways was melting!*

Of course, that record heat wave hit Europe just days after the U.S. Supreme Court handed down its bombshell 6-3 ruling in *West Virginia v. EPA*. It said the Environmental Protection Agency does **not** have the regulatory authority to push the U.S. power industry toward clean energy sources, including solar and wind power, to mitigate greenhouse gas emissions.

Writing for the court's conservative majority, Chief Justice **John Roberts** argued, "Capping carbon dioxide emissions at a level that will force a nationwide transition away from the use of coal to generate electricity may be a sensible 'solution to the crisis of the day.' But it is not plausible that Congress gave EPA the authority to adopt on its own such a regulatory scheme."

Plausible or not, the words "crisis of the day" do seem to minimize the undeniable climate crisis we all now face in 2022. But the even greater impact of this ruling is that it has now called into question the EPA's authority to regulate, well, anything.

And that may have a devastating and disruptive effect on our industry, in particular. Indeed, this issue's cover story, itself, is driven by recent EPA rulings governing the use of hydrofluorocarbons and guiding building owners to switch to A2L refrigerants that have lower Global Warming Potential (GWP).

As **Jim Cika** of the International Code Council tells us, there are very aggressive deadlines rapidly approaching for that switch-over, which has caused many in our industry to scramble. In light of the recent Supreme Court ruling, however, it now seems plausible that there will be new legal challenges on this issue, as well.

Of course, that will cause still more delay, which also has consequences. Even so, the engineering community is still pushing forward on climate, and it is thinking globally.

This October in Athens, Greece, ASHRAE will host its first International Building Decarbonization Conference, organized by the professional society's new Task Force for Building Decarbonization. That task force is co-chaired by former ASHRAE presidents **Don Colliver** and **Tom Phoenix**, who joined us on our 'HPAC On The Air' podcast earlier this year. They told us then that as recently as last fall, they had started noticing a shift in the marketplace, where clients suddenly seemed "much more willing to talk about how to get to zero carbon."

So, perhaps, the tide already has turned in our industry, to the point where scientifically foreseen consequences will drive more building owners' decisions… even if regulatory authorities no longer can.

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BY ROB MCMANAMY, EDITOR-IN-CHIEF

# Worker Shortages Loom as Hiring Peaks While Commercial Planning Still Grows

*Fierce headwinds have yet to turn back the economic tide, leading some to speculate that a recession may not be imminent, after all. We look at the latest numbers.*


With fuel prices still inching downward nationally in mid-July, unemployment remaining low and overall construction project data staying steady, debate is growing over the presumed inevitability of a predicted U.S. economic recession triggered by record inflation and global supply chain woes.

"We don't want to talk ourselves into a recession," cautioned U.S. Commerce Secretary **Gina Raimondo**, speaking July 10 to *ABC News*. "The fundamentals of this economy are very strong. I don't see any reason to think that we will have a serious recession."

On July 11, St. Louis Federal Reserve Bank President **James Bullard** echoed those sentiments, telling *Associated Press* that he saw little sign of recession on the horizon. Bullard added that he was optimistic the Fed's ongoing series of interest rate hikes, including June's 0.75% boost, would be effective in taming prices. "Now we have lots of inflation, but the question is, can we get (inflation) back to 2% without disrupting the economy?" Bullard asked. "I think we can."

For its part, the U.S. construction industry so far has weathered the uncertainty. The industry's latest economic measures continue to show resilience, even as worries persist. On July 11, the Dodge Construction Network's monthly Dodge Momentum Index, which tracks nonresidential building projects in planning, logged a 1% increase in June to reach a 14-year high. It was led by a 4.1% rise in the index's commercial projects component, still driven by the ongoing boom in warehouse construction.

"A new cyclical high in the Momentum Index is a sign that developers feel that projects still have hope of moving forward, despite concerns of an impending economic slowdown," explained Dodge Chief Economist **Richard Branch**. "However, this sentiment will be tested in the months to come as higher interest rates eat away at business and consumer confidence."

Even so, the construction industry added 13,000 jobs in June, according to the U.S. Bureau of Labor Statistics. But the number of jobseekers with construction experience plunged to a record low for the month, according to an analysis of the new data by the Associated General Contractors of America (AGC).

BUT THAT WAS JUST THE

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| Construction Employment Statistics: June 2022 | June 2022 | May 2022 | June 2021 | 1-Month Net Change | 12-Month Net Change | 1-Month % Change |
|---|---|---|---|---|---|---|
| ***Employment*** | | | | | | |
| Construction | 7,670,000 | 7,657,000 | 7,378,000 | 13,000 | 292,000 | 4.0% |
| Nonresidential | 4,515,700 | 4,499,200 | 4,345,400 | 16,500 | 170,300 | 3.9% |
| Nonresidential Building | 808,200 | 807,600 | 786,200 | 600 | 22,000 | 2.8% |
| Nonresidential Specialty Trade Contractors | 2,627,600 | 2,616,200 | 2,520,600 | 11,400 | 107,000 | 4.2% |
| Heavy and Civil Engineering | 1,079,900 | 1,075,400 | 1,038,600 | 4,500 | 41,300 | 4.0% |
| Residential | 3,154,100 | 3,158,200 | 3,032,700 | -4,100 | 121,400 | 4.0% |
| Residential Building | 898,600 | 903,100 | 852,500 | -4,500 | 46,100 | 5.4% |
| Residential Specialty Trade Contractors | 2,255,500 | 2,255,100 | 2,180,200 | 400 | 75,300 | 3.5% |
| ***Average Hourly Earnings*** | | | | | | |
| All Private Industries | $32.08 | $31.98 | $30.52 | $0.10 | $1.56 | 5.1% |
| Construction | $34.68 | $34.55 | $32.85 | $0.13 | $1.83 | 5.6% |
| ***Average Weekly Hours*** | | | | | | |
| All Private Industries | 34.5 | 34.5 | 34.8 | 0.0 | -0.3 | -0.9% |
| Construction | 38.8 | 39.0 | 38.7 | -0.2 | 0.1 | 0.3% |
| *Source: U.S. Bureau of Labor Statistics* | | | | | | |

"Although nonresidential contractors were able to add employees in June, the industry needs more, as demand for projects is outpacing the supply of workers," said AGC Chief Economist **Ken Simonson**. "With industry unemployment at a record low for June and openings at an all-time high for May, it is clear contractors can't fill all the positions they would like to."

The unemployment rate among jobseekers with construction experience tumbled from 7.5% in June 2021 to 3.7% a year later, the lowest rate for June in the 23-year history of the data, Simonson noted. The number of unemployed construction workers fell by 345,000, or 47%, to 385,000, suggesting there are few experienced jobseekers left to hire, he added.

"This employment report was a welcome respite from a sea of bad economic news," said **Anirban Basu**, chief economist for Associated Builders and Contractors (ABC). "This does nothing, however, to dim the risk of recession. Employment tends to be a lagging indicator. Moreover, the solid employment performance makes it more likely that the Federal Reserve will continue to raise interest rates during the months to come, including this month. Higher borrowing costs working in conjunction with lofty materials prices and rapidly rising worker compensation mean that the threat of significant numbers of project postponements and cancellations remains firmly in place."

On July 12, ABC released the results of its latest Construction Backlog Indicator (CBI) and Construction Confidence Index (CCI), based on monthly surveys of its association members. CBI fell 0.1 months in June and stands at 8.9 months, according to an ABC member survey done between June 21 and July 5. That reading is up 0.4 months from June 2021.

"Several months ago, there was conjecture that contractors were generally too upbeat regarding their collective future," said Basu. "Increasingly, the data suggest that they were. At the time, many contractors reported surging backlog and an ability to pass along hefty cost increases to project owners. For months, contractors expected sales, employment and margins to expand. The most recent ABC survey indicates that, to secure work and to induce project starts, a growing fraction of contractors is having to trim margins."

That could explain why the latest CCI readings for sales, profit margins and staffing levels all declined in June, according to ABC. The indices for sales and staffing remain above the threshold of 50, indicating expectations of growth over the next six months, while the reading for profit margins fell below the threshold of 50 for the first time since October 2021.

"In the context of rising fears of recession and rising borrowing costs, the stage has been set for softer nonresidential construction activity going forward," said Basu. "That said, public contractors can expect to remain busy in the context of a significant infrastructure spending package. Still, the market may not prove as robust as anticipated given delayed project start dates as public agencies determine the right moment to purchase construction services. Despite all of these considerations, contractors continue to expect industry sales and employment to expand over the next six months."

