

HYC #53 - Air Quality Science, Technology & Improving Operations


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SPEAKERS

Anthony Adkins, Adam Kulbach

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 Adam Kulbach 00:23
hello and welcome to the higher enlightenment podcast brought to you by higher yields cannabis consulting your seed to sale Business Solutions team. My name is Adam part of the creative team here at higher yields. And today's episode is about what you don't know about air quality but you should. And today's guests are Adrian Gio Vanko from inspire Anthony Adkins from higher yields consulting Josh rim Bush from buyers. So let's get on with the show. Let's start with the cellphone introductions. Let's start with you, Adrian.

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Thanks, Adam. Great. Great to see you guys. I'm Adrian Giovinco. On the founder of Inspire. We are intimately involved in design, build and operation of cannabis cultivation facilities and curing facilities. We've been involved in this business focused exclusively on horticulture and cannabis for over seven years. I've been I've been involved peripherally beyond that up to 12 years ago, in the northern California Bay area, particularly. We offer HVAC and dehumidification systems that are integrated together and are controlled and monitored with a data cloud type system to be able to really use data and science as a tool to drive your cultivation decisions. be giving you the ability to have close adherence to set points inside of your cultivation spaces is really what allows you that the ability to go to the next level and start to use the environment as a crop steering tool. And to truly utilize all of the different systems and money that you've put into a cultivation facility. The the lights, rats, irrigation, fertigation systems, all the different parts and co2 enrichment, delivery, all of those systems, and all of those into independently are

ways that you can help control and steer the crop. But the environment really is what brings all of those together and allows you to maximize that. And so that's that's the role that we play in the industry. Okay, well, thanks

 Adam Kulbach 02:42

a lot for being here. How about you, Anthony?

 Anthony Adkins 02:46

Yeah, absolutely. I'm Anthony Atkins, Chief Revenue Officer here at higher yields consulting. My background is deep into business market partnership, development, revenue and client acquisition. So you know, very important to me in terms of connecting to the market. And, of course, higher yields connecting to the market in the market connecting to higher yields. The partnership side and the development side is all about positioning and making sure that we're working to solve issues, to resolve problems, to make sure that we're being efficient in terms of, you know, from point A to point B, if you will, and really working, you know, with our partners in partnership development, in order to bring the best of the best to the industry to our clients in either a corrective environment, a startup environment, or an expansive scaling environment. So how air quality elements and odor mitigation analysis and making sure that the plant is given best environment is very important from a business development perspective in order to how to position and identify, you know, what those what those particular points of partnership are so great to be here.

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Well, thanks for being here, Anthony. Josh brim blush. I'm the Vice President at buyer scientific buyer scientific is a a niche engineering firm that designs and builds air purification and odor mitigation equipment. We're a bit unique in that we have a dedicated division called emissions analysis, that is staffed with two active PhDs that allow us to not only research the plant, understand the gas phase emission rates of the plant, but also take a active role in helping facilities diagnose and understand existing air quality challenges, whether that be related to dust, pathogens, indoor odor, and so on. unique offering in addition to the technology, which we take a lot of pride in, because it's all been third party tested. And so we help cultivators, processors, manufacturers, identify and correct problems, not only for health and safety considerations, but more often for compliance driven considerations, and finding balances with community and making sure that fugitive emissions don't impact local communities. Hey, well, thank

 Adam Kulbach 05:30

you. Okay, so first question, what are the biggest issues in air quality that affect cultivation staff? Sir, I'll,

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I'll jump in. Josh, do you want to take that from maybe from a perspective of just sort of the challenges that you run into specific to air quality? And then maybe I can take it more from a holistic HVAC type of approach?

