# OFFERING BETTER: Upselling Your Customers with High-Efficiency Systems



OFFERING BETTER: UPSELLING YOUR CUSTOMERS WITH HIGH-EFFICIENCY SYSTEMS

SPONSORED BY

GRUNDFOS

CONTRACTOR
Contracting Business

# SELLING YOUR EXPERTISE

**STEVE SPAULDING, EDITOR-IN-CHIEF, *CONTRACTOR MAGAZINE***

Your knowledge of how systems work—and how you use it to solve your customers' problems—is always your greatest asset.

There's a story they tell in the trades about a factory that has a breakdown that stops production. No one who works there can figure out how to fix the problem. Then someone remembers Old Bob, who used to work there back when the factory was built and knows the place inside-out. He still takes occasional jobs and someone knows his number, so Bob gets the call and he agrees to come out and take a look.

He spends about an hour poking around, then goes over to a piece of machinery, hits it with a hammer and suddenly everything starts up again. He then presents his bill to the floor manager: $1,000. The manager swallows hard and says, "Hey Bob, you think I could get this itemized?"

Bob ponders for a while, then scribbles on a notepad:

Hitting machine with hammer -- $1

Knowing where to hit machine -- $999

Everyone who works in the plumbing, heating and HVAC trades competes on price. Price is usually the prime concern of the customer, especially new customers. But the fact is there will always be someone out there willing to cut a few corners and do the job cheaper. Making a low price your only selling point is a race to the bottom, always making yourself more and more work for less and less money.

Instead, make yourself the expert and sell your expertise. If you make yourself the person who can do the work that other guy can't—and do it to a high standard—then the work and the money will find its way to you. You'll be able to offer your customers better systems, more comfortable systems, more efficient systems, systems that require less maintenance. In the end they'll be able to say, truthfully, that the extra money they spent with you was worth it.

Here are a collection of articles from the pages of *Contracting Business* and *CONTRACTOR Magazine* that explore various technical aspects of modern plumbing, heating and HVAC systems. We hope there's something in this collection to inspire you, something you can use to broaden your company's offerings—something to expand your own range of expertise.

# SIMPLIFY YOUR STOCKROOM WITH TWO RESIDENTIAL HEATING PUMPS

By driving a well-stocked van, contractors can save both time and money. For example, by carrying just two pumps—the Alpha2 15-55 and Alpha2 26-99 from Grundfos—installers can cover 90% of residential applications.

"The pumps take the place of more than 30 competitive models," says Steve George, key account manager for domestic building services for Grundfos. "By having the need for less inventory, you don't need to get to the job and then run back to the supply house to pick something up. You can simplify your life and keep just two pumps on your truck to cover almost any residential hydronic job you come across."

## MAKING MODIFICATIONS

The Alpha2 family of circulator products not only helps contractors streamline their inventory, but it also saves energy costs for homeowners. The product's software driver control mode automatically sizes the pump to run at top efficiency.

Grundfos first came out with a three-speed circulator back in the late 1980s. Fast forward to today, and the Alpha2 model features an electrically commutated motor (ECM) with a permanently magnetized rotor. As such, it reduces the amount of electricity required to spin the rotors and operate the motor.

ALPHA2 26-99

By adding an auto adapt feature to the control mode, Grundfos took the product to the next level. Previously, the circulator featured three fixed speeds. Based on 60 years of hydronics experience, however, Grundfos created a software algorithm that detects how hard the motor is working electrically.

Based on the wattage draw or the energy consumption, the pump automatically sets the motor speed to the match the demand and run at the lowest possible power consumption. If contractors want it to work like a traditional circulator, they can select the "fixed speed" mode with three speeds and three constant pressure settings, and still reduce electrical costs by about half.

"The Alpha products have a simple push button so when you first power the pump, it starts in the auto adapt mode," George says. "You don't have to do any programming. You just power it and let it do its thing."

Over time, Grundfos also made other modifications to the Alpha2 product line to improve efficiency. For example, if a hydronic circulator sits in the off season, it may not start up.

"If a pump doesn't run for four to five months, and the guys don't purge or clean the system, murky boiler water can get sticky and prevent the rotor from turning," George says. "Then it ends up being a service call."

To reduce contractor callouts, the system now has a continuous re-start feature.

## STREAMLINING MAINTENANCE

ALPHA2 15-55

Grundfos has simplified troubleshooting by designing the product with a digital display on the face of the pump. With this feature, contractors can easily discover how many watts of power the pump is using as well as the estimated gallons per minute (GPM) that the pump is performing at.

"If you are on a no-heat call, you can look at the display and see if the pump is working," George says. "You can then start analyzing if the pump is getting enough GPM or is undersized for the application. There is a lot of good data to figure out what is going on."

if the pump is running under 1 GPM, it now reads "low flow," and if it is above 16 GPM, it reads "high flow." Before this modification, if it had a low flow, it showed a zero reading, which could cause confusion if the zone was heated.

