

HIGH-PERFORMANCE HVAC TODAY™

If You Don't Measure, You're Just Guessing!™

2022 Residential Market Forecast

ALSO IN THIS ISSUE:

- **Contractor Spotlight on James A. Wheat & Sons**
- **History and Misconceptions of Draft Converters/Draft Hoods**





Two great brands. One smart system.

The Google Nest Thermostats E + Goodman is a completed branded system that brings together the helpfulness of Google with the year-round comfort of Goodman.

- ✓ Program designed for Goodman® brand dealers
- ✓ Outstanding 5-year limited warranty*
- ✓ Easy installation with every new Goodman system
- ✓ Long-term customer connection through Nest HVAC monitoring



Visit www.goodmanmfg.com/products/controls/goodman-nest to learn more about the Nest Thermostat E + Goodman.

* The full text of Goodman limited warranty on this product may be viewed at www.goodmanmfg.com/products/controls, or may be requested in paper by contacting us at 19001 Kermier Road, Waller, TX 77484.

Our continuing commitment to quality products may mean a change in specifications without notice. © 2022 Goodman Manufacturing Company, L.P.

NOW is the time

to check out NCI's winter training schedule and plan ahead!

Go to

ncilink.com/ClassSchedule

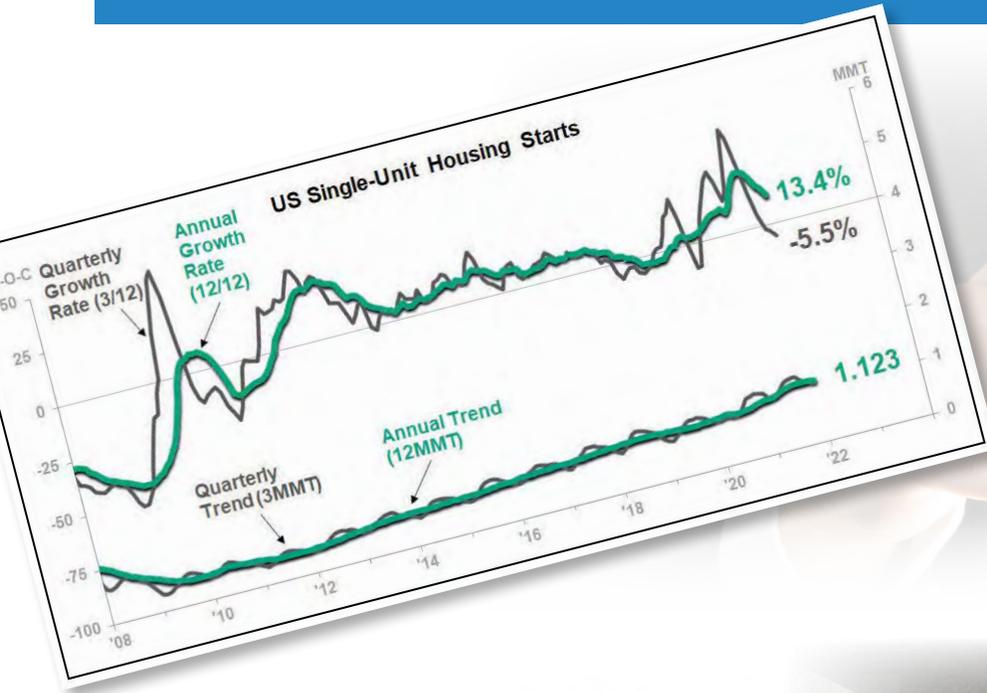
or call **800.633.7058** for a class near you.



Leading the Industry in High-Performance HVAC™



HIGH-PERFORMANCE HVAC TODAY™



10

COVER STORY:

Residential Market Forecast

Economic predictions are for a slowdown in growth. That's not necessarily bad. It is still growth says ITR Economist, Jackie Greene.

13

TECHNICAL:

History and Misconceptions About Draft Diverters and Draft Hoods

These system components are often misapplied because many in our industry don't understand why they were created. NCI's Jim Davis explains.



DEPARTMENTS

Today's Word.....	4
High-Performance Products.....	5
Contractor Spotlight: James A. Wheat & Sons.....	6
NCI Update	16

HVAC Smart Mart.....	17
One More Thing	18
Ad Index.....	19

To Everything, There is a Season ...



Mike Weil is editor-in-chief and director of communications and publications at National Comfort Institute, Inc. Contact him at ncilink.com/ContactMe.

For those who remember the iconic hit song from 1959 by Pete Seeger -- *Turn! Turn! Turn!* -- you may not know that the lyrics date back 2,000 some years! In fact, they are biblical: from Ecclesiastes 3:1-8.

The gist of the song was to attribute seasons to several series of opposing actions: “A time to be born, a time to die; a time to plant, a time to reap...” Some say Seeger saw the words as calling out for a transition from one thing to another.

In the HVAC universe, we are in several transitional “seasons” of our own.

One of them is the phasedown of HFC refrigerants and replacing them with **“lightly flammable” A2L refrigerants**. We are at the early stages of this transition, but there are already some concerns — specifically for contractors.

Since May 2021, the U.S. Environmental Protection Agency (EPA) has approved the use of A2L refrigerants in residential and light commercial air conditioning applications. These chemicals have been in use in window units and PTACs since 2015 and chillers since 2012.

It’s only a matter of time before the A2L refrigerants will replace their HFC cousins in the broader residential HVAC marketplace. With the EPA goal of reducing HFC consumption by 85% over the next 15 years, it’s more important than ever to pay attention to the potential changes facing the HVAC marketplace.

SAFETY FIRST

Yes, A2Ls are somewhat flammable. But according to the EPA and other industry sources, A2L refrigerants don’t ignite easily. They have a slow or lower flame speed and low heat of combustion. Still, contractors and others in the HVAC supply chain will most likely need to wear protective gear when handling these refrigerants, and

they will need training on how to reduce risks associated with them.

Also in the safety category is how contractors transport refrigerants to job sites. Gone are the days of storing refrigerant tanks horizontally on service and installation vehicles.

