Whole House Air Purification Methods

Andrew Pace: Welcome to the Non Toxic Environments podcast. My name is Andrew Pace every week. My cohost Jay Watts and I will discuss healthier home improvement, ideas and options. Thank you for finding us and please enjoy the show.

Welcome back. It's Non Toxic Environments, everybody. This is Andy Pace and as always, Jay is with me this week. Jay- really interesting topic this week because it's something that, not only because of what we're going through in the country with the pandemic, but just on an every day issue is all about indoor air quality in our new home builds and remodeling projects. When we get the question every single day, what's the best air purification system we can put in. If we're going to go, if we're going to do this as healthy as possible.

Jay Watts: Yeah, it does. It comes, it comes every day. We're also, when we're talking about remediation, improving indoor air quality, from a coating standpoint or a building standpoint, I always mentioned the idea of managing your air quality mechanically. So this is going to be a great podcast looking forward to hearing what Steve has to say.

Andy: Well, full disclosure to everybody. As you may or may not know, Green Design center, our retail company is actually a retailer of the SolaceAir products, that Steve's going to talk about today. And we're not making this a sales pitch for these products. We want to talk about the products more specifically about what they do, but we want to talk about the mechanisms the way they work and how each system is for different applications. So it's really more of an informative discussion about purification systems in general, obviously how Steve's products fold into that to make sure we make the right decisions. Let's just start the conversation. I want to introduce Steve from Dynamic and SolaceAir, Steve, how are you this morning?

Steve, Dynamic Air: Doing great Andy and Jay how are you guys?

Jay: Great. Thank you.

Andy: Very well. Very well. And so can you give the audience an idea of what you do with Dynamic and Solace and what your background is?

Steve: Yeah, that'd be great. Dynamic Air Quality Solutions is a fairly old company in indoor air quality industry. We were founded in 1982. I came on board in 1990 in different capacities currently I'm VP of training and sales for the residential division. We also have a commercial division, which is huge. Right now, we're about a 50/50 split. It used to be about 60 commercial, 40 residential, kind of catching up with those boys over there. But we do a lot on the commercial side, hospitals, casinos, office buildings, high rise towers and stuff like that. And there's tons of case studies on our products, and we take that technical information and the things that we learn on the commercial side and just apply it to residential products. So it's the same, obviously different designs because, commercially we're working with larger much larger air handlers, but it's the same technology that we use in medical applications, in isolation, tents, here again, casinos that used to be really big for like smoke removal and stuff like that, which a lot of people went into non smoking. So that's not an issue, but there's always been issues. And when I've got going in this in 1990, it was kind of before it was cool to get into an indoor air quality. On the residential side, we started going through the heating and air conditioning industry and specialized company like yourselves, and direct to contractor and direct to consumer because there's a lot of education involved in what we do. You know, it's not just buying something off the shelf. And we like to say- there's four things involved in technology.

There's the science behind it, there's the logic behind it. And then there's the testing. And I'll explain more of this as we go along. And there's also the marketing aspect of it. And a lot of product today is designed, or I shouldn't say designed by, but led by marketing people, you know, just say it does this so we can market it. So, and then we'll use some testing make sure it works. With that said, there's a lot of smoke and mirrors out there today. I'd love to be on this podcast today and say, Dynamic's got the only product that works. And we don't, we've got some, actually we've got some great competitors and we can even talk about a few of those, but, we do have some unique technology that that's not only unique to the industry, but it's also unique when homeowners go out and searching for different products. Usually what they end up with is some type of a room air cleaner, some of these stuff that's out there today, a Pure Air and Molecule, let's say they all work. That's not the science behind it, but if they did all work, they only work in one room. What you guys talk about and what we stress is his whole house air cleaning. Room to room, you get a plug line in every room they're all loud. And some of them work, some of them don't and here again, even if they all worked, you're only doing one room, you live in one room in the house, wouldn't it be better to get rid of sources, number oe, and that's a great thing that you guys do in rebuilds. So we always talk about source removal. First, let's eliminate as much as we can, but there's always that balance in there. Even the EPA says indoor air is two to five times, can be a hundred times worse in outside air. That's because we've tightened up our home since the early seventies with the oil embargo and we have a lot of off gassing and a lot more chemicals that we're using today. We have dark damp duct work and HVAC equipment that creates a mold problems and bacteria problems. And it goes on and on, you have to address all three phases of contamination in a whole house scenario rather than a room to room scenario. Before we get into technology, I just wanted to stress that it's number one, a whole house, number two, it's got to have the right science behind it and understand what's in the air to begin with. Just because you have a filter doesn't mean it's

filtering the particle sizes that we need to deal with. So, fast forward to today, we've got nine reps in the field to do training. I manage those guys and we're always researching, especially with COVID now out there. We're researching anyway. When guys ask us, what should we be saying now with this? I always tell them, don't say anything different. We've been teaching it for the last 30 years. You know, viruses aren't new, bacteria isn't new, particle and gases in your house is not new. This strand of virus is new and you're going to deal with that. But at the end of the day, there's ways of taking care of these things.

