Mike: Hello, everyone, and welcome to It's Your Water. I'm glad you found us. I'm Mike Urbans, and today we have a special guest, Ted Begg with Purolite. Hi, Ted.

Ted: Hey, Michael, how are you doing? Thanks for having me here.

Mike: Yeah. Yeah. Thanks for coming. It's your second trip here.

Ted: It is.

Mike: He's a popular guy here. Now, Ted has a pretty impressive resume. If you guys didn't listen to our podcast, Ted did the one called Getting Down with Anion. Because we've always had this issue with anion and pH, which would drop the pH, so listen to that one. Listen to Ted's incredibly impressive resume. How long have you been with Purolite?

Ted: You and I were both very young back then, but -

Mike: I'm still younger.

Ted: - I started in 1990, so I'll be 32 years in - in April.

Mike: Oh, wow.

Ted: This - this coming year.

Mike: God. I started - well, you were in the industry longer, but I started in 1985 with Res-Kem.

Ted: There you go.

Mike: Purolite has been an innovator with ion exchange. I mean, a real big innovator, actually. They have a lot of new products, a lot of twists on products and, you know, that's what makes them unique, big, and powerful. But today, I want to talk about something, it's - I've used. And for my friends out there that like me - hear this, another tool in the toolbox, it's called SST-60. It differs pretty much entirely from all other ion exchange resins. And we'll stick with the cation for this, because most of my listeners are the water treatment dealer types.

Ted: Sure. Sure. We could - we can touch base on some of the other SST -

Mike: Yeah, the -

Ted: - products.

Mike: I will, yeah.

Ted: Yeah.

Mike: Which is kind of - you know, that's the geek in me. SST differs pretty much entirely from other ion exchange resins because it uses shallow shell technology.

Ted: Very good.

Mike: Yeah. Shallow - SST, right?

Ted: That's the acronym, yep. Shallow Shell Technology. We also refer to it as Salt Saving Technology, too.

Mike: See? See where we're going here? And it has a different part number now. We used to do the SST, so now it's SST 6000E?

Ted: Right. So, the potable grade would be SSTC6000E and the industrial grade is just standard SSTC-60.

Mike: C-60. And when everybody runs to order this at the end of the podcast, what makes it so unique? I know what makes it unique, but you're the man.

Ted: Okay.

Mike: You're the man.

Ted: Well, I think the best way to describe SST is to - to first talk about standard soft resin.

Mike: Right.

Ted: What - what does it look like?

Mike: Mm-hmm.

Ted: And I think everybody listening here would probably know that standard ion exchange resins are a bead, right? It's a bead that can range between .3mm and 1.2mm, kind of a normal distribution.

Mike: Mm-hmm.

Ted: But all resins start off with a copolymer, and the copolymer is made from two monomers, one is styrene and one is divinylbenzene, and you've probably heard of divinylbenzene referred to as DVB, and that's a cross-linker. And what I've always said about the cross-linking, it's kind of the glue that holds the bead together.

Mike: Mm-hmm.

Ted: The more cross-link you have, the tougher the bead is, the more resilient it is.

Mike: Yeah.

Ted: So, we start with a copolymer and then, in the case of a softening resin, we activate it with sulfuric acid to put exchange groups on, known as sulfonic acid groups. So you have this bead with millions and millions of exchange groups on it, sulfonic acid groups, that are in the sodium form. So, the sulfonic acid group, which is negative, has a positive sodium associated with it and that's what exchanges for the hardness in the water.

Mike: Gotcha.

Ted: Now, with a regular bead, it's completely activated from the middle of the bead, all the way into the core, all the way out to the surface.

Mike: Mm-hmm.

Ted: The difference now, with SST, is that we do a controlled activation where we only activate about 60 percent of the radius of the bead.

Mike: Gotcha.

Ted: Now, some people say, oh, you're only activating 60 percent -

Mike: Right.

Ted: - am I losing capacity? Well, if you do the math, that's still about 94 percent of the total bead volume, so you're not losing any capacity. And, actually, you're going to gain operating capacity because of the way it's designed. So, just imagine you have a bead with an inner core that's just that styrene-divinylbenzene -

Mike: Mm-hmm.

