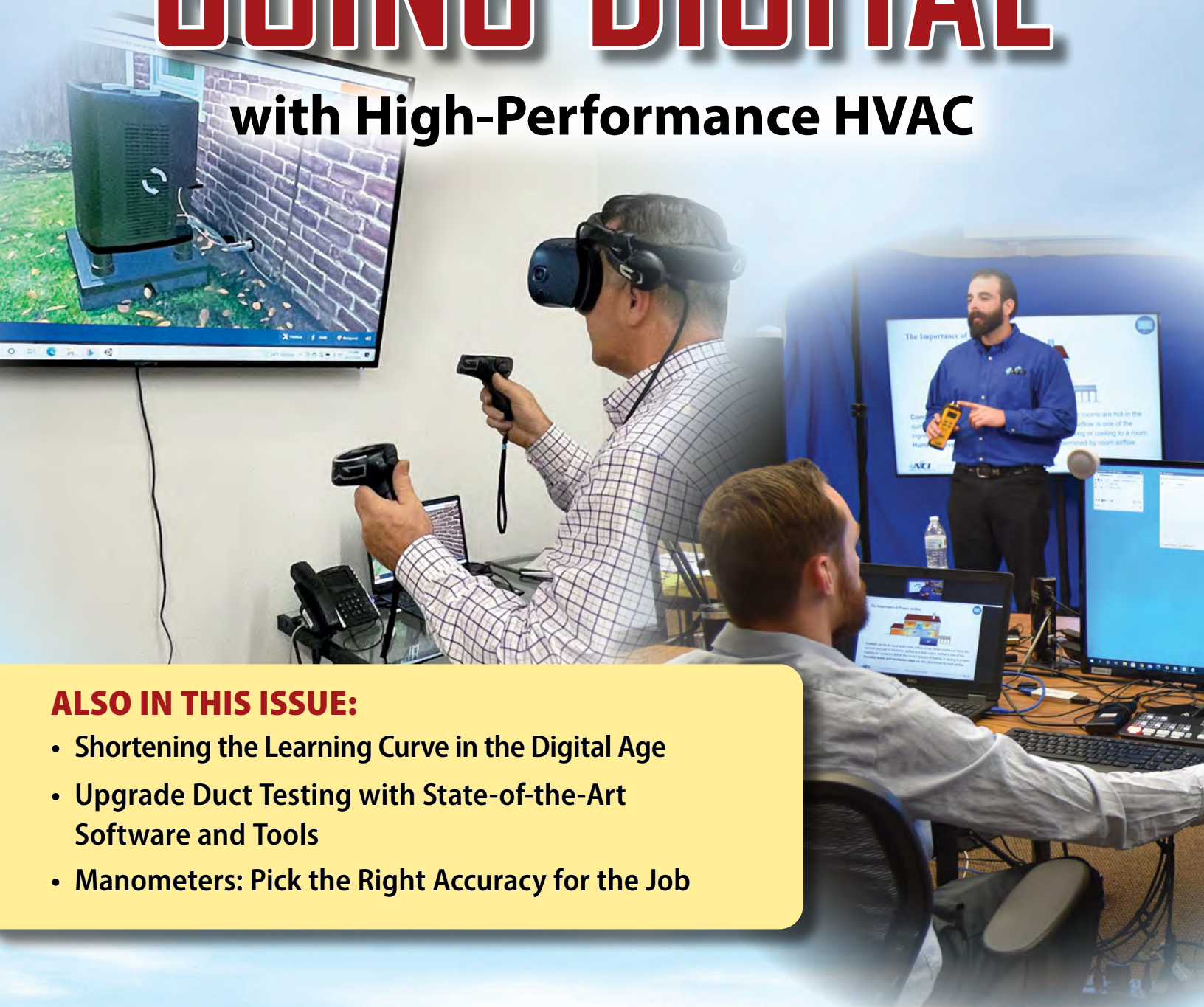


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Is Smart Tech Ready for Prime Time?



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

This month, we focus on the impact of smart technology on the High-Performance HVAC Industry. Yes, smart technology, or smart tech, has been around for a long time. Once considered a fad, this technology makes deeper inroads into the psyche of the American consumer and the HVAC business owner each year.

It started with smart control of lighting, kitchen appliances, and even residential security systems. But with the 21st Century push on better environmental management and reducing the energy load of a home's largest energy consumer – the HVAC system – smart tech is more important than ever to homeowners.

In a study posted on the [Statista](https://www.statista.com) website, the total number of smart homes in the U.S. could go beyond the 78 million mark by 2024! Controlling consumer electronics has led the way in this phenomenon, but with the introduction of smart thermostats, companies like Nest, Amazon, Google, and others entered the HVAC arena.

So, what does this mean for the average HVAC service and installation technician? First, most smart tech can alert homeowners in advance of problems.

In the case of smart HVAC systems, the technology can add to the complexity of equipment, requiring technicians to be trained to use and interpret the information generated by it.

In his article, *"Smart Technology and the High-Performance HVAC Professional,"* contractor Eddie McFarlane explains what this could mean for today's HVAC technicians and the companies they work for. He outlines some key advantages, especially for High-Performance HVAC contractors, regarding smart monitoring opportunities, predictive maintenance, and more.

McFarlane talks about the importance of test-

ing, measuring, and diagnosing based on real information as the philosophy of the high-performance professional. He says that it's not a far stretch to add to the data collection in terms of monitoring so contractors can predict issues, and use that knowledge to correct them before they even come to the customer's attention.


Also, in this issue, NCI's David Richardson talks about using digital instruments to help collect data on your service and install calls. Check out his article, *"Upgrade Your Duct Testing with State-of-the-Art Software and Tools,"* to learn more.

The common thread is training. Alana Ward, owner of Baggett Heating and Cooling in Clarksville, TN, shares how virtual training helps keep her technicians sharp in the High-Performance HVAC world. Read her article in this issue, *"Shortening the Learning Curve in the Digital Age."*

What does it require for you to take advantage of these smart opportunities? Start with what you know: Smart temperature controls. Manufacturers have onboarded sensors into their HVAC equipment and components for years, and thermostat technology today makes better use of them to run continuous diagnostics helping homeowners save energy and money on their utility bills.

This includes zone management, carbon monoxide detection, remote control through mobile apps, and so much more.

With built-in Wi-Fi, smart technology can also send you alerts when it's time for annual or routine maintenance so homeowners' systems run smoothly and last longer.

So, do you think smart tech is ready for prime time? Are you considering whether to make it part of your high-performance offerings? I'd love to know your thoughts on this. Drop me a note at ncilink.com/ContactMe. 

Written by HVAC Contractors, for HVAC Contractors

FIELDPIECE JL3MN WIRELESS MANOMETER

"Start working the way you want to." That's the Fieldpiece motto. The **JL3MN wireless manometer** is easy to work however you want. As always, this manometer's very durable and compact design is fantastic.