Andy: So, Jay and to everybody also- full disclosure, I did not tell Steve to use certain words and phrases that you and I use all the time. So this is why I wanted to have Steve on the podcast, because I believe that Dynamic is along the same train of thought as we are here in Non Toxic Environments. When we talk about indoor air quality being worse than outdoor, we talk about the reasons why we have problems because of the way we build homes. So there was no coach involved here to Steve before this podcast started. Steve, I want to ask you, actually just kind of a followup to what you said. I started my career 30 years ago in commercial construction. And before I started Green Design Center and got into residential healthy homes. What I found, and I did actually a lot of work in hospitals by the way. And I found that materials that are made for commercial construction, specifically for hospitals, healthcare that have to be made to certain standards. I'm not talking about, two by fours and drywall. I'm talking about things like air purification systems that have to be made to certain that have to be usable and accurate enough to filter out certain things in the air, that gives you guys a competitive advantage when you're going into residential, because in the residential market, and maybe paraphrasing what you just said, the residential market, we don't have those same standards. It's okay, it works, it works in a room, but real world scenario is you've got 2000 square feet of a house, somebody walks in and then maybe they're carrying a virus,

or maybe they're carrying pollutants on their person. How does a portable system take care of that? Well, Dynamic because of your experience in commercial and you translate over the residential gives you that competitive advantage.

Steve: It does. And it's interesting because on the commercial side, the first thing that they address, and we've learned this from them and we do it as well. It is really not asthma and allergies and health care, even though we're in those facilities. The first thing we talk about is having the equipment that you installed and paid big money for run at peak efficiency. So you've got to have good air flow, right? And the challenge, when you get into certain types of filters, those are better filters on the market, but the better, they get the more they can collect, the more dense they are. So you got to figure out a way of how can we still collect the particle, keep the coil clean, clean the blower wheel, keep the parts and pieces clean so they run at the efficiency that you paid for, and that's what they stressed in the commercial side. It becomes a oh, and by the way, you get cleaner, fresher, healthier air, and at your employees be healthier and you're not going to pass the colds and flus and things around as much. So we address both. So we take that in the residential market. And most people don't know that the most expensive piece of appliance they're going to buy is that heating and cooling system. And they spend eight, nine, 10, $15,000, even more depending if they had a communicating system in that. And then they go to the store and buy a dollar throw away filter and put it in there. And then the thing gets all crapped up with dust and the mildew and they wonder why the system's not working correctly or why they're always having service calls on it. So we got to keep the equipment clean and then, Oh, by the way, you know, who in your house suffers from asthma and allergies or other ailments cause this helps that as well. So we look at source removal first. We look at protecting the equipment and all this kind of comes together when it comes to health concerns as well.

Andy: The traditional three quarter inch wide pleaded filter that goes in from the return air plenum back into the furnace, your fan, that's typically there just to protect the equipment. Even though you can buy these real expensive three-quarter-inch, at Target and so forth. Those things are really designed just to protect the equipment itself. And don't really do a good enough job in purifying the air. Is that correct?

Steve: Oh, well, that's correct. Remember I told you, there's science, logic, testing and marketing. That's where marketing comes in. People are go to the store and it says 95% efficient, and then they buy it because they think it's the best filter on the market. They're buying a high end one for 30, 40 bucks, and then they get a real air cleaner comparison. You know, you're going to get into six, seven hundred, a thousand dollars, but there's a huge payback on an investment when you get the right product in. And we go through that and a little bit later as well. But those filters would have to be careful with filters that you buy at the store. People ask this all the time, Steve, you've been studying this for 30 years. What's the best filter on the market? I say man, I wish we sold it but it’s sold at home Depot. It's called plywood. Just get a piece of plywood and cut it the size of your filter and put that sucker in there. And man, you're going to get really good particle control. Oh, wait a minute. There's no air going through it. Well you said what's the best filter, right? So, or we could switch that around and say, well, geez, we had to let the air go through so well, let's go buy some chicken wire and you know, staple that to a 16 by 25 frame and put that in there. Well, wait a minute. That's not going to collect anything. Yeah, but you got great air flow. So marketing our filter companies try to meet somewhere in the middle. We can't let all the particles go through. We can't block all the airflow. So the original ones that came out were just exactly what you said, just to protect the equipment. And that was the old fiberglass filters, which you can still buy

today, but you can hold them up to the light and see right through them. So they started making them more dense to collect more of the particles. What would most, I think filter manufacturers understand this, but I think the typical lay person doesn't understand that 98% of all the particles we breathe every single day are below one micron in size. So what the heck is a micron? If I took a human hair, that's about a hundred microns. And if I could slice that into 100 different pieces of human hair, obviously be invisible. But one of those slices is one micron. And what you breathe is smaller than that, that stuff passes right through these pleated filters, you know, so, okay. So where they get the 95% at? Well, you gotta read the fine print. It'll say 95% at 20 microns. As a layman, you're like, sounds good to me? We don't know what the 20 microns is right in the indoor air and in the environment in the air, the invisible microscopic world we live in here. That's like a big giant boulder compared to a pea. So when you put that under a microscope, you look at a fiber, a throw away pleated filter, it'll look like big holes and you can see where the little things would go through there, but when you buy it at the store and look at it and hold up to the light and love, must be pretty good. I can't even see light through it. Well, if you can't see light through it, you're going to have other problems. So, and they face load very quickly, at least with a fiberglass filter, you got some room for the dust to work through. There's no room here. It's just face loads. As at face loads, now the pressure drop goes, the resistance the air flow goes up. So in our industry, commercial and residentially, we're very concerned about airflow number one- so the system works efficiently, but if we don't block enough air flow or can't collect the particles, how the heck are we going to collect the particles? And there's different designs, different technologies that can do that.