And economists differ widely on the "inevitability" of a recession and

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## Producer Price Index: June 2022

| | 1-Month % Change | 12-Month % Change | % Change Since Feb 2020 |
|---|---|---|---|
| Inputs to Construction | 1.9% | 20.1% | 46.0% |
| Inputs to Residential Construction | 1.8% | 20.3% | 46.4% |
| Plumbing Fixtures and Fittings | 0.4% | 11.0% | 14.9% |
| Fabricated Structural Metal Products | 0.6% | 26.2% | 55.8% |
| Iron and Steel | -2.9% | 16.3% | 97.4% |
| Steel Mill Products | -1.8% | 22.4% | 124.3% |
| Nonferrous Wire and Cable | -0.6% | 15.1% | 50.7% |
| Softwood Lumber | -24.8% | -38.1% | 48.4% |
| Concrete Products | 1.9% | 13.5% | 18.8% |
| Prepared Asphalt, Tar Roofing and Siding Products | 3.2% | 22.2% | 37.5% |
| Crude Petroleum | 19.4% | 77.1% | 152.6% |
| Natural Gas | 24.3% | 224.5% | 517.9% |
| Unprocessed Energy Materials | 20.4% | 126.8% | 236.4% |

*Source: U.S. Bureau of Labor Statistics*

the longer term prospects for the U.S. economy, overall.

"The surge in material prices and labor shortages are causing significant project cost hikes and delays, reducing funding available for new projects," noted **Jack Riddleston**, a construction analyst at London-based GlobalData, which just released the midyear update to its latest report, *Global Construction Outlook to 2026*. "For example, the initial cost expectation of the Des Moines International Airport terminal expansion was $434 million when it was announced in 2018. However, due to a spike in input costs, the project is now set to cost $733 million, and officials are considering staggering the construction of the project to offset the increase in costs."

That sobering example explains why GlobalData has cut its North American growth forecast from 4.5% down to 2.4% for 2022. Still, it remains bullish toward 2023.

"The outlook for North America will improve, as inflationary pressures and supply-chain disruptions will likely subside and federal spending from the IIJA (Infrastructure Investment and Jobs Act) will likely be realized in late 2022 and early 2023," added Riddleston. "As a result, GlobalData expects the North American construction sector to grow by 3.7% in 2023."

If that happens, of course, the "inevitable" recession will have been pushed off for yet another year. HPAC

## Construction Confidence Index

| Response | June 2022 | May 2022 | June 2021 |
|---|---|---|---|
| ***CCI Reading*** | | | |
| Sales | 58.3 | 60.9 | 65.7 |
| Profit Margins | 49.4 | 50.0 | 56.3 |
| Staffing | 59.6 | 62.8 | 63.5 |
| Sales Expectations | | | |
| Up Big | 10.4% | 9.3% | 11.2% |
| Up Small | 43.0% | 47.5% | 55.8% |
| No Change | 20.4% | 21.9% | 20.0% |
| Down Small | 21.7% | 20.2% | 10.8% |
| Down Big | 4.5% | 1.1% | 2.3% |
| ***Profit Margin Expectations*** | | | |
| Up Big | 3.2% | 3.3% | 5.8% |
| Up Small | 32.6% | 33.3% | 41.9% |
| No Change | 29.0% | 29.0% | 26.9% |
| Down Small | 29.4% | 29.0% | 22.3% |
| Down Big | 5.9% | 5.5% | 3.1% |
| ***Staffing Level Expectations*** | | | |
| Up Big | 6.8% | 4.4% | 7.7% |
| Up Small | 40.7% | 53.0% | 50.0% |
| No Change | 38.0% | 32.8% | 32.7% |
| Down Small | 13.1% | 9.3% | 7.7% |
| Down Big | 1.4% | 0.5% | 1.9% |

*Source: Associated Builders and Contractors, Construction Confidence Index*

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# Four Technologies Building Momentum for Wider Use

*The director of Oracle's new construction innovation incubator offers an informed preview of the digital jobsite improvements he sees on the horizon.*

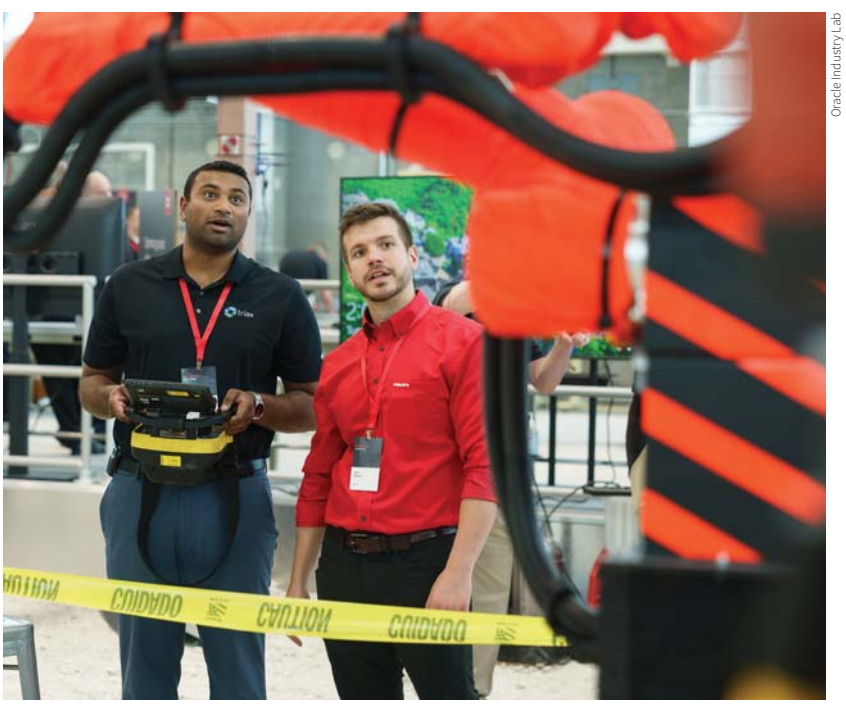
By BURCIN KAPLANOGLU, Vice President, Innovation, Oracle Industry Lab

There has never been more pressure for the construction and engineering industry to continue its digitization efforts as it now confronts the continued disruptions of COVID-19, shifting project types, increased competition, and a retiring labor force.

These many challenges have the industry rethinking every aspect of project delivery models and the vital role technology can play to improve outcomes while driving down risk and costs.

Owners and contractors we meet are continually looking for any advantage possible when determining the latest and greatest technologies for their projects. They would like to be able to research and test new technologies prior to purchasing the solutions that they hope will become the foundation for their future successful projects.

With that in mind, Oracle this spring opened the doors to the 30,000-sq-ft Oracle Industry Lab near Chicago. The new working Lab, now one of three such facilities Oracle operates globally, gives industry customers a hands-on environment to develop new ideas and utilize modern technologies as they become availble from Oracle and from more than 30 of our industry partners.




Oracle Industry Lab

***The Lab recently tested Hilti's Jaibot, a robot that can drill holes in concrete while also collecting and analyzing related data.***

One of those industry partners is VREX, a leading provider of virtual reality (VR) collaboration software for the construction industry. Together, we have integrated VREX into the Oracle Smart Construction Platform,

*Burcin Kaplanoglu is Vice President of Innovation at the Oracle Industry Lab in Deerfield IL, outside Chicago. He also serves as an adjunct professor at Northwestern University and chairs an advisory committee to the A.I. in Construction Institute at the Grainger College of Engineering, University of Illinois, Urbana-Champaign. Kaplanoglu previously spent 15 years with Lendlease, and holds multiple degrees in civil engineering and construction management. He can be reached at burcin.kaplanoglu@oracle.com.*

a secure, cloud-based software that connects owners and contractors so they can more easily work together to improve decision-making at every level of their organizations.

For example, teams can use Oculus VR headsets to virtually collaborate inside a 3D model or point cloud to identify potential issues in an HVAC installation or other systems. Since delays and mistakes in a construction project are often due to unclear communication between individuals, this integration can give anyone who needs to make an informed opinion the first-hand experience of project models on a platform shared by the team.

Additionally, we also recently worked with Hilti's Jaibot, a robotic solution designed to take on the tedious and sometimes unsafe task of drilling holes in concrete while also collecting and communicating valuable data as it progresses. The solution's semi-automated drilling technology helps work teams be more productive to more precisely and safely install the hangars needed to suspend HVAC ducts and other conduits. Using

Oracle Industry Lab

*Oculus VR headsets allow teams to virtually collaborate inside a 3D model or point cloud, where they can identify potential issues in the building systems.*

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Oracle Industry Lab

*Just opened this spring in Deerfield IL, the new facility is now one of three in the world operated by Oracle.*

digital plans, the Jaibot can mark and drill holes, relieving site workers from the arduous task of overhead drilling.

With the Chicago area Lab now open, our focus is on working with customers and partners to assess new technologies, and together, we are thinking about the future of construction innovation this year and beyond. Here are four technologies we think will lead the pack:

## 5G Will Truly Connect the Worksite

Greater mobility and the advancements in connectivity brought about by 5G will further accentuate the industry's ability to utilize insights provided through common data environments (CDE), the sensorization of jobsites and materials, augmented reality (AR), artificial intelligence (AI), and machine learning (ML).