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And that sounds awesome. Yeah, thank you. So some of the immediate challenges that we're seeing right now is Keef dust, we see where dust is creating significant issues. Issues that should not be taken lightly. And I think this group probably is aware, unfortunately, we've seen two fatalities now, specifically related to keep dust. And it's something that we should really embrace, one of the responses that we see is provide personal protective equipment, by or scientific would say, and as an undergraduate in safety management, industrial safety management, I would say that PPE should be a last resort. Engineering controls are the proper way. And before we even get into engineering controls, again, assess the current air situation, understand particle count, understand particle count range in size. And so dust is an ongoing issue for cultivation facilities. The second thing that I'll comment on and then I'll turn it over to Adrian is his pathogen control. So this group knows quite well, that mold and fungus and yeast as well are the three primary that we see right now that can really wreak havoc on a facility. And so whether it's yield optimization, the impact of the bottom line, and or we're seeing now where if a large batch of product doesn't pass and the community gets to learn about it, now all of a sudden, we have significant damage to a brand. And so when we look at the dollars and cents, the time invested from a stakeholder down to the master cultivator, it can be very damaging, again, not to understand or rely on air sampling to understand current spore count levels of Aspergillus, or yeast and mold. So these things are significant, not only can they have a potential health and safety impact, they can affect the bottom line, and ultimately by our scientific would suggest, understand your air quality first, then we can spec equipment, and then the appropriate next step is then test the air again, once the controls are deployed to validate or verify what you believe to be true. With that, I'll turn it over to you, Adrian for maybe a bigger picture approach.

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Yeah, no, I really appreciate you going. Starting starting there, because I think that's really what's most important is to know, you know, what are the issues that we're seeing coming out of it. And to me from it from a H back and facility infrastructure system design perspective and operation, I kind of want to take you take a take a little bit of a step back and look at it from a perspective of what type of business are and facility are we trying to create here? Right? And what is what are the short and long term goals of that of that business? This is a, this is a manufacturing facility, right? These are true industrial manufacturing facilities that are being designed and built and operated. And many of the stakeholders that are involved Vegas in general, just there's a lot of different definitions, I guess of that, in general. And from our perspective, we just we'd like to advocate for a culture of clean and the ability for you know, for a business to be able to produce the best possible product that is clean and safe for their consumers. And in order to do that you need to do exactly what what Josh was just sharing where you need to design it in such a way that you know what you need to attack and and design around and then you need to test it and make sure that it really was done in that right way. Right did it get you know, it's every every plan that an engineer has ever drawn is the perfect plan until it gets built and then you realize like, hey did the con tractor pickup this or

pickup that? Did it actually really get done in the way that it should? And did it get commissioned properly at the end of it. And these are, these are challenges that we see throughout the industry. And almost regardless of whether of how experienced them different designs and construction team members are on projects, and it's a really, really big opportunity for cultivators and cultivation businesses, to take advantage of as a way to not only reduce their operating costs, reduce any sort of, you know, challenges with labor and compliance and OSHA, and, you know, kind of all of the, you know, health and safety of their workforce, be able to provide a clean and safe product for their consumers. And oh, by the way, it's the way keys to a profitable business. And then these are all connected together in the way that you think about it upfront and design a facility with these goals in mind from the beginning. And then you have those gait checks as you go through to make sure. Did that design get built and commissioned? And is it now operating the way that it was designed? And then a year later, go back and check it again? Are we still there? Where are we where we designed it? Or are we doing better? Hopefully?

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Adam Kulbach 11:23

How about the biggest issues in air quality that affect the plants? Are they the same or different?

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Can be the same? It can be different? You know, in I think I think we're starting to see, you know, I mean, I guess in general hoplite and Vi roid, as far as a pathogen is probably the number one answer that cultivators would give you from a plant health perspective. In general, that's not something that we're going to get rid of, by with better better air cleaning. But it does the air cleanliness. And just the general cleanliness of a facility has has a part in it. And in order to truly try to get rid of pathogens, you need to do the process that Josh just just sort of went through, maybe I'll kick it to you from that that side of a judge. But it's, you know, it's a matter of identifying what the challenge is, and then a proper solution to be able to mitigate it, and then be able to test and make sure that you really did did handle it.

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12:28

Yeah, from from an airborne standpoint. yeast and mold are the hottest ones that we see Aspergillus is right behind it. And, and one of the things we see is that cultivators are spending time and energy, whether it's neem oil, or whether it's pesticides, treating the flower, what we do not see as a common practice, is proper air filtration to remove or stop the transmittal of the spores. And that's where a little step goes a long, long way. And so, I would also add that here in Colorado, it's not uncommon that so much of the flour is irradiated as as a way to ensure that they're able to pass the QA QC testing. And so how do we move away from that? Or how do we use that as just a last ditch option, as opposed to relying on something like that, and or dipping full flour in different products that are hitting the market now that claim to remove or make an active mold and fungus? I think at least from from my vantage point, most of the folks that I know in the business are really interested in clean product, it's safe. And so as we talk about really proactively addressing air quality in these cultivation facilities to try to remove or at least minimize the transmittal of these molds and funguses. The primary ones is as I would