Because A2Ls are lightly flammable, they must be stored and transported upright. This means costs for retrofitting vehicles to handle tanks properly. Furthermore, the Department of Transportation may require signage on trucks indicating there is flammable compressed gas on board.

SYSTEM PERFORMANCE

Then there is the high-performance HVAC aspect of how A2L refrigerants will be affected by system airflow, static pressure, and more. We may need to look at **potential changes in how we test and measure not only the refrigerant** lines themselves, but all the other factors that impact proper refrigerant charging.

We need to better understand how equipment charged with A2Ls impacts overall system performance (including ductwork).

One more thought: will A2L refrigerants require different test instruments? As NCI’s David Holt says, “With HVAC components becoming more specialized, having the proper tool at hand for a given service has never been more critical.”

Be sure to stay on top of what is happening regarding the HFC phasedown and the move to A2Ls. If you have customers with older equipment running on high GWP refrigerants, such as R-410A, you may want to educate them on upcoming refrigerant options. Being proactive with your business and your customers today can help set you apart from the competition.

This is the season for change. And as Seeger wrote, it’s time to “Turn! Turn! Turn!” 

Written by HVAC Professionals for HVAC Professionals

Wireless Psychrometer

Accurate temperature measurements are a challenging obstacle high-performance contractors face in the field. If you've ever measured temperatures at the air handling equipment and then sprinted to the supply registers and return grilles to gather their temperatures, you know what I'm talking about. The **Fieldpiece JL3RH wireless psychrometer** solves this and other challenges.

This psychrometer includes a nine-inch flexible probe and sliding magnetic mount. These features simplify attaching and positioning the probe assuring accurate readings. It also prevents the frustrating problem of your thermometer falling out of ducts and grilles. The probe measures dry bulb temperatures

up to 250°F and down to -40°F. Other available readings include wet bulb, enthalpy, dew point, and percent of relative humidity. Each probe has a color-coded switch for supply or return readings, so you see the right temperature from the correct location.

To minimize testing time and increase measurement accuracy, you can connect multiple wireless psychrometers at one time with **Fieldpiece's Job Link** app. Your smartphone simultaneously measures from the psychrometers so you can see live equipment Δt (temperature change) and duct system temperature loss in one place.

You can also quickly measure delivered Btus into problematic rooms during diagnostics or on a sales call.

First, place one probe into the room's

supply register and one in the return grille to measure system Δt . Next, measure delivered supply airflow into the room with an air balancing hood. Once you have these values, you can plug them into the appropriate Btu formula.

If you're looking for ways to speed up temperature testing, measure live duct temperature loss, or quickly estimate delivered room Btus, the JL3RH is for you.

For more information or to buy this instrument from the NCI Store, go to ncilink.com/FieldpieceJL3RH.

— David Richardson, NCI Director of Curriculum Development



R.E. MICHEL COMPANY

WHOLESALE DISTRIBUTORS • AIR CONDITIONING • HEATING • REFRIGERATION
PROPANE • EQUIPMENT • PARTS • SUPPLIES

— Since 1935 —

INVENTORY SOLUTIONS TO FIT YOUR BUSINESS



Contact your local branch or email sales@remichel.com

remichel.com

James A. Wheat & Sons: *Laser-Focused on Comfort*

Forty-five years ago, in Gaithersburg, MD, The **James A. Wheat & Sons** HVAC contracting firm was born. That year, Jimmy Carter had just become the 39th president of the U.S., rock-and-roll icon Elvis Presley died, and Nasa launched its first space shuttle – Enterprise – into orbit (to name just a few).

Then, in 2018, **High-Performance HVAC Today** magazine profiled this family-owned company. Since then, a lot has changed, and some things remain the same.

Back then, the company cleared a total of around \$5 million in revenue. In 2021 their combined revenue was \$6.5 million (53% of which is from the HVAC side of the company). Their focus, since day one, has been

on providing customer comfort in the residential service and remodeling marketplace.

To do that requires a plan, a process, and a laser focus on training, which remains the foundation on which James A. Wheat and Sons operates. In that effort, the company, which currently employs close to 46 people, became members of National Comfort Institute (NCI) in August of 2004 and began its journey toward high-performance HVAC contracting.

According to Jeff Wheat, he first attended an NCI air balancing certification class in the late 1990s/early 2000s. He says his mother and brother took NCI classes before that. When he returned to the shop, he wanted to change how they did ductwork – from subbing it out to doing it themselves.

TRAINING IS AN INVESTMENT

“Our approach to training is the same today as it was in 2018,” Jeff Wheat says. “From my perspective, if I don’t train my people, who will? Frankly, I consider spending time and money on training an investment in our team so they can go out and do the work correctly.

“I would much rather get a young guy in, train him how to do things the correct way, and let him grow. I certainly understand that many contractors worry about spending so much money and time on training, and then the tech leaves.

“That is annoying,” Wheat continues. “But at least I know that tech will be doing things correctly someplace else. That’s the way my mentality has always been, and it’s never going to change.”

He adds that hiring technicians from other HVAC contracting firms who’ve been in the industry for 15 to 20 years is challenging because they often know nothing about static pressure, airflow, or even ductwork.

Wheat says, “Those are the first things they should be checking on every home visit.”

Sure, training goes beyond home performance for this company. Wheat believes strongly in staying up to date on anything technical, especially when manufacturers come out with changes that include variable speed and all the communicating features of that



The James A Wheat & Sons management team includes (left to right): **Darlene Clark**, Office Manager; **Scott Eslick**, Installation Manager; **Michael Wheat**, President; **Jeff Wheat**, Vice President; **Ernesto Calva**, Installation Field Manager; **Benjamin Abbott**, Service Manager.

equipment. It's all part of providing customers with the best bang for the buck when it comes to comfort.

"We install Carrier and Daikin equipment," Wheat explains. "However, I not only send my guys to classes provided by those two manufacturers, but I also send them to courses from Trane, Rheem, and others. If there is a company training on their equipment in our area, I'm sending my guys to it. That way, we can work on anything we see in the field and know what's going on."

NEW REFRIGERANTS

With the current phasedown of HFC refrigerants and the move in the United States toward "lightly flammable" A2L refrigerants, Jeff Wheat says he is trying to stay on top of all the changes. However, he feels there still isn't enough information on them.

