

# The Art of Engineering with Denise McIntosh

Episode 012: Caroline Hand, Production Engineer, Healthcare and Nutrition Division at [Evonik Industries](#)

Caroline and Denise talk about how a love of math and science drew her to an engineering expo while in high school. Shortly out of college, Caroline was interviewed by Evonik Industries where she is now a production engineer in the healthcare and nutrition division. She takes advantage of the many mentorship programs offered at Evonik, including Women's Interest Network which continues to motivate and inspire her. You'll also learn how Custom Powder Systems and Evonik came together to solve a production line challenge no other company was able to tackle.

*Denise McIntosh:*

*Well, welcome to this podcast of the art of engineering. This is Denise McIntosh with custom powder systems. And today I am delighted to have Caroline Hand who was a production engineer in the healthcare and nutrition and care division of Ivantec corporation and bring at the Birmingham laboratories in Birmingham, Alabama, and Caroline. Welcome. And, and tell us about, I'm always curious for young people in, in this industry, how you found this industry, what was your interest in chemical engineering, which makes my head hurt thinking about it, but how, how did you decide on chemical engineering?*

*Caroline Hand:*

*So actually that kind of goes back to high school. So when I've always been very indecisive, I'm still kind of am. But when I was trying to decide what major I wanted to go into in college, I was, I really had no idea. I knew that I loved math and science. I'm very strong in both of those fields. I knew that I wanted to do something, but I didn't really know exactly what that something would be. And it was actually kind of funny. So one day, one of my favorite teachers, he brought up an engineering expo that one of our local colleges was having to me as a high school student. That just sounded like a great way to just go. Cool. And hang out with your friends and, you know, my favorite teacher, like it just, I was really have too many expectations when I was going there.*

*Caroline Hand:*

*At that point I didn't really know what engineering was. When I thought of engineering deals, mostly someone with maybe plans in their hand. Usually a male, a field, maybe something in construction. But when I went into that expo, it just, it was like kid in a candy shop feeling almost. It was incredible. I had no idea what all you could do with engineering. They had expos showing that you could create toys and miss and, and just everything that my mind just couldn't wrap his head around and that's just sparked my interest. And after I saw that I was set on engineering and then chemical engineer, you*

*just kind of came, it fell into place. I loved chemistry. That was probably my favorite science at the time. And chose that stuck with it. Love it, very happy, stayed with it.*

*Denise McIntosh:*

*So was your choice of the university of Alabama, an automatic one from family or, or because of chemical industry in chemical engineering? Not really*

*Caroline Hand:*

*Actually. So my mom works in colleges and she actually the one who brought up Alabama, I, it was not completely off my radar. I hadn't thought about it at all. I was very focused on just rankings in high school. I just, I really wanted to go to top school. So I, I ended up going to some of those top schools, but it during different college visits and it was just, it was odd experience. So some of them, it was, I went to one at which point I had already been accepted and it was probably maybe a hundred students there, and this may be an exaggeration just based off my memory, but I was maybe one of three women and it was very odd feeling. It was I felt very not called out in a bad way, but they were just very, I could tell that they were looking for women to go there and Alabama, it was an interesting experience for me. There was actually a lot more women in engineering then noticed at other schools. It was it was very exciting. They're very focused on building their program right now. So when I went there, I loved the campus. The program was very impressive when I went to go check it out. And at the end of the day, that just felt like the right place.*

*Denise McIntosh:*

*That is, that is such a, such a big part of knowing you're in the right place. It's when it feels*

*Caroline Hand:*

*Right. Yeah, absolutely. Couldn't agree more. Tell*

*Denise McIntosh:*

*Me about then how did you come about the opportunity to join Yvonne? Like,*

*Caroline Hand:*

*It's kind of funny. So I never really had planned on going to Alabama, but I ended up going to stay in Alabama too. I was looking at different careers in Birmingham of that area, so Ivanek just came up. I ended up getting an interview and I guess this is similar to the college experience. I was interviewed by what ends up being to my supervisors for a long time. And we just clicked, it was a very comfortable interview. I was very exciting. I honestly didn't know too much about exactly what pharma did and how engineers were involved in that. But when just during the interview, it was, it just really felt like home. It just, it was very supportive environment, very open to any kind of experiences. So*

*Denise McIntosh:*

*What did you start there doing? Because I think I noticed on LinkedIn that you actually started as an operator.*

*Caroline Hand:*

*I did, yes. So actually start as an operator. I got a really interesting experience, so it was actually myself and one of my good friends, Amanda, who was also operator at the time, but we both have an engineering backgrounds. We replaced on this this project, which is actually the ended up being the production line that you built the lift for. So we replaced on this production line and it was in this stage of qualification. So there's lots of troubleshooting involved. It was very, very hands-on. You know, we had the operator role budge, really wasn't operations. Most of the time. We're heavily involved in the qualification of all the equipment deciding what needed to be done, the troubleshooting that had to be completed and how we were actually going to make this line work and have it get, be ready for commercial production, which at this point we are ready for, which is very exciting to see it come full circle.*