call low hanging fruit at this point, and there are safe technologies on the market that have been third party tested to do so. One editorial comment is there are also three or four products on the market right now that are not safe at all, that have not been third party tested and not been reviewed by universities. And that's a bit concerning, because there's no federal oversight. We see with our two h two PhDs, excuse me, where there are technologies being used today that are frightening. They are creating byproducts and, and the industry should be aware of that. And so anyway, I'll leave it at that but but air filtration for those things as a proactive approach to minimize and stop the transmittal of mold and fungus is a primary start. Yeah, it

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Adam Kulbach 14:46

was just about to ask if there's regulations that deal with air quality.

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So when it comes to pathogen testing, I'm not aware of that the pathway all the pathogen testing I'm aware of is specific to the flower indoor product. Adrienne, you might be able to speak better that tonight but for air quality concerns, we're not aware of any standard. Now I know that NIOSH is doing some extensive research and development of potential regulations for biogenic VOCs. At this time, by our scientific is also working directly with a third party Institute, which I cannot name at this time and a large cultivator here in Denver, to also do some third party testing on air quality specific to particulate count, and also pathogen. So we see where these entities that don't necessarily have a dog in the fight, are getting engaged to try to help the industry get better overall. But today, I'm not aware of any other regulations. Adrian, are you when it comes to air quality?

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15:39

No, not not, not indoors. I mean, it's you know, there's a, there's a much larger conversation here around air quality in general, beyond just plant, you know, in a facility such as these, right, we just live through a pandemic. And it's somewhat amazing to me how quickly everybody, you know, went and grabbed MERV 13 filters, and, you know, threw them in, and we're starting to put in other types of air cleaners and things. And, you know, and I've been in the HVAC industry for almost 20 years, and the, the interest in additional better and better air cleaning devices, and better air cleanliness overall, in all industries is very, very low. And it's, it's really, it's, it's quite concerning, to be honest, like, you know, to think about the type of air that our kids breathe at schools, and that everybody breathes in office buildings, and even at hospitals and other places that you would think would be very clean, has to do in general with a lot of deferred maintenance and lack of maintenance, in most facilities, really, through all all different types of industries. So there's a, there's a much larger conversation around that. And I know that ASHRAE, which is the American Society of heating, refrigeration, and air conditioning engineers, that I'm deeply involved with, has been working on this heavily, obviously, with, with the pandemic we just live through, there's a lot of different air cleaning technologies that were then kind of thrust into the fold. And like Josh just mentioned, some well validated with third party data and testing and shown to be effective and safe. And many others that that just don't have that that background and backup. And so there's, there's a real challenge for consumers

right now to be able to figure out and pick through what is what is, what is really safe and effective and what's not. You know, so I will kind of leave it to the to the organizations like ASHRAE, and ASTM standards writing body and, and others to help with trying to put the right codes in place. To me, this is a business this is in general is back to like your business metrics, right? This is not going to be in the cannabis industry, you're not going to have a profitable business. If you have 20 to 50% crop loss from molds and powdery mildew and botrytis, that's just the way it goes. Right? Like you can't write off that amount of product, and still expect to be able to turn a profit or even break even. And so, you know, it's, again, to me, it's really it's all it'll, to me, it's all very well aligned around, you know, safety, high quality product and profitability for these businesses, if they were to look at it that way.



18:33

Adrienne awesome comments there. And, Adam, if I could add one thing, I think we're seeing more and more where a handful of our clients have come forward and said, We're prepared to invest in our employees. Let's talk about the culture at our facility. Let's talk about our commitment to clean air for our people. Let's talk about that proactive investment right in our people. And so I think there's a lot to be said for that. And some of the companies that that have had that mantra from the beginning, and continue to invest in their employees, they keep the good folks around. And so I think there's a lot to be said, from a culture building standpoint. It's no secret that inhalation safety concerns are now very serious in our industry, and we must react and reacting with a piece of personal protective equipment is not enough. And so I'd like to add that there is a big opportunity, whether it's an MSO, or it's a small cultivator here in Denver, to really invest in show that they're investing in their people and leading the way and developing a culture amongst our people that compliance and safety is the leader. And so I think that should be noted.



