PARTICLES PLUS®

Show Number: 708

Nate Adams

The House Whisperer & CEO of HVAC 2.0

The Importance of Air Sealing for IAQ and Energy Efficiency

This week we welcomed back Nate Adams the House Whisperer for a show on the importance of air sealing for IAQ and energy efficiency.

Nate "The House Whisperer" Adams is the author of The Home Comfort Book and the Air Sealing Course. He's helped numerous clients in Cleveland Ohio electrify while making their homes healthier and more comfortable since 2014. Now he is teaching HVAC contractors how to naturally sell heat pumps through the HVAC 2.0 Technical Sales Process. His most recent project was completion of The Air Sealing Course and he continues to practice what he preaches while working on his Airbnb rentals in wild and wonderful West Virginia.

Nuggets mined from today's episode:

Why is electrifying everything important to you? Electricity is currently the least expensive energy resource we have. And it's where we are going. Our armed forces are protecting our fossil fuel sources. The US can make the equipment to generate and distribute electric power in the US. Electric power results in cleaner air and cleaner water. Pulling energy out of the air and sun seems like magic. We'll eventually run out of stuff to burn. Heat pumps pull heat out of cold air and pump it into our homes and provide air conditioning when working in reverse. Nate began talking about this in 2017-2018. The issue has become politicized. Don't worry the government isn't coming for your gas stove.

Inflation Reduction Act? The incentives from the Inflation Reduction Act are poorly structured. The only silver lining is that manufacturers will make more efficient equipment over time. Federal programs will keep going. In the short term the experiences of homeowners and contractors with the programs haven't

been good. Price incentives bring equipment and money to the front of the conversation. According to Nate, there is only one mid-priced unit that works (he is a fan of a 5 stage Carrier unit that doesn't qualify in the north), but it has several drawbacks. It doesn't perform well in cold northern climates and the air handler is large and won't fit through many hatches in the south. These issues make life harder.

Inflation Reduction Act? Fundamentally the federal bill is built on a poor foundation. Nate fears that we may have a redux of "sick buildings" caused by attaching mini split units to dumb indoor units which can't control coil temperatures, and forcing a choice between cooling or dehumidification which will result in making houses wet, causing health complaints in 2 years. 1-10% dehumidification when we need 20-30% and preferably 50%+.

This will result in bad PR. He can see the train wreck coming.

Air Sealing? Air sealing is sealing up gaps between the inside and the outside. Analogy is plugging holes in a leaking boat. The fix for a leaky boat isn't a bigger bilge pump it is fixing the leaks. If you want to control energy cost, occupant comfort and IAQ you must seal. Reasonable tightness is 1-to-1 cfm 50 to above ground square footage. A 2000 square foot home usually becomes controllable with HVAC at around a 2000 cfm50 blower door result.

Good comfort and better air quality is often easier to attain in newer homes.

In older hard to heat and cool homes built between 1900-1950, a 3-1 ratio is common. Often you can change to a heat pump add some resistance strips and move on, or run a hybrid (furnace + heat pump). Labor cost is too high for air sealing and insulation in many cases and it doesn't come back at resale predictably.

Use caulk and foam to seal cracks and gaps, rough openings around windows, attics, basements, crawlspaces (bowels of home). "If it hurts to get to, it saves energy".

Nate's air sealing course is 12.5 hours of video, 1300 slides and over a decade of work. Air sealing can be learned in a couple of days. Nate wrote a book and commissioned many illustrations. Other sealing training provides too much

technical or worthless information. Nate's course provides the why, the what, and the how.

Illustrations simplify the HVAC 2.0 sweet spot thinking. The goal is to get to 90% odds of success where spending more $ to improve results may not be justified. Getting good results is individually dependent on the home.

Low hanging fruit-caulking windows, just caulking rim joists in basements provides good bang for the buck. DIY is labor intensive. Advanced DIY will achieve better results.

HVAC contractors fear the technical, blower doors, infrared cameras, etc. Poor education results in HVAC contractors recommending silver bullet solutions such as UV lights and PCO that have consequences and aren't really useful. HVAC contractors are often unaware of client complaints about completed projects (e.g. comfort, IEQ). Robert Bean teaches that HVAC can create good mean radiant temperature by washing all indoor surfaces with heated or cooled air. Human body has 165K temperature sensors. HVAC contractors don't realize that they have more control over IAQ and IEQ than any other trades.

HVAC 2.0 designed as a swimming pool with shallow and deep ends. If you dive into the deep end prematurely you will get stuck. Created by a Super Nerdy Home Performance Bone Head who wonders why other people don't care about this stuff? Course provides the knowledge to do basic projects and move onto more complicated ones. Course provides logical pathway to solving problems. Getting the HVAC system right solves many problems.

COURSE

Basic Concepts- Why,

Materials

Common Methods and Assemblies comprise 50% of the course.

12.5 hours of video, 1300 slides, a decade of knowledge.

If you are mechanically inclined you can do this.