The two models, which cover a wide range of residential heating applications, are available in two sizes. The Alpha2 15-55 covers applications up to about 15 GPM and up to 18 or 19 feet of head. The larger model—the Alpha2 26-99—is closer to five GPM and 40 feet of head. Through versatility and range in one product or SKU, a contractor eliminates the need for different pumps.

"By controlling the speed of the motor, you can eliminate the need for multiple SKUs of residential circulators," George says. "It eliminates the need to stock multiple pump models on your shelf/truck and still have what you need to do the job." ●

# HOW TO CHARGE MORE FOR YOUR DUCT SYSTEMS

## Renovating deficient existing duct systems along with equipment replacement is an additional source of highly profitable work with little competition.

BY ROB 'DOC' FALKE

Your first thought may be, "Service companies don't sell duct systems! Only new construction companies deal with them." If so, think again. Service companies that renovate existing duct systems along with equipment replacement have found an additional source of highly profitable work with little competition.

Most importantly, almost every duct system needs upgrades so new equipment can operate within manufacturer specifications. As soon as customers understand their lack of comfort and high utility bills result from poorly operating duct systems, they want to learn more.

When they connect that new equipment alone cannot resolve their problems, they will pay more to get what they've wanted all along.

### MOBILE PHONES AND DUCTS

Your mobile phone doesn't work very well without good reception. The weaker the signal, the choppier the call, the slower the download, and the more videos freeze up.

**Duct renovation has no fixed price. Few offer it, and every job is customized for the customer. This is prime criteria for a profitable service that your customers will pay more for.**

Think of air handling equipment like the mobile phone and ductwork as the signal. Ducts broadcast conditioned air into the building. The equipment can work just fine, but the system is substandard unless the duct system carries the air where it needs to go.

On how many bars is your HVAC system running? Does it freeze up occasionally?

### MOST SERVICE COMPANIES...

Many service companies focus their replacement sales on the strength of the equipment they carry. A typical sale assumes equipment is so superior that it can overcome any issues the duct system may cause.

New Curved Duct

There are a lot of assumptions made with this approach. First, it assumes the duct system was perfectly installed when it was new. Second, another assumption is that duct systems do not deteriorate over time. And a third assumption is that every room has been comfortable from day one.

Most service companies perceive ducts as a necessary evil. They believe there's no money in duct upgrades and that customers only want new equipment to get the heating or cooling turned back on.

### A FEW SERVICE COMPANIES...

Progressive service companies understand that HVAC equipment has become a commodity offered at the lowest price by their competitors. However, experience taught them that spending time to consider more than the equipment changes the sales conversation. The resulting discussion sets them apart from other companies that offer only equipment replacement.

When it's time to replace equipment, most customers want more than just the air turned back on. For once, their full attention is on their heating and cooling system. At that moment, they're open to new ideas.

**Progressive HVAC service companies have learned that spending time to consider more than the equipment changes the sales conversation.**

Once a customer knows the duct system controls how the equipment works, their equipment replacement decision changes.

Customers begin to see companies that offer equipment replacement only as scam artists looking for a quick sale. They view them as quick-fix companies unwilling or unable to solve real problems. It becomes evident to customers that they'll get stuck with a sloppy system and marginal comfort for the next decade.

## HOW TO CHARGE MORE FOR DUCTS

Sound business principles dictate that to get more, you must give more. Your success depends on your ability to assure what you provide has a far greater value to your customers than it costs you.

The key to charging more for your duct services is to help your customer see the value in their ducts. It is surprisingly easy to do because many of your customers don't think about their ducts and what they do.

The mobile phone example can help many customers understand the importance of their ducts. Other examples you can use include electric power transmission lines or a car transmission.

Also, duct renovation has no fixed price. Few offer it, and every job is customized for the customer. This is prime criteria for a profitable service that your customers will pay more for.

Duct renovation is not a commodity like most products in our industry. So set your price accordingly.

## ASSESS THE DUCT SYSTEM

People will see right through your fast talk if you claim their duct system is garbage without first testing it.

Many salespeople invite customers to join them as they perform a few simple tests. This activity may include inspecting duct fittings near the equipment. It's surprising how few owners have looked at their ducts before. You can also check whether ductwork is sized right, leaking, pinched off, or belongs in a junkyard.

**A duct static pressure test consists of two one-minute measurements. You compare each pressure reading to a maximum allowable duct pressure and immediately reveal the duct system's resistance to airflow.**

A duct static pressure test consists of two one-minute measurements. You compare each pressure reading to a maximum allowable duct pressure and immediately reveal the duct system's resistance to airflow. Static pressure tests also assess duct installation conditions. Email me for a free test procedure (ncilink.com/ContactMe). Customers easily understand these test results,  too.