Adam Kulbach 19:46

Okay. Yeah, we sort of touched on it, but how does air quality affect operational efficiency?



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I can kind of start on this one. And I was I was going to talk about this I'm here am I I'm gonna go. And I think it makes a lot of sense. Now it's like the act of air cleaning is a great way to address, you know, specific types of pests and pathogens that are in the air. But to take a step back, and to and to help mitigate crop loss, and you know what we just talked about a moment ago. But to take a step back, that those are sort of still somewhat well, while there's they're active solutions, they're still somewhat reactive to what I would consider a poorly designed an environment overall, right? The the reason that you have molds and mildews, is because you can't control the environment inside of that growth space. And if you can truly control the environment. And you know, it's, I find it is somewhat comical, almost that, you know, we're working within an industry that's called CEA, which stands for controlled environment, agriculture, yet those first two words controlled environment are something that I would say more than 50% of cultivation facilities around the world are not able to actually attain, these are not controlled environments in the way that we all think that they should be. And could be. And so, just to take that little bit, step back and say, like, the technology, the design

knowledge, and the technology is here today, and is available and is affordable, to do it in a way where you can design your facility and your overall air environment in such a way. And with the appropriate amount of dehumidification capacity. Particularly, that's the really the number one thing that we see, almost across the board is that there's not nearly enough dehumidification capacity, or it's just a lack of understanding by the design engineers or the cultivation team, or those that put the project together where they ended up in that in that spot. But the technology and expertise is out there today to build facilities that give you true environmental control. And with that, you can then augment it further and get even better air environments beyond that with more with active air cleaning, which is something that we advocate for in our base traditional design for how these facilities go together. Because you're looking for the best bang, you know, best, you know, risk reward and return on investment for what you invest into that infrastructure. And so trying to figure out what a good balance between capture filtration and active air filtration and biosecurity is, is really where where you get to play some of that risk reward game on it. And that's really where we're where Josh and Byers comes in from that perspective.

 22:54

Yes, I guess the only other thing I'd like to add is is that you know, working with a company like Inspire is ideal at from a design build standpoint. You know, although Adrian's equipment has tons of capabilities, when it comes to air quality. In situations where there may be additional support or additional needs, we find that being at the design table is absolutely ideal. Because we can work together to understand what what inspires needs are to make XY and Z happen. And at the same time we can recognize, okay, you may need a certain face velocity for one of your pieces of equipment, for example, sure, we can work with you and we'll slow the airflow down to meet that requirement just as an example. And so I think that that team approach is really critical. And I also will say that when it comes to understanding the emissions of the plant, I would recommend that you really partner with a company that truly understands when you know when when it comes to transpiration of the plant, I know that there's a company that knows everything back to forward and that's inspire, not to sound self serving, but when it comes to the emission of the plan, Dr. Alec scooter and Dr. William sweat a there are no other gentlemen or females on this planet, quite frankly, that understand the gas phase emission rate of the cannabis plant right now. And so all I'm suggesting is rely on those experts so that they understand your design your facility and what your goals are. So that these you know, whether it's the mechanical, whether it's the air purification vendor can all work together for a holistic solution.

 24:31

Oh, I couldn't, couldn't agree more and just to put a cap on the operational efficiency piece. If it was so, so interesting, because a few years ago, efficiency was like far down the list on like, you know, the the list of the goals of you know, designing and putting a facility together. And now with price compression, where it's at and the challenges that the industry is going through, it's been clearly thrust into the spot Light here, again, which is, which is really good to see. And it's just oh, it just highlights overall the importance of balancing both your capital costs and your operating costs and understanding what the overall design approach of a facility is. So that you can get really what is at the, you know, the hope. And the goal is that you get the best Total Cost of Ownership solution chosen for that given lifespan that you're designing for.

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Adam Kulbach 25:32

Okay, so what technologies that we do we currently have to deal with these situations?



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Adrian, you want to talk big picture? And then I'm happy to?