These technologies will provide greater connectivity, capacity, and democratization of technology.

Eventually, work sites could be able to "sensorize" virtually everything on a job site, enabling companies to collect data from tools and materials. For example, workers could put sensors in concrete to assess curing time. Capturing such crucial information from IoT sensors can make 5G a crucial component of any time-sensitive project.

Additionally, 5G will further heighten the focus on visualization and enable experts to provide real-time guidance to new technicians connected via headsets, glasses, or other visualization technologies.

As 5G becomes more accessible, it could also open up new capabilities for monitoring, laser scanning, BIM modeling, and much more.

## 'Construction Moneyball' Will Be a Hit

Construction industry executives and operators are now realizing they must standardize, digitalize, and automate their processes to differentiate themselves in the market. So, we expect organizations to start taking a '*Construction Moneyball*' approach where they will analyze everything meaningful that can possibly be measured.

After determining the data or metrics they need to capture and monitor, organizations would be able to standardize, digitalize, and automate their processes to measure and analyze this data in real-time. The results may be surprising in revealing what really holds the keys to success. Recall for the Oakland A's in *Moneyball*, the data surprisingly showed the risks of bunting and stealing didn't always add up to the reward of producing a run. For construction firms, similarly, maybe one overlooked aspect of daily operations could be the linchpin factor that routinely throws off an entire project.

With standardized business processes, constantly pulling and analyzing data, firms will be able to drive productivity and efficiencies to better compete, to differentiate themselves, and to stay ahead. Quick data intelligence can also help identify and resolve data security issues faster. **This alone could become a growing competitive advantage in the coming years as customers will want reassurance that their data will be kept safe.**

## Intelligent Platforms Will Transform Everything

As noted, engineering and construction organizations will look to improve how data is managed – and how it is used to inform decision-making. With hundreds of decisions all happening at once on a project, organizations will utilize construction technology platforms to better keep everyone synchronized, and to provide the project team the visibility, tracking, and reporting it needs to stay on track.

As contractors and engineers increasingly move towards more digital

workflows, a new breed of **intelligent** technology platforms, powered by an AI and ML "data backbone," will emerge. These platforms could help organizations liberate their data and convert it into the intelligence needed to accelerate performance.

They may also provide highly secure information management, reporting, and workflow automation to drive efficiency, visibility, and control across project processes. These cloud-based intelligent construction platforms would support a new era of construction performance needed to compete in an increasingly competitive market.

## Predictive AI Will Be the Future of Planning

To date, business intelligence technologies have generally provided only a backward-looking view into project data, i.e., what has *already* happened on projects. While these insights are valuable, organizations will soon look to construction technology platforms that utilize AI to predict what is **likely to happen** throughout the construction process. This will improve chances for delivering projects that are both on time and on budget.

New developments in AI already have unlocked another level of project intelligence, enabling **predictive** insights to drive better decision-making and improve project outcomes. Taken together, they can yield a dynamic view into such variables as:

- Factors that might delay a project;
- Probability of delay on a project;
- Amount of predicted delay;
- Likelihood (and severity) of a cost overrun;
- Hidden risks around safety, design, rework, litigation, etc.

So, AI will help organizations to succeed in the present, by learning from the past, to improve the future. It will yield predictive insights that add value to nearly every aspect of construction project management, including critical areas such as schedule, cost/budget, quality, safety, risk, and collaboration.

Of course, all these technologies and use cases driving safety, productivity, and quality will need to be tested before being deployed in the field. We created Oracle Industry Lab as a test bed specifically for this purpose. The Lab allows Oracle, customers, partners and their ecosystem, to explore, test, validate new technologies, improve processes, and enhance the skills of the future workforce.

And the results will help to accelerate and to fine-tune the myriad changes that are transforming our industry, both sooner and for the better. HPAC

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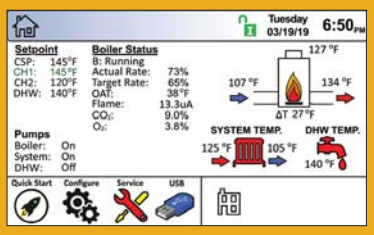


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# Refrigerant Standards Update, with ICC's Jim Cika

*Big code changes on A2L refrigerants are fast-approaching. Will you be ready? An expert from the International Code Council fills us in on what you need to know.*


This summer, as record heat once again drives many indoors, our podcast topic appropriately enough is refrigerants. Indeed, much is happening in that area, so *HPAC Engineering* reached out to **Jim Cika**, director of PMG technical resources for the International Code Council (ICC).

There, Cika serves as a subject matter expert on plumbing, mechanical, fuel, gas and swimming pool and spa codes. He represents ICC in federal and state coalitions, task forces, committees, and councils where expertise in I-Code subjects is needed.

With more than 20 years of industry experience in manufacturing and construction, including time as an HVAC design engineer, Cika holds a mechanical engineering degree from the Georgia Institute of Technology. Here, he previews major code changes upcoming on A2L refrigerants that will impact our industry much sooner than many may realize. So soon, in fact, that ongoing global supply chain delays had best be figured in to building managers' decision-making, he says.

*What follows is an edited transcript of our recent podcast:*

***HPAC: Mr. Cika, thanks so much for joining us on HPAC On The Air. There seems to be quite a bit going on with the International Code Council this year. Before we get to some specifics, can you first describe your role with ICC and your background a bit?***

**Jim Cika:** Thank you for this opportunity. I have been in this role as director of PMG technical resources for more than five years now. I do have a mechanical engineering degree from Georgia Tech, and I did start my career as an HVAC design consultant. But from there, I shifted my focus to appliance manufacturing, where over a period of about 20 years, I served as a chief engineer responsible for regulatory and product standards, building codes and product engineering matters for manufacturers of water heating and space heating appliances.

As many of your readers may know, the energy efficiency of products from those sectors is regulated from the U.S. Dept. of Energy. What they may *not* know is that the U.S. Environmental Protection Agency (EPA) regulates many of the materials and chemicals, including refrigerants, used in the manufacturing of those products.

So, I have spent a lot of time and energy over the last 20 years helping the companies that I worked with, and their customers, to prepare for and plan for, changes in the federal regulations imposed by these agencies. And many of my experiences from the past are similar to what the HVACR industry is going through today, in regards to refrigerants.

***HPAC: Very good. Let's dive right into some of those specifics on refrigerants. Last year, EPA issued a new rule under the American Innovation and Manufacturing Act of 2020 that will mandate an 85% phasedown in HFC refrigerants over the next 15 years. Already, more sustainable A2L refrigerants are starting to be ushered in to take their place and codes are being changed accordingly. You wrote on this subject for ICC earlier this year. Can you give us an update on related code change proposals that reflect those new refrigerant standards?***

**Cika:** Sure thing. Before I get into the code changes, though, let's first look at the EPA regulations. Back in the 1990s, EPA initiated the phaseout of the CFC and HCFC refrigerants, due to the breakdown of the ozone layer. So,

CFCs and HCFCs were replaced with hydrofluorocarbon refrigerants, or the HFCs that we're currently using. Those have an ozone-depletion potential of zero, and at the time, they were a good fit to fill the void left by the elimination of the CFCs and HCFCs. However, they are also potent greenhouse gases with a medium-to-high global warming potential (GWP), which can cause long-term harm to the environment.

This brings us to the EPA's latest rules, which as you noted, will mandate that 85% phasedown in both the production and the consumption of HFC refrigerants over the next 15 years. Now, just as the HFCs filled the void left by the phasedown of the CFCs and HCFCs, the latest rule has ramped up acceptance of the other class of refrigerants to fill the new void.

Last year, EPA adopted a final rule accepting six refrigerant alternatives for use in new residential and light commercial air conditioners and heat pumps that meet the requirements in UL 60335-2-40 (Edition 3) for air-conditioning equipment. Each lower GWP alternative — R–32, R–452B, R–454A, R–454B, R–454C and R–457A — is classified by ASHRAE as A2L, for mildly flammable.

A2L refrigerants have lower toxicity and flammability than A2 or A3 refrigerants. A1 refrigerants have no flammability. As of December 2018, more than 68 million air conditioners using A2L refrigerants have been installed around the world and they have been used safely.

However, A2Ls for use in residential and light commercial are new to the U.S. market.

These replacement refrigerants have different flammability characteristics, so safety, training, and in particular, building codes all had to be addressed. The 2021 and earlier versions of the building codes don't allow A2L refrigerants to be used for human comfort, meaning for air-conditioning in homes and businesses. There were concerns about the flammability of those refrigerants and that had impacted their acceptance within the codes.