Ted: - and around that core, you have activated groups that will do the exchange. So, why is this more efficient? Well, what you've done is you've reduced the diffusion path that the ions – in the case of softening, calcium and magnesium – have to diffuse into the bead. And they don't go all the way to the core, they go about - about 60 percent of the radius of the bead.

Mike: That's kind of - I want to stop here real quick. Could I explain it as the business end of a sponge that - a kitchen sponge.

Ted: Mm-hmm.

Mike: The business end is only the outside.

Ted: Right.

Mike: We're using only the outside.

Ted: Correct.

Mike: But then, all the yucky stuff happens on the inside of that, so it's almost like you're making a kitchen sponge with a solid core so you don't get all the soap and whatever on the inside, which is kind of like wasted space.

Ted: To basically describe it a little bit further, why it's more efficient is that the diffusion path is slower. So, when you regenerate with a brine -

Mike: Mm-hmm.

Ted: - the brine's got a chance to go in -

Mike: Mm-hmm.

Ted: - exchange for all that calcium and magnesium that you've taken out during the service cycle, and take it out much more efficiently because, with a whole bead, the brine has to go all the way into the center of the bead and come out.

Mike: And come out, mm-hmm.

Ted: Well, most regeneration cycles doesn't afford you that amount of time to do that.

Mike: Right.

Ted: So what you end up with is a more efficient regeneration, which means it's exchanged more of the calcium and magnesium that you've collected during the service cycle and it's removing a majority of that.

Mike: Right.

Ted: And also iron - or manganese -

Mike: Yeah, yeah.

Ted: - if that's in the water too, is very efficient so you end up with, actually, a cleaner bead. And when you think about a cleaner bead, the cleaner bead is not going to leak as much hardness during the next service run because there's less of it left in the bead.

Mike: Left over. Like -

Ted: Right.

Mike: - soap left in the sponge, kind of.

Ted: Exactly.

Mike: Yeah.

Ted: Exactly. So that's really the beauty of the SST concept.

Mike: Mm-hmm.

Ted: Shallow shell technology, it has a shorter diffusion path.

Mike: Mm-hmm.

Ted: So the rate of exchange going in and out of the bead is much faster. You end up with a cleaner bead and you use less salt.

Mike: Mm-hmm.

Ted: Up to 20 percent less salt.

Mike: Wow.

Ted: Not only do you use less salt, you need less rinse water -

Mike: Water, right.

Ted: - to rinse the resin after you do the regeneration. So, a typical regeneration, you'll use about probably up to two or three bed volumes -

Mike: Mm-hmm.

Ted: - of water for rinsing, for the slow rinse, and up to five more bed volumes for the fast rinse before you go into service, before you hit that target -

Mike: Mm-hmm.

Ted: - hardness level that you want to maintain in the household or wherever you're treating.

Mike: Mm-hmm.

Ted: Boiler feed water, for instance.

Mike: Right.

Ted: So with the SST, you're talking about one bed volume versus two or three for the slow rinse.

Mike: Right.

Ted: And you're talking about one and a half bed volumes versus three to five bed volumes for the fast rinse. That's a lot of water that you're saving.

Mike: That's a lot of water, especially in commercially industrially too.

Ted: Exactly.

Mike: I mean, that's like -

Ted: That's really quantifiable. And actually, I'm glad you brought that up, Mike, because it's important to allow the user of the product to demonstrate that there's a cost performance involved here, where there's a payback, an ROI.

Mike: Mm-hmm.

Ted: What we're finding with the use of SST, despite the fact that it's probably about twice the cost of standard cation, the end user cost -

Mike: Mm-hmm.

Ted: - the payback on the higher cost is 6 to 8 months.

Mike: Yeah.

Ted: So, in the 6 to 8 months, that's salt savings, the water savings, and in the case of industrial operations, you can't discount the cost of wastewater treatment.

Mike: Mm-hmm.

Ted: Okay.

Mike: Oh, yeah.

Ted: So, those three elements, you're reducing them so much that your payback on a more expensive resin is going to be between 6 and 8 months. After that, it's all in your pocket.