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Yeah, yeah, why don't we do that? Happy to. So in general, you know, where I think everything really all came from was passive filters. Right, where you're, you're, you're using filters inside of an air handling unit in the HVAC system to capture any, you know, any particles that are that are flying through the air, right the air. In general, the speed at which those particles, and the air is moving through the air handling unit systems is in depending on where in the system it is, is between 500 feet per minute and 2000 feet per minute, right. And so you have to be able to understand what is going to, you know, what size particle is going to be caught by what type of filter, right and so there's, there's a rating system that's called the MERV rating system. And you'll hear the terms like MERV eight filters, or MERV 13, filters, or HEPA filters used, all of which fall at different places along this MERV rating system. And it's really based upon the size of the particle that's going to be caught and the efficiency or effectiveness of catching that particular size particle and larger. So and I don't have the MERV rating scale in front of me here we can, you can throw that up on the you know as a as a follow up where you can check it out. But like a MERV eight filter, MERV three MERV five MERV eight in general are kind of we call it in, you know, for lack of a better term column rock catchers almost right like these are these are filters that are set for, you know, multiple microns and larger, and to the effectiveness of the 50 to 75% range. Merv 13, is really what we've seen to be utilized as the best way to try to get basically, particles that are of around the size of one micron and larger to be captured. And then HEPA filters is you know, is like what MERV 1819, on that scale, in general, or close to it. And so we're talking about those filters, being able to capture very, very small particles. The challenge with those different types of capture filters is that as you increase that efficiency of the filter that effectiveness and getting smaller and smaller particles, the pressure drop increases through that filter. So it's all a balance, really between the overall fan energy that you're using, the amount of space that you have available in your air handling units and systems. And what's going to make the most amount of sense, which is really one of the main reasons why we don't see HEPA filters used predominantly in these types of applications is because it takes up a lot of space, it's a more customized air handling unit, it costs a lot more, and there's more fan energy there. And the replacement cost is very high, and things and so there's other types of more active air cleaning devices, which I'll throw it to Josh here in a moment to talk about a number of them. We've evaluated lots of them on the market as well. And I would highlight what Josh has shared, where it's, you know, third party testing data, and verify validation and on the demonstration, that these systems are safe and effective by a third party testing agency is extremely important in in any of these, because if we remember back to the days of the sharper image, and the the ionizer, right, where they're sending, you know, they're sending these ions out, then Josh probably has a hole maybe I'm maybe I'm butchering this story here. But you know, like, the sharper image is no longer around as a result of the lawsuits that that were put down on them by these air cleaning devices that were not tested.

And so it's just it's extremely important for human safe DEA as well as plant safety in this case, to really make sure that you know that what you're getting is effective. And maybe from that, in that I'll turn it over to Josh to talk more about other the different types of active air cleaners that could be paired with or used in conjunction with passive air filters.



30:21

Yeah, Adrian, I really appreciate your comment about the MERV rating and HEPA filtration when it comes to cannabis facilities because we totally align their HEPA filters are great at what they do. However, they're expensive, and they draw a significant requirement for power in almost all cases. So one thing that I would point out before we talk about particular types of technology is that I will say one of the things that we have discovered in the last three and a half years with our staff is that there are very effective air filtration technologies that are used in museums, surgical centers, medical facilities, but these particular types of air filtration devices may not be safe in cannabis facilities. And the reason for that is we see an excessive amount of biogenic VOCs inside a cannabis facility, truly billions of compounds being created. And so there can be secondary reactions depending on the type of technology and I'm not going to get into details today. But there are some technologies out there that when they operate in these environments, I mean, non HEPA, non fiberglass woven type technologies that are not safe in these environments because of the very, very rich bvoc environment because the cannabis plant and emits biogenic volatile organic compounds, which by the way, are 100% safe, there's nothing to be concerned when we talk about those types of B VOCs. They're naturally occurring as opposed to anthropogenic, which are manmade VOCs. But I want to I want to put this out there that please be sure that these pieces of of air filtration technology have been tested in cannabis facilities, because I can assure you through third party testing that we've done, and validation or vetting of other equipment that we've done in the past, we did see the creation of carcinogens in these environments, which is very, very serious. So without getting into details on the different types, I would suggest to to do some research rely on experts. And again, look at third party testing inside of these facilities. Because the the creation specifically of aldehydes is very real in these environments. And neither the master cultivator, the facility manager, or the employees, whatever, no, this is happening because nobody has third party tested these some of these pieces of equipment in these environments. So without being without creating fear, proceed with caution and do your due diligence. When it comes to whether it's removing particulate or particulate that has viruses, bacteria, mold, or fungus attached to it. That's how we evaluate those. And so look at particle size. And look at that efficiency removal over time, the maintenance of these systems is absolutely critical that nobody would ever drive a car for 10 years and not change the oil or check the tires. And so Adrienne hit the nail on the head early on and said a lot of this comes down to maintenance. A lot of this comes down to supporting these these facilities. And we saw this early on. And that's one of the reasons that buyer scientific, never sells a piece of equipment and walks away. We continue to maintain the equipment, we provide operational support and testing of the third third party testing equipment as we go. And so again, find a vendor that's that's vested in your facility and is prepared to back and service this equipment.