*Cika advises firms to start planning now.*

On the standards side, however, safety standards for air-conditioning systems, such as ASHRAE 15, UL 484, and others, were all updated and now include coverage for A2L refrigerants. With these standards now in place, and the flammability concerns being resolved through some recent analysis by AHRI (Air-Conditioning, Heating, and Refrigeration Institute) and additional testing performed by Underwriters' Laboratories, the 2024 International Building Codes were recently updated to include A2Ls.

So, changes have been made now to the building, fire and mechanical codes, making them consistent with the ASHRAE, UL, and other standards addressing the A2Ls. So, with these changes, the 2024 IBC, IFC, and IMC all will permit the use of A2L refrigerants for human comfort use, consistent with industry standards. That will help to facilitate the phase-down of HFCs, following the EPA rules.

These changes are extremely important, as the EPA phasedown mandates a 40% reduction in the production of HFCs, beginning in January 2024.

***HPAC: Of course, that is just the end of next year. So with these changes fast-approaching, how can HVACR professionals best prepare for them? What should they be doing to get ready?***

**Cika:** Well, that's a multi-faceted question. Looking first at the key code changes to the 2024 Mechanical Code, the code is going to require "Risk of Fire" labels for A2L piping, due to its flammability. You'll see requirements for building shafts that contain A2L piping, including requirements for continuous ventilation, and requirements for leak detection within the shafts. Looking at the machinery rooms housing A2L refrigerants, they cannot contain flame-producing equipment, or equipment with continuously hot surfaces above 1290°F. Machinery rooms also will require refrigerant detectors that signal an alarm and activate the room's ventilation system, complying with the ASHRAE 15 Standard.

In addition to these, the code also will limit the amount of A2L refrigerant that can be used within an air-conditioning system used for human comfort. Residential systems will have a limited maximum capacity of 6.6 lbs. of refrigerant, and commercial systems will have a limit of up to 22 lbs. of refrigerant.

So, those are the most important changes that need to be addressed. And that can be easily done through the design process, by HVAC engineers, and such. Where things get tricky is when you're planning for the future, because it comes with that EPA 40% phase-down requirement for 2024. So, by January 2024, we have to be 40% lower than where we are. That's only 18 months away!

So, at a minimum, we need to look at adoption of the 2024 codes that do permit the A2L refrigerants for comfort conditioning. Another thing we need to look at is the supply chain for the availability of air-conditioning


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systems that utilize A2L refrigerants. And lastly, we need to look at the contractor network, for installation and for servicing.

But looking at code adoption, right now, the majority of U.S. jurisdictions have adopted the 2012, 2015, 2018, or 2021 codes. But the 2024 codes aren't even available for adoption yet! So, the Code Council right now is working with state and local jurisdictions to get them ready for 2024. With the federal mandate, for this transition to go smoothly, it's going to be absolutely necessary for them to have measures in place to allow the use of A2L refrigerants, beginning in 2024.

***HPAC: Supply chain issues are certainly in the news this year. Please speak a bit more about how that is creating such a squeeze in the refrigerants market.***

**Cika:** When we look at the supply chain and the manufacturers, you have to understand that due to the flammable nature of A2L refrigerants, you can't just convert equipment that uses HFCs to those that use A2Ls. And as with the previous EPA phasedowns going back to the 1990s, much of the refrigerant that is going to be produced at that time (2024) is still going to be needed for maintenance of existing equipment that's already out there in the marketplace. So, what that means is that manufacturers have essentially just one and a half years now to transition their manufacturing process to produce the new equipment that utilizes the A2L refrigerants. And they will also need to fill the supply chain with that product ahead of 2024.

Much of this is already being addressed by AHRI and other groups that represent the manufacturers. So, a lot of work has been done going down that road already. But there is still a lot of concern now about whether or not we're really going to be ready for that transition to take place. Also, what will the implications of that 40% reduction be for those refrigerants that are already in the supply chain. Questions like that.

When we look at the contractors, both the installers as well as the service firms, there's a whole, completely different set of issues to address.

For instance, contractors need to confirm that the tools and instruments they use today are compatible with the A2L refrigerants. Will standard hand tools and wrenches be the same? They'll need to verify that vacuum pumps, leak detectors, and their refrigerant recovery equipment is also going to be compatible. They may find that what they're currently using today may not be suitable come January 1. So, you've got a whole other supply chain issue over whether or not there is going to be enough of that new equipment and tools out there, come 2024.

They're also going to need to review and understand the new requirements and procedures related to the handling and use of the A2Ls. So there's a whole other set of requirements for them to know. There's a lot to look at and I know AHRI is doing a lot of work on trying to get training out there. At the Code Council, we're also looking to develop some training to help folks prepare for that, too.

***HPAC: You had mentioned before that there would be benefits to being an early adopter of the new code. But if it is technically not yet even available, then how can firms get out ahead of this if they want to be early?***

**Cika:** Well, that's kind of the conundrum that we're in. Because of the regulation that is in place at the federal level, it is incumbent upon us to work with our membership and local jurisdictions to make sure that there is something in place, so that we are not a hurdle. Codes can't be a hurdle to that requirement. It's going to have to happen, so we need to find a way to do that. But we're at the very early stages of this. We just finalized the 2024 Code, so now we are going to go back and look at jurisdictions that might be on, say, the 2012 Code. We want to see what would be required for them to amend their existing codes to be in compliance with the new 2024 Code.

Looking at the benefits of being an early adopter? Well, here, when it comes to manufacturers, contractors and distributors, I would say that for them, their biggest benefit is that they're going to survive this transition. And survival is a very important thing to look at here. Come January 2024, you are going to need to have things in place that allow you to continue to do business as usual. Unlike with the previous phase-out, this does require new equipment. Wholesale distributors have to look at new storage requirements.

And because of the flammability of the A2Ls, the requirements are different from what they were for non-flammables. Before, they could carry an unlimited supply in their warehouse. Now it's limited by code how much can be in a certain room, etc. So they have to take these things into consideration... and planning needs to start now.

***HPAC: Since time is of the essence, where can our readers go to find out more information about what they need to do and by when, regarding these new refrigerants?***

**Cika:** Well, on the code side of things, I would go to *www.iccsafe.org/pmg/* and look for our related resources on this subject that we will be posting. We have four other PMG directors, like myself, who all cover different regions of the country, and we are all accessible through that website. So, your readers should feel free to contact us if they have any questions. HPAC

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FEATURE

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# Moving Hospitals Toward Energy Savings *and* Environmental Stewardship

*The quickest, most cost-effective way for healthcare facilities to cut emissions is to improve energy-efficiency. Here are some expert tips on how to get started.*

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

It is well understood that hospitals are one of the top energy users in the building industry. So all eyes are watching the healthcare industry now to see how it will position itself to be a better environmental steward through improved sustainability.

All over the world, hospitals face the daunting challenge to implement energy practices that will contribute to reducing their carbon footprint and its societal impact from greenhouse gas (GHG) emissions. While decarbonizing the existing building stock is critical to meeting carbon-reduction goals, for the foreseeable future non-renewable energy sources will still be required. Therefore, a cost-effective solution for hospitals to immediately cut emissions is to improve upon their energy-efficiency.

This article will suggest some initial steps for hospital and healthcare facilities to consider as they work towards accomplishing this lofty goal while also keeping their organization viable and profitable in today's fast-evolving world.

## Benchmarking Performance

When looking to improve a hospital's energy footprint, one of the most important things that must be understood is how well (or how

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poorly) the building is performing. Benchmarking can help answer this question and is the process of comparing a building's energy performance to something similar, such as the like performance of the building at the same time last year, or the like performance compared to similar facilities (peer buildings) elsewhere.

The starting place for any serious energy-reduction initiative is with an understanding of the hospital's Energy Utilization Index or EUI. The EUI is defined as the total amount of energy used by a building (electricity, natural gas, and other fuels) per square foot of floor area (annually) and is used to establish the facility's baseline energy use.

"Source EUI" is the total amount of raw fuel that is consumed in the operation of a building. It considers all transmission, delivery, and production losses and provides a more comprehensive assessment of the environmental (or resource) effects of a building. "Site EUI" is the amount of energy consumed by a building as reflected in its utility bills. This may be more important to a building owner as it represents the actual energy purchased and provides a baseline in determining how much this energy use may change over time.

Site EUI is a relatively straightforward calculation and requires identification of the energy used in the facility by adding up all the units of energy (in this case, British Thermal Units, or Btu's) purchased. The yearly consumption of gas and electricity may be found by aggregating the values for each, listed on those monthly utility bills. Natural gas can be converted to Btu's by multiplying the number of therms purchased x 100,000 Btu/therm. Likewise, kWh of electricity is converted to Btu's by multiplying kWh's purchased x 3412 Btu/kWh.