Are DIY Mini Split units really DIY installable? Yes it's doable, as some brands of mini split units come ready to install and charged with gas. The primary failure

points are the factory installed flare connections. These often leak which can result in system failure in approximately 1-2 years. Replacement parts are generally unavailable. Nate suggests hiring a pro to braze the lines and boil out impurities from lines, which often doubles usable lifespan of unit.

Heat Pump Hot Water Heaters? Heat pump hot water heaters are a great technology. In 2018-2019 the quality was good. Currently there are quality problems due to refrigerant leaks and failed components. No Fun! Heat pump water heaters save massive amounts of energy. Standard water heaters use 4-5K kWh of electricity per year. Heat pump hot water heaters use 500-1K kWh per year and save enough energy to fuel and Electric Vehicle for a year. Nate is a big advocate of Heat Pump Water Heaters; he finds it frustrating that there is a push for HPWHs when there are quality issues, it's almost certain to slow adoption of what can be a great technology. He hopes that the government will provide financial incentives to distributors to only sell two way Heat Pumps, not one way air conditioners. Vancouver Canada has successfully done it and Canada is doing it. Nate opines, consumer acceptance isn't a technical problem, it's a psychological problem. Using heat pumps along with furnaces offers the consumer the option to choose between two fuel sources.

Jim Bergman who created the measureQuick app (OBD2 onboard diagnostic system similar to those used on cars) is a big fan of natural gas as a fuel. Jim is a friend of Nate's who added a heat pump to his furnace in part because of Nate's prodding. Jim's wife prefers the system Nate provided over their prior system because it runs more often and washes all the interior surfaces. It's quieter too.

Sweater, windbreaker, or both? To be and stay warm, we need both. Fiberglass insulation is not a windbreaker. The tops of the interior top plates in Jim's 2nd floor hallway were sealed with spray foam effectively reducing leakage.

Batman and Robin? Nate refers to blower doors and infrared cameras as Batman and Robin because they work well together. Infrared camera images or fingers and blobs confirm air leakage.

Nate recommends ventilating homes during spray foam insulation and then cracking windows open on 1st and 2nd floor for a couple weeks after to allow VOCs to dissipate.

Nate advocates the use of closed cell spray foam insulation to seal the top plate assemblies at the top of homes and adding vent baffles to reduce stack effect and wind washing. A DIY spray foam kit costs $800 and covers 500 board feet (A unit of cubic measure for lumber, equal to one foot square by one inch thick.). If more than 2 kits will be required, Nate recommends hiring a pro.

Nate classifies homes into 4 categories: one story (e.g., ranch), 2 story (e.g. colonial), 1.5-2.5 story (e.g. cape cod), split level (e.g. tri-level)

Two story homes often have knee walls on a side of the attic where garage touches the second floor. These are often leaky due to rim band joist leakage. In order to have stack effect you need both a hole and pressure. It's not unusual for 2nd floors to be 10°-15°F different. Knee wall leakage is commonly 50% of the leakage in a home. This type of leakage results on reverse stack effect in the summer, a noticeable symptom is smelling fiberglass insulation in the summer often attributed in part to mouse urine in the attic.

Cape cod homes are the worst due to tricky duct work, and too few chases. Areas above cantilevers are often leaky. A symptom of this type of leakage is cold floors at the edges of second story rooms.

Nates Final Thoughts:

The big takeaway is that air sealing is not difficult.

Successful air sealers need to know many little things.

Air sealing routinely solves IAQ and comfort problems.

The labor force for air sealing should be detail orientated.

Air sealing assists in gaining control of indoor air to control problems.

After R10-R20 insulation, air sealing becomes more important.

Knowing the blower door number is a prerequisite.

Commercial buildings make leaky homes look tight.

Renewables make energy inexpensive; people won't fix problems which waste energy until energy becomes more expensive.

Z-Man signing off

Today's trivia question is dedicated to Victor Cafaro a long time audience member and dear friend who passed earlier this week. Victor was the kind of friend you could only hope to be lucky enough to have. We met in the late 70's when he was making glasses with another friend in the Pittsburgh area. My family spent many Christmas holidays visiting Vic and Pat at their home in Penn Hills before they moved to Chesterfield VA. Vic always kept in touch with the old Pitt gang. Anybody that knew Vic would say one thing about him "The nicest guy I know". He was a gentle giant and avid talk show fan that never forgot a birthday or holiday. Vic loved the holidays and you never knew when a package would arrive with some thoughtful gifts. Vic was our most loyal audience member for many years and will be sorely missed. One of my most fond memories was when he and Pat came to our Healthy Building Summit and Pat spoke to the crowd. He was so proud of Dr. Cafaro you could see his chest swell up whenever he talked about her. Rest in Peace my friend.

Radio Joe Hughes, September 15, 2023

Victor and Pat Cafaro

Trivia Question: Per capita which country has the most electric vehicles and the most charging stations per electric vehicle?

Answer: Norway