Often these initial duct surveys uncover more extensive issues. When this happens, an agreement is made for additional in-depth testing and diagnostics. A cost is agreed to, and the work is authorized. Companies send a trained and certified technician to identify what the system needs to meet equipment and design specifications.

Customers who are willing to participate in duct system assessment and pay for additional testing are often eager to get more. They want assurance of a better system.

## BIGGER DUCTS

Ongoing field testing continually confirms many duct systems are undersized and restrictive.

Everyone knows that bigger is better but bigger costs more. So compared to traditional duct design, companies that offer duct renovation install larger ducts. Customers readily embrace this idea because it makes sense to them.

In addition to bigger ducts, additional services build the value of duct system upgrades. Other upgrades typically included register and grille upgrades, increased duct insulation, improved duct materials, and additional suspension.

## PROVE IT!

I grew up with cousins on the other side of Falke Street. My cousin Jeff Falke had a favorite comeback; he'd constantly challenge me to "Prove it!"

You can charge more for a better duct system when you "prove it." You can show you gave your customer what you promised when you complete an equipment replacement job with duct renovation.

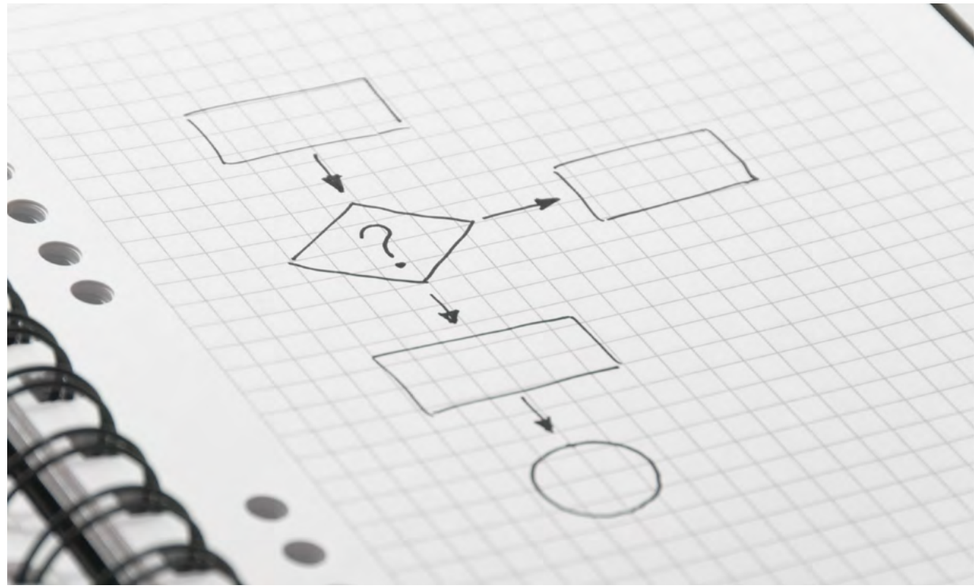
A simple report documents that airflow, static pressure, temperatures, and equipment performance are within specifications, and the job is done right.

Adding duct renovation to equipment replacements remains a relatively fresh frontier in our industry. If you're new to duct upgrades, I encourage you to look at your next duct system and consider if only replacing equipment is the right thing to do. ●

Ruined by Recirc

March 26, 2021 A recirculation system is designed to make hot water available at the fixture nearly instantly.

Most of the time, I write articles about hydronics in some way, shape or form. However, for some reason, in the last year, I have been inundated with questions about hot-water recirculation systems. More specifically, the questions relate to problems, such as pinhole leaks in recirculation lines. These leaks are causing major damage and extra maintenance all around the country. ●



# THE IMPORTANCE OF PROCESS

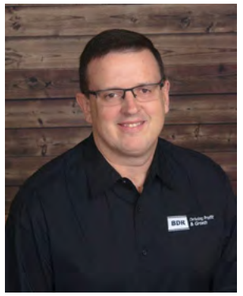
**Without a process, confusion reigns. And in a business like HVACR service and installation, confusion and haphazard methods can lead to diminished sales and the downfall of a business.**

BY TERRY MCIVER

John Michel, a training coach with Business Development Resources, wants to emphasize the fact that HVAC, plumbing and electrical businesses are among the most process-intensive home service businesses you will find.

"HVAC service, plumbing and electrical are all about having a process for each step of the technician's day," Michel says.

Which processes do you have in place, if any? If you have none or a few, you must work to establish more processes for 2022.



John Michel

"Process development begins before the year begins, by crafting a solid and structured business plan for the coming year," Michel says. "It's very important to have a budget that contains realistic projections for revenue, average ticket, and number of active and expected new maintenance agreements for the coming year, so you can build a solid plan for your company, with an applicable number of service technicians and installers, and a plan for appropriate staffing."