With information like this, a building's site EUI can be considered similar to a car's "miles per gallon" (mpg) rating, used to label the efficiency or economy of an automobile when compared to another. It allows one to relate total yearly gas and electricity use to

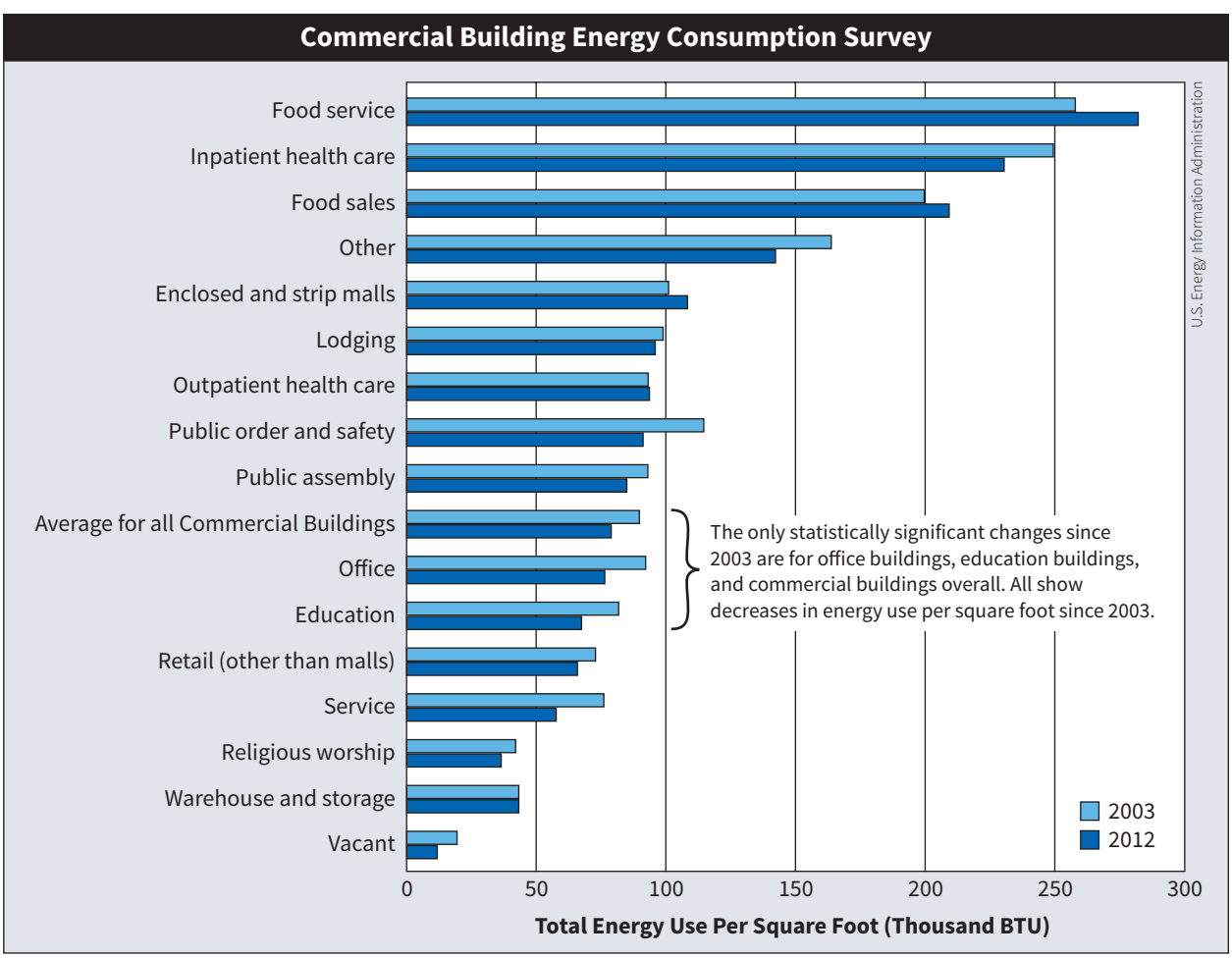


*Figure 1. Some typical source and site EUI's for various building types, as listed in the Commercial Building Energy Consumption Survey (CBECS), reported by the U.S. Energy Information Administration (EIA). These represent national building median energy use, in kBtu/sqft-yr.*

**Typical Large Hospital Energy Use Profiles — by Process**

**Electrical Energy Consumption by Process**

| Hospital Process | Percentage of Total | Ranking Total |
|---|---|---|
| Lighting | 14% | 4 |
| Misc. Electrical | 15% | 3 |
| Outdoor Air Cooling | 5% | 7 |
| Space Cooling | 17% | 2 |
| Fan Heat Losses | 5% | 7 |
| Cooling Tower/Cond. Pumps | 9% | 5 |
| CW & HW Pumps | 6% | 6 |
| Ventilation Fans | 24% | 1 |
| Heating Auxiliaries | 5% | 7 |
| 500,000-sq-ft hospital x $2.84/sq-ft-yr electric = **$1,420,000**/yr. utility cost | | |

**Gas Energy Consumption by Process**

| Hospital Process | Percentage of Total | Ranking Total |
|---|---|---|
| Outdoor Air Heating | 7% | 3 |
| Reheat | 65% | 1 |
| Space Heating | 15% | 2 |
| DHW Heating | 3% | 5 |
| Dietary/Sterilizers | 5% | 4 |
| Distribution Losses | 5% | 4 |
| 500,000-sq-ft hospital x $0.94/ sq-ft-yr natural gas = **$470,000**/yr. utility cost | | |

*Note: Typical hospital energy usage profile, by site energy source, for South Central United States. ASHRAE HVAC Design for Hospital and Clinics, 2003.*

***Figure 2. Hospital energy usage profiles.***

industry standards, which can help in recognizing if the facility is 'on' or 'off' the energy mark when compared to others. In addition, once target areas of excess energy consumption are identified, it provides a useful tool in helping assess potential energy and utility cost savings based on estimates of improving efficiency resulting from proposed energy reduction measures.

Food service, inpatient healthcare (hospitals), and food sales buildings are the most intensive users of total energy among the building types. Hospital HVAC energy use is high because of around-the-clock demand for all end users and because of a wide variety of specialized, energy-intensive equipment, such as medical imaging equipment. Large, single-source energy consumers include reheat, which alone may account for 40% or more of a hospital's natural gas consumption, while ventilation fans can consume up to 25% of its total electrical use.

New hospitals can reduce energy consumption from the onset of design with a comprehensive approach that includes maximizing the building envelope, utilizing heat recovery systems, optimizing space usage, and implementing renewable energy sources. But what about legacy hospitals that struggle to overcome operational issues resulting from buildings in need of updating and equipment which may have been poorly kept or is nearing the end of its service life?

While there are many ways to improve upon the efficiency and sustainability of any HVAC system, here are two relatively straightforward and effective options:

## Improve Chiller Plant Delta-T

Within an HVAC system, chilled plants may typically be the largest hospital energy users and have the highest first cost, so optimizing their operation makes good overall financial sense.

Chiller central plant systems are designed with a (building side) supply and return water temperature difference, also called delta-T (ΔT). This specified chilled water (CW) temperature rise is what drives the thermal heat transfer between the water circulated through piping, and the room terminal units or air handling unit (AHU) coils that provide air conditioning for the building.

Design water Δ-Ts can range from 10°F to 20°F or more. But regardless, once the system is designed and the chiller is selected and manufactured for its specified ΔT, if anything less is delivered in operation (low ΔT), it can result in reduced performance (capacity) that may lead to inadequate temperature control such as a space that is too hot, too humid, or both. Many times facility managers may incorrectly assume their central plant is lacking capacity and might consider the purchase of an additional chiller. But, in fact, the plant is not performing at design capacity due to what has been labeled in the industry as "low ΔT syndrome", as described above.

A simple example would be a chilled-water plant designed with two 1000-ton chillers sized to manage a peak building load of 2000 tons. With this design, both chillers would run to meet full load requirements.

Assuming these chillers are selected for 42°F supply/52°F return water (10°F ΔT), then each chiller should be capable of producing 1000 tons when processing the full CW design ΔT at design flow. If the building load is reduced to 50% and the CW system can maintain the 10°F ΔT with reduced flow (assuming pump VFDs), then one

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chiller could be run at 1000 tons (100% capacity) while the other chiller, along with any ancillary devices, could be shut off. This sequence can help optimize the energy efficiency of the HVAC systems design.

On the other hand, if the CW system is capable of merely producing a 5°F ΔT, then each chiller would produce only 50% of its full load capability, or 500 tons (see below). In this example, both chillers (along with its associated chilled and condenser water pumps and cooling tower) would need to run to meet the 1000-ton (50%) building load. You can easily comprehend the inefficiencies and other issues that arise with a CW plant running in this condition, including lack of cooling capacity, chiller sequencing complexity and excess energy consumption.