"What I have read is that manufacturers are changing the standard of their testing in the factory. They are looking at a new approach to rating equipment using SEER 1, SEER 2 Rating. From my point of view, this is good – I've always felt the old SEER rating system has been inaccurate.

"On the other hand, from the aspect of A2L flammable refrigerants, the international code now says you need to pressure test refrigerant lines for 20



minutes or so, and then you need to pull a vacuum. Then you put a micron gauge on it.

"I find that interesting. Our team has been doing this, but to be honest, the International Code wants contractors to hold that pressure test for an



hour. We hold a maximum pressure test for 20 minutes, and then we turn the vacuum pump on."

Wheat adds that he thinks there is a chance that the new refrigerants may require different airflows than what is standard now.

He says, "Any way you look at it, the change to A2L refrigerants isn't going to be fun for a lot of people.

"Also, once we change over to the new refrigerants, we'll have to change how we carry the tanks on our trucks. These will fall under Department of Transportation (DOT) requirements currently in place for carrying flammable gases in vehicles."

Whatever changes come down the pike, Jeff Wheat knows he will need to get his field service and installation teams trained on the proper handling and transport of A2L refrigerants, and he is prepared for that.

SYSTEM RENOVATIONS AND AIR UPGRADES

Since 2004 James A. Wheat and Sons has been training and selling using the High-Performance HVAC contracting approach. Like many contractors on the **Performance PATH**, there is usually some resistance in the



field – either from customers who just don't get it or from competitive companies that badmouth the approach. Jeff Wheat says that may have been the case in the early years for them, but today, not so much.

"We find our competitors don't know about high-performance HVAC," he says. "For instance, there's a large company in my market that receives a lot of accolades for their sales. It makes me laugh because they don't deal with airflow or duct renovation. They refuse to bother with it.

"Meanwhile, we've been called into several of their customers' homes to fix comfort complaints. We often find a new furnace and air conditioning system. I'll ask the customer what the installing contractor says about the issue, and often, the customer says that the contractor tells them to call someone else! That is usually us!"

Wheat adds, that High-Performance HVAC is really at the core of what they do.

"We like to do all the testing and measuring and then offer customers choices to get the biggest bang for their dollar. Those choices include how we can best help them right now: the best, fastest, easiest way."

He explains that there are a lot of basement and attic systems in the Gaithersburg area. Basement systems pose challenges for duct renovations because they are difficult to access and install balancing dampers without tearing into walls and ceilings.

On the other hand, attic systems are easier because he says his team can change balancing dampers or install them if needed.

"Every house is different, and we always need to do what's best for the



customer," Wheat says. "In our area, adding and fixing returns that are too small and addressing filter issues are key. Then we look at sealing ducts."

The company invested in an Aero-seal® (aero-seal.com) machine after 2018 to expedite duct sealing. According to Jeff Wheat, they sub out insulation work to a partner company that also does home energy audits.

"In the end, we find that we close on more duct renovation and air upgrade sales today, though that depends on me," he says. "If I slack off on talking about duct renovations and air upgrades with my guys, then things go into a lull. But if I'm up on it and constantly remind them about it, then we get more jobs doing this work."

A CONTINUOUS PROCESS

Wheat says the culture at the company is strongly focused on high-performance HVAC contracting. However, in his words, "it's not like we are there yet. It is a changing and evolving process that always requires someone to lead it.

"For me, what makes things we're doing successful is when our field team understands it and believes in it. It's always a matter of training them and keeping them up to

Michael and Jeff Wheat are the second generation owners of James A. Wheat and Sons, Gaithersburg, MD.

date on everything. I spend a lot of time teaching technicians about what we're doing, why we do it, and how to do it. Sometimes they just don't get it. Then I send them to NCI training, and finally, the light bulb goes off for them."

He adds that the other challenging part is getting the customer on board.

"We can prove what is happening with a customer's system using the high-performance approach. Customers will only do what they want to do. As a technician and a contractor, you must understand this fact. Our objective is to provide them with options. Give them choices based on their needs, wants, and budgets.

"This is our laser focus. We provide customers with the best comfort service options through testing, measuring, and diagnosis.

"It's not our job to tell customers what to do. It's our job to give them the options and let them choose," Wheat concludes.

It is for these and so many more reasons that **High-Performance HVAC Today** magazine chose to focus our spotlight on *James A. Wheat and Sons*. Congratulations to the entire team. 



Mike Weil is the director of communications for **National Comfort Institute** and the editor-in-chief of **High-Performance HVAC Today** magazine. Contact him at ncilink.com/[ContactMe](#) with

comments or suggestions for future content.

Turn Your Surplus & Used HVACR Equipment Into **WORKING CAPITAL!**

SAVE 25% - 50%

on the manufacturer brands that you are currently selling.
WE WILL QUOTE ANY PROJECT WORLDWIDE.

HVAC EQUIPMENT SPECIALS:

- 3 New Trane 115 ton Gas Roof Tops 460 volt Top Discharge \$77,000
- 1 New Trane 120 Trane Down Flow Gas Roof Top 460 volt \$77,000
- New Trane 120 ton Chilled Water Air Handler \$18,000
- New Daiken 70 ton 6 stage Cond Unit 230 volt 3 phase with Matching Coil \$22,000
 - Mini Split Sale: 9k \$440 • 12k \$570 • 18k \$620
 - 18 K Multi Zone \$640 • 24k Multi Zone \$740

lazco Corp

www.lazcocorp.com • Fax: 866-437-3531

Send your Requests to buy or Sell to Lazcocorp@gmail.com

LAZCO CORPORATION Buys & Sells Surplus... HVACR EQUIPMENT

- Compressors
- Controls
- Chillers
- Cooling Towers
- Roof Tops
- Boilers
- Generators
- Liebert A/C Units

Take the First Step Towards High Performance

with **Duct System Optimization and Residential Air Balancing Training**

Learn how to deliver high quality, profitable duct system renovations that really work! Set yourself apart from competitors by knowing how to optimize a duct system so it delivers the heating and cooling the equipment was designed to provide.



NCI
National Comfort Institute, Inc.