Mike: Right. Right. And that question's floating in my brain, is, is it any stronger? Like, you know how we went through 10 percent cross-linking, you know is it - does the shallow shell make it any weaker or stronger to chlorine or oxidation attack?

Ted: It's really the same chemistry as I mentioned before. It's the styrene-DVB copolymer with sulfonic acid groups on it. SST is the same as standard resin, same type of chemistry.

Mike: Mm-hmm.

Ted: So, chlorine will affect it just as much -

Mike: Will attack it.

Ted: - as it will.

Mike: Yeah.

Ted: However, it can tolerate very high flow rates. For instance -

Mike: Hmm.

Ted: - in industrial laundry would be a good example, where they're running at linear velocities that are off the chart and can, at times - and also, if there's chlorination involved to weaken the resin, that this standard resin will break down very quickly, mostly because of the high flow rates. SST, we do a - what's called a Chatillon test, a bead hardness test, and it's in terms of so many grams per bead. And, typically, what you want to see, industrial-wise, is 350 grams of pressure per bead or more. SSTC6000E or SSTC-60 is off the charts, it goes beyond what the actual machine can measure, so it's greater than 1,000 grams per bead. It's a very, very tough, resilient product.

Mike: Strong, physically strong.

Ted: Right.

Mike: Squish strong, you know.

Ted: Right. And the other thing too, is that, because you have that inner core, the shrink/swell, which is about 6 percent -

Mike: Right.

Ted: - with - with strong acid cation resin, it's about half that.

Mike: Right. So, for the -

Ted: Very little swelling.

Mike: - for the, like, the uninitiated, you know, we can - Ted and I can geek out here huge. But when you regenerate a cation bead or a cation bead, but cation acts differently, it actually microscopically swells and contracts.

Ted: Right.

Mike: So, as you brine it, it swells?

Ted: It will. It will. Not tremendously, not like an anion, which will - will swell when you go from, say, a chloride to a hydroxide form if you're using it as a demineralizer, it can expand 15 to 20 percent.

Mike: Anion can really expand, but that will physically break down a bead over time too, that - just, regeneration cycles, in, you know -

Ted: Right.

Mike: - 10, 15 years down the road - or, industrially, sooner because you have more and more cycles and more and more punishment. So the SST really shines in a lot of different ways.

Ted: That's a great point, Mike. Actually, I didn't even think of it that way. But life of the resin is really a function of how many times you regenerate it, how many cycles they go through, from -

Mike: Mm-hmm.

Ted: - exhaustion, to regeneration, to, you know, to exhaustion.

Mike: Mm-hmm.

Ted: And when you think about it, it's the toughest chemistry that bead's going to see.

Mike: Mm-hmm.

Ted: It's normally seeing regular water, right? Now you're putting a 10 percent brine to it, which can create a little bit of osmotic shock, which will tend to break the bead down.

Mike: Mm-hmm.

Ted: But again, over time, cation resins will - if they're treated properly, you should probably see about 8-10 years on a - on a brine cycle.

Mike: Yeah. And no oxidation. You know, we - we try to tell everybody, but it's hard to herd the cats. They should remove chloramine chlorine before you get into any cation and anion because it reacts with the chemistry of the bead, and it acts as an oxidizer, and it slowly but surely will break the bead down. And then, the more regeneration cycles, the more susceptible to the chlorine attack because you're swelling the bead, contracting the bead, you're working the bead, and the chlorine has only added - added extra stress on the bead. And, especially, I was always told, as most of us do - we use – on the east coast here, anyway – we remove a large amount of iron, ferrous iron, with cation because it works so darn well. And our pH tends to be a little bit lower, and our manganese and iron is very dissolved and in an ionically friendly state. However, a regular - this is why we're segueing into something, does it remove iron better, or is it better for iron removal? A regular cation bead has all those nooks and crannies that can fill up with garbage, and that's what fouls out the bead. But you put chlorine to that, now it has even a host of garbage that the chlorine can cling to and you can accelerate the problem of degradation of your bead.