There are various reasons low ΔT can occur, and its influence is notoriously present in large campus-type CW systems. The cause and effect of this problem occurs anytime there is an unwarranted reduction in a terminal unit or cooling coils thermal heat transfer performance, or the ability of the system to "wring-out" all the Btu's the chilled water has to offer. This can result in system controls (and often, building engineers) compensating for a loss in HVAC system capacity by speeding up fans, lowering chilled water temperatures and increasing chilled water flow, all at the expense of reduced system capacity and increased energy use. When heat transfer devices can be restored to their design operating performance, some of these energy inefficiencies may be reversed or avoided.

One of the most effective ways to help correct chiller low ΔT syndrome is to improve the transfer of Btu's through terminal units or AHU coils. Some possible items to look at in helping to diagnose this problem within your CW central plant should include:

**Chiller Plant Low Delta-T (ΔT)**

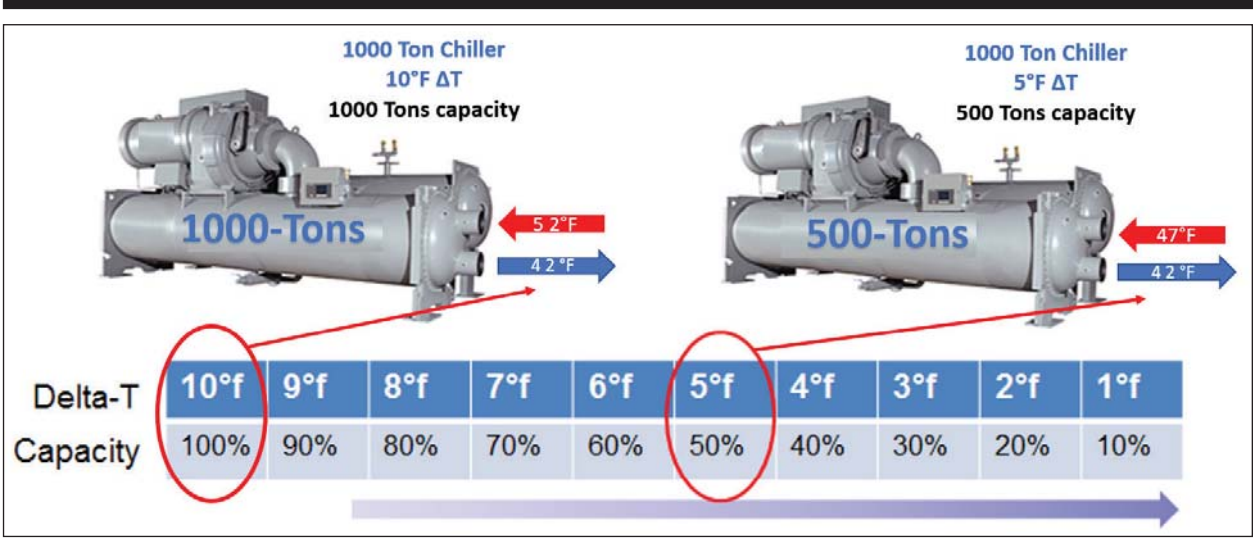


*Figure 3. A 1000-ton chiller designed for a 10°F ΔT but experiencing a 5°FΔT will run at 50% capacity, producing only 500-tons.*

## Needlepoint Bipolar Ionization

*Figure 4. Needlepoint Bipolar Ionization installed on upstream side of cooling coil to reduce microbial growth*

- What is the "operating" CW ΔT, and is it on target with the original design?
- Are you pumping the proper CW system flows (gpm)?
- Are space temperature set-points too low? If yes, are fully open CW valves incapable of satisfying the space temperature set point?
- Are space and system temperature sensors properly installed and calibrated?
- Do your AHUs have dirty filters?
- Are your AHU cooling coils dirty?
- Are your AHU cooling coils improperly piped?
- Are space terminal units fouled and dirty?
- Is there air in the piping system?
- Does your CW system include 3-way control valves?
- Are you using pressure-independent control valves (PICV) at terminal units and coils? *(If not, you should be).*

### Keeping Coils Free of Microbial Growth

As described earlier, a reduction in a cooling coil's thermal performance can occur when its surface accumulates anything that insulates heat transfer, such as bacteria, mold, and biofilm.

One recognized method to help remove accumulated bio-growth from cooling coils is with steam or chemical cleaning treatment, a physical process that may be both interruptive (system downtime) and labor-intensive. While effective if done correctly, it must be repeated on a regular basis (typically annually) as bio-contaminants can proliferate again shortly after treatment.

Beyond physical cleaning methods, proven technologies may be employed that can work around the clock to help effectively keep coil surfaces continuously clean, without disruption. Two technologies, in particular, Ultraviolet Disinfection (UV-C) lamps and Needlepoint Bipolar Ionization (NPBI), both have a long history of satisfactory results. While both actually consume electricity, they can help return coil pressure drop and heat transfer efficiency to original design conditions, providing documented AHU operational cost savings and energy reductions of between 10% and 25%.

An added advantage beyond energy savings alone also comes from providing a higher quality of delivered air to the occupied environment, contributing significantly to better overall indoor air quality (IAQ) and a healthier hospital for patients and staff.

Dependent on the type of source energy being used by the hospital, it will typically have an associated release of greenhouse gas emissions tied to its production and delivery. By improving their facilities' site EUI, through energy saving measures such as those described above, healthcare organizations can take advantage of both utility cost savings, as well as reductions in GHG emissions reflected through lowering consumption of the source energy, itself.

Of course, any new sustainability plan should start with an assessment of the facility's energy needs, its consumption, and areas of potential waste. Then, you can look at implementing cost-effective energy management measures that can help reduce all three. HPAC

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# Summer Meeting Delivers Great Content, High Energy

*Gathering in sunny Florida, ABMA members were treated to a full slate of informative business sessions, motivating speakers, and a slew of engaging diversions.*

By SCOTT LYNCH, President & CEO, ABMA

From June 24-27, ABMA and its members convened for the 2022 Summer Meeting at The Ritz-Carlton-Amelia Island in Fernandina Beach, FL. Based on the initial feedback, the meeting was a big success and offered attendees an experience that far outweighed the investment.

The meeting officially kicked off on Friday, June 24, with the Associates' Group Meeting presentation, "*Business Insurance for Boiler Manufacturers, What You Don't Know CAN Hurt You,*" by **Colin Donovan** and **John Kerr** of STICO Mutual. This was followed by a Welcome Reception, sponsored by the National Board of Boiler & Pressure Vessel Inspectors (NBBI).

Saturday morning started with a Member Breakfast sponsored by Power Flame and a presentation from the Rental Group featuring **Robert Sutton** from BNSF Logistics about supply chain challenges, solutions, and trends. The next session was the Professional Development Workshop sponsored by Warren Environment. **Megan Patton** from Mastering Midsized conducted the presentation about how the best companies recruit top talent.

The final Saturday presentation was for the Alternative Energy Group, *"Repurposing Wastewater for Usable Steam,"* presented by **Ron Swanson** with Sustainable H2O Technologies, followed by the Group Lunch, sponsored by Superior Boiler. The members enjoyed eating lunch together while networking.

ABMA

Saturday ended on the Oceanfront Lawn with lots of fun and playful competition during our 2nd Annual Cornhole Tournament & Social, sponsored by Frederick Cowan Products by ICI. The winner of the Cornhole Tournament was Team *"Don't Mess With Texas!"* Congratulations to the Shippy's on their big win.

Sunday morning kicked off with the Spouse Breakfast & Sea Glass Art Activity, sponsored by Preferred Utilities Mfg. Corporation. The spouses and guests had a fun time coming together, visiting, and making a sea turtle art project out of sea glass in the Courtyard.

ABMA member attendees enjoyed their own breakfast Sunday morning sponsored by Webster Combustion, followed by a presentation from the International Group, *"Doing Business in China - Significant Opportunities and Navigating Challenges for Success"* by **Manny Menendez** from ClearSign Technologies.

The day continued with an Industrial Group Meeting presentation by **Bob Bessette**, former CIBO President discussing the future of steam and thermal energy. The Sunday sessions ended with the Controls and Instrumentation Group (pictured above), presenting on *"Efficiency Improvements, Technologies & Their Effect on Decarbonization: A Panel Discussion."* Panelists included: **Bill Gurski**, Zeeco; **Jason Howard**, Power Flame; **Jamie Tighe**, E-Tech; **Dave Reinink**, Johnston Boiler; **Jesse Coffee**, Oilon; **Rich Simons**, Laars Heating; and **Jeremy Zellmer**, Industrial Steam.

The attendees had a magical Sunday evening watching magic tricks by Chris Herrick Magic while networking and enjoying delicious desserts with

friends. Thank you to Industrial Steam for sponsoring Sunday's Dessert Social and Magic Show.

Our final day of the Summer Meeting began with the Monday General Session Breakfast, sponsored by Umicore Catalyst USA, followed by the Closing General Session, sponsored by RENTECH. The session consisted of a virtual economic Q&A with **Connor Lokar** from ITR Economics and myself, and concluded with a motivating and high-energy presentation by **Dana Cavalea**, former performance coach for MLB's New York Yankees, on *"How to Build a Championship Team,"* to close out our Summer Meeting sessions.