Andy: So let's get into that then. So, we've mentioned the term pleated filter. This is a way to capture those particles and the thicker that pleated filter gets the, theoretically, the more of a pressure drop you have. So what that means is for the lay person, the rooms that are furthest

away from your heating or cooling source will not get that warm or cool air, or as much of it because your pressure drops in the air flow and your system just can't push enough through those thick pleated filters. So, what Dynamic has done is, you guys have created a polarized media filter that actually can fit in that same three quarter inch slot, or even be used in lieu of the four or six inch filter slots. And so how does that compare to a pleated filter and in its usability and functionality?

Steve: Just real quick, I'd like to address the pleat. You got the ones that everybody's familiar with at the stores, but there's big ones to three, four, five inch pleats, right? That most furnace manufacturers sell, the good thing about those is they've got more surface area. So just pick, you got five inches and it's like an accordion, and there's all kinds of surface area there. What they do on the one inch or the three quarter inch ones that you mentioned is they take that same material and they put it in a real small one inch pleat. There's no room for the dust to go. So it face loads. The big pleats will face load as well, but they last longer before they start having the problems that you're talking about. But with that said, they still have to have the pores large enough to let the air full go through. And they're larger, usually larger than five to 10 microns. We just mentioned at 98% of the particles in the air are smaller than the size of 100th of an inch of a slice of hair. So I think keeping that in mind, well then Steve, how are we going to collect the particles without having small holes? Well, there's another thing about particles that people need to understand is that they're charged. They already have a voltage that mother nature puts on it. That's where we get the term polarization in our filter. Because we actually polarize the media that's inside there. It's a low oil content fiberglass. It's not the kind of fiberglass you put in your insulate your walls with. Its long strands, so it doesn't break off and get out into your airflow. But because of its design it's dielectric, which means it can hold a charge. So you got to think of it like this. We got positively and negatively charged

particles floating around there, that’s the majority of them in 98% of them. So there's very few particles floating around the air that are inert. Cause if it's a inert, it's gonna fall out of the air. So these charged particles, it's called Brownian motion. They bounce off of each other and they're just kind of staying suspended in the air and they get sucked into your return, go through your air handler and go back out the supply. So now you've gotta put something in there, number one, to protect the equipment. So to protect the equipment, we've got to get all this stuff out of the air because even small stuff he can't see will eventually accumulate on a coil. You already mentioned it, the system's going to run harder. It's going to take longer to get heating and cooling any other side of the house, but it's also going to make the system run harder. It's going to put stress on capacitors and all these parts and pieces in there. So that's where you start having service calls on your equipment. It's not going to last as long as it used to last, you're not getting the efficiency that you paid for. You know, if you paid for 16 Sera, 95 and a half percent furnace, or you should want it to function that way. And if you put a 59 cent throwaway filter in there in six months, it's not going to act like that because the coils built up with dirt and dust and slows the blower wheel and the duct work. So, okay now how do we get it out of the air? With polarized media we let the air go through. You can hold it up to the light and you see the light right through it. It's got a charging section in the middle it's made out of carbon. So the contractor or the technician would wear it into a 24 volt transformer that gets plugged into a power head. It's on the filter frame itself, the air cleaner frame. And then that steps up the voltage to 7,000 volts of DC coming out of this titanium probe. When they put the media in there, you close it like a book, slide it in, that whole media, every fiber in there takes a polarized charge at 7,000 volts, low amperage. I mean, if you touch it, it's not going to shock you or anything. So you've got low amperage, but high voltage. So now let's let the air go through. Because now we're not concerned about catching particles collision, were collecting with an electrical charge. Positively, negatively charged particles coming through to duct work,

carried them with the air. We let the air go through with the constant air flow it should have. And now all of these fibers have a charge so when these particles come through there, they get grabbed by the fibers, magnetically grabbed it. So they got the opposites attract. Every fiber has a positive and negative charge. It's like a magnet would, just like a battery does as a positive and negative same thing here. So if it's a positively charged particle, it gets attracted negative side. If it's negative, it gets attracted at a positive side. So that's number one. That's where polarization comes in. It's polarized, magnetically charged can grab it just like if you had paperclips on a table and you put a magnet on and all the paperclips would grab it, gravitate to the magnet. Now you can take that magnet and shake it and the paperclips would fall off. We don't want that to happen. So we use the polarization to collect it and we use the voltage to burn it onto the cell, fire burning it's called electroplating. It basically makes it bond to the fibers themselves. So even if you turn the unit off, it's not using much powers. Even if you did you ended up the system when it's time to replace it, that stuff doesn't fall off of there. Because it's bonded to the fibers. So in layman's terms, let me go through positively or negatively charged particles, magnetically attract in it and then burning onto it, removing it from the air. It does not release back into the air flow. Now because we're doing that, it takes for every three to four months that stuff's gonna grab enough of it. It's gonna to start creating a film around these fibers and then the voltage is going to go down. So that's when we have to change it. About three to four times a year on our one inch media filter. But then we have other products that, I know you guys promote it very well, that they have larger filters in there for even better airflow.