Measuring in at 5-in. long and 1.25-in. in circumference, it is ideal for most technicians, unless you have bear paws for hands — then it may be a little tiny. The JL3MN is magnetized for hands-free testing and comes with short static-pressure tubing for a tangle-free setup. These instruments do not have a display screen because the JL3MN communicates directly with the [Fieldpiece Joblink™](#) app and with the [MeasureQuick™](#) app.

Fieldpiece's connectivity keeps im-



proving. The included static pressure tips are the same as always — there is no reason to reinvent the wheel when you've hit perfection.

These puppies have a 1,000-foot range, that's 305 meters for those of you out of the States. The only caveat is that range is based on line of sight. Obstructions

will affect the connectivity.

JL3MN manometers require two AAA batteries which will provide around 150 hours of use. When the batteries approach their end of life, the green indicator light will flash red to remind you that it's time to change them.

On the back of the manometer, indicator switches enable the technician to designate what side of the system they're testing: return or supply.

The JL3MN manometers are great for anything and everything involving static pressure. If you don't have your own set, you need it. This manometer is a perfect instrument for the HVAC air upgrade technician.

For more information, visit ncilink.com/jl3mn. **NCI**

— by Casey Contreras, NCI Instructor



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Upgrade Your Duct Testing with State-of-the-Art Software and Tools

Twenty-five years ago, I read an article by Rob Falke that changed my life. It was about how to add the duct system to your maintenance agreements. That single article changed how our family company did business and caused us to look past the equipment to the entire HVAC system. This shift helped us to realize the “box” was not the system.



We started with a **Magnehelic** and eventually adopted digital manometers to measure static pressure. Then we began estimating fan airflow using manufacturer fan tables or NCI Generic Fan Tables. Both tests helped us see the HVAC system differently than ever before.

Since then, instruments have improved, and software has made these tests and measurements much easier and faster. Because of this, there are new possibilities that didn't exist a few years ago.

For example, now you can have measurement and testing processes in the palm of your hand, which simplifies adding a duct system to your maintenance agreement. Let's look at how these changes can offer additional benefits when you upgrade your duct testing tools and software.

BUILDING ON STATIC PRESSURE AND AIRFLOW MEASUREMENTS

Static pressure and airflow are cornerstones of airside performance. If they are wrong, the entire system is as well. Static pressure is the blood pressure of the HVAC system and can help identify overall health problems. It is a test that “screens” the airside of an HVAC system.

To measure and diagnose static pressures and airflow, a technician needs a manometer kit, static pressure budgets, and manufacturer data. They also must install test ports in the proper location and communicate measurement results to the customer and back to their company.

When the hand-off to the salesperson occurs, they must inform the customer of the test results and then choose a path of action to tackle airflow-related issues.

These skills are an art form that will remain with our industry and never disappear. But with all the other responsibilities most technicians and salespeople have, it's easy to leave static pressure and airflow testing out.

Unfortunately, to some, it looks like just one more thing to do while on a call.

One way to address overwhelming techs and salespeople is to find ways to automate their tasks. Wireless instruments from companies like [The Energy Conservatory](#) (TEC) and [Fieldpiece](#), combined with software like [MeasureQuick](#), are a powerful combination that simplifies many

parts of the job, from data collection to diagnostics to communication.

With the advances in these test instruments and software, there are opportunities to improve how our industry handles airside testing and diagnostics. Two examples are the *Duct System Screening* and *Duct System Analysis* tests.

Using wireless test instruments and software, each test helps diagnose a duct system through static pressure and airflow measurements. Plus, these two examples can help convert measurements to simple concepts and reports that are easy for industry professionals and their customers to understand.

DUCT SYSTEM SCREENING

The Duct System Screening test uses wireless manometers, such as the **TEC DG-8** or **Fieldpiece JL3MN**, to communicate static pressure measurements from four locations to the MeasureQuick app. You can use a single wireless manometer and capture readings one at a time or four wireless manometers to profile the entire system with one click.

Next, you need to assess fan airflow using total external static pressure (TESP), the fan speed, and a fan table. A tech uses these tools to estimate fan airflow moving through the air-handling equipment.

Instead of a technician performing all the math, looking up static pressure budgets, and then calculating percentages, the Duct System Screening test performs these tasks in a split second. By working smarter, a tech – who may have been intimidated by this process or didn't grasp the principles – can quickly look at the airside.



They can livestream their data to a senior tech or service manager if there's a problem. Everyone can see and diagnose TESP, airflow, filter pressure drop, coil pressure drop, and duct pressures simultaneously.

Finally, the technician can email the visual PDF report to the customer and the office to share the results and ensure everyone understands. Technicians don't have to interpret the results and discuss anything with the customer if they don't want to. This method sure beats losing the paperwork or writing your readings in a notepad in your shirt's front pocket, never to see them again.

The Duct System Screening test is ideal for helping techs diagnose airside issues and generate leads for poorly performing duct systems on maintenance or emergency service calls.

DUCT SYSTEM ANALYSIS

While the Duct System Screening test serves as a tool to help a technician identify poorly performing airside issues, the Duct System Analysis test takes the testing principles one step further and looks at **measured** airflow. A salesperson can use it to gather additional information with

simple steps that don't require a lot of technical ability.

One hurdle many High-Performance HVAC contractors face is getting their salespeople to gather static pressure and airflow measurements. These tests and measurements are outside their comfort zone unless the salespeople have a technical background.

Suppose a technician has already performed a Duct System Screening test. In that case, the salesperson only needs to take one pressure measurement in the supply plenum through a pre-installed test port and then get a direct airflow measurement using a test instrument known as the **Digital TrueFlow Grid** from The Energy Conservatory (TEC).

To perform a Duct System Analysis test, you'll need the Digital TrueFlow Grid and companion **DG-8 micro-manometer**.

This micromanometer communicates via Bluetooth with the TrueFlow Grid **and** either the MeasureQuick™ app or TEC's True Flow™ app (which also integrates with MeasureQuick).

The testing principles, at a minimum, require a salesperson to measure static pressure in the supply



TEC DG-8 digital pressure gauge

plenum with the air filter installed. Next, they remove the air filter and replace it with the Digital TrueFlow Grid in the filter rack or a filter grille. Then they turn the air-handling equipment back on, and the TrueFlow measures airflow directly. No interpreting a fan table or guessing how dirt on the blower wheel affects your measurement accuracy. The TrueFlow is a direct measurement device that isn't affected by these conditions, whereas a static pressure measurement is.

If the salesperson wants to take their testing one step further, the app can measure all four static pressure locations like a Duct System Screening test and then add measured airflow. This provides a higher level of accuracy. Now the salesperson can not only discuss airflow, but also they can identify areas of concern that are causing problems.