During the General Session, ABMA presented Distinguished Service Awards (DSA) to **John Viskup** from Victory Energy, and **Earle Pfefferkorn** from Cleaver-Brooks, for their hard work and dedication to the boiler industry.

**Gene Tompkins**, ABMA's Technical Consultant and **Shaunica Jayson**, ABMA's Marketing Director, were recognized during the General Session for their service to ABMA. Tompkins will be retiring at the end of 2022 and was recognized for his service and dedication to ABMA and the boiler industry. Jayson was recognized for her 5 years of service to ABMA.

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*Mark your calendar for the 2023 Annual Meeting, which takes place January 13-16 at the Park Hyatt Aviara Resort in Carlsbad, CA. More details on this event will be posted in the coming months and registration will open by September. We look forward to seeing you in California!* HPAC

# Supply Chain Resource: ABMA Launches Boiler Efficiency Calculator

*New screening tool aims to reduce boiler operating costs and boost equipment longevity.*

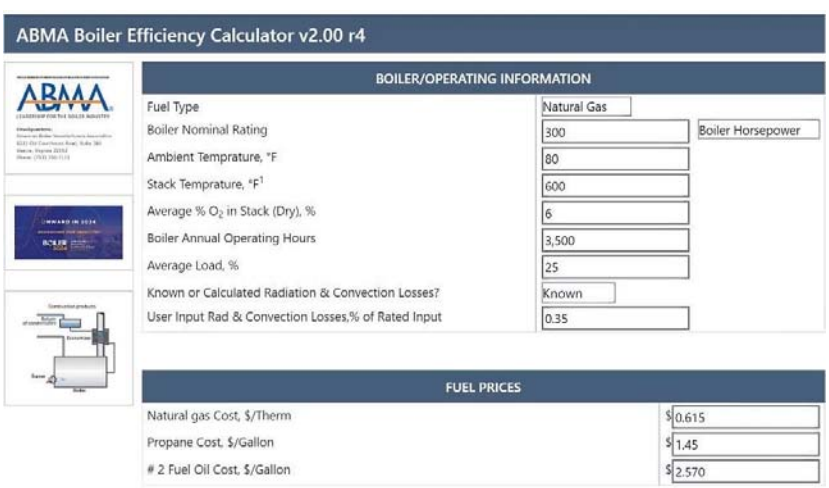
By TYLER VOLLMER, ABMA

The American Boiler Manufacturers Association has launched a *Boiler Efficiency Calculator*, created in partnership with ABMA's Technical Committee and led by Technical Consultant **Mike Valentino**.

The calculator assists boiler users and the boiler supply chain to better understand current operating costs and how changes in the boiler room can maximize safety, increase production, and reduce fuel and overall costs of operation. Utilizing this screening tool can lead to a reduction in boiler operating costs and boost equipment longevity.

While there are default settings, many of the fields offer the end user the opportunity to enter real data from their boiler room. Gathering a little information can go a long way to understanding if you are getting the most out of your boiler room.

This calculator measures average load, excess air, radiation & convection losses, boiler efficiency, annual operating costs and more.




For example, you can calculate the impact of reducing excess air and see how it affects fuel costs and carbon dioxide emitted. A similar calculation can be done for reducing stack temperature, increasing excess oxygen, wind speed and room temperature.

The tool also includes a calculation that shows the decrease in fuel costs and reduction in carbon dioxide for changing from oil to propane and oil to natural gas. The results from this tool may support investments with minimal payback time, and all scenarios can be downloaded as PDF documents.

To access *ABMA's Boiler Efficiency Calculator*, visit www.abma.com/boiler-efficiency-calculator.

*If you have any questions regarding the Efficiency Calculator or any of ABMA's other products or services, please contact Tyler Vollmer at tyler@abma.com.* HPAC

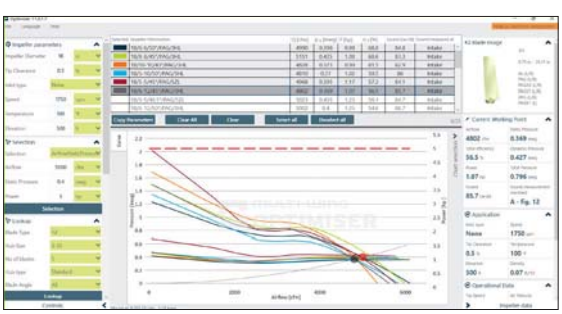
## Metasys 12.0 BAS with Enhanced Security

Johnson Controls launches its Metasys 12.0 building automation system; it integrates HVAC and non-HVAC systems into one platform for maximum operator efficiency. The 12.0 release is designed for fast troubleshooting in the field, to maintain the latest IT security and networking standards, and to reduce installation time and costs. It improves system security by following the new BACnet Secure Connect interoperability standard for current IT security protocols, helping to further secure communications among Metasys IP components. Featuring an expanded line of next-generation equipment controllers with onboard displays and keypads, including a new remote-mountable display assembly.
***Johnson Controls***


## System Designer by Systemwize

Bell & Gossett introduces System Designer for the Systemwize hydronic product selection software. Users answer four questions online in the Systemwize interface and, within minutes, System Designer generates a complete hydronic system design, including all supporting documentation and details, making quoting jobs faster and easier than ever. Advanced features include saving project schedules, generating submittals and sharing submittals with a Bell & Gossett manufacturer's representative in the user's area.
***Bell & Gossett***

## OPTIMISER 11 Fan Specification App



Multi-Wing America introduces its OPTIMISER 11 fan specification app, an easy-to-use resource for original equipment engineers to specify the most efficient fan for their application. It is ideal for specifying fans in HVACR and features an intuitive interface that more efficiently accesses essential fan curve data, such as horsepower and sound information for select static pressure and cubic feet per minute (cfm) data. Users have more flexibility to modify their dashboard, including data preferences and color selection for customized visual display of fan performance curves.
***Multi-Wing America***

## Expanded Si-Series Acoustic Imaging Cameras

The expanded Si-Series acoustic imaging cameras from Teledyne Flir now includes a set of sound imaging cameras featuring a wider acoustic detection range, up to 65Khz, and an integrated battery with a quick-start power button to make condition monitoring and inspection more efficient and effective. The redesigned Si124, Si124-PD for partial discharge inspection and the Si124-LD for air leak detection can detect sounds in the expanded 36 kHz to 65Khz frequency range, providing professionals the ability to detect very small leaks and discharge at short distances. The industrial acoustic imaging cameras sense, display and record sound waves by producing a precise acoustic image derived from the 124-microphone array.
***Teledyne Flir***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## T2+ MAX Hard Hat

The T2+ MAX hard hat from WaveCel is lined with its collapsible spatial cellular structure—shell, crown and sides—to provide 360 degrees of protection and better absorb energy from a head impact from all angles. The network of hundreds of interconnected shock absorbers attenuate impacts through three principal mechanisms: Cells crumple to absorb linear forces, and flex and glide to attenuate rotational forces. It has top and rear vents, accessory rails as well as standard earmuff slots. Its low profile results in less head bumping when working in tight spaces. Due to its lower dome, the hard hat is lighter and feels more stable for all-day comfort. It is 93% porous, allowing air to circulate freely through 93% of the dome.

***WaveCel***

## RIB SpecLink Online Specifying Tool

Bradford White announces that RIB SpecLink is available for specifying engineers to explore and connect with the company's wide range of products. It joins a powerful suite of online and digital specifying tools available to professionals that includes RightSpec product sizing tools, Revit and Deltek Specpoint. Users have immediate, 24-7 access to key information to identify the right Bradford White water heater product for new construction, replacement or an update to an existing system.

***Bradford White Water Heaters***



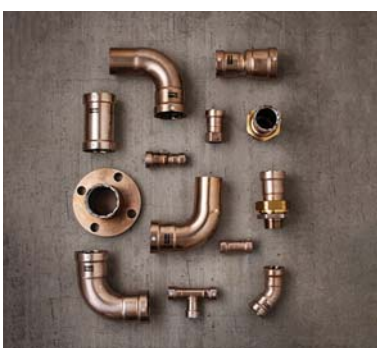
## Tescia Vibration/Acoustics Software

Hottinger Brüel & Kjær launches its latest version of its Tescia software, which is ideal for targeting vibration, acoustics and observing applications. It helps reduce setup time, safeguard test items and improve data quality and test result validation. The Steady Data Analyzer and Interface Protocol enables engineers to gather and correlate steady and dynamic data so that parameters such as temperature, wind and humidity can be mapped and analyzed. A new Acoustic Post Correction license helps optimize test time by automating calibration processes, calculating and applying frequency response corrections for microphones and other accessories.