Andy: So I want to just clarify something that you said, or maybe for myself, and tell everybody that, years ago, I'm talking back in the sixties when manufacturers create what are called electrostatic filters that used ionization to essentially ionize the air to… theoretically what

happened is you would electrically charge the particles as they were passing by. And those particles in the air then would collect and fall out of the air. And as a dust, you could wipe up the dust. But what happened way back when was, when you mentioned electroplating in your scenario, in your system, the particles electroplate to the replaceable media in the old way, it would actually electroplate to the walls. And I think a lot of people think of that when they hear those phrases.

Steve: Absolutely right. You're talking about kind of different technologies. I know you're trying to blend it all into one, but there's the old electrostatic filters. You don't plug them in or anything. They just a static charge. So the way they work is air comes through it and the air creates friction on the material and they create a static charge. Static electricity will collect the particles, but it doesn't have a high enough voltage to hang onto it. So it would collect the particles kind of like our polarization did, but it didn't have a high enough voltage to have the electroplating effect. So it would release it back out in the air flow. Now ionization is another product that you mentioned that people used to put that in, like you can buy an ionizing box, they still sell them today. And you can put that in a room you turn on, it ionizes the air. And it does exactly what you just said. Remember, particles are charged. So if you given out negative ions, they're going to grab the positive particles and they start accumulating, agglomerating and they get larger. But you know, when people talk about ionizers Andy, there’s some ionizers you can put in duct work now, and the question I always ask is- great, it’s taking particles out of the air, where do the particles go?

Andy: Right?

Steve: You got to remember science and logic science. Scientifically, it's going to take particles out of the air. Logically, you got to ask yourself a question, where do the particles go? Well, they're heavily charged. They go to the first place that can find they can ground themselves to. If you put it inside the ducts, like some of these ionizing products in there, or the old electronic air cleaners that had ionizing wires, right? The way those worked it ionized the particles. The concept was, let's charge the particles that have metal plates to collect it afterwards. But technically you can get rid of the the ionizing wires, because the particles are already charged. The plates will still work, but they only worked for like 30 or 40 days. They got loaded so much with plated particles that, you needed to clean them all the time. And they started off gas and spark and stuff like that. So then the particles would be going through, they're ionized, not collected, now they're sticking this thing, it's called black wall effect. Google black wall effect. We have all kinds of different articles, EPA talks about it. And they have exactly what you were just saying is the one question that got asked, where did they go? Well, where do they go? They start plating to something. So they electroplate the walls and ceilings. They could even electroplate into your lungs!

Andy: I remember this from my grandmother's house years ago and that my grandma and grandpa were smokers. And so they had one of these electrostatic or ionization smoke eaters back in the time. While you go into the office where they worked in their firm and the walls were literally like a silvery black color.

Steve: That's exactly how.. they hadn't even more particles collide, that'll even happen with invisible particles, but you add something like smokers it happens much, much quicker because now you get heavily invisible particles plate right to the wall.

Andy: All right. So we talked about the filterization, the filters that are used, one of the things that we like to bring up to our customers, and you mentioned it, are the three phases of purification of air? And you know, we'll talk about this in a moment why we really focus on your RS systems. You've got your filtration of your particles. You've got the absorption of chemicals, gases, VOCs, and then you have the destruction of viruses, bacteria, and mold spores. Let's talk about the second one, carbon filtration. One of the questions that comes up from customers is that they purchased a new HVAC system. The furnace company decided to sell them on the idea of putting in a four inch pleated filter. They said that'll collect all your chemicals and VOCs. And then my question is, well, how does that actually work with chemicals and VOCs? This is why I promote the RS systems because of that carbon filtration. And so can you explain for us how carbon absorbs those chemicals, gases, VOCs is where the, the fill the pleated filters really can't.

Steve: Well, the pleated filters are not designed to do that at all. I mean, even our polarized media air cleaner don’t do it. You mentioned that there's three phases of contamination here. There's particles, there's germs, and there's gases. There’s three different technologies work on those and they don't work on the other one. Same thing outside, ionization settles particles out of the air, a UV light from the sun kills the germs and keeps control of the viruses, bacterias outdoors. We're even hearing about that on the newscasts. Now, when they're talking about the coronavirus can't live that long outside like at three minutes, well, if it's sunny out, it's getting blasted by the UV rays from the sun, UVC rays, and it does its job. So that's a fact. Now indoors, we don't have that, we don't have ionization indoors unless you create it. And then you get black wall effect. We don't have UV light inside. The UV light from the sun doesn't penetrate glass. So it's not going to get in here and it's gotta be UVC wavelength, there's UVA, B, C, and D. Now the gas phase contamination outside is controlled by big, bad ozone. And that’s a whole