The Duct System Analysis test can generate leads for further airflow diagnostic testing with a balancing hood or as a differentiator when selling equipment and duct upgrades.

IMPLEMENTATION AND THIRD-PARTY REPORTING

Being a High-Performance HVAC contractor isn't easy. If it were, everyone would be one. These professionals face some re-occurring challenges.

Two of the most common are performance implementation and inconsistent reporting.

The Duct System Screening and Duct System Analysis testing models may hold some answers.

Implementation is probably the biggest obstacle for many professionals. Paper forms are hard to track and leave much room for interpretation and gray areas.

It's also easy for technicians and salespeople to do their own thing without oversight or systems to standardize processes. Upgrading duct testing to use these tools automates standard workflows since they are built into the app.



By the way, these tools also benefit new technicians learning how to measure static pressure and airflow. The built-in workflows supplement their training and put what they've learned before them. They don't have to rely on memory or handed down information that may have lost its context.

Another feature of tools and software upgrades is improved reporting features. It's sometimes challenging for a customer to make sense of written notes, even in a report form. Taking the data, which is automatically

fed to an app like MeasureQuick or the TrueFlow app, generates a PDF report in customer-friendly language that explains what you might have trouble translating.

It used to be that a customer had to take your word for the test results. Now software gives the same information in an unbiased format. You have a digital assistant backing you up and giving you third-party credibility.

USE WHAT WORKS FOR YOU

If you're hesitant about change, there's nothing wrong with using the procedures and test instruments you're used to, especially if you're getting the desired results. There's no sense in fixing what isn't broken.

However, if you are considering an upgrade, these tools and two duct testing options are worth considering. Think about how these new technologies can make your life easier and solve some of the most common problems you're trying to overcome.

While the principles of adding a duct system to a maintenance agreement have not changed, the way we gather and share information has changed. Can wireless test instruments and software upgrade your duct testing to serve you and your customer better? **NCI**



David Richardson serves the HVAC industry as Director of Technical Curriculum/ Instructor for National Comfort Institute, Inc. (NCI). NCI specializes in training focused on improving, measuring, and verifying HVAC and

Building Performance. If you're interested in learning more about duct testing tools and instruments, contact David at ncilink.com/ContactMe or call 800-633-7058.

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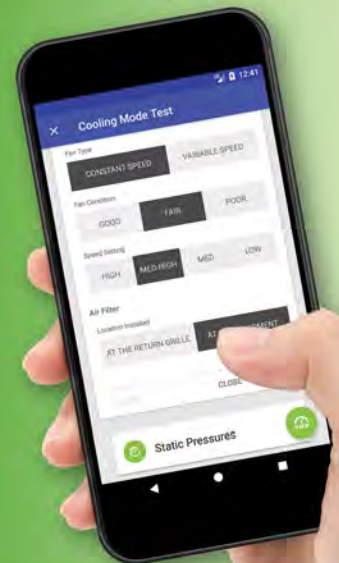


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Shortening the Learning Curve *in the Digital Age*

As an HVAC company owner, training is very important to me. I have owned [Baggett Heating and Cooling](#) since 2006 and believe that our success depends on our technicians being up-to-date on current technology and tools so they can take the best care of our customers as possible.

As the hiring pool of well trained, experienced technicians shallows, we are choosing to recruit the right candidates and build professional technicians in house.

In the last 12 months we have added several new team members and we are committed to upping our game and, simply put, being better than everybody else regarding the technical side of the business.



Traditional training often takes place in a contractor's training room, at a distributor's facility, or a third-party training center.

Doing this requires a lot of training. We want all techs, regardless of experience or seniority, to develop new and better skills and be up-to-date on new techniques, products, and so on.

After all, iron sharpens iron and our more senior techs need to be refreshed, on top of changing trends, and on top of their game in order to lead our freshest crop of technicians.

In the last few years, I have found that web-based and virtual training classes best fit my team here at Baggett. Why? It may make sense to first talk about our approach to traditional training to help explain how

virtual training is better meeting our needs today.

TRADITIONAL TRAINING


Over the years it's been commonplace for in-person training offerings to be provided by manufacturers and distributors, as well as trade associations. But I haven't always been pleased with the quality of topics or information shared.

When it comes to the training provided by manufacturers, I find it most often to be more product related than fundamental, technical training. In fact, I'm very wary of sending my technicians to anything the manufacturers teach because that "training" often ends up being simply a product showcase.

I completely understand why they want their products in front of our technicians, but our technicians' time is much better spent in the field solving customer's problems than in a sales presentation. I think other levels of sales or management are better positioned to attend these showcases and to determine product offerings that most align with company goals.

Our local distributor recently hired a new service advisor with an educational background and I believe there is a lot of potential there. I'm pleased that his training so far has been well prepared and stays on topic. He recently met personally with my team and had one formal training class on diagnosing refrigeration problems. We had another in April on airflow. I am impressed with what he has done so far.

As we continue to build our own techs, using training mentors engaged in daily, on-the-job training, is an important part of this process. I have two senior techs who are mentoring and informally teaching most days. We recently began holding a 15-to-30 minute tech meeting



every morning. This is an organizational way of starting the day with an added training element we call “tech talk.” Some mornings techs come in, get their job assignment, then head out. On other mornings they’ll spend more time talking about issues that have occurred on recent maintenance or service calls.

THIRD-PARTY TRAINING

Most of our training comes from third-party organizations that I hire or through association-offered classes. Currently, this is most of the live training we do. We also have a training room here at Baggett, and I look for opportunities to bring in trainers and hold classes here.

Organizations like [**National Comfort Institute**](#) (NCI) are among the training suppliers we work with. I feel these groups are most concerned with selling us knowledge and not specific products. They also have established reputations for the highest quality training.

This training offers my technicians a deep dive with hands-on learning. This is a great way to build technicians with little technical HVAC experience when we hire them.

We also send technicians away to training. This is at great expense to Baggett but worth the investment for a quality experience and with the right candidate.

VIRTUAL (ONLINE) TRAINING AND MORE

During the pandemic years, I began

During the pandemic, many organizations, like National Comfort Institute, developed live online training to help contractors keep their technicians up-to-date.

investigating the advantages of online or virtual training. The pandemic certainly impacted that, but it also had to do with changes in my staff.

Before the pandemic shutdowns, Baggett was already embarking on a new strategy of growing our technicians. We already had several new folks on board and couldn’t go anywhere to train them.

The virtual option just came up and changed everything. Today there is more virtual training available than ever before, but that wasn’t the case earlier. In the early part of the pandemic, groups like NCI began focusing more on it and helped to drive others to change their focus, at least temporarily.

NCI showed that training doesn’t all have to be in person, in a classroom. I would say it was a perfect storm that brought virtual training together.

Once we tried it, the light bulb went off. That is the secret: Don’t knock it till you’ve tried it.