*Denise McIntosh:*

*So just, just curiosity and I, and I don't want you to reveal anything that's that's secret or confidential, but what will that line manufacturer?*

*Caroline Hand:*

*So this line so I guess a little bit background of VanEck Birmingham is a CDMO we work as a contractor. This line is made to be very highly adaptable. So the main draw to it is we can configure it to multiple different setups. So I can't really give you an exact answer because the answer really is limitless so we can keep modifying it.*

*Denise McIntosh:*

*I really would like from here for you to describe how we got involved and then maybe what the process was of even recognizing that you needed something and then go from there.*

*Caroline Hand:*

*Absolutely. So, as I mentioned before, we finally came full circle. We have this production line fully qualified, and we actually, the first customer that we have signed to go onto this line and get filled. They use a very large vessel, which the production line wasn't able to handle. So before this happened, we had identified a weakness or I guess area for improvement in our process, we have a valve that we use to discharge powder from. We need a very stable support and the one we had at the time, it just, you know, it was fine for during qualification, but we really, for full production, we needed something that was a little bit more stable just to keep that valve in place and not cause any issues. So that was something we had already identified. But then with this first customer, their vessel that they used, it was so large that we had, there's no way to not have a product lift.*

*Caroline Hand:*

*So we knew we were going to have to have some kind of method to actually raise this vessel up in the air. Cause this, this valve sits about eight feet in the air. It's not something that you can just roll something onto and have it discharged. You have to*

have it lift a very heavy vessel, lifted up into close to the ceiling of this room. So one of the biggest limitations was actually the size of the room. We didn't have much floor space. It was heavily utilize if there was a space that we could put a piece of equipment and we did obviously within safe ranges for the operators, but you know, everything was very highly utilized in terms of space. So when we were looking at different vendors to make this product live, CPS came up this was actually a company that Raj had.

Caroline Hand:

I think I forget exactly it might've been Scott, who we had met one of the expos. And he was just very impressed with them it'd been a couple of years ago, but he's still remembered you. And he reached out and we did look at a couple of different other vendors, but CPS gave us a design that actually had the lift coming down from the ceiling. And that to us was so valuable because we already had that limited floor space. So to have something that could get the job done and get that vessel lifted up, but then also conserve space. That was, it was a very easy decision to choose CPS after that.

Denise McIntosh:

Good. Well, so tell me about your role in that Caroline. Right

Caroline Hand:

Now, now I operate as a system owner for this fill line. So any new projects that come on, any modifications that we need to make to this fill on, I'm very involved in I look out for the production interests. So mainly with this lift project, I was looking at how is this going to work for production? Is it going to be easy for, for our operators to use is this something that we're going to have issues with maintenance all of which we all worked out. And we obviously do not have any of those issues with that. We were just

Denise McIntosh:

Talking about that today because we built so many lifts and this one is sophisticated. Oh yes. My best description because of the close tolerance on the docking. Absolutely.

Caroline Hand:

So we, for this valve, we have to dock this very heavy vessel within a couple millimeters and it has to be exact and repeatable every single time. So that was a huge challenge when designing this slide for you guys to actually make that happen from a manufacturing perspective, that's something that I was very concerned about at first. That's, that was probably my biggest thing. Rather I knew you know, we could find a vendor that could lift a vessel up and get it in the air, but to actually have that docking and that precision and have it also be very easy and usable for operators that you know, CPS really came through for us in that.

Denise McIntosh:

Well, thank you. So from your, from your perspective, because having never been on the other side of that, I find it fascinating, the process that, that accompany goes through a to decide to determine that they have an issue. And second, how do you go about finding that vendor that will fit that? But then to me, as a young engineer, maybe

*looking at this is the opportunity to maybe go because we, we were thrilled to have you and Raj come and be able to do that functional testing, even during the COVID. And have you onsite to see that. Yeah,*

*Caroline Hand:*

*I was absolutely excited about that. I mean, yeah, just having both Raj and I being able to go, that was very exciting with this fill line, since I did mention it was so adaptable. That also means there's a lot of opportunities to add new new pieces of equipment. And for me, this is my first fat. It was very very impressive one to, to not just have any fat, but for one, for a product container lived, which is the first for our site at Birmingham, it was unbelievably exciting*

*Denise McIntosh:*

*For listeners that may not know what NFAT is, would you describe from a functional because that's what it is a functional test, what your expectation was.*

*Caroline Hand:*

*So whenever we start out a project, especially a very large and complicated one, like this lift, we come up with a list of requirements that we need this lift to actually have. So in pharma, big thing is for in our claim rooms, which are the spaces that we actually have our production. We have to have very low surface finishes. And also we're very, very particular about the types of materials so that we don't have any rust or no particulates in the clean room area, since that's so critical for production. That's a big part of it. We also we identify the types of the power requirements that we need the spacing though, especially with, for the lift. We had a very long list of requirements that we had sent over. But for the fat the functional testing we test and we basically go over all those requirements or all those that we can at the time and verify that they're all within specification and all within basically we're getting exactly what we asked for. And so I'll, I'll you met all the criteria. It all looks good. And then after fat, once the customer, which for this was us once we say it's okay, that means it's good to ship and it actually gets installed on our site and it is there installed now, right? Yes, it is. It looks, I have to admit, it looks a little bit better, especially in that cleaners face. So yeah, that was impressive having an outside, but it's, it's really incredible seeing that inside. Have you, we sent you any pictures*