other podcast we can do someday. It controls it. So you can ozonate indoor air, but you don't want to put ozone right into the breathing space. And even though you'll oxidize gasses and do that, and now you're going to have an overproduction of ozone. That's not good. So if you're gonna use ozone, you got to put it in the ducts, you gotta to be able to control it, do its job inside the ducts and not have it in the breathing space. But an even better way to do it is, like you mentioned, with carbon, the challenge with carbon is- remember science, logic testing. Scientifically carbon works, and it's actually called adsorbing, not ABsorbing because what carbon does, it has all these little nooks and crannies in there and little cavities in there and adsorbing means it'll hold it in a pocket. Absorbing would be like a water and a sponge and all absorbed into the sponge, but then it can leak out. When you adsorb it, it initially can't leak out, over time it can and that's why we change the carbon. But the challenge with carbon is like these room air cleaners, so they got a big HEPA filter in there. Good. You're know you're going to collect the particles. Oh, we got carbon too. And they'll wrap the HEPA filter with you know, an eighth of an inch of a carbon poly foam. And then you can say you got carbon, there's companies that have put it in your duct work. They'll put five little UV lights. And on top of it, they'll put little slices of carbon. Carbon works, but you gotta have enough for it to work. So what the RS units that you mentioned, we put a full slab of carbon in ours, so it's porous, so the air can get through it, but it's the same size as the filter, we're covering all the air flow and it's one inch thick. So it's thick enough to have some longevity to it. If we put a little slice of an eighth of an inch of poly foam carbon in there, it's going to last two days. With the amount of carbon that we use and the thickness of it and the design that the carbon matrix that we use, and it's the stuff we use commercially. That's where we get our knowledge. The commercial engineer said, when we put this in an air port, we got a lot of gases we're going to take care of. So it's got to work, right. Cause we can't be changing filters every day.

Jay: Can I interject here just for a second? This is so fascinating. I'm a visual guy, Steve. So I'm creating like a picture in my mind of all the things you've been discussing, but I just want to interject, it's just such an interesting subject that I'm thinking, Andy, cause we're running way over half an hour right now. I'm thinking, could we make this a two part interview?

Andy: Yeah, let's just keep going. And then I can split it up a split it. Okay. Yeah.

Steve: Jay, it's interesting. You say that we just did a bunch of our modules and training. We did our training modules and some of them were over an hour long is like four hours of recording and we just took it and spliced it into different modules, 20 minutes, 20, 30 minutes.

Andy: In talking about carbon, and to give people at home a visual of what this is, think of a window screen. With a tiny little holes. Now imagine if that window screen was an inch thick, still with the same tiny little holes. This is what we're talking about with carbon within the RS system is that you've got thousands of tiny little holes, but that are an inch deep. And so there's a lot of surface area for the adsorption of chemicals and gases into the carbon. And this is why it's so effective. Now, the size, maybe you can help us with this. You're talking before about how what we breathe typically on a daily basis is less than one micron. Can you come give a comparative size to a chemical or a gas that tells us why it can't be collected by a filter?

Steve: Well, that's a really interesting question. And, the reason it's almost hard to compare is, because it's not a particle and it's a gas, gas is more fluid. Gas is like floating in the air and it's not a piece of something, right? It's a plasma, it's more of a mass of something. So now they have taken it down and with the electron microscopes and they measured it like 0.0, zero one, when they can finally break down the atoms and the molecules. But that size is so small. It's in

the below the 0.01 micron size, some of them some is 0.001. So, I mean, this is really, really, really small stuff, that thousands of the size.

Andy: So this is why when somebody says, I've just put in this $4,000 purification system and in their furnace that has four giant pleated filters, and it's supposed to take everything out of the air. I keep on thinking to myself- if can't take everything out of the air, but because to make a pleated filter tight enough to actually keep those chemicals and gases from going through to your first point, as we started talking, it would have to be a piece of wood.

Steve: If you just going talk about filters, forget polarization irons and all that stuff. And just a filter has holes in it, pores in it. And the pores have to be large enough to let air through and small enough to collect particles. So what type of particle are you trying to collect? We're trying to collect here again sub-micron particles, really, really small stuff. So it's going to pass through these filters. So I don't care how many pleats you put in it. You can make this pleat five foot thick and 10 foot wide. The holes and the pores in the filters are still the same size, right? So it's still going to go through there. And then, when you get in the gasses, like I said before, some of them put a little slice of carbon in there. You'll get some, get some gas control for a couple of days, and then that's it, so you have to have enough carbon and enough thickness and enough nooks and crannies in there to get the adsorption it's going to take to get the VOCs out of the air. Okay. So even with ours, I mean, It's not one size fits all. It's not one technology fits all. Why would we just not do polarized media air cleaners? Why would we add carbon? Because they do two different things.

Andy: Well, and that brings up the third way of purification, which is the use of UV lights. And I know with the SolaceAir systems, you offer a number of different configurations, but the ones

we typically deal with are the standard UV lights. And then also we do deal with some that will include a separate bulb for the creation of ozone. I know that ozone is that dirty word that ever since Alpine Air from 20 years ago in their multilevel marketing companies started selling these things to people who had no idea how to use them and people got sick. We're talking about something that is controlled, that produces about the same amount of ozone as what you find outside. It's it does have a controller on it so that you can reduce or stop the production of, and there are reasons why we would use ozone, but let's just talk about the use of UV lights and what that does as the third phase of purification.