At Baggett, we have an overall agreeable group of folks working here.

In my opinion, typically, good technicians love training. They’ll take it however they can get it. The only downside – this is not something they’ve voiced, but I have observed – is when training takes too long. Techs typically don’t like to sit at a desk all day. It’s usually better to split training up over several days.

I prefer a two to four-hour class, this keeps the technician engaged and not antsy, and also allows us to have some productivity that day as well.

ADVANTAGES OF VIRTUAL TRAINING

Digital virtual training changes so many things for us. I am excited about it. The biggest reason is that I couldn’t always justify the investment in sending my guys out to live training.

With virtual training, the class cost is nothing compared to paying for travel, hotel rooms, time away from work, and so on. In cases where live classes start on a Monday and the techs must travel on Sunday, that eats into their personal time.



With virtual training, those and other negatives go away. I watch the quality of online live and virtual classes and assess the quality of in-person training because I don't like sending my technicians to something I haven't been to myself. This goes back to knowing it will be worth the dollar and time investment, and that the syllabus aligns with our way of doing business.

Because virtual is much less of an investment, I'm more apt to try something and then look over their shoulders occasionally to make sure it aligns with our greater mission and direction.

NCI does a great job. Their virtual classroom technology works, the quizzes work, and so on. It's always disheartening when it sounds like a great idea, and nothing works.

This can frequently happen, especially when organizations first adopt the technology, and it doesn't work. It makes me wonder whether they practiced or tried to work out the kinks BEFORE training started.

Those things concern me, but again, I'm much more apt to rip the Band-Aid off because the investment of time and money is usually quite a bit less.

PRE-RECORDED AS-YOU-GO ONLINE TRAINING

I also find value in using pre-recorded self-paced training and live webinars. The NCI airflow pre-recorded module is one we use most often lately, but I find value in having self-paced courses in general. Frankly, these courses are how I keep myself up to speed.

The first time I studied how to measure static pressure and airflow testing, pre-recorded training was a great first step. It was comfortable. I could

do it at my own pace over a few nights when I came home from work. Instead of watching TV, I would hang out with my laptop going through the modules.

When I followed up the self-paced online class with the live webinar, I found myself more prepared and better able to interact with the trainer and other participants in the class. That provides reinforcement of the concepts and brings even more value.

ALWAYS BE TRAINING

Someone once told me that successful contractors should always be training and I agree. In that light, I like to use training to fill in a day when things are slow. It's hard to predict slow days, so pre-recorded training is a resource I can go to instantaneously. I can have the techs sit at various computers so they can catch up on training they are behind in or can start new training.

When you plan to send someone to classes in person or attend a live webinar, they must go at that specific time. In fact, it seems to never fail, when I schedule a technician to be out for training that is EXACTLY the time we will have plenty of work to do!

We not only use virtual training on the technical side of the business, but also for non-technical staff. There are many online options for customer ser-

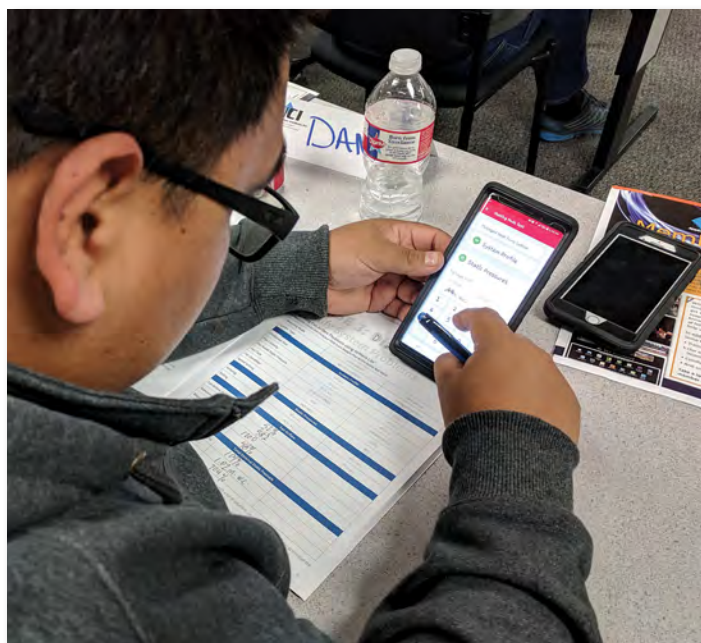
vice, sales, and business training.

Our manufacturer supplier is [Tempstar ICP](#), and they offer some customer service and dispatch classes online.

AND THEN THERE IS VIRTUAL REALITY (VR)

I believe virtual reality or VR training is in the early stages of becoming critical. It's only a matter of time before it becomes more prevalent. I have NOT used it here at Baggett, but I know VR is part of the evolution of training. Like anything else, the adoption of VR will follow this industry's historical curve of change.

Though, in my opinion, nothing will ever replace getting in a truck and riding around with a senior techni-



cian, watching them do what they do, but that doesn't mean you shouldn't take advantage of all forms of training.

Classroom, online, and virtual reality training set people up so that when they get in a truck with a senior tech, they'll start to pick up things faster.

For me, that is the most essential point of this entire article. Shortening the learning curve is so important for the success and growth of any HVAC business.

SHORTENING THE LEARNING CURVE

For example, my senior technician Jesse has been with Baggett for 12 years. Jesse had a lot of electronics and construction experience when he joined Baggett, but he had no heating and air conditioning experience. We have been on an 11-year journey together to where he is today.

My next most senior technician is Ed. He has been with Baggett for around five years, and even though Jesse is still the most senior tech, our

last line of defense when no one else can fix it, Ed is close.

We shortened the learning curve from 11 years to five years. That is what we're trying to do.

I recently onboarded a maintenance technician with nine months of new construction installation experience. But in around 60 days, we got him in a truck, and he's running maintenance independently. Talk about shortening the learning curve!!! And he is doing a good job.

We're trying to shorten the curve by doubling down on training, mastering skills, and setting up the next generation of technicians for success and growth as they join the industry.

In the end, for me personally, I'm still a work in progress 22 years later.

I guess we're all students and should be all our lives.

The day I walked across the stage to receive my college degree, there was a lady in her 80s who was also getting a degree. It was like her 7th one. She never stopped learning. There's a lesson in that. **NCI**



Alana Ward is the second-generation owner of **Baggett Heating** in Clarksville, TN. The \$1.6 million residential replacement and service business opened in 1974, and Alana took over in 2006. She is a member of **NCI** and was

named *Woman of the Year* by **Contracting Business** magazine in 2012. In 2021 the **Service Roundtable** named Baggett Heating one of the top 10 companies in the U.S. providing customer satisfaction. She can be reached at ncilink.com/ContactMe.