### WHICH PROCESSES DO YOU HAVE IN PLACE, IF ANY? IF YOU HAVE NONE OR VERY FEW, YOU MUST WORK TO ESTABLISH MORE PROCESSES FOR 2022.

John Michel recently provided additional insight into HVAC activities that are most effective when held fast by unwavering processes:

**STAFFING:** "Sufficient staffing is a major challenge for the HVAC industry and other industries today. Insufficient staffing creates many efficiencies. Be certain, going into the year, that you have a solid business plan, to include all departments that will require staffing, and what areas need to be work on for correct processes and procedures, to set up for a solid year.

"Your staff includes technicians, installers, salespeople and inside support – customer service and dispatchers -- who are in place to secure the customer and set the field staff up for success. They are absolutely essential frontline contacts."

**DISPATCHING:** "Are dispatchers routing service calls as efficiently as possible? For installations, are they obtaining the materials installers and technicians will need? The appropriate staffing of the dispatch group and the customer service team, depending on the size of your company, is crucial," Michel said.

**TRAINING:** "If the customer is asking about devices or products that can keep their indoor air quality home environment safer and healthier, contractors need to have training programs around that topic for technicians, installers and salespeople, that will help them communicate more effectively with the homeowner about products that can make them healthier and attack viruses. Those products are out there, and I've seen technicians and installers who are really able to help [counsel the customer on the applicability to their situation]."

**PROBLEM:** Depending on the size and experience of the company, it has become very difficult to find skilled and experienced technicians and installers.

"Therefore, you must be looking at your training, and find ways to create efficiencies in training," Michel said. "There will be less experienced people coming out of trade schools and other sources, such as the military, and there need to be career paths for them. The HVAC industry has many opportunities for people interested in the trades.

Having the ability to train talented people who are good with customers and good with their hands and can learn, can help to improve efficiencies, and also if there is frequently a new person joining the team."

**SALES:** This is where a sales "cadence" comes into play. The cadence is a regular pattern of activity that is proven to be effective in keeping the team on track.

"If the customer is not ready to make a decision, having a sales cadence process is powerful," Michel says. "If they're not ready, talk to them about when they may make a decision, and schedule a series of follow-ups, according to their preferred method of communication. I think we're seeing a trend with multi-generations; some may prefer a text follow-up, some phone, some email. Having that process written out in a manual can have significant impact on close rates, monthly sales, profitability, and commissions."

*The cadence is the flow of the communication: "On Day 1 I do this. On Day 2 I do this…" Ideally, there is a series of steps the salesperson follows.*

**INSTALLATION:** During the installation process, every couple of minutes represents a significant amount of money, so you need to be as efficient as you can. And the transfer of information from salesperson to technician must be well-documented. Oftentimes the salesperson is no longer involved after the sale. But has the salesperson given information about the customer and the home? Are there specific instructions or home surroundings they need to know about? Are there any photographs of the home? Photographs of any pets?

Salespersons should take photos of the unit that's coming out and the replacement unit. This will help them think about the project in advance, and ensure the parts are ready in advance.

**AFTER THE SALE:** We always suggest the salesperson has a follow-up process with the homeowner after the installation, to close the loop, and do what you would said we would do as part of the process. We are being the kind of contractor we want to be. They customer signs up for a maintenance program and they're customers for life if we do all we said we would do. That includes the follow up after the job is complete, getting them on a maintenance program, and ensuring the warranties are in place. Continue to grow the business through customer referrals, because our processes are sound strong and efficient. ●

# HOW TO SIZE DUCT IN THE FIELD

**A duct system has one simple mission; direct all the air from the equipment into each room and then back to the equipment.**

BY ROB 'DOC' FALKE

### THE GREAT AIR LOOP

A fan rotates and creates a suction and a discharge pressure. The discharge pressure pushes air through the duct system into the home. Then the suction pressure pulls the air into the return duct and back to the fan. The great air loop fills and empties the air in the house about once every 10 to 15 minutes.

Most of the air's journey through this air loop is through the duct system. Success depends on duct size, installation, and how much they resisted airflow.

### CONSIDER FAN LIMITATIONS

Each fan is sized to deliver airflow matching the system's heating or cooling capacity at a specified maximum rated pressure. If the resistance to airflow through the ducts, filter, and coil is too high, the fan can't move the required airflow, and the system's heating and cooling capacity decrease.

You can find the fan maximum pressure capacity listed on the air moving equipment nameplate. In residential systems, the most common is .50 inches of water column (in. w.c.). That isn't much pressure to work with.