Steve: Well, now we're getting into the viruses, bacterias, living organisms that are in the air. They're small as well. The flu virus, the coronavirus, rhino virus, they're all in that 0.1 point, some of even smaller there there's very few above one micron, if any, so, they're going to pass through all kinds of different filters as well. And even ours. Yeah. We'll electroplate some, but they're small enough that they're going to work their way through. They hitch rides on things, hitch rides on water vapor. They would hits rides on dust particles, viruses don't have wings. They don't fly around. They got to find a mechanism for them to travel with. So the more dust you get out of the air, the more other things you get out of the air, the less chance of them to be able to travel so that it helps that way. But to actually sterilize them, deactivating is the word we like to use. You have to use ultra violet energy. Now it's all over the airwaves. Now, president Trump said it did it. He goes that blue light thing in one of his little speech things, and then a Fox news did a special on UV. And so did a CNN, CNBC and they're all talking about UV now. There’s things you have to consider about UV, it's just like carbon, just like filtration in that you have to have the right science. So which means you have to have the right UV wavelength. Now there's UVA lights. There's UVB, UVC, AMB are the lights that they use in tanning salons. So you can sit in one of those coffins and get a little skin tan. Now, if you put a UVA and B

lights in a duct work and try to kill a germ, it can't do it. It's not the right wavelength. So you need two things with U. Number one, you needed the right wavelength, UVC. We're not the only ones that use UVC. I would have to say that 95% of the UV manufacturers that are promoting through contractors and people like yourself and putting in people's homes are using UVC. So let's say we're all same across the board there. The second thing you have to have is enough power. This is what's driving me nuts today. There's some filters out there now, now that UVC has got the big buzzword, and they'll put a three inch UV light inside their room HEPA air cleaner, and then they claim we got UV too, that thing you saw on TV. We can kill germs. Scientifically, that is correct. UV will kill germs, but it has to have enough power to do it. And power is measured in microwatts. So if you want a light bulb in your house to be brighter, you get a higher wattage. If you want a UV light to be a more power to get higher micro wattage. We can get real scientific and geeky on that. But all you need to remember is it needs to have enough power to work. What's enough power? Well, it takes thousands of microwatts to kill viruses and bacterias. So if you use a 10 microwatt light that's UVC that little three inch one, you can say, I got UVC installed in your duct work. But not enough power to do anything. I guess a good analogy would be, if I lit a match and would it be hot?

Andy: Yes.

Steve: Yeah. I could burn my hand on it. Can I heat a house with it? No. A matche is one BTU. If you read the BTUs on your furnace, it takes tens of thousands of BTUs to heat a home. So even though it's the right science, the right technology, it's the wrong design, logically, it's not going to work. So when you put a UV light in someone's duct work, people have to realize is this stuff that’s going by th4e duct, its just not kind of like walking along, it's moving at 400 feet per minute. That's fast. Sometimes the velocity is even faster. We only have a second or two to

have an effect on it. So now, a lot of these companies will come out with a test. We killed 99.9% of the bacteria. Well, then you read the tests, they put the unit, one inch away from a Petri dish in a one foot by one foot box and lo and behold, it killed everything. Well take that Petri dish and zing it by like a Frisbee, now tell me how many units killed. So when we design from our commercial engineers down to the residential, when we designed it, we designed it to work. We design it by Westinghouse standards, RTI labs, who comes up with basically the recipe to how to build the correct UV system. So our systems are usually about 3.3 times more powerful than the standard UV light that you see out there. Now you might ask yourself, well, geez, people have been putting them in their house, but usually they use that and they put it inside of a coil. They want to keep the coil clean, not a bad idea, but you don't need a high output lamp on a coil to kill something on a surface because the coil doesn't move. So you can use a low output lamp, which we do have one, if people are really in the coil cleaning, the furthest south, we get in our markets, it's kind of a given. Put something on the coil, but we don't need 180 microwatt lamp on a coil. We can use a 55 micro outlet. So you can use a cheaper lamp. It's a little bit different type of install, 24 volt. But to do it under the return, to kill stuff, before it ever gets to the coil, you need a higher output lamp. So use the right energy, the right wavelength, the right power.

Andy: Awesome. That's fantastic information. And so now what would be the time that I want to kind of tie all this in together because we've talked about the three methods of purification of air inside of a residential application. This is why we have been big promoters and supporters of your RS systems. And specifically the RS4, for us has been that sweet spot for most of our customers. I know we have some that have done the RS2 an RS3, and maybe you can describe the differences between them. And I think, and the RS4 for us fits into most systems that are out there. But sometimes if you have an air handling system that is a little bit larger, you need

to go to one of the other systems.