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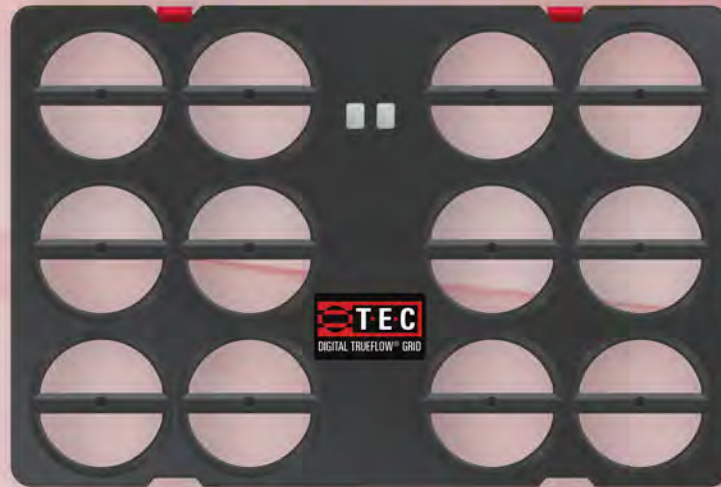




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Smart Technology and the *High-Performance HVAC Professional*

In the HVAC Industry during the late 1990s, Smart Technology may have made its initial inroads through thermostat and comfort control advancements being installed into higher-end homes. Today with integration, the Internet of Things, artificial intelligence, Smart Thermostats, and a drop in the cost to buy and install these things, Smart Technology is more the norm than ever.

Plus, most HVAC equipment manufacturers have been baking smart tech, in the form of sensors, into their products for years. The stage is undoubtedly set for next-level opportunities for High-Performance HVAC contractors.

If you think about current industry changes like new refrigerant development, higher minimum SEER requirements, more demanding energy mandates, they all lead to smart technology. In my opinion this plays right into the high-performance side of things. With that in mind, I think the days of the HVAC contractor sitting on the sidelines are ending.

To understand what this means, it makes sense to know the differences between terms like Smart Technology and The Internet of Things (IoT).

IOT VERSUS SMART TECH

There is a loose connection between IoT versus smart tech. Interestingly, IoT is a spectrum, an umbrella term that can mean many things. IoT is about a lot of home products that are enabled through Alexa, Siri, and other similar artificial interfaces. For example, I have deck lights controlled and scheduled through Alexa. But the lights aren't connected to a security system. These products aren't often integrated, so they don't "talk" to each other. In other words, IoT is more about individual products that we can control using different mobile phone apps.

With smart technology, on the other hand, everything is integrated. The products speak to each other and can make decisions where homeowners and contractors can know what is happening throughout a home.

We'll see High-Performance HVAC becoming critical for things like load shedding as the U.S. infrastructure ages. smart home tech will allow us to seamlessly experience our homes in today's environment.

High-Performance HVAC is all about testing, diagnosing, and fixing invisible issues that plague homeowner comfort and energy efficiency. Smart Tech makes it possible for contractors to monitor and control home systems. Technology similar to [Emerson's Sensi Predict](#) or other OEMs'





interfaces can put the high-performance contractor in a position that was only a dream 20 years ago.

This tech can tell contractors in real time what potential issues will happen. It can help contractors and homeowners to make choices in a world rife with finite labor, escalating costs, and a need for skill allocation — getting the right person to the right job.

In other words, it allows us to manage our businesses in ways we never could. For me, the goal is to understand Smart Tech possibilities and how to leverage them to benefit the customer and the HVAC company.

THE SECRET SAUCE

Having worked for an HVAC company for many years, we jumped in early with the Sensi product and smart monitoring. Emerson's predictive maintenance solution helped the company I worked for to analyze customer HVAC systems and know how it was performing BEFORE problems popped up.

But this wasn't something we could just jump into. It required a partnership, training, and understanding of getting equipment to perform how it's designed to perform. These three ingredients were part of the secret sauce that led to my company's success.

As an HVAC company, connecting

with your OEM or a training organization such as National Comfort Institute is the gateway to understanding the difference between rated and delivered performance. You must understand that difference.

THE NEXT STEP IS TO GET TRAINED

Training looks different to a lot of people. Some prefer in-person classes, whereas others want digital access. You can access much of the Smart Tech training via video libraries, online refresher courses, and information available for people to pull up in the field.

As a result of this wide-open approach, training has improved. However, it's essential to pick the proper training for the right group of people. Some technicians want to get their hands on Smart Tech and learn about it that way. Others wish to have classroom time. Some want both.

Besides technical training, communication training is also necessary because it will determine how your team talks about Smart Tech, answer consumer questions, and think about it.

The last thing you want is for your field technicians to think that Smart Tech is the boogie man coming to take their jobs. Instead, they should think about how this technology helps them

take better care of customers.

Because, at the end of the day, every tech worth their salt wants the best thing for their customer.

Communication training is vital to help techs think this way. It helps them explain what Smart Tech is, why they should consider offering it, what it does for the homeowner, and how they should talk or not talk about it.

To be involved with Smart Tech, you must embrace the training. We truly live in the information age, and I think there's an opportunity today to deliver higher service levels than we ever had before.

THE POWER OF DATA

The key to smart tech AND high-performance contracting is the power of data. It provides tremendous opportunities. What if you could monitor static pressures, airflow, and more remotely? What if we could fine-tune delivered Btus into the home where we can prevent discomfort, get ahead of potential carbon monoxide issues, and ensure that customers' homes are both comfortable and energy efficient without having to send technicians out?

One technology that has been around for a while and will come more into play over the next five years is smart monitoring. As I mentioned earlier, I have experience with Emerson's

Sensi Predict. Their data is tremendous; they can interpret readings from 12 different sensors to predict faults with coil leaks, capacitor issues, and much more.

It can also lead to helping contractors with things like price transparency, labor management, and more.

Such predictive monitoring may answer HVAC seasonality issues, cash flow, and help with smarter workforce use. Add IAQ sensors, and contractors can monitor comfort at the register in the future.

POTENTIAL ISSUES

The smart home technology industry is still beginning to realize all its possibilities. From my perspective as a contractor, the most significant danger is OEMs' tendency to create proprietary software and communications protocols that may not play nicely with each other.

I've spoken to some equipment and component manufacturer leaders who have talked about onboard sensor technology being part of their products for a long time. Many of these sensors are air-gapped, meaning they're physically segregated and can't connect wirelessly or physically with other computers or network devices.

They do this because they believe having proprietary data streams is their opportunity. Frankly, I think it's their obstacle. They need to flip that view and allow for true smart home integration.

If they don't, this could contribute to a fragmented approach to HVAC system smart tech, leading to the need for gateway technology. Because of the air gap between sensors in HVAC equip-

ment, third-party vendors will likely begin developing workarounds. But that won't be easy to deal with from a contractor's perspective.