For more information, go to ncilink.com/DSO or call 800.633.7058

Residential Construction: *Slowing Growth Beckons*

The U.S. industrial sector is on the cusp of transitioning to a slowing growth trend. Our analysis, which includes examining several leading indicators, provides strong evidence that growth rates will be lower in 2022 than in 2021.

U.S. ECONOMY

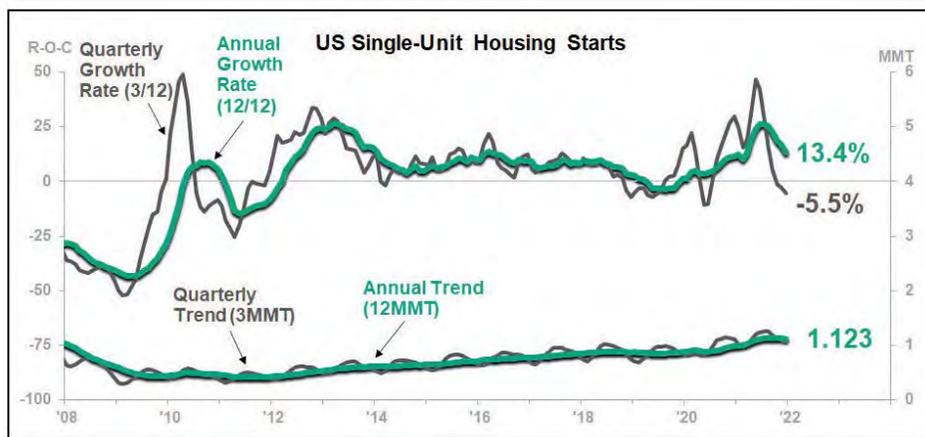
Despite this slowdown, we do not expect contraction during this cycle. **U.S. Industrial Production** will rise through the next year, just at a less robust rate than in 2021.

As such, we are entering a dangerous part of the business cycle. This cycle is the crucial period during which firms will likely feel the energy of

Purchasing Managers Index. Be sure to track your business' performance against the macro economy.

If necessary, adjust your expenditure plans.

Inflation is a top-of-mind economic trend for 2022. The Federal Reserve is beginning to pull back its monetary stimulus, and leading indicators simultaneously move lower. This suggests inflation will be more modest than in 2021. Inflation rates will cool in 2022 and into late 2023 due to multiple factors, including easing demand during the upcoming macroeconomic slowing growth trend. Lingering supply chain issues will keep inflation elevated in the near term, particularly in the first half of 2022.



In addition to dealing with inflation, consumers are also contending with a less robust **U.S. Personal Disposable Income** (PDI) trend. We expect DPI to normalize along the lines of the pre-COVID trajectory in the next several months. So, we expect the consumer position to be less strong in 2022 than in 2021. A weakened consumer position will likely result in more price consciousness this year, contributing to the anticipated slowing growth trend in **U.S. Total Retail Sales.**

overall growth but may miss the signs of waning momentum.

Those who ignore the signals emanating from leading indicators may fall into the trap of straight-line budgeting or over-expanding capacity. These signals include the ITR Leading Indicator™ – our proprietary indicator that leads U.S. Industrial Production through the business cycle by about three quarters – and the **U.S. ISM**

We expect Retail Sales to generally rise into 2023, in real and nominal dollars, despite business cycle decline. However, firms should keep a close eye on inventory turns during the backside of the business cycle, as inflation can easily mask real growth issues if you are not closely watching unit levels.

Now is the time to be meticulous in understanding your business's relationship with the various sectors of the macro economy. The



backside of the business cycle can afford you the time to adjust. With today's relatively low interest rates, it is still a good time to invest in your business, particularly given the growth expected throughout much of the macro economy during the next three years.

Implement improvements and efficiencies in 2022 and 2023 while activity is slower than in recent quarters.

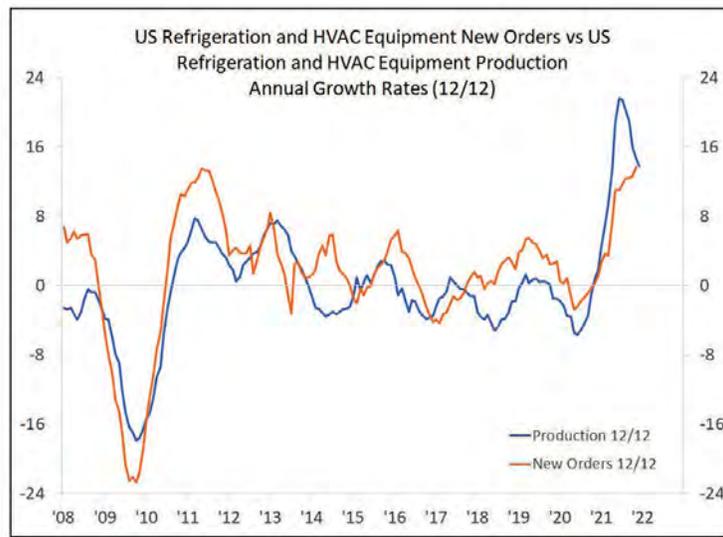
RESIDENTIAL CONSTRUCTION

U.S. Single-Unit Housing Starts totaled 1.123 million units for 2021, coming in 13.4% above the 2020 level. Last year was the highest-volume year for housing starts since 2006. Even so, the 2021 total includes some late-in-the-year stagnation, with the 12-month moving total dropping about 1.5% from the August level by year-end. We expect the rise to resume in the near term and persist until at least 2024. However, the pace of rising will be slower this year than in 2021.

U.S. Home Prices continue to climb, backed by a strong consumer, low mortgage rates, and limited inventory. However, the pace of rise for quarterly home prices has ticked down. Nascent business cycle decline in home prices is in line with the overall slowing growth trend in housing starts.

Mortgage rates are another important factor for home buyers. Rates depend on many factors, including the Federal Reserve's monetary policy, inflation, and bond market conditions. The recent rise in long-term rates, combined with inflationary pressures taking a bite out of consumer purchasing power, will contribute to less-robust growth rates for the housing sector in 2022 than in 2021.