Steve: Commercially, they've got much more of a challenge than we do. And one aspect, they have some real specific things, like you said, there's codes they have to go by, they have to bring in so much air from the outside in, and they have to take that in consideration. We have to have so much velocity to the air that they go through it so to make these work right, sometimes they use some companies use bag filters and other things that we use polarized media in that application so we can get it done right. But they have a lot of room I've been on some of these commercial applications. You can walk into the return plenum. You can put a ladder in there. You have put a ladder in there to walk up, to get the filters 20 foot above your head. So you can design it because you got a lot of room. In residentially, we're kind of stuck with the size of return plenum that it's a given it's usually 10 by 25, 10 by 20 that's the air that comes down into the air handler. And they use it as a filter slide in there. Sometimes it's built right into the furnace. Sometimes they put it outside, but it's a given size. So typically if it's designed right, that's plenty for the air flow, but is it a bad idea to get more air flow if we could? If we had an opportunity to give it even better air flow, wouldn't that be a good idea? So at the RS units, we basically take part of the return out, put the RS unit in there and it becomes part of the return. And now we can put a bigger filter in there. We put it in a V, the RS2 and RS3 units. There's two filters in there and they're at a V instead of flat remap mounted in it. It's, it's a V. So we got much more surface area, which slows the velocity of the air down. We've got much more opportunity to collect. RS4, we only still put one in there, but we put it in on an angle and there's enough room in there to put the carbon in there. It's kind of hard to put the carbon on the back end of a one inch return plenum rack. It's not designed for it. This is designed to have that in there. And then the third thing is we can put the UV light right in there. So in one unit we're going to get high power gem control at the high output light. We're

going to get the polarized media, pulling the particles out there, and then you get the adsorption of the carbon. So the reason we design our RS fours and twos and threes, was to get, number one better airflow, that capability of adding the UV light and ozone, like I said, that could be a whole other podcast, and to be able to implement carbon in there, enough carbon to get the job done.

Andy: Really for us, this has been just a unique way, but a very novel, logical way to purify the air, not only in an existing home, but for all of our new builds that we have across the country. You know, typically I would say 95% of these new builds have an RS4 or one of the other RS systems in it. Because especially when you're installing new duct work, it really is a simple installation. And it just makes sense. All of your filtration methods, purification methods in one box, it makes it easier to service, it's a very set schedule for replacing the replaceable parts. And it really leaves no stone unturned. When you're thinking about how am I going to purify this air?

Steve: That's right. And it is a huge advantage of the RS units is… I don't want to repeat myself. I want to make this clear because people wonder why, geez, you got the one inch. You can just replace my filter. Now for retrofit, if someone's on a service call and it's not a new construction, it is easier to just pull the filter out and slide this one in, and then wire it to a 24 volt transformer you're done. And you can add the UVS, some parts of the duct work on the return. If you have the room, if you can cut all that out and put this in, but usually on a service call, a service technician is not going to get in to that deep of an installation and it costs more money to do that. But the perfect ideal way to do it is to get as much air flow as you can. And that'd be exactly what you just said, Andy, and when you're a new construction, you can make it any size you want. You know, unless you're limited to a closet installation, you can work with

it. A retrofit existing system- sometimes those returns aren't designed right to begin with. So I know you guys are concerned about air flow, so that gives you the best air flow. You're concerned about particle control at sub-micron levels and VOC control with the carbon. And then the added benefit of adding the UV all in one whole house air cleaner.

Andy: Really is. It's a brilliant system. I love it. I have on my house, I can't tell you how many of these now we have across the country. And it's really been an absolutely wonderful system for our clients. You know, one thing I want to bring up before we end today's show, I think we'll definitely have to have you back on, because I know Jay's got some questions about, we talked about ozone and, and some really specific applications, but I wanted to bring up the effects that humidity can have on purification systems. And the reason why I'm bringing it up is that I recall in years ago, we still do sell some portable purification products for specific applications. And I learned years ago that especially with carbon as humidity in a room rises, the effectiveness of carbon goes down because the carbon itself can absorb those water molecules. And now all of a sudden there's less surface area for chemicals and gases to be adsorbed by. And if you can touch on that for us.

Steve: That's a perfect example of gate keeping, people look at carbon just looks like a flat piece of black something. You look under a microscope, it's nooks and crannies and cavities, and every one of those cavities grabs a gas molecule. But to your point, it can grab water molecule. It can grab H2O. If you fill one of those cavities with H2O, well, there's no room to put the VOC in there. So, you got to control the humidity and for other reasons as well, the virus is a big thing. Some thrive on low humidity, some thrive on high humidity. Bacteria thrives on high humidity; mold on high humidity. Some bacteria is low humidity. There is like a perfect pocket in humidification. And you can go look at charts online and stuff, and they'll tell you what

it is. It's 35 to 65%, some go up to 80 some, it's that little area of that does everything we need to control. So in the wintertime, when it gets dry, we humidify the air, in the summertime we dehumidify with the coil. So now back to filtration, yes, it could fill the pores in a carbon. The other thing that it can do a regular filter, that's a paper filter that's not fiberglass. It can absorb into that just like it would absorb into a sponge. And when that happens now, now we've got a perfect breeding ground for mold and bacteria. So what we're trying to do is clean the stuff out of there, and it becomes a problem in and of itself. Sorry about my dog, by the way. That's just a working out of home, right? I bet the UPS man must be here. But the point is there's a perfect humidity level that carbon works best in. So we, and I know you guys do humidity control as well. Absorbing it into a carbon is not good because it makes it less capable of collecting VOC is what you're trying to do. And then on the other end, let's take these large pleats, you know, these four or five inch pleats, you get moisture in those things and you know what it grows mold, darkness, moisture, and mold spores. There's mold spores in the air. It's dark inside there. Now we got the pleated filter is going to absorb water, that humidity level. Now we've got that problem. So controlling humidity is really important to get into that little pocket there.