Adam Kulbach 33:56

Okay, what does the future hold as far as technology?



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I guess I'll, I'll be but that one of the things that we haven't really talked about are fugitive emissions. And so I guess one thing that I would I would mention is that there are a lot of claims today when it comes to odor, odor mitigation. And it's such a subjective topic, it can be very difficult to prove it can be very even more difficult to defend. And so when it comes to those types of emissions buyers in particular, we are firm believers in molecular filtration. You know, the term carbon scrubbing has been around for for many, many years. And we are aware that that basic carbon scrubbers have kept people out of jail for years cultivating cannabis and we see that however, on today's scale, I would I would advise the listeners The viewers to really understand molecular filtration in a much more detailed way. And and porosity CFM, ratings face velocity, sequestering rates things of this nature. And so that's one topic we hadn't touched on yet that I just wanted to briefly mention when it comes to pathogen control, buyer scientific has tested and vetted. And we really like what we're seeing with electrostatic precipitation and filtration. So as we talk about the future of air cleaning, we love a very, very low amp draw sustainable solution that allows us to really pull nanoparticles out of the air with very little restriction. And so that equates to energy savings, which is exactly one of the things that inspire has leveraged to make them the firm they are today, getting the biggest bang for the buck, for the for the least amount of energy invested. And so when it comes to dust, and pathogen control, I would I would step forward and say that electrostatic precipitation, specifically Aspera is the is the patented approach that we solicit and manufacture. We believe that's the way of the future when it comes to addressing both particles and all pathogens with one type of air filtration. Technology.



36:23

No, no. And we, from our perspective, we've you know, there's there's other types, there's many other types out there. And we could probably do a whole podcast just on like pros and cons of different air cleaning technologies and things that are out there. One one that we've used and have third party testing data on and the particular what one of the things that I think that you find, and what what Josh just alluded to is like, you know, each of these types of technologies has many that are many different ways that they can, can be constructed and put together. And so it's really important to make sure that the specific application of what you're using is going to be you know, is going to be safe from that perspective. And so one of the ones that we've used over the years, and have had really good success with but there's many out there that haven't been able to have the same type of success because of the way that it's applied, is a technology called photocatalytic oxidation. PC PCO for short, is a way that you can clean the air as well, of smaller particles, you're not actually removing those particles out of the space. Similarly, you're just you're looking to try to render them inactive in that way. But again, it's it's taken us a significant amount of time to test the air and the particular account with these different type types of technologies, and installed in different types of configurations, really, to see what what the best, best overall technology would be in combination. And I just thought I would I just just kind of checked to make sure that I had the name of it, right. But ASHRAE, just this summer, released a standard, a new standard called standard 241, which is control of infectious aerosols, that I think is going to help uplift the level of education throughout the whole engineering and construction community, in general around infection risk management, and clean air flow rates and the type of air change rates that you want to use. And then also it goes into requirements for the different types of filtration and air cleaning technologies that we're talking about here, which I think is going to help significantly try to, you

know, level the playing field. And hopefully the result of this is that the consumers are able to see products, only products that are compliance, and not though and not have to try to wade through that themselves to determine what is going to be safe and what's not going to be safe.

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Adam Kulbach 39:14

Okay, so when when should cultivators start implementing these technologies and upgrading their facilities?



39:21

I would say today, yesterday, yesterday, I mean, it's it's an opportunity. It's it's a massive opportunity. And I mean, I don't know maybe Anthony, that's a way for you to chime in some on like, you know, cultivators needs, and you know, from a from a business perspective, like how does this ultimately affect the business and the business? You know, vitality of a business and an operation?