However, less-robust growth is still growth. Despite the recent rise, mort-



gage rates are still low relative to historical norms, and consumers have savings they can tap. Furthermore, the strong jobs market will enable consumers to purchase homes.

Use this time of slowing growth to prepare your business for subsequent years. Improve corporate governance, create hiring and retention plans, and make capital investments.

U.S. REFRIGERATION AND HVAC EQUIPMENT

Be careful when looking at **New Orders** and actual **Production for U.S. Refrigeration and HVAC Equipment** – the trends are not as aligned as you might think. Annual new orders totaled \$52.1 billion in November, up 13.7% from last year. Overall production for 2021 was up 13.8% from the 2020 average, seemingly in line with new orders.

Expect annual new HVAC equipment orders to rise through 2022 generally but will grow at a slowing rate throughout the year.

In contrast, annual new equipment production will rise into the middle of this year before declining into 2023.

Softening demand in the U.S. housing sector is applying some downward momentum to both new orders and production, but there are three main factors for the differences that you

should be aware of.

- Pricing
- Supply Chain Woes
- Multiple Orders.

Pricing – New Orders are based on the pricing of units ordered, while Production is based on the number of units actually made. Because higher costs are passed onto the consumer, we see a rise in new order dollar

amounts. Production does not directly benefit from the higher prices.

Supply Chain Woes – New Orders can be placed, but sluggish activity in the supply chain can hinder the production process. While we expect supply chain constraints to lessen as we progress through the year, this remains an ongoing risk to the production process.

Multiple Orders – With customers concerned about long delivery times and inventory in general, some are placing multiple orders and then canceling any not-yet-delivered products. This can result in inflated order numbers relative to the desired number of units.

There are steps you can take to position yourself better for 2022. First,

know how you align with the trends. Is your business more in alignment with New Orders or Production? How does your business relate to the macro and regional housing environment?

Secondly, ensure your suppliers are well-positioned for 2022. While customers are now accustomed to longer-than-normal delivery times, being speedy will help win business.

Thirdly, ensure you have strong cancellation clauses in place. You do not want to build out capacity for orders that may be canceled on you.

Lastly, while we see the housing market and U.S. Refrigeration and HVAC Equipment on the backside of the business cycle in 2022, it is essential to remember that the overall outlook is strong. Even the decline in U.S.

Refrigeration and HVAC Equipment Production in the latter half of 2022 into 2023 will be relatively mild and will not erode all of the gains made in 2021.

Lead with confidence. Your teams may become nervous as they see the news. Share the leading indicators and our forecasts with them so they too can feel confident. 



Jackie Greene is Vice President of Economics and has served ITR Economics' (hubs.la/Q011t5WX0) clients since 2005. She has contributed to the company's forecasts, publications, and thought leadership. Jackie works with many clients in a one-on-one capacity and delivered keynote addresses on multiple continents.

When it Comes to DUCT SUPPORT It's Time to REINVENT the WHEEL

Work Smarter NOT Harder
It Doesn't Just Look Better ~ It Performs Better



Old Way of Hanging Flex

Increases Efficiency Complies with UL2043 Reduce Labor Costs



It Doesn't Just Look Better ~ It Performs Better



One SKU Fits ALL Jobs
RNC & Retrofit Applications

Free Shipping
for Packs of 100
or more!

History and Misconceptions of Draft Diverters and Draft Hoods

When were draft diverters invented, and why? How are the functions of a draft diverter explained? Are some draft diverters today used as intended, or have they been modified from their original design? Do draft diverters perform as intended? If they do, would this be considered a safe operation? Most answers to these questions are based on misconceptions. They're rarely answered correctly.

The original design of draft diverters, once called "down-draft diverters," was to keep the flue from connecting to vented equipment. The early products most likely appeared in the late 1930s or early 1940s after a surge in demand for natural gas equipment with standing pilots. By the way, during those days, gas processed from coal was also listed as natural gas.

SOME HISTORY

One of the first patents listed for downdraft diverters was for Rheem® water heaters in the 1940s. Though furnaces were not mass-produced until 1937 (by the Richardson & Boynton Co.), there were many gas water heaters, boilers, and ovens at the time.

Down-draft diverters were invented to minimize pilots from blowing out on gas-fired equipment under windy conditions. Baltimore Automatic Shut Off (BASO) created the gas safety shut-off in 1934, but early gas safeties only turned off the main gas, not the pilot gas. So if the pilot went out, it was important to re-light it as soon as possible.

This was the responsibility of the gas company and quite a nuisance. The solution was the invention of the downdraft diverter.

Before down-draft diverters, the only devices used in flues were single-acting barometrics designed for wood, coal, and oil-fired equipment. These were used to regulate draft and help control combustion.

However, these barometrics were not effective on gas equipment with standing pilots because they did not relieve downdrafts. Double-acting gas barometrics were not yet invented.

All original down-draft diverters were round or mushroom type.

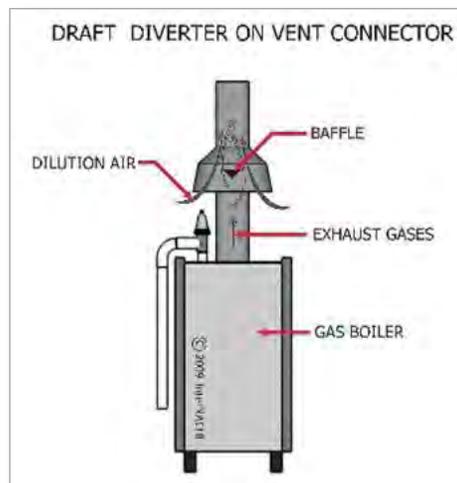
A deflector plate was centered inside the down-draft diverter that re-directed flue down drafts into the room rather than into the equipment. This would also send all the combustion gases into the room if the burners were operating.

That was considered less of a nuisance.

Before going forward, I think the theory behind atmospheric venting could use some better explanation.

ATMOSPHERIC VENTING THEORY IS OFTEN MISUNDERSTOOD

From many articles I read and some wonderful videos viewed on YouTube, the common thread seems to be that atmospheric equipment relies on positive buoyancy. Positive buoyancy is the principle of a dense material displacing a less



All original down-draft diverters were either round or mushroom-shaped.

dense material and causing it to float or move in an upward motion.