Andy: Well, thank you for that because that's something that Jay and I have been really stressing in the last year on the show. We've really focused a lot of our attention to the negative effects that moisture and humidity has on the house. Not just indoor air quality, but of materials. Chemical off gassing increases as moisture increases because as moisture is released from a surface, it'll carry with it the chemical footprint of where it was. And so it'll exacerbate somebody's sensitivities. And so if you're going to spend a whatever amount of money on a quality purification system for your home, I think it's imperative that you first get the humidity levels in check because whatever performance that you want to get out of this system, it just, if

you're not yet, it's going to be a fraction of what it could be. If you've got humidity levels that are all over the board and now your system just doesn't have the ability to perform.

Steve: Well, you're bringing up something I kind of wanted to touch on is that as much as we like to sell UV lights and the correct ozone and carbon, everything else, number one thing to do is get rid of the source. So if you've got a dead cat in your basement and starting to smell the house up, the solution's not carbon, the solutions get rid of the dead cat, right? You got radon downstairs, radon can't be broken down with ozone. It's an element it's far enough broken down as they can get. The solutions not, ozone the basement, or put a carbon there, it's mitigate, remediate it, get rid of it, put those pipes underground, suck it out, and get rid of as many VOCs as you can while you're building, nontoxic paints and different types of drywall stuff that you guys are much more familiar with than I am. But let's start with as least amount of this stuff as possible. And if we know what the source is, let's get rid of the source, but you never going to get rid of everything. I don't care, because homes are tight and we bring stuff in, no matter how great a carpet you get, it's still going to off gas for formaldehyde and other things,, low toxic paints. They're going to do some of it and always going to have the viruses and bacterias and other particles. So there's always going to be a need for it, but let's do source removal first is what we always preach.

Andy: Boy, that's a great place to end the show on. Steve, thank you so much for all of your information. We'll definitely have you back on, cause I want to have a show just about ozone, because I think that could be a fascinating conversation. Jay, the last thing that Steve talked about was something you and I have been hammering for decades. The very most important thing you can do in your home is remove the source of the pollutants. Then if you can't remove the source, then you look at ways of mitigation, remediation, so on and so forth. That's our

theme.

Jay: It’s a mantra we have, and it's so logical too, and if you think about it, just why bring it in if we can avoid bringing it in? Andy, because everyday we hear this. Sometimes that's not something that our clients control necessarily. You know, they may be working with someone that's convinced them that whatever they're doing is going to be fine over a period of time. And then as you know, they find out, our clients find out that that's not the case. And then we're in the situation where we've got to deal with the problem. I think what's interesting in my mind, as I'm thinking about the conversation and it's been so informative, I feel like I’m in IAQ 101. I’m sitting in the front of the class here. And don't Steve, don't throw me a pop quiz. Okay. Cause I wasn't taking down notes. I just kind of letting it all absorb it in my mind. But one of the things that I was thinking of is we were talking generally being able to do a whole house system where we can actually go in and do this thing in the right way, which is of course logical, but there's many situations where our clients don't have the ability to do that. I'm thinking of people who were in rental situations, they're not going to get into their system and do it right. So they're going to want to treat this in more of a spot, a localized way. And so I think that maybe that's another part of another interview where we talk about what does someone do when they don't have control of the HVA system and the way that we've been talking about?

Steve: You know, and that's a good point, Jay. And we get that a lot in the Northeast where they don't have air handlers, they have a radiant heat and boilers and they say, what can we do? And I know we didn't touch on it. This could be another podcast as well, is that we do have a bypass HEPA system that mounts onto the return of our HVAC system. But we can also use that remotely. It'll it'll handle a thousand square foot in and of itself. So 2000 square foot house

up and downstairs, let's say you can put one of those in the attic or crawlspace or in a closet and put a return plenum in a supply and circulate the air through a HEPA. And there's ways of adding UV to that as well.

Andy: You're basically its own loop.

Steve: Yeah. You can create its own little because they don't have that. They're not moving air in those houses. Exactly.

Andy: Oh boy, that's fantastic. Definitely a topic for another show, Steve, thank you so much for your time today. We really appreciate your knowledge. Folks, if you have any questions about this episode as always, please feel free to email me and andy@degreeofgreen.com go onto our website. Leave us a SpeakPipe question. We'll be happy to answer these questions. I know this episode will definitely bring out more questions as these technical episodes typically do, please send along those questions. We'd love to expand upon the things that Steve was talking about and as always tell your family and friends about the show, we are still the number one podcast relating to healthy homes and alternative building. This is Non Toxic Environments. Jay, have a great weekend and week. Steve, thank you very much again for being on the show. We look forward to having you back.

Steve: Yeah, I enjoy doing it. Jay and Andy, thanks for having me.

Jay: Excellent, Steve. Really appreciate it.

Andy: Take care.