Fragmentation was a massive issue in the commercial marketplace for years before the advent of BacNet/Lonmark open protocols, and even those had problems.

Then there is the issue of HVAC system integrations with other residential systems like lighting, alarms, smoke detection, and more. Is such integration necessary?

Right now, I don't think so. However, as utilities seek ways to work around aging infrastructure, we may find them developing rebates and other programs which will go beyond the traditional focus on upgrading to high-efficiency equipment. As I said earlier, smart tech is pushing things toward high performance, and I see utilities starting to see the power in that.

In states like California, some utilities offer consumers an option to let the utility monitor energy use for lower energy prices to try and control demand. If that approach spreads across the U.S., we may see a push for more integration between HVAC and other residential systems.

The HVAC industry, which consumes around 40 to 60% of a home's energy, is responsible for understanding our part in it and what that consumption does to the consumer's energy bill. That's when the importance of integrating HVAC into the Smart Tech system will happen.

FINAL THOUGHTS

Smart tech is here. Timing is something to look at when considering

adopting Smart Tech. I have friends in the information technology sector who always discuss the difference between the leading and bleeding edges. They say it's OK to be on the leading edge, but you don't want to be on the bleeding edge.

The bleeding edge is where all the lessons are learned at your expense.

Another hurdle is training. Training is required, and quite often, it can evolve quickly. You may need to update your training from time to time.

Then there is a hurdle that I call consumer mindshare. If consumers aren't thinking about it and other contractors aren't talking about it, smart tech can be harder to sell.

That's where I think timing is key. If you have the right technician talking to customers and connecting with them, educating them about Smart Tech is worth it.

Don't tie smart tech success to labor in a world where you want to grow your maintenance base. Use smart tech to give you insight into a call or to see something before that critical time of year when you need to make hay while the sun shines.

Smart tech is a game changer; offering smart services like predictive maintenance can make all the difference in your business. **NCI**



Eddie McFarlane most recently served as president at Haller Enterprises, Inc., Lititz, PA. He has been in the HVAC trades for 19 years serving in various roles in commercial and residential sales, marketing, and management. He recently left Haller to seek other opportunities but plans on remaining involved in the HVAC Industry. You can reach him at ncilink.com/ContactMe.

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Manometers: Picking the Right Accuracy for the Job

Have you ever read through the manufacturer's accuracy specifications for a manometer? Did you understand them well enough to know if the accuracy was good enough for the measurements you needed? Are you aware that even though you can see a stable number on the screen that looks like any other good measurement, it could be so inaccurate that you might as well be looking at a random number generator?

Every HVAC technician's tool bag should have a manometer in it. Techs need to measure static pressure in ducts, gas valves, rooms, and the combustion appliance zone (CAZ), to name a few. For each of those measurements, a certain accuracy is required to be sure you have a useful measurement.

Manufacturers have different ways of specifying the accuracy of their instruments (see **Figure 1**). They are not easy to compare just by reading them! It looks like "Manometer A" might be the most accurate because it says 0.5%, and the other two say 1% and 0.9%, which are larger percentages. But that does not tell the whole story.

FIGURE 1 - MANOMETER SPECIFICATIONS

	RANGE	ACCURACY
Manometer A	0 to 40 in W.C.	±0.5% of Full Scale
Manometer B	0 to 40 in W.C.	±0.02" in W.C. from 0 to 2" in W.C. ±1% reading from 2" in W.C. to 40" in W.C.
Manometer C	0 to 10 in W.C.	±0.9% of reading or ±0.0005" in W.C. whichever is greater

Confusing right? If we break down those specifications, they consist of just two types of errors or uncertainties:

- Errors that are a fixed pressure across the measuring range

- Errors that are a fixed percentage across the measuring range.

THREE COMMON MEASUREMENTS

To unravel the meaning of these specifications, let's use them to estimate the accuracy of three common measurements (see **Figure 2**) an HVAC technician should take.

- A gas manifold pressure of 3.5-in. W.C.
- A supply duct plenum pressure of 0.1-in. W.C.
- A bedroom pressure of 0.01-in. W.C. (Room pressures are more commonly measured in Pascals (Pa), but we'll do everything in inches of water column (in W.C.) to keep it consistent. 0.01 in W.C. is about 2.5 Pa, a common pressure for a bedroom in a house).

FIGURE 2 – COMMON PRESSURE MEASUREMENTS



THE MATH FOR ACCURACY

Let's have a look at the chart on the next page (**Figure 3**). If you study this chart, you will see the three manometers applied to our three use cases. Green indicates that the manometer's measurement accuracy is good enough to be useful.

Red is not accurate enough, and yellow is probably useful, but could occasionally be misleading.

In the first scenario, we measure gas pressure with Manometer “A.” The manufacturer’s specifications are 0.5%. But any time you see a percentage, you should ask yourself, “Percent of what?” In this case, it’s a percent of Full Scale. For this manometer, the full-scale reading is 40-in. W.C., and 0.5% of 40-in. W.C. is 0.2-in. W.C. So, this is really a fixed pressure error; the error is ± 0.2 -in. W.C. at any reading.

FIGURE 3 – COMMON MANOMETER TESTS

Test “1”		
	3.5 in W.C. - gas manifold	
	PERCENT	IN W.C. ERROR
Manometer A	5.7%	0.2
Manometer B	1.0%	0.035
Manometer C	0.9%	0.0315

Test “2”		
	0.1 in W.C. - supply plenum	
	PERCENT	IN W.C. ERROR
Manometer A	200%	0.2
Manometer B	20%	0.02
Manometer C	0.9%	0.0009

Test “3”		
	0.01 in W.C. - room	
	PERCENT	IN W.C. ERROR
Manometer A	2000%	0.2
Manometer B	200%	0.02
Manometer C	5%	0.0005

When we measure 3.5-in. W.C., it’s ± 0.2 -in. W.C. That means we expect the true pressure in the gas manifold to be between 3.3 and 3.7-in. W.C.

when the manometer displays 3.5.

Now let’s also look at that as a percentage of what we’re measuring. To calculate the percentage, divide the error by the pressure we’re reading: $0.2 \div 3.5 = 0.057$ or 5.7%. So our measurement would be 3.5-in. W.C. $\pm 5.7\%$.

Let’s look at making that exact measurement with Manometer “B.” The specifications for Manometer “B” say that between 2 and 40-in. W.C., the accuracy is $\pm 1\%$ of the reading. Our reading is 3.5-in. W.C. One percent of $3.5 = \pm 0.035$ -in. W.C. So we expect the true gas pressure to be between 3.465 and 3.535-in. W.C. when the manometer reads 3.5.

Suppose we keep repeating this exercise using all three manometers. In that case, we must either convert an error in inches of W.C. into a percent, or convert a percent into an error in inches of W.C. Keep in mind that for Manometer B, it’s the opposite calculation above or below 2-in. W.C. For Manometer C, you must do **both** calculations, then pick whichever one is bigger.