If you lay on your back in a swimming pool and float, that is considered positive buoyancy, but it is deemed negative buoyancy if you sink. In this case, we are talking about the density of combustion gases versus the surrounding air temperature. Atmospheric pressure and humidity also come into play.

This would be logical if the equipment were installed outdoors and only influenced by outdoor conditions. Some examples of natural buoyancy and atmospheric pressure are campfires and forest fires, and that doesn't always work when the wind blows.

I have read many times that when you heat something, its molecules move faster and rise. Could that be why there are lids on barbecue grills, so our food doesn't float away? The science says that heated items may expand, but they still must be less dense than their surroundings to rise.

Natural buoyancy might be predictable if something is only affected by one set of conditions. However, when installing equipment indoors, it is subject to two pressure zones, outdoor atmospheric pressure and the indoor stack effect of the building and/or building leakage. Then there is the resistance or pressure drop of heat exchangers, boiler sections, or baffles in water heaters. For hot combustion gases to rise up and out requires enough denser air to displace them and overcome this resistance.

Could it be that our forefathers were



aware that a certain height or a minimum vertical rise is necessary to allow enough dense air to displace hot gases? Were they also aware that internal building conditions could affect this?

LAB CONDITIONS DON'T EQUATE TO FIELD CONDITIONS

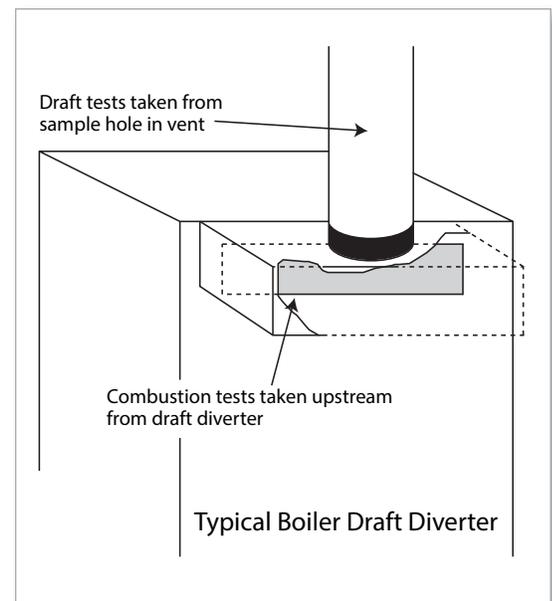
In the original installation instructions of mushroom down-draft diverters, it says to mount them at a minimum height on top of the equipment. This was usually 12 in., but could be less if the heat exchanger was taller. After installing the diverter, a tech performed a smoke test, and if the smoke did not pull in freely, the diverter needed to be raised another 12 in.

Much like today, this only simulates one set of conditions and -- as we learn in the NCI Combustion Analysis and CO Safety class -- this does not verify venting, only a venting action. Nonetheless, this was at least something to address existing environmental conditions back in the day.

Then manufacturers faced a new problem -- a construction

trend to lower the ceiling height in mechanical rooms. Equipment was now too tall to be installed with the movable mushroom down-draft diverter.

Was it possible to build the draft hood into the equipment and shorten its height? Along came the attached or built-in draft hood of the 1950s and 1960s. Could these draft diverters be adjusted to overcome equipment pressure drop and internal building conditions? Like so much HVAC equipment, they were tested and certified in



labs under ideal conditions that rarely occur in the field.

For example, draffhood equipment tested in a lab with controlled ventilation keeps the room neutral or slightly positive. They test it with five feet of vertical pipe and two elbows.

I am not aware of those conditions existing in the field. That brings us to a problem that everyone ignores.

Engineering data or specifications on draffhoods or downdraft diverters state they work safely with 40% to 50% dilution air. Does that imply draffhoods work unsafely at different dilution rates?

It's like telling a skydiver to pull their ripcord at least 300 feet above the ground. No mention of what happens if you don't, but odds are you won't repeat this mistake more than once!

With no adjustable control, how will dilution air be maintained? When looking at NCI's Combustion Diagnostic Charts, we see that the design draft for all draffhood equipment is $-.01''$ to $-.02''$ w.c., as measured in the flue above it.

This is the approximate draft where 40% to 50% dilution air occurs, or at least in lab tests. For those who measure, draft can be much higher.

If dilution air is 50% in the flue, then flue gases should be 50% as well, which means the flue would be sized for the quantity of both. Looking at industry venting tables you will notice equipment without draffhoods have a smaller flue size.

WHAT ABOUT A BLOCKED OR RESTRICTED FLUE?

One of the biggest problems with a draffhood is it allows equipment to operate with a restricted or blocked

flue. But they all have blocked flue switches, right? At NCI we teach how to correct this problem, yet, in an article I wrote many years ago, I was condemned for tampering with equipment to make it safer.

Does a blocked flue switch determine if something is venting or not? The answer is no because it can be spilling out from the burners, especially during high draft conditions.

ANY TIME YOU SEE RUST, WHITE POWDER, OR MELTED GROMMETS ANYWHERE ON THE EQUIPMENT OR FLUE, THERE IS A POTENTIAL HAZARD WAITING TO HAPPEN.

TESTING DRAFT DIVERTERS

Testing a downdraft diverter or draffhood for spillage or proper venting has different industry recommendations. Some are based on misconceptions. From the beginning, the common practice was to use some kind of smoke and watch it pull into the draff diverter.

Until 1999, the National Fuel Gas Code recommended using a cigarette, cigar, pipe, or match for this test. Now they recommend using a match, candle, or passive smoke. Then there is the standard draft test with a draff gauge. Unfortunately none of these verify venting.

In the beginning, the downdraft diverter made some sense. Because they were moveable, they could be adapted to existing conditions. If every piece of equipment with these draff diverters had adequate spill and flame roll-out switches, the possibility of unsafely

operating equipment was minimal.

But, having proper safety switches might create a bigger nuisance because the equipment would fail more often than when pilots blew out or would keep tripping the safety switches.