Ted: You're basically oxidizing the iron in place in the resin bead -

Mike: Mm-hmm.

Ted: - with the oxidant, the chlorine.

Mike: Yeah.

Ted: So, but just recall what I - I said earlier about regeneration efficiency. Because the - the SST product is so efficient at regenerating, even at lower doses it keeps the resin cleaner. So it's not going to retain as much iron or manganese within the bead as opposed to a standard resin.

Mike: Right.

Ted: I - I think Mike has some clients over in New Jersey that have been using SST for -

Mike: Mm-hmm.

Ted: - I can say decades now.

Mike: Yeah.

Ted: Because this product was really brought to the market in the early 90s.

Mike: Yeah.

Ted: It's an iron buster, is basically what it is.

Mike: Yeah.

Ted: I did want to mention, we have lots of case histories for both municipal water, for produced water where they're doing the oil sands and they're separating oil from - from the sand out in the west coast, in Bakersfield, and then up in - up in western Canada -

Mike: Yeah.

Ted: - Fort McMurry, where the water is very, very high TDS. It could be up to 8,000-9,000ppm of total dissolved solids, with maybe 100 to 150 parts of hardness in there. Well, that TDS won't allow a standard resin to meet the .5ppm hardness leakage required for the boilers that produce the water and steam that goes down into the earth to - to separate the tar - the - the oil from the sand. An SST can do that with no problems at all, at about 20 percent salt savings. So you can imagine, with a high TDS like that, they really have to hit it hard. Usually, you hit it with 20 percent salt, and you're talking 20-22 pounds per cubic foot.

Mike: Mm-hmm.

Ted: And you just dial the injector back to about 16 pounds, and you've not lost in terms of leakage or a throughput, you're still maintaining the same throughput at - at the leakage that's desired for the plant.

Mike: Yeah. I had a guy in Saratoga Springs, New York, where the hardness is 105 grains up there. No other cation would bring it down to zero except for SST-60. So, there you go, they're - that's kind of a different application, but it's a high hardness background, higher TDS, and SST was the only thing that would bring it back down to zero hard.

Ted: So, we're basically telling everybody, where would I apply this material?

Mike: Mm-hmm.

Ted: Okay. In special situations, as we mentioned earlier, the high TDS, high iron, high manganese. We have a guy up in - and this is a - a reference we can provide. We have a guy up in Maine that treats 25-35ppm of iron, 2-3 parts of manganese. And I won't lie, he'll have to clean it periodically with a - phosphoric or a citric type based chemical, but it's producing less than 1 part per million of iron - excuse me, I'm sorry, hardness is - is less, iron and manganese are both below the MCL.

Mike: Wow. Yeah. So it's a beast. Yeah, that's why we like it and, again, that's why it's another tool in the tool box. Now, flipping back to, say, guys want to do a commercial but it's quote/unquote the sticker shock - not that bad, though. But for the - the customer to say, okay, we have this product that will do this for you, and, you know, if the world is going to a lower brine discharge, there's a lot of water police out there that really want to see a green initiative. We have a customer right now, we can't tell you who it is, but they want to do the SST because they want to tout that to their shareholders, that they are now reducing - you know, we use the new technology that's reducing our waste profile, our brine profile, blah, blah, blah. So it's a feel-good thing for them too, and the shareholders, but how do we prove - does Purolite provide a - a service where we can actually model the incoming water, the usage, and then prove to this customer, say, look, here it is. On paper, this is what you're going to save. What do my customers need to provide us if you could run that program for us?

Ted: Great question, Mike. Actually, we have a suite of performance models, programs that are on our website, they're referred to as PRSM.

Mike: Yeah.

Ted: You can go to the Purolite.com, and on the - on the landing page of Purolite, you'll see that there's a - an area where you can get into the PRSM programs. Initially, you'll have to register. Within - I'm going to say within 24 hours you'll be registered and allowed to use these programs. So, the beauty of these programs

is that they're built based on providing a client with cost performance information.

Mike: Mm-hmm.

Ted: So, take the softening program. What we'd need for the softening program is basically your equipment design, or let's start - if we're designing a new piece of equipment, let's start there.