Figure 3 shows the result.

TEST 1: THE GAS MANIFOLD TEST

Any of the three manometers would be accurate enough to give a meaningful measurement. The errors are all within a few percent of the measurement, so it’s not likely you’ll think the gas pressure is OK when it’s too high or too low, or think it’s a problem when it’s actually OK.

TEST 2: THE SUPPLY PLENUM PRESSURE TEST

Now look at the supply plenum pressure. If measured with Manometer A, the error is 200% or 0.2 inches of



water column. That could be a problem. Imagine your manometer reading is 0.1-in. W.C., when in reality, there is 0.3-in. W.C. in the supply plenum. It’s way too high! You’d think everything is OK when it’s not OK at all.

That measurement is so inaccurate that it’s not useful.

Next, let’s look at Manometer “B.” It tells us that the pressure is 0.1-in. W.C., but it could be as high as 0.12-in. W.C. or as low as 0.08-in. W.C.: plus or minus 20%. That generally tells you whether there’s a problem, but you wouldn’t be too confident about the readings.

The error will worsen if that pressure is lower at the next house.

TEST 3: THE BEDROOM PRESSURE TEST

Now for the hard one; a bedroom pressure of 0.01-in. W.C. In this example, you’re running the HVAC system at full capacity and measuring the pressure in each room with the door closed to see if there’s a clear path for the air to get back to the return.

In this example, only manometer “C” provides a reading accurate enough to be useful.

This measurement determines if you need to add transfer grilles, jump duct, or a larger door undercut to allow air to flow back to the return when that door is closed. Manometer “C” will reliably tell you if that bedroom pressure is a problem.

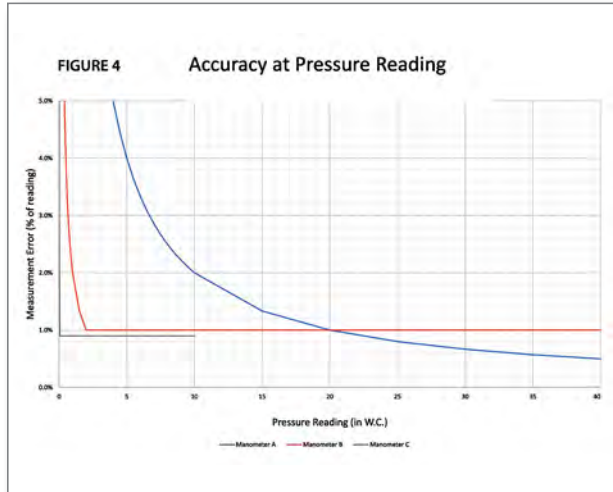
THE WHOLE RANGE

If we want to see the entire accuracy picture, we can make a graph (see **Figure 4**) to compare all three manometers over their full range.

This is easiest to do by looking at the measurement error as a percent of the reading. Here’s what that looks like:

FIGURE 4: ACCURACY VS. PRESSURE CHART

This graph shows that at pressures



above 25-in. W.C., Manometer “A” is the most accurate – the blue line has the lowest error. That’s because of that small percentage: 0.5%. But once you get down to 20.-W.C., the error is doubled to 1%. And when you go down to 1-in. W.C., the error doubles again.

In fact, it just keeps doubling every time the measurement goes down by

half – that’s why it skyrockets at low pressures.

But it’s hard to see what happens at low pressures with manometers “B” and “C.” It looks like they shoot up to infinity really fast. But that’s not what’s going on.

To see it, we must change the graph to a log scale (see Figure 5). You don’t need to worry about what that means; you need to know that this lets you zoom in on the lower pressures and higher errors.

FIGURE 5: ENHANCED ACCURACY VS. PRESSURE CHART

Manometer “A” still shows an error of 1% at 20-in. W.C. and Manometer “B” still shows an error of 1% down to 2-in. W.C., and then it starts to go up.

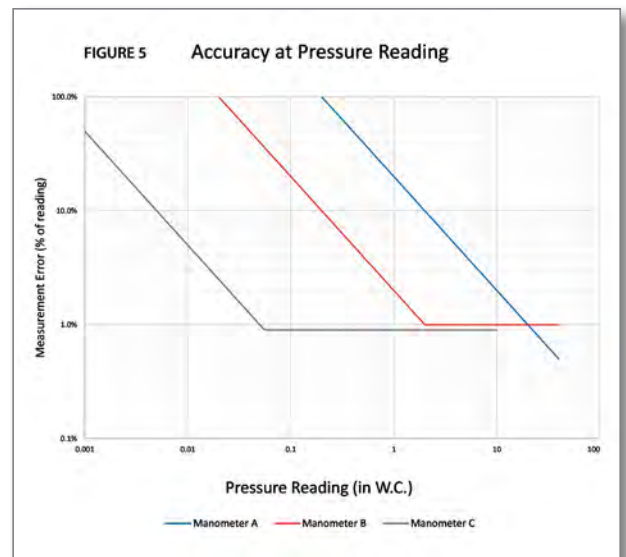
But now we can see what’s happening with a tiny reading of 0.01-in. W.C., which is the bedroom pressure in our example. Manometer “C” has an error of 5% at that reading, and Manometers “A” and “B” are off the chart – over 100% error.

This graph shows us how all three manometers will ramp up when they get to that “fixed pressure” error at the lower end of their specifications, but they start ramping up at different starting points. We can also see that manometers “B” and “C” have a flat line when they get down to the

“fixed percentage” part of the graph. Manometer “B” starts ramping up at 2-in. W.C., and Manometer “C” starts ramping up way down at 0.055-in. W.C.

KEY TAKEAWAYS:

HVAC technicians must measure many different pressures accurately



enough to make confident decisions. But manufacturer’s specifications can be complicated and make it more challenging to know if the instrument is right for the job. Hopefully, this information will help you select the right manometer or know if the one you already have gives you reliable information to make important decisions about system performance. **NCI**



Steve Rogers owns The Energy Conservatory (TEC), a manufacturing company specializing in home performance. The firm produces the MINNEAPOLIS brand precision diagnostic equipment and develops processes to solve building comfort, energy use, durability, and air quality problems. Steve can be reached at ncilink.com/ContactMe.

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Another Summit is in "The Books"

The 2023 edition of National Comfort Institute's (NCI) **High-Performance HVAC Summit** took center stage in Branson, MO from April 17th to the 20th. More than 100 contractors, preferred partners, and other industry luminaries gathered to celebrate the importance of taking the critical steps to building a solid high performance maintenance program.



This year's program format was all interactive and driven by the attendees. Every session had a facilitator, but the conversation was driven by the attendees themselves.

From the pre-conference kick off to the closing luncheon, excitement radiated as contractors networked, interacted with exhibitors, and spent three days learning.