For over 40 years, I have experienced the dangers of draff diverters and draffhoods. In 1993, a field test with AGA Labs verified the poor performance of draff diverters and draffhoods.

In their report, AGA stated that removing or blocking draff diverters or draffhoods and replacing them with double-acting barometrics improved the safety and operation of all equipment tested. Eighteen out of eighteen had tested unsafe!

Any time you see rust, white powder, or melted grommets anywhere on the equipment or flue, there is a potential hazard waiting to happen.

Finally, as if the above isn't enough, there are two things that must always be avoided:

- Never install any venting fan above a draffhood!
- Never use a horizontal draffhood fabricated by a sheet metal company!

NCI is the only training organization that addresses the above with real world experience. We believe it is our responsibility to keep customers safe!

And then they will live happily ever after!!! **NCI**



Jim Davis is the senior instructor for National Comfort Institute (NCI). He has a long and storied career in the HVAC Industry. Today he is considered one of the foremost authorities on airflow's impact on combustion and carbon

monoxide safety. If you have questions, you can contact him, at ncilink.com/ContactMe.

HVAC Summit 2022 Is Nearly Here

With slightly more than a month until the **2022 High-Performance HVAC Summit** kicks off (March 27 to 31) at the



We-Ko-Pa Casino and Resort in Scottsdale, Arizona, it's time to put your plan together.

Here is a preview of two of the 18 breakout sessions from which you can choose.

How to Create Custom Air Upgrades – Make Air Upgrades the Center of Your High-Performance Strategy. David Richardson will show you how to assemble customized air upgrade kits based on the installation conditions you see most in the field in this Practitioner-level class.

Two Must-Do Combustion Safety Tests to Help Keep Your Customers Safe. Contractor Tom Johnson teaches the basics of measuring ambient carbon monoxide (CO) and discussing the sources and causes of CO and combustion issues inside a building. This CO class fits into our novice-level category.

With 18 total classes, you may need help deciding who to send to what session.

We can help you with that. National Comfort Institute (NCI) created a brief survey you can take that will enable us to build a personalized schedule for you and your team!

BONUS: by taking this survey, each employee will receive a unique code that is good for \$100 off their registration fee.

To take the survey, click ncilink.com/SummitSurvey and get started today.

Find out more about Summit 2022 here (gotosummit.com). And if you haven't already done so, register here: ncilink.com/summitreg.

Welcome New NCI Members

Membership in NCI is a step toward becoming a High-Performance HVAC Contracting firm. It is a commitment that has an extraordinary impact on your business and your team.

So, it is our pleasure to recognize and welcome those new members who joined our ranks since January 1, 2022:

- Comfort Monster Heating and Air, Raleigh, NC
- Greg Steger Heating & Air, Plymouth, WI
- Greiner HVAC, Dixon, CA
- Picture Rocks Cooling, Heating, and Plumbing, Tuscon, AZ
- Thermo Direct, Raleigh, NC
- Volpe Service Co., East Hanover, NJ.

We are pleased you all opted to join our family and look forward to hearing from you. Please look for regular member benefit updates here and on our website.

NCI's Online University

NCI membership gives you access to the **Online University**: an online training approach that allows you and your team to do training at your own pace and on your schedule. Our Online University is organized into "logical learning steps."

These steps begin with:

- Advanced Technical Training
- Business Management Training
- Customer Service Training.

Within the **Advanced Technical Training** category:

NCI Fundamentals 101 has nine courses to help your team understand airflow basics, fan laws, and more. It also includes an introduction to Carbon Monoxide.

NCI Fundamentals 201 has nine courses to take your field people to the next level after mastering the 101 series. From how to take duct traverses to basic building pressure, and so much more.

System Performance Testing features eight courses covering the fundamentals of HVAC system performance and measured Btus.

Members get a 10% discount on all classes, while those with the **Learning Excellence Premium** and **Learning Excellence Online** subscriptions get the entire Online University included.



The **Online University Business Management Training** has a similar organization. There are 101, 201, and 301 levels plus a four-module **Path to Performance with NCI's 4-D Business Model** course.

Online University also offers **Business Performance 101** and **201 Training**.

Our **Customer Service Training** includes the following courses:

- Customer Service Excellence
- Proactive Customer Service 101
- Proactive Customer Service 201
- HVACR for Rookies.

Learn more at ncilink.com/NCIMembership.

For information on advertising in

High-Performance HVAC Today

email: advertising@hvactoday.com

TO YOUR *Success*

The #1 gifting service for home service companies

CUSTOMIZED GIFTS & AUTOMATION

WWW.TOYOURSUCCESS.COM

Simplify Your Pricing!

THE NEW FLAT RATE

info@menupricing.com

TURN AIRFLOW INTO CASHFLOW

Learn about key zoning topics and get hands-on training on installing Arzel Zoning.

MARCH 18TH, 2022!

Arzel Zoning TECHNOLOGY

Comfort College

SCAN to save your seat!

www.arzelzoning.com | sales@arzelzoning.com | 800-611-8312 | Follow us!

MyHomeComfort.org

The source for homeowners to find the right contractor (you!)

You can only be listed if you or your company are currently NCI-certified, so be sure that all your certifications are up-to-date. Become an NCI member to get a premiere listing for your company.

Be sure to take advantage of this lead-generating tool today!

NCI National Comfort Institute, Inc.

Call NCI Customer Care at **800.633.7058** to find out how to be listed and featured.

Technician Shortage: Our Industry's #1 Challenge



Dominick Guarino
is publisher of
**High-Performance
HVAC Today** magazine
and CEO of National
Comfort Institute, Inc.
He can be reached at
[ncilink.com/
ContactMe](http://ncilink.com/ContactMe).

Our industry needs roughly 400,000 technicians and installers to operate at normal capacity. This number has been fairly consistent for more than 30 years. According to the Bureau of Labor Statistics, the HVAC industry is short one in four technicians. In other words, we're only employing roughly 300,000.

If we don't do something meaningful soon, one out of two HVAC field positions will remain unfilled by 2027. That's 200,000 out of 400,000 unfilled positions!

Just think about the damage that could do to our industry, not to mention the impact on consumers. So what can we do about it?