Mike: Yeah. I can help with that.

Ted: So we'll need the average flow rate, we'll need the water quality, a full water analysis, cations and anions. Okay, this is all input into the - the softening program that you're going to use, and you can use it, not just - this is open to the public.

Mike: Mm-hmm.

Ted: So, you also need to know what your leakage requirements are. Do I have to make less than half a part per million, or is it a municipal water plant where you want to retain 60-80ppm of hardness, so I'm going to treat part of the stream and re-blend in.

Mike: Mm-hmm.

Ted: Well, the program will do that for you. You can put in a bypass amount -

Mike: Mm-hmm.

Ted: - to get the hardest level that you want, that your customer -

Mike: Yeah.

Ted: - is requiring. So, the beauty of the program is that you can compare -

Mike: Mm-hm.

Ted: - standard resin versus SST.

Mike: Oh.

Ted: Okay.

Mike: Okay.

Ted: Now, you also need the cost of salt, the client's cost for water -

Mike: Water, yeah.

Ted: - which you're going to be rinsing with, and your client's cost for wastewater, if they have a - a wastewater cost associated with it.

Mike: Mm-hmm.

Ted: This is all put into the program as well. The program will basically give you a basic design for the system -

Mike: Mm-hmm.

Ted: - tank diameter, bed depth of the resin, et cetera, et cetera, and it will predict the leakage. And then, most importantly, it will show you whether or not you will be able to get a return on your investment for the higher cost for the SST product.

Mike: Mm-hmm.

Ted: It'll give you the ROI and a percent, but it will also give you payback in months, and as I mentioned earlier, typically what we see is about a - a - a 6 to 8 month payback period.

Mike: And these are for big jobs. I mean, you know, when - when we want to use this for residential, we're going to think of it more of - as a marketing tool, you differentiate yourself. Plus, if you have the high iron, high manganese background, you - you probably don't need the PRSM -

Ted: No.

Mike: - to run that.

Ted: No, you wouldn't need that for that.

Mike: But for commercial industrial, oh, it's - it's a wonderful tool. And when Ted was saying, you know, like, the quality of water - like, a hotel doesn't care if you have 1ppm of hardness leakage, you know, they probably don't care, they won't see it in the laundry, they won't see it anywhere. But an industrial boiler, you have to have zero. So, that's most important to - what is your application and do you care about a little bit of hardness leaking by? Because you can run cation with a huge differential, and a gallon -

Ted: Sure.

Mike: - a minute per square foot. We use 10-20.

Ted: Mm-hmm.

Mike: 10 being a critical boiler, gallon a minute per square foot. 20 being a, eh, you know, apartment building, a hotel or something where they really don't care.

Ted: The higher you go in, as Mike was saying, linear velocity gallons per minute per square foot, your tank diameters get smaller. You can sink so many gallons per minute going through a service area of square feet of a tank -

Mike: Mm-hmm.

Ted: - the more square feet you have, the lower the LV is going to be, and actually the lower the pressure drop. But you'll have a smaller footprint if you run a higher LV, as Mike was saying, at 20gpm per square foot. Your tank diameter at that flow rate is going to be a lot smaller than at 10gpm per square foot. So, squeezing it into a small utility room at a hotel, or a hospital or something like that, you're going to want to run at the higher linear velocities and the SST is designed for that.

Mike: Yeah. Yeah. Well, I think we've pretty much covered everything about it. It's a great, unique product. I mean, last week I just realized there was an anionic SST. For about 88.9 percent of the listeners -

Ted: Yes.

Mike: - they're probably not going to need an anion, but it follows the same -

Ted: Yeah, same principles.

Mike: Yeah.

Ted: So, let me just let you know about the SST product line.

Mike: Yeah.

Ted: So, we have the cation, which we went over just now, the strong acid cation -

Mike: Mm-hmm.

Ted: - it's the SSTC-60 for industrial. The 6000E for municipal or drinking water applications, your home water softeners, et cetera, are all potable water. Anything with an E on our products is basically good for food contact and - and potable water. We have a weak acid cation as well, SSTC104. We also have strong base anions, we have a Type 1 and a Type 2. If you listen to the last podcast, you'll know all about Type 2 resins.