***Hottinger Brüel & Kjær***

## Type-57P CPVC Butterfly Valve

Asahi/America adds 10-in. and 12-in. in a CPVC body and disc model to its Type-57P butterfly valve line. The valve is now available in ANSI wafer-style connection or with 316 stainless-steel lug inserts. Both options are offered with a Plasgear operator only. Additionally, the Type-57P CPVC can be actuated both electrically and pneumatically, and various manual accessories can be installed. Best suited for chemical processing applications, in facilities such as datacenters, where large diameter CPVC body and disc butterfly valves are needed due to elevated water temperatures.
***Asahi/America***



## MegaPress, ProPress Fittings

Viega's MegaPress CuNi press fittings and ProPress copper fittings are approved for use on U.S. Navy combat ships. Last year, MegaPress CuNi press fittings in sizes 1/2 in. to 2 in. were approved to be used in surface combatant vessels for a variety of systems, including chilled water, potable water, electronic freshwater cooling, seawater cooling, washdown countermeasures, drainage and many others. ProPress copper 1/2-in. fittings were also approved for potable water and various drains. Now, MegaPress CuNi 90-degree elbows, 45-degree elbows, straight tees, reducing tees and reducer couplings have been added. MegaPress CuNi is made of a 90/10 copper nickel alloy specifically designed to withstand harsh marine environments.
***Viega***

## Ability Mobile Connect for Drives

ABB introduces its Ability Mobile Connect for drives, a cloud-based software service accessible through the ABB Drivetune mobile app. It enables ABB Drives partners to easily commission and troubleshoot local drives remotely. It features live chat and end-user-controlled access that can be used to pull backup files, change parameters, capture site and installation images, and send voice and text messages. The service minimizes downtime, delivering efficient and effective support by granting ABB partners instant access to all the data necessary to provide quick and convenient resolutions for online end-user issues — both remotely and in cases requiring an on-site visit.
***ABB***

## Mixing Valves with PEX F1960 Connections

Watts adds cold expansion fitting tailpiece connections (PEX F1960) for the LFMMV and LF1170 mixing valve series. The addition of PEX F1960 union tailpieces allows a wide range of tailpiece options for these point-of-use and point-of-source thermostatic mixing valves, which also includes threaded, sweat, PEX, CPVC, press and push-to-connect options. Connections are available in 1/2-in. and 3/4-in. sizes.
***Watts***

## Press And Pro-Pal Ball Valves

Press and Pro-Pal ball valves from Webstone include press × NPT ball valves with reversible handles, elbows and couplings. Choose between male iron pipe or female iron pipe ends to easily transition from iron to copper, or appliances to system piping. Also available is the press ball valve with bleeder and reversible handle and large Pro-Pal Union Ball (sizes 1 1/4 in. and 1 1/2 in.) in female iron pipe, sweat and press.
***Webstone***

## SchoolMate Ground-Source, Water-Source Heat Pump

Modine's SchoolMate water/ground-source heat pump maximizes energy efficiency, saving schools thousands of dollars annually. It combines the natural heat sink of the earth with the patented CF coil, and requires less HVAC equipment space and reduces operating costs. Available in 24, 30, 36, 42, 48 and 60 nominal MBH. Patented two-row microchannel technology maximizes efficiency and performance. Advanced blower and compressor technologies decrease sound and power output. Modulating EC fan motors allow variable speeds for fluctuating load conditions and energy savings. DX, Hot Gas Reheat and Hot Water/Electric Heat coils fit inside a standard unit. The SchoolMate with STUDY Package increases acoustical performance and achieves the highest standard of noise reduction in the classroom.
***Modine***

## Eversteel Stainless-Steel Commercial Line

The Eversteel stainless-steel commercial line from T&S Brass are lead-free, designed to meet all global certification requirements, and crafted from premium 316L and 304L stainless steel. The pre-rinse units feature a new stainless-steel spray valve, a patented design with high cleaning power and durability. Options are available in several product categories, including manual faucets, pre-rinse units, spray valves, glass fillers and accessories. Compliant with ASME A112.18.1/CSA B125.1, NSF 61 and NSF 372.
***T&S Brass and Bronze Works***

## DH56 Sidewall Sprinklers

Reliable's Model DH56 family of sprinklers are quick-response, extended-coverage sidewall sprinklers for use in light hazard applications. The DH56 (5.6 K Factor) can be combined in the field with the FP or F2 escutcheon to make a recessed sprinkler. It is a horizontal sidewall sprinkler intended for installation in light hazard occupancies in accordance with NFPA 13. These sprinklers are designed to provide fire protection in long and narrow spaces such as hallways, corridors, decks and rooms up to 28 ft. wide and 10 ft. long. They are rated for 250 psi and can be mounted between 4 in. and 12 in. down from the ceiling. Available in a variety of plated and painted finishes.
***Reliable Automatic Sprinkler Co.***

# AD INDEX



## 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. The installer needs to make only a single connection a piece for the water, power, gas, vent, condensate drain and building-recirculation lines.

***Facilities Resource Group***

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# Supreme Court Ruling Aside, Global GHG Efforts Continue

*Despite EPA's new legal setback, negative-emissions technologies (NET) are still gaining ground elsewhere in the broader war on climate change.*

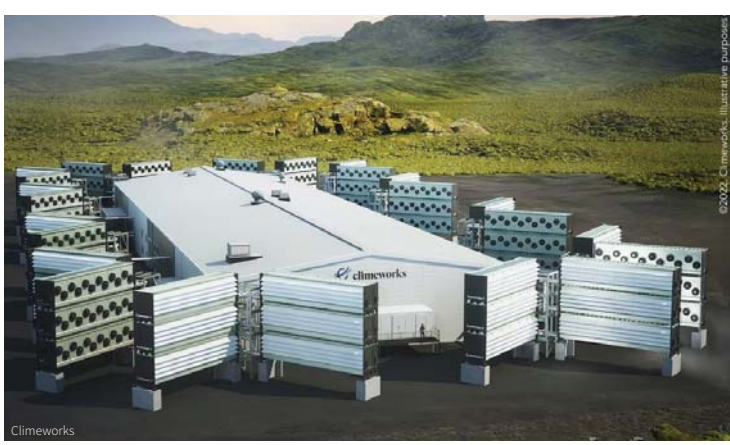
**Larry Clark**

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.

In spite of the Environmental Protection Agency's newly reduced authority after the Supreme Court's controversial June 30 decision — which clearly will impact the U.S.'s ability to meet its greenhouse gas (GHG) emissions goals — the global effort to reduce those emissions is still moving forward.

Case in point is the recent announcement by Zurich-based Climeworks that it has broken ground on its newest and largest direct air capture (DAC) and storage facility. In February 2021, I wrote about negative-emissions technologies (NET) gaining momentum and specifically referenced Climeworks DAC technology, which removes CO2 from the air and stores it permanently underground.

Dubbed *Mammoth*, the newest plant (pictured) is located in Iceland and aims to be operational by 2024. It is Climeworks' 18th project overall and the second commercial DAC plant.



Climeworks

Currently, the world's largest existing DAC plant, with storage developed by Iceland-based Carbfix, was launched just a month after the United Nations' Intergovernmental Panel on Climate Change (IPCC) 2020 report was released. Named *Orca*, that plant had the capability of permanently removing a verifiable 4,000 tons of CO2 per year. For its part, *Mammoth* has been significantly scaled-up in capacity, and when it becomes operational, will remove and store (using Carbix's storage technology) 36,000 tons of CO2 per year.

According to Climeworks, *Mammoth* is the next step in its plan to achieve millions of tons of CO2 capture and storage by 2030, and achieve a gigaton of capacity by 2050. The company recently raised $650 million in capital in order to continue development and implementation of its large, modular, DAC technology on a global scale.

The Climeworks DAC plants use collector containers arranged around a central processing assembly, and can be remotely controlled and operated. All of the energy for *Orca* is provided by a geothermal power plant. Because of their modular design, the collectors for both *Mammoth* and *Orca* can be stacked to increase capacity, and are intended to run entirely on renewable or waste-produced energy. An independent life cycle assessment cited on its website indicates that the "grey emissions are below 10 percent." In other words, for every 100 tons of captured CO2, at least 90 tons are permanently removed.

The collectors operate in two steps:

- First, the collector fans bring in air, allowing the CO2 to be captured on the surface of a highly selective filter material;
- Next, after the filter material is saturated with CO2 , the internal collector temperature is raised to 180-200°F. This causes the concentrated CO2 to be released and permanently stored in the ground.

Of course, Climeworks in not the only company developing DAC technology. It is interesting to note, however, that most of the major DAC developers are located outside of the U.S.

So, it is doubtful that further limiting the EPA's authority to lead U.S. efforts in addressing climate change will now encourage the innovation — and financial investment — here that will be required to reduce our country's own sizeable carbon footprint. HPAC

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