WE HAVE TO BE ABLE TO SHOW THE SEXY SIDE OF HVAC, AND HOW TECHNICIANS CAN BUILD A LIFETIME CAREER THAT IS BOTH FINANCIALLY AND PROFESSIONALLY REWARDING.

A DIFFERENT MESSAGE

If we are to attract good talent to our industry, we must paint a very different picture than that of a technician or installer sweating it out twisting wrenches and pounding metal.

We need to provide a vibrant image of diagnosticians who use sophisticated instruments and software to diagnose and solve problems. We must show potential installers how they won't just be laborers in the trade, rather craftsmen who understand how systems really work.

We must demonstrate how they are responsible for properly servicing and installing equipment, and improving air distribution systems with measured, proven results. We have to be able to show

potential candidates the sexy side of HVAC, and how they can build a lifetime career that is both financially and professionally rewarding.

These new technologies are available today, not five years from now. It is up to serious contractors to make them part of their company culture. This will make it easy to share the vision and mission with people considering an HVAC career.

RETAINING OUR EXISTING BASE

One of the keys to keep us from losing roughly 100,000 technicians in the next five years is to find ways to stop them from *wanting* to leave. Some will just age out, of course, so we also must focus on bringing new talent into the industry.

The three keys to retaining good people are **providing a real career path, paying them well, and continuously training them.** We also must have the flexibility to provide a better work/life balance. This is a common desire, especially among younger generations.

This flexibility will require different thinking in terms of scheduling while still being able to respond to customer needs. It will be easier for mid-size to larger companies as they have a bigger pool to pull from to cover for more flexible work schedules. Smaller companies will have to be more creative to maintain flexibility.

CREATE REAL CAREER PATHS

How do you create and communicate that you are an attractive option to existing and potential employees?

First take a look at the existing positions in your company. Take some time to illustrate each position, both in words and visually.

Continue reading this article online by clicking ncilink.com/0322OMT2.

Advertiser Index

Arzel Zoning Technology, Inc. www.ArzelZoning.com	17
Baker Distributing Company www.BakerDist.com	19
Duct Saddles www.DuctSaddles.com	12
Goodman Manufacturing www.GoodmanMfg.com	2
Lazco Corp. www.LazcoCorp.com	9
R.E. Michel Company www.REMichel.com	5
The New Flat Rate www.TheNewFlatRate.com	17
To Your Success www.ToYourSuccess.com	17



Publisher
Dominick Guarino

Editor-in-Chief and Associate Publisher
Mike Weil

Art Director
Judy Marquardt

Online Development Director
Brian Roseman

Circulation Manager
Andrea Begany-Garsed

Go to ncilink.com/ContactMe with your comments and questions.

To Subscribe to High-Performance HVAC Today:

ONLINE: Visit HVACToday.com/subscribe for a FREE digital subscription.

PRINT: 1 year/\$72; single copy \$7. Canada: 1 year/\$92; single copy \$9. Payable in advance with U.S. funds. Prepaid subscriptions may be sent to: High-Performance HVAC Today, PO Box 147, Avon Lake, OH 44012. Phone: 440-949-1850; toll free 800-633-7058; or visit HVACToday.com/subscribe to order online.

Baker
Distributing Company

Download the Baker
**HVAC/R
CONTRACTOR
ASSIST APP**

Our free app provides access to product information and tools while on the go. Features include Warranty Search, AHRI Matching and Curbside Express Pickup. Check pricing & availability from any store, any time.

www.bakerdist.com/contractor-assist

FREE Mobile App

AirMaxx™
a ComfortMaxx app
LITE

NCI's AirMaxx Lite™ app features easy-to-use data entry and easy-to-display reports.

Get started on the path to High-Performance HVAC™ today!

Download this free app onto your phone or tablet, and display an airflow 'grade' for your customers.

Apple App Store
ncilink.com/AML1A

Google Play
ncilink.com/AML1D



Cutting-edge Training

From the industry leader in High-Performance Contracting™

Think you know airflow? Think you know carbon monoxide safety? Think you know how to solve your customer's comfort issues? Be sure. Don't guess. Find the training and expertise you need from the National Comfort Institute (NCI). Only at NCI will you find certification courses like Duct System Optimization and Combustion and Carbon Monoxide Safety, taught by leaders and innovators in the HVAC industry. Find out why NCI says, *"If You Don't Measure, You're Just Guessing!"™*

Visit the link below or call 800-633-7058 to find classes near you.

UPCOMING 2022 NCI TRAINING SCHEDULE

PUBLIC LIVE TRAINING

Commercial Air Balancing Certification Program

Mar 15-17: Centennial, CO
Apr 19-21: Richmond, VA

Residential HVAC System Performance and Air Balancing Certification Bundle

Apr 26-28: Monroeville, PA

PUBLIC ONLINE TRAINING

Improve Economizer Performance and Meet Today's Ventilation Standards

Mar 7-8 & 14-15: ONLINE

Combustion and Carbon Monoxide Online Recertification

April 26-27: ONLINE

***SCE SPONSORED LIVE TRAINING**

Hydronic Testing, Adjusting, & Balancing

March 9-10: Los Alamitos, CA (**SOLD OUT**)

Commercial System Performance

March 17-18: Los Alamitos, CA

Duct System Optimization and Residential Air Balancing Certification Program

March 29-31: Los Alamitos, CA

Improve Economizer Performance and Meet Today's Ventilation Standards

Apr 5-6: Los Alamitos, CA

Residential HVAC System Performance and Air Balancing Certification Bundle

Apr 12-14: Los Alamitos, CA

Commercial Air Balancing Certification Program

April 19-21: Los Alamitos, CA

****TECH CLEAN CALIFORNIA TRAINING** <http://ncilink.com/TECHCleanCA>

Residential HVAC System Performance and Electrification

Mar 15-17: Sacramento, CA

Airflow Testing & Diagnostics

April 4: Los Alamitos, CA
April 7: Sacramento, CA

*NCI training sponsored/subsidized by Southern California Edison (SCE) for qualified local contractors

**NCI training sponsored by TECH Clean California for qualified local contractors



Visit NCIlink.com/ClassSchedule to view the latest schedule of NCI Training events