Mike: Mm-hmm.

Ted: But they're the most common strong base anions, Type 1 and Type 2. We do not have a weak base, we don't see that necessary right now -

Mike: Mm-hmm.

Ted: - cause they're - essentially, weak bases are very efficient resins.

Mike: Mm-hmm.

Ted: But now we're getting into using an acid and caustic. Okay. So, don't be intimidated by that. If you see some opportunities out there -

Mike: Mm-hmm.

Ted: - you know, call Mike up, we'll work with you on that. And I was also going to say before, if you're more accustomed to working with small units for residential, that type of thing, a softener's a softener. It doesn't matter whether you're putting through 5gpm or 500gpm, they all operate the same way. So if you see an opportunity to change out standard cation in a big system with the SST, go for it.

Mike: Yeah.

Ted: We're here to help you.

Mike: It might get you the job -

Ted: Yeah.

Mike: - over anybody else, because it does have a very unique profile, and the savings can be proven to those people. It's not a gimmick, it's been around for a long time. And everybody's saying, why now? Well, there's a lot of my customer base that are using it right now, and they're, you know, quite happy and it - everything that we say it's doing, it's doing, and it's differentiating your product.

Ted: Exactly. Differentiating, you're bringing value to the client, you're just not bringing a me too.

Mike: Mm-hmm.

Ted: So you're going to separate yourself from everybody else. But I just wanted to repeat Mike's comment before on - he didn't use the wording, but sustainability. As Mike pointed out, every big corporation has a sustainability clause in their annual report. A lot of them have a tough time keeping up with it -

Mike: Mm-hmm.

Ted: - and making - meeting that goal.

Mike: Right.

Ted: Well, SST is the whole suite of resins but the cation resin for sure. You're bringing that sustainability to the client and salt savings and water savings.

Mike: Mm-hmm.

Ted: And that's going to attract them. That might make them even ignore the higher cost, even though they're getting a great payback.

Mike: Mm-hmm.

Ted: It's going to help them with their sustainability clause and their - their stockholders are going to be very happy with that, let's just put it that way.

Mike: Yeah. And - and also, your homeowners will be real happy because they're using a little less salt and getting a lot more iron. Yeah. It's like, what did Elvis say? A little less talk and a little more action.

Ted: Yep.

Mike: So, think of that as the Elvis Pressley of resins, right there.

Ted: That's right.

Mike: Gosh. I have to - I digress. You know -

Ted: Yeah.

Mike: - it wouldn't be this podcast unless I did something goofy.

Ted: Of course.

Mike: But did we cover just about everything, I think?

Ted: I think so.

Mike: Yeah.

Ted: I - I just -

Mike: We don't want to bore everybody. It's just a - it's a great product that I just thought - Denise, of course, she beats me into submission on these podcasts, you know, with new ideas and everything. And I have a million ideas in my head, but I said, man - I said, Ted lives so close by. We're - we're both triple vaccinated, all good to go, and I wanted to bring him in here live. I think the quality of the podcasts are better.

Ted: Just one other point. I encourage you guys to go to the Purolite.com website -

Mike: Mm-hmm.

Ted: - and if you go to search, there's a little magnifying glass that every website has in the top right corner of the - the homepage. Just type in shallow shell technology, and it'll take you to the - all the SST information.

Mike: Uh-huh.

Ted: And, of course, if you have any questions, give Mike a holler.

Mike: Yep.

Ted: And again, we'd be more than happy to work with you on jobs, on larger jobs -

Mike: Yeah. Oh, yeah.

Ted: - that you may not normally go after, but.

Mike: Yeah. We did - we coupled together just recently here. You know, I'm sure - I'm near positive they're going to buy it because they want to have the sustainability. You know, it's a big public corporation, so it's - it's an upsell. All right. Well, thanks, Ted. And Trust the Frog, everybody.

Ted: Thank you, Michael, and thank you everybody out there. It's been a pleasure coming over to Mike's and doing the podcast. Take care.

Mike: All right. Bye bye.