A study of well-operating residential systems shows the filter and coil consume about 60% of the fan capacity. This leaves only about 40% of that capacity to move air through the ducts. With a .50-in. w.c. rated fan, only .20-in. w.c. of pressure remains to push and pull air through the ducts.

To help customers better understand duct design pressures, consider using the weight of a jellybean. When you design a residential duct system, you can ply work with pressure equal to four jellybeans in the palm of your hand. Two jellybeans of pressure push air through the supply duct, and two jellybeans of pressure pull air through the return duct.

If duct pressure is too high, airflow decreases and forces the system to operate outside its specifications. The system won't work nearly as well as it should. When heating and cooling capacity plummet, utility bills skyrocket, and comfort cannot be achieved.

### FIRST, HOW MUCH AIR?

Before you can begin to size a duct, you'll need to know the required airflow that duct must move. So, when sizing ducts entering or exiting the equipment, size them to move the total amount needed of fan airflow.

If a supply trunk duct serves three-branch ducts, add together the airflow needed for each branch duct. Size the trunk duct to carry that total volume of air.

The other end of the duct system distributes air into or out of each room. Before sizing end-run ducts, you'll need to know the required room airflow. Traditional load calculation software is available. Refer to this article, ncilink.com/ReqAirflow, for more information.

### FRICTION LOSS AND DUCTULATORS

Duct sizing calculators, or *ductulators*, are the most common tool used to design ducts. The challenge with ductulators is which friction rate to use. Interestingly, most ductulators have a big black mark over the .1-in. friction rate scale.

Unfortunately, field airflow test data shows that using a friction rate of .1-in. produces duct systems that are far too restrictive. This typical duct design factor, coupled with poor installation practices, often produces duct systems delivering dangerously close to only *half* the required airflow.

My personal experience in duct sizing brought me face-to-face with this reality many decades ago. Our family company was more than 40 years old at the time. We believed our primary strength was great duct systems. Then the day came where my first balancing hood arrived. Imagine how I felt when the system I had just designed and installed only delivered 58% of design airflow!

We removed the new duct and replaced it with larger duct. I balanced my first system, walked away filled with questions, and faced a challenging year ahead seeking answers.

That day, I learned .1-in. friction rate on a ductulator did not deliver the airflow we believed it should. Immediately, our duct design methods got overhauled. Over the years, when we used the ductulator on residential jobs, we typically chose a .05-in. friction rate for flex duct, .06 for metal pipe, and .07 for rectangular duct.

If you use software to design your ducts, stop smirking -- the same principle applies to all design. Unless you measure installed system airflow and static pressures, you have no evidence your design performs in the field. Measurement is the only verification that an installed duct system delivers designed airflow.

## BIGGER DUCTS?

**FACT:** The average residential duct system is too small. Once again, field testing shows typical static pressures exceed 150% of maximum rated fan capacity. Plus, delivered airflow at the grilles hovers at or below 300 cfm per ton.

Bigger ducts are better because they deliver more comfort and efficiency. Stop worrying about maintaining high air velocity -- that's a left-over idea from the 1950s that should have been buried in the 70s.

So, what duct design method should you use? Surprisingly, most duct design methods and software can produce well-operating duct systems. The number one mistake that ruins most duct designs is underestimating the friction rate. Always adjust friction rate calculations upwards until installed system measurements consistently agree with design airflow values.

## SIMPLE IN-FIELD DUCT SIZING

One in-field duct sizing method proven effective is a National Comfort Institute (NCI) table created in 2005. It was created by gathering and averaging thousands of airflow measurements from operating, balanced HVAC systems in the field. It includes rectangular and round sheet metal and flexible duct sizing recommendations. You can receive a copy of this table. The offer is at the end of this article,

The design airflow in this table may be less than your current design method suggests. In that case, if you choose to use this table, you will find a substantial increase in system airflow and reduced static pressures in your new systems.

**Flexible Duct**

| Duct Size | Design Airflow |
|---|---|
| 5" | 50 |
| 6" | 75 |
| 7" | 110 |
| 8" | 160 |
| 9" | 225 |
| 10" | 300 |
| 12" | 480 |
| 14" | 700 |
| 16" | 1000 |
| 18" | 1300 |
| 20" | 1700 |

By using this table over the years, we've seen proven results. Many of its users are trained and certified to measure airflow. They verify its results constantly.

## HERE ARE A FEW STEPS TO FOLLOW IF YOU CHOOSE TO USE THIS DUCT DESIGN METHOD:

1. In the field, sketch out a rough duct schematic of the system using your preferred type of duct system. Show the equipment and each supply and return duct and grille. Indicate the room name and the required airflow. List the equipment size and required airflow.
2. Assure the installation follows best practices; reasonable duct lengths and fittings, adequate duct access.
3. Size the last duct in each run connected to a register or grille first; select the duct size to deliver the required CFM to each grille, according to the duct material used. The airflow shown on the chart is the maximum CFM expected when selecting that duct size.
4. If a duct run is more than 30 feet from the equipment, increase the duct to the next larger size.
5. Continue to work back towards the fan. When two ducts join together and connect to a larger duct, add the airflow from both ducts, and size the trunk duct for that amount of total airflow.
6. Continue to size each duct accordingly throughout the remainder of the system, working back to the fan.