*Denise McIntosh:*

*Believe so, but I, but I will share with our listeners that because of the configuration of our building and the space that we had available, we actually did this fat outside. So I'm sure it looks a lot more impressive in that shiny plain,*

*Caroline Hand:*

*Well, I guess also the really impressive thing too. You see how tight of a space that, that lived fits into every time I watch it, it's like, how is this not hitting the wall? It's no, it, it makes it's perfect every time it's nerve wracking in the sense that it looks it's very tight tolerances, but that Lyft has no problem making those tolerances.*

*Denise McIntosh:*

*Good. Good, good. Well, thank you for explaining all of that. And if we can just maybe divert just a little bit. Well, who have been your boss? You mentioned you mentioned a teacher, but beyond that, who have been your influencers or your mentors, or maybe currently, where were you already phonics?*

*Caroline Hand:*

*So out of VanEck, we have a really incredible group of women that are very supportive. And I think that was one of the biggest things that I took away just within my first couple months when I started my first job. So this is my first job right out of college. I was still figuring out what I want to do. I was figuring out how this industry worked how just this entire site, it was all new. And as I mentioned, those, the two women who had initially interviewed me, who just really sold me on avantic in addition to so many others there, you know, I was never allowed to doubt myself at Ivanek. Every single time, if that, if I even tried to I'd get pulled into a room and you know, one of my supervisors she would tell always tell me, like, you are absolutely qualified.*

*Caroline Hand:*

*You can do this. You're going to be fine. And, you know, that's been such that's really helped me grow, especially as a young engineer, having that support system. Great vote of confidence. I know sometimes it's like, do you really mean that it's a really tricky I love challenges, but it's incredible how much they believe in you and that's been such a blessing working here. I think that's a huge thing. The VanEck has, we even have entire it's called a women's interest network where we have all the women on site that all get together and it's basically just a giant support system to build women up and really to help you be the best that you can be. So*

*Denise McIntosh:*

*Any idea how Ivanek got started down that path? I just find that so refreshing.*

*Caroline Hand:*

*Yeah. So I want to say it was maybe a year and a half ago that, that that club had, was actually started. But you know, I think it's just all comes down to the culture at Ivanek. So you know, I really, I would never even try to list all the women that I've had come up to me and, you know, give me advice or you know, even just say that, Hey, like if you need anything, just let me know. You, it's almost every single person who works there and even the men too, they're just, it's a very supportive environment and great place to grow.*

*Denise McIntosh:*

*Our first introduction to Raj was actually several years ago. And we, we, we built, I believe a small containment device around a piece of equipment. But I will tell you, I was impressed with Ivanek just from meeting Raj because he's so personable and so approachable. I have at every conference since then, if Raj was there, made sure I found him because those, those are the types of relationships that we like to build on.*

*Caroline Hand:*

*Absolutely. Yeah. He's been at VanEck for a long time, so definitely speaks to the kind of people that Ivanek looks for.*

*Denise McIntosh:*

*Well, anything you'd like to share with other young women, young men who are looking and trying to decide what to do with their lives, anything you'd like to share.*

*Caroline Hand:*

*So I think the biggest thing that I'm still learning is that it is completely okay to not be absolutely set on what you want to do. I think, you know, when I first started my career, I'd meet people that were about the same age and they knew exactly what they wanted to do. Just very straight line didn't have any worries is like, this is what I'm going to do. This is what I'm going to be. And that is that. And I've just never been that well, I have lots of different interests. I you know, I've, I could be happy as equally as happy in five different jobs. And I think just, you know, getting, like, trying that first job, understanding what you'd like and just kind of growing from there. And then building on top of that, you know, not being afraid to ask, like, say that, Hey, I'm really interested in this. I want to continue down this path. From my experience that's always been met. No one's ever said that, no, you absolutely can't do that. It's always taken very receptively and you know, most of the time people are gonna listen to you. If you say that you're interested in something and you know, what you want to do.*

*Denise McIntosh:*

*Well, Caroline, this has been delightful and you and I have lots in common because if anybody tried to follow my career path, they'd gotten lost on the first turn. And I so appreciate you and Raj being able to come here so we could meet in person. Oh, absolutely. And thank you so much for sharing your thoughts with us today. Thank*

*Caroline Hand:*

*You for having me. I was very excited when you sent me that message. Well, we may be able to do this again. Oh yeah. We can do it a couple of years from now. We'll see where I'm at then. Exactly.*

*Denise McIntosh:*

*And which turn I've made*