Some of the key highlights of this year's program include:

● **Reach For The Summit:** Returning champion Dawn Mroczek of GV's Heating faced off against Hunter Wallace of Progressive Heating. Contestants answered multiple-choice questions from real-world installation and service scenarios. Then, the audience voted via the NCI Summit 2023 mobile app for the answer they thought was correct.

Each question was followed up with commentary from the tag team duo of David Holt and David Richardson, who discussed the merits of each answer and which way they felt the audience would vote.

The winner was Hunter Wallace.

● **Idea Meeting:** This contractor-only session was hosted by Vince DiFilippo of DiFillipo's Service, Paoli, PA and Mike Weil of NCI. The session was divided into two one-hour sections: one dedicated to **High-Performance Lead Generation** and the other to **Sales**.

Attendees presented their ideas on each topic and then voted for those they felt were the best. The winning ideas were from **Dawn Mroczek of GV's Heating** (Lead Generation) and **John Whitehead from Honest Heating and Cooling** (Sales).

● **Exhibitor Showcase:** Twenty-two exhibitors shared the latest technologies and services with attendees throughout the conference. Their tabletop displays were in the general session ballroom providing contractors the ability to speak with them during breaks and regularly scheduled show hours.

Exhibitors also participated in NCI's annual Preferred Partner Prize Drawing. Attendees received "game cards" that had to be stickered by each exhibitor, then turned in to be eligible for the drawing.

● **State of the High-Performance HVAC Industry:** Dominick Guarino delivered the state of this segment of the HVAC Industry and the impact Rob Falke had on it.

● **Summit 2023 Awards and Recognitions:** This event is the highlight of every Summit. Here the NCI management team recognizes excellence in the High-Performance HVAC industry. The 2023 conference marked the 19th year that NCI recognizes excellence in many different categories.

Winners are as follows:

— **Small Contractor of the Year:**



JN Electrical, Bowersville, GA

— **Medium Contractor of the Year:**
Crossway Mechanical, Tomball, TX

— **Large Contractor of the Year:**
Cardinal Heating and Air Conditioning, Sun Prairie, WI

— **John Garofalo Implementation Excellence Award:** **Getzschman Heating, Fremont, NE**

— **David Debien Award for Technical Excellence:** **Cliff Dennis, Vassers Service of Richmond, Mechanicsville, VA**

— **Scott Johnson Training Excellence Award:** **Hearn Plumbing and Heating, Madison, OH**

— **High-Performance Sales Excellence Award:** **Will Horner, Canco ClimateCare, Newmarket, Ontario, Canada**

— **The Rob Falke Servant Leader Award:** This new award is in memory of Rob "Doc" Falke. The inaugural winner is **Mike Greany, Aire Rite AC & Refrigeration, Corona, CA**

— **The Spirit of Excellence Award:** This also is a new award. The 2023 inaugural winner is **Tom Turner, Austin Energy, Austin, TX**.

— **The Preferred Partner Award:**
Daikin Comfort Technologies


— **The Chairman's Award:** **Greg Wallace, Progressive Heating, Cooling, and Plumbing, Newnan, GA**

We will cover the entire Summit in more detail online very soon.

And stay tuned: Summit 2024 will be in Asheville, NC. 

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High-Performance HVAC Can Help Solve Our Technician Shortage Problem



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In **March 2022**, “**One More Thing**” column was about our shortage of HVAC technicians. According to the Bureau of Labor Statistics at the current rate of employment in HVAC, we are inching closer to only having one in two technician slots filled by 2027 – four short years away! As an industry, we must work together to not just stem that tide, but reverse it — ASAP.

So where is everyone? Some are living in their parents’ basements trying to figure out if they really ever want to work again. Others have joined the “Gig” economy, basically selling their time. This includes ride-share driving, providing day labor, subcontracting, and trying any other way they can to make a living outside of a traditional job.

OVERCOMING THE STIGMA

The HVAC industry and other trades are feeling the pinch more than other service industries. Why? The trades are saddled with the stigma of being where kids who aren’t college material end up. The trades are viewed as dead-end low-paying jobs.

However, a closer look, shows that nothing is further from the truth. We have a growing, thriving industry filled with opportunities, whether people want to work with their hands, like to be challenged by cutting edge technologies, or really enjoy helping customers make their homes as safe, healthy, comfortable, and energy efficient as possible.

In comparison to other service industries, HVAC pays quite well. Many technicians can grow to make six figures and have a lifestyle that often exceeds that of a college graduate.

So how do we get across how different HVAC service is from the stereotype that has plagued us for decades? We must start promoting ourselves as an industry of well-paid professional craftsmen, not tradesmen.

PAINT A PICTURE

One of the best ways to make your company stand out is by showing them you are a high-performance HVAC organization, and what that means for your employees and your customers.

For starters, paint a picture of what a day in the life of a service tech, comfort advisor, or installer looks like working for a company with a High-Performance culture. You must show them how you are different. Also show how there are clear paths for advancement within your organization.


To attract Gen Z’s and Millennials, you also need to structure your company so it can accommodate varying life-work balances. I’m not suggesting you coddle employees. Just the opposite: find out what motivates a prospective hire, and make the position work for both of you with clear, written expectations.

A DIFFERENT POND

A contractor recently shared with me that he rarely hires talent from other companies, and candidates fresh out of trade school typically have to be retrained.

Instead he “grows his own,” and takes advantage of every opportunity to look for talent outside our industry. His favorites include car dealerships, both in the showroom and the shop, and other in-home service companies.

The bottom line is we have to learn to “fish in different ponds.” HVAC can be taught. Other attributes like a great attitude and people skills are harder to teach, often impossible.

In the book, *Good to Great*, author Jim Collins emphasizes the importance of getting the right people on the bus. When you have the right people, you can always figure out the best seats for them on the bus. Let’s be more open-minded as we look for the right people on our buses. 



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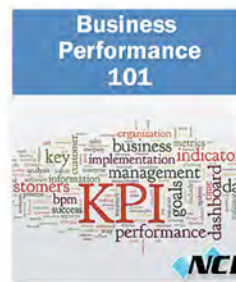
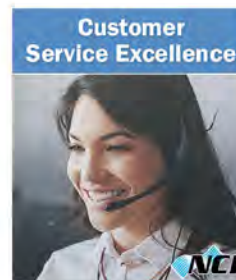
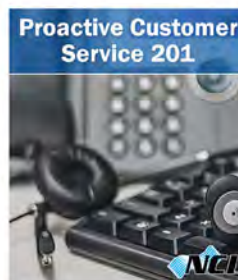
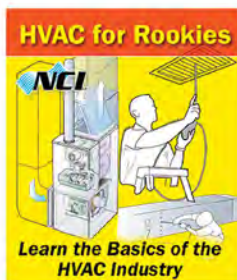
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