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Anthony Adkins 39:49

Well, definitely for us, I mean, we're always taking a risk mitigation and investment protection, viewpoint, right. So everything is built upon that foundation. So if you're not mitigating risk along in the way of, you know, protecting investment along the way, and that starts at the genetic level, I mean, all the way through the process, because you don't want points of failure, you don't want points of contention in your system with that could eventually either fall out of compliance and was be shut down because of some pathogen that gets into the system and ruins the process or ruins the operation. So, you know, paying attention to the detail. I mean, higher yields is about from the beginning from concept. And in terms of that design, so we're always looking at, you know, the, the buyers, the inspires, I mean, the key elements of our partnership, because of the expertise that you both bring, and because of the risk mitigation and investment protection that we're going to, you know, together bring to those startup clients. But now you have a whole bunch of opportunities, or a whole bunch of existing facilities that need to take a look, spend a little time slow down to then go fast, and do the analysis, do the assessments, you know, figure out, you know, where, where the system is weak, and then go through incorrect and retrofit and apply the methodologies of buyers and have better scientific and inspire, in order to be able to take your growth to the next level, take those cultivation those operations to the next level, and be known as a quality producer, a quality cultivate, you know, so they knew, you know, when you know, the, you know, when it gets to end user, when it gets to client, that they're going to be trusted, it's going to be a great experience, and, of course, the preserve the precision elements, precision medicine of this particular plant, that we've you know, have a unique opportunity to be a part of it will, will fulfill its goal and origination of what it ultimately was originated to, to be so, you know, taking a look at it from a business perspective, taking a look at as from a developmental perspective, you know, always about risk mitigation, always about investment protection, you know, from the beginning, and then, you know, doing the analysis and the data, the data analytics on on your process on the system is, is key.



42:24

Yeah, that was well said, I guess one of the things that I'd like to add that we I hear and see when I'm in the field, is we don't have an air quality problem. You don't? Okay, well, how do you know that? But we just don't. And so without being disparaging or disrespectful, because so many of these contaminants are not visible to the human eye, it creates this false sense of trust and security. And if we didn't learn that with COVID, maybe this is another opportunity for us to see things a little bit differently. I think Adrian hit on this, at the beginning is that air quality is absolutely key. And, and without error analysis. Let's let's use let's get some data. Let's understand particle count. Let's understand spore count, I have so many prospects and clients say, Well, I'm passing my flower tests. I'm good. And so I'm saying well, you're good after you radiate the flower. Do you have any idea what's in the air? How, where? Where are these things coming from? Where are these pathogens or contaminants coming from? Well, we don't know. Well, let's start with understanding what's in that air. So again, I cannot, I can't understate the importance of hiring a firm to come in and do some basic sampling. It's not that expensive. And it tells us so much about what's happening there. And back to another point that Adrian's already made. So often, we see that it's either a breakdown in the HVAC system, it's a lack of maintenance, or it's both, or they've taken a facility that wasn't originally intended to cultivate cannabis. And they've turned it into a cannabis facility. And they're wondering why they're having some of these challenges. So for me, it all comes down to data collection. Let's let's do some analysis. Let's do some air sampling. Let's do some spore counts, have a third party, trusted lab do the analysis. So you've got something in hand as a baseline to say, No, we don't have a problem, or yes, we do. And here's how we're going to solve it. So it all to me, it all comes down to understanding the problem. And the only way to do that with air is to take samples, you're



44:29

agreed that the technology is there to do it, right. There's, there's I mean, there's still a massive amount that's unknown around optimization of this plant and you know, in you know, what, what it what it's going to take, ultimately down the road to produce the right type of botanical treatments if it's a medical treatment or recreational product and what and how that's all going to come together. But there's, this is something that you can go and do today. Right? If you say Josh It doesn't cost that much money to do it. It's just a matter of taking that holistic view and investing in your business holistically. And your people. Yeah. Well, it's all it's all part of, I guess I would lump that lump that all together, right? It's the it's the product that you're the products that you're producing. And the people that are that you have to do it, it's the whole the whole enterprise. And, you know, this is just, this is sort of just one, you know, one specific item in that whole ecosystem of what it takes. And it's, it's really one of them, to me is one of the biggest challenges that cultivators have today is that there's so many things that they have to get their arms wrapped around in order to be successful. And if you miss some of these important ones, you know, you'll end up paying the price for a lot of a long time to come.