Once you finish the installation, measure system airflows, and pressures, then compare delivered airflow to your design. **Design and installation are incomplete without field-measured verification.**

# MINNESOTA "FOREVER HOME" TURNS TO PEX-BASED PLUMBING, RADIANT HEATING

## Veteran pipefitter Justin Johnson chooses Wirsbo hePEX™ and Uponor AquaPEX® to boost the health, comfort, and energy efficiency of his new home

A radiant heating system was the plan from the beginning. Photo: Uponor.

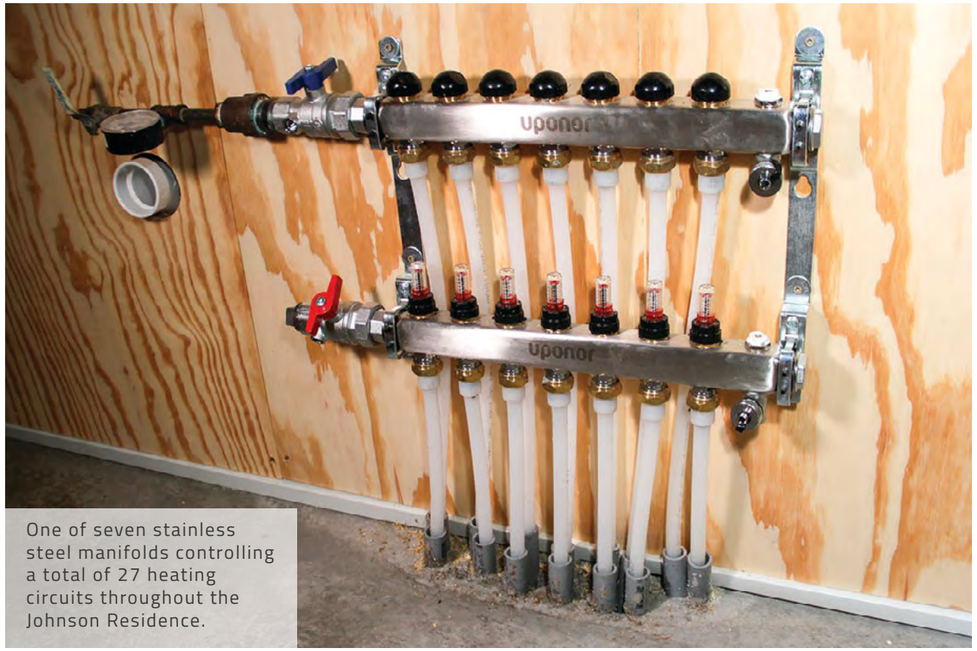
AFTON, MN — Justin Johnson and his wife, Jessica, had been planning their "forever home" for five years when they decided in late 2019 that they were finally ready to begin construction. Johnson has worked as a union pipefitter in the plumbing and HVAC industries on a variety of commercial, industrial, and residential projects since the mid-1990s. Now, the 25-year industry veteran would have the opportunity to install many of the same comfort-enhancing and energy-efficient systems inside his new, 4,600-sq.-ft. home.

Construction began in the late spring of 2020. After an incredibly smooth building process, managed by Johnson—who also served as lead installer on the plumbing and heating systems—the couple moved in right before Thanksgiving in 2020.

In his current role with Metropolitan Mechanical Contractors, Inc. (MMC) of Eden Prairie, MN, Johnson has frequently installed Uponor PEX systems for plumbing, hydronic distribution, and in-floor radiant heating applications. While on a residential job site for MMC in early 2019, Johnson shared plans for his new home with several Uponor North America (UNA) representatives, including associate product manager Brian Bollenbeck. Shortly afterward, the collaboration formally commenced, with UNA offering not only to provide product, but also to assist in the design and layout of the plumbing and heating systems.

"After using in-floor radiant heating on any number of projects for MMC and experiencing the comfort, efficiency, and health advantages of these systems, I had to have radiant for our new home, no matter what," says Johnson. "The elimination of dust and dry air through in-floor heating simply just makes for a healthier home."

Johnson also knew — in somewhat of a departure for a home built in the northern United States — that he wanted the construction to be slab on grade, not the typical basement or crawl-space foundation. The radiant system featured Wirsbo hePEX™ tubing from Uponor — equipped with an oxygen barrier to prevent corrosion of ferrous system components. The install involved loops of tubing stapled down to foam insulation on the concrete slab. In addition, the heating system incorporated multiple zones throughout the structure, including the garage.




One of seven stainless steel manifolds controlling a total of 27 heating circuits throughout the Johnson Residence.

The manifold in zone four provides radiant heating and maximizing comfort in the dinette, kitchen, foyer, office, and great room.

"Slab on grade is growing in popularity, especially in our residential development," continues Johnson, explaining he wanted a single-level house with no stairs. "My other motivation was the in-floor radiant heating itself: Burying the tubing right in the concrete slab is the most efficient approach."

## RADIANT: SEVEN COMFORT ZONES

Created by Scott Hellendrung, lead design technician for the Uponor Construction Services team, the heating design called for segmenting Johnson's floor plan into seven zones, each with its own manifold. The entire layout included 27 heating circuits. (There can be more than one PEX loop in a given zone.) The design featured the following zones in the home:

- Zone 1: Garage
- Zone 2: Bedroom #2, including bath, pantry, and hallway
- Zone 3: Bedroom #3
- Zone 4: Dinette, kitchen, foyer, office, great room
- Zone 5: Mud room
- Zone 6: Master bath, walk-in closet
- Zone 7: Master bedroom (#1)

Working with Hellendrung, Johnson shared his floor plan, the mapped-out heating zones, and all his heat-loss calculations. "Uponor Construction Services gave us everything we needed, including the accessories, and made it the easiest process," Johnson says. "I felt well-prepared for the installation after that."

The in-floor radiant installation process, involving nearly 5,500 feet of Wirsbo hePEX tubing, spanned two days, with Johnson and an MMC colleague doing all the work. On the first day, they completed the main floor of the home, which measured approximately 2,450 sq. ft.; the second day included the 1,800-sq.-ft. garage.

They arranged the tubing in the usual serpentine fashion and stapled it to 2" R-10 polystyrene foam. Once in place, they air tested the PEX and then filled the system with a 50% glycol solution heated to a set point of 117°F by a wall-hung, 110,000-Btu condensing boiler equipped with a 50-gallon storage tank.

Johnson feels so strongly about radiant technology and its benefits, he added it to other areas on his property as well. The glycol solution runs through a heat exchanger to heat a snow-melt system outside the home, and his detached, 2,000-sq.-ft. barn features a separate radiant heating system.

Supplementing the radiant system are two furnaces — one on the main floor and one directly above the garage — for those exceptionally frigid Minnesota winter days. Both units feature humidifiers, and an air exchanger is nearby as well.

The setup serves as a dedicated outdoor air system, designed to bring outdoor air into the home and remove contaminants, allergens, viruses, etc. According to Johnson, "I leave the fan on at low speed just in case the humidity levels need to be corrected."

Justin Johnson used a Uponor PEX Foam Stapler to manually set the loops and secure them in place, speeding up the installation process.

## PLUMBING: BENEFITS OF RECIRCULATION

The Johnson residence uses a well water system, equipped with a booster pump to maintain pressure of 60 psi. Johnson chose to install a variable-speed well pump, a little different from the pumps usually seen on a well system. The variable-speed pump provided

additional efficiencies the family wanted, and its quiet operation added to the benefits.

A small expansion tank with a pressure transducer monitors household water pressure. The pump changes speed in response to pressure changes, which are a function of water demand in the home. For example, if the family is using multiple faucets at once, the pump will accelerate to maintain the desired pressure of 60 psi. In general, the more outlets operating, the more likely the pump will run.

Kou Vang, also a lead design technician with Uponor Construction Services, designed the plumbing system in a trunk-and-branch layout. The design involved approximately 800 feet of Uponor AquaPEX® in diameters from ½" to 1¼" and featured hot-water recirculation, which was another priority amenity for Johnson. Once again, extra comfort, efficiency, and health were the drivers.

The recirculation system consisted of a single circulator with two balancing valves to control the gallons per minute (GPM) to each circuit for the hot water re-circulator and a pair of ½" recirculation lines: one serving the east side of the house and the other serving the west side. A timer governs the recirculation system to move warm water to the various outlets on either side, based on household usage patterns. The water circulates seven hours daily in three time slots: 4 to 8 a.m., 3 to 5 p.m., and 10 to 11 p.m.

"With the half-inch recirculation line, it's always instant hot water," says Johnson, explaining the benefits. "The fact that hot water is not constantly circulating means increased efficiency, because no heat is wasted." Hot-water recirculation also reduces waste on potable water — as well as the energy used to heat it — while waiting for hot water to arrive at the tap.