Adam Kulbach 45:50

A while I think we're about at the end of the questions, is there anything else you'd like to add? Or tell us like, what, what's the first step if somebody wants to upgrade their facilities?



46:00

And from our perspective, I mean, I think all three of us would say the first step is to understand what you have. And test and you know, if that from Josh's perspective, that's actually physically getting in there with particle counters, and, you know, the ability to test and see what is in the air, from our perspective, that's going and understanding, you know, what is the load this, you know, to take another kind of step back, right, this is, this is all about balance inside of these rooms, right, you try to grow, you do whatever you're going to do inside of an enclosed environment. In this case, it's growing plants, which are have a very dynamic, you know, psychrometric, and, you know, physiological dynamic to them and balance to them, there's water coming into the room, there's energy and to be a light coming into the room, there's moisture that needs to be removed out of the room, there's heat that needs to be pulled out of the room, all of that ends up is basically just a balance equation to determine what it's going to take to size the systems that serve it. And so from an evaluation perspective, you can go and look at it and say, Okay, here's my inputs, here's the systems that are handling my outputs, do those match up, right and can very, very, very quickly be able to determine, you know, if that's out of balance or not. And then as you're as you roll it up in, you know, into the way that that higher yields, and Anthony would share about, you know, a holistic facility on it from that perspective. So I think in a way, we're, you know, we're parts and pieces of a holistic facility audit to really determine where you're at and benchmark where you're at, and, you know, something that we're starting to see more of is benchmarking against your peers, right, and get more data collected. So you can see you shoot, we're, you know, we're down in the 30 percentile, compared to where our peers are of a facility of the same size, like, we've got some opportunity for improvement here. Or no, maybe we're, you know, we're up on the cutting edge of, you know, 80 90% of, of the that percentile. And so the more data that you can collect to use as that benchmarking analysis. And, you know, a jumping off point, the better.



Anthony Adkins 48:19

Yeah, gotcha, yes,



48:22

no, please, Anthony.



Anthony Adkins 48:23

No. So what I was gonna say is, is really that it's it's about an ecosystem, and that each part of that ecosystem is so important, not only for, you know, the productive element, but a healthy environment in order to be able to produce an endgame end goal that we're all, you know, seeking to come after, in every single aspect of the ecosystem is important and agree and hats off to the benchmarking elements, the analysis and the data, as assessments really understand what we are just like, we test water, just like we test our blood, we do our blood tests, in order to mitigate potential risk. I mean, it's, it's identifiers. It's, it's, you know, markers, and understanding those variables, and then applying the solution to remove those in order to keep the health of the ecosystem moving,



49:13

I guess, to in addition to sampling, and understanding current air quality, I would say, based on recent experience of the last three or four site visits that I've done, we realized that the air movement in the building wasn't happening as designed. And so we saw very, very hard to find areas where air was actually transitioning from one room to another or from a room to a hallway to another room or we saw in a very unique hybrid greenhouse situation where airflow based on meteorological conditions was causing all sorts of very difficult to identify situations and so really understanding the air movement what is happening at these different animals. Sure, on a sunny day with a two mile an hour when you may have an interior condition of x. But But in most unless it's a design build type of facility that's, that's really sealed, quote unquote, we see where meteorological conditions and outside variables can really affect what's happening in doors. And so we've had a couple here recently where we had to dig a little deeper than usual to get to the culprit, and we got there. But just understanding those nuances of how the building is has been designed, how it's currently functioning, what the mechanical was designed to do, and then actually physically what's happening, you know, even by way of using an anemometer, to understand where is that Where's air moving? Where were things happening here? Are there cracks, are there is there something above the the full ceiling, for example, that might be occurring? So anyway, without getting too far into the out of the weeds, you know, a site assessments great air testing is great. But I would also say really understanding where the air is moving and why it's moving the way it's moving is critical to mitigating dust pathogens and fugitive voter.



Adam Kulbach 51:07

Okay, any other final thoughts? No, very good. Okay. Well, I



51:11

appreciate the opportunity today.



51:13

Well, thank you.



Adam Kulbach 51:14

Thank you very much. It's been very informative. So thanks for being here. Oh, yeah.



Anthony Adkins 51:18

Yeah, thanks a lot. Folks could really appreciate it and always get Hey, Anthony.



51:22

Thank you. We appreciate the opportunity to support higher yield. Hey guys. Bye bye.