One of the advantages of PEX is the option to design the pipe with higher flow velocities than copper and CPVC pipe. This allows plumbers to replace size for size despite the smaller inside diameter (I.D.). The smaller I.D. in PEX generates faster water delivery: 15% faster than a same-sized CPVC system and 30% faster than copper. According to the calculations by Uponor Construction Services, Johnson's trunk-and-branch system would save roughly three-quarters of a gallon of water using PEX versus CPVC and 1.7 gallons versus copper. In other words, that's how much less water would be lost down the drain every time the fixtures farthest from the water heater called for hot water.

However, Johnson's decision to go with hot-water recirculation brought even more dramatic water savings. The same PEX trunk-and-branch system, now with hot-water recirculation, cut hot-water delivery time by another 98%. Going from three-and-a-half minutes to five seconds ultimately saved a little over four gallons of water with each activation.

Wirsbo hePEX tubing coming off the reel for the radiant heating system.

"Besides offering a higher flow velocity compared to CPVC or copper, a PEX system holds a smaller volume of water than the same-sized system using either of these materials in the same pipe diameters," explains Justin Churchill, residential segment manager, at Uponor. "As a result, Johnson's household should cycle through that water more quickly. Faster cycling means less water sitting in the line for extended periods. That, in turn, reduces the chances for contaminants and bacteria growing in the system."

Or, as Johnson sums it up: "This is another key part of the healthy 'forever home' we were aiming to build."

## A FOREVER HOME

What is Johnson's favorite part about his new home? "Where do I start?" he asks.

Well, how about comfort?

"Coming home, slipping off your boots, and walking across the warm floor after a long day's work is the best. All of our Minnesota neighbors take immediate note of that, too, when they are visiting."

Another cherished aspect is better health: "Knowing that our home has cleaner air is a big positive," he continues. "In my experience, this is becoming a major homeowner demand. They want better indoor air quality. Different and thicker filtrations and cleaner air are high values in home building right now, and radiant systems can help supply it."

# PROJECT PROFILE

## Johnson Residence

### LOCATION

**Afton, Minn.**

### PROJECT HIGHLIGHTS

- Slab-on-grade construction
- Total area under roof: 4,593 sq. ft.
- 100,000 Btu/hr heating load | R-40 ceiling, R20 walls, R10 floor
- Radiant installation: Staple down for both the home and the garage
- Plumbing installation: Trunk and branch
- Well system uses a booster pump to generate water pressure of 60 psi
- Recirculation line installed with a recirculation pump to reduce hot-water delivery times, eliminate water waste, and prevent water stagnation
- All hot-water and recirculation lines insulated to meet ASHRAE 90.1

### PRODUCTS USED

- Plumbing: 800 feet of Uponor AquaPEX® ranging from ½" to 1¼" with 148 fittings featuring Uponor ProPEX® connection system
- Radiant heating: 5,462 feet of Wirsbo hePEX™ | 186 fittings | 7 stainless-steel manifolds controlling 27 heating circuits

# INSTANT HOT WATER

## THE CONVENIENCE THAT SELLS ITSELF.

Grundfos hot water recirculation pumps provide a modern convenience most people don't even know is possible — instant hot water! No matter the home or the plumbing, Grundfos has a high-quality, affordable, easy-to-install solution that ends the waiting and the waste. It's a win-win: Keep the water hot and the customers happy.



**See how at grundfos.us/hotwater**

be
think
innovate

GRUNDFOS

# ABOUT THE SPONSOR

### WE ARE IN THE WATER BUSINESS WITH YOU

As a pioneer and global leader in water pump technology, Grundfos creates intelligent, sustainable solutions to help solve the world's water and climate challenges. Through our heritage, we have the experience and innovative capabilities to help our partners, customers and communities move water in an increasingly energy and water efficient manner. We see this as not only a great business opportunity, but as an obligation to ensure the world heads toward a more sustainable tomorrow. Our complete portfolio of pumps and solutions are designed for commercial, residential, groundwater, municipal and industrial applications with emphasis in trendsetting, energy efficient technologies such as permanent magnet motors and advanced pump controls and monitoring. Because water matters, and so does your business.

To learn more, visit grundfos.us or follow us on Facebook, LinkedIn and Instagram.

# RESOURCES

Grundfos Hot Water Recirculation
https://product-selection.grundfos.com/us/applications/domestic-buildings/domestic-hot-water-recirculation?tab=explore

Residential Buildings Segment Brochure
https://api.grundfos.com/literature/Grundfosliterature-6512056.pdf

Instant Hot Water – The best thing since indoor plumbing.
https://lp.us.grundfos.com/hot-water-recirculation.html

Grundfos Hot Water Recirculation With A Return Line
https://www.youtube.com/watch?v=HQKh-1vGUBY&t=25s

Grundfos Hot Water Recirculation Without A Return Line
https://www.youtube.com/watch?v=JdOIsylW4Cc&t=66s

Join the G-Pro Installer Program: It's Free, It's easy to use. It's that simple.
https://grundfos.nextbee.io/auth