Liz: Hi everyone welcome to Waste360's NothingWasted! Podcast on every episode we invite the most interesting people in waste recycling and organics to sit down with us and chat candidly about their thoughts their work this unique industry and so much more so thanks for listening and enjoy this episode.

[INTRO MUSIC]

Liz: Hi everyone, This is Liz Bothwell from Waste360. With me, we have Matanya Horowitz, Co-founder and CEO of AMP Robotics. He's also fresh off of winning Waste360's first innovator 40 Under 40 award. Welcome Matanya. Thank you for being here.

Matanya: Yeah, thank you Liz.

Liz: We have so much to discuss but please tell us a little bit about your background and how you ended up in this unique industry and did you really play with transformers and watch The Jetsons?

Matanya: Oh yeah. No, I would say those Saturday morning cartoons are really I think what first turned me on to robotics. But yeah I've always been fascinated by these interesting ideas of what creates intelligence and how is it that people are so good at all these amazing things they do whether it's you know the way we use our hands or the fact that we can read and really think. Well yes, so I went to graduate school to study robotics study for my peers at Cal-Tech and had a chance to see what made what was working well in robotics and what was still a challenge and what I worked on myself was what we called robotic grasping but trying to teach robots how to pick me to pick up

different objects and what I learned was humans are amazing and we really had not figured out what it was that allowed us to be so sophisticated. You know, you think about picking up something simple like a cup and there's all these things going on where your hand starts to feel a cup and kind of, we call it localize is it but figures out where that cup is without you even looking at it you know just based on the texture and how it sliding against your fingers and we had no idea how to do that or robotics. But what I saw was computer vision was becoming incredibly powerful very very quickly. And so, I started studying that and then I just well became enthralled with it and was looking for different areas where I could be useful and that that eventually led me to recycling.

Liz: So how far do you think the robots mind has come since then. And tell us a little bit about that transition since I think it was 2013.

Matanya: Yeah well you know more broadly not my work but more broadly actually that that technology has come about a really long way since 2013. There is a whole field now called deep learning which is their way of trying to answer the question of how to teach machines to think in a particular way. And there's all this interesting work happening right now with grasping and with trying to teach these things to make real decisions. And there's some really great groups out there, different groups like Google and deep mind among many many others doing really interesting work. I don't, I wish I was more involved with a lot of that now. Now I kind of look from the I'm a bit of a bystander. I find some of the work we're doing in our robotics keeps me pretty preoccupied. But in terms of what we've done, you know, it's interesting where there's these kinds of exciting advancements. What we're always trying to do is take those insights and apply them to the real world as fast as possible. So, you know if we read something interesting for one of these more academic sources and it has a little gem of an idea, it can go from idea to application within a day or two. And so, it's you know it's just all of those advancements there. They're kind of hitting recycling and they're hitting all these other industries whether it's automotive or manufacturing or anything just amazingly fast. I'm not sure that I've certainly never seen anything like it out in the world see anything like it this rapid transition from knowledge to the application it is its speed of light.

Liz: It really is. And now that you've been in its a while are you seeing other uses for AI and robotics in our industry in particular?

Matanya: Yeah. So at AMP, well we actually started in construction and demolition material but quickly switched over to a single stream recycling. And there you know there's a lot of tough problems we're trying to solve. We're trying to identify all this different packaging even though it has all these different labels. There's so many different types of different types of resins, different types of fiber. And in retrospect it was probably the hardest problem we could have picked especially the ones we went after first. We have a great partnership with the Carton Council. But we found you know the cartons have so many different graphics and stuff on them that we really had to find a great solution to make it work well, which we did of course but yeah. Now that now that we have that we're starting to look at all these other domains. We have a great partnership with ERI sorting out e-waste and the technology has really transition to that very nicely and in fact I wish we had we started with two ways. First there's all these things we found that that make it a little bit easier and then more recently we've worked with our partner reaction in Japan to launch our technology into construction and demolition recycling and then we're continuing to look at all the other niches that you have in the recycling industry automotive scrap and others.

And you know, it's incredibly exciting for us. We had this thesis when the company first started of you think about all of these different sorting applications where you have people standing by conveyor belts sorting out things by hands, you know, not only in recycling but in all these other industries you have hazards and different dangers on the lines different issues with getting enough people to do it because it's not the most thrilling job and the thought was you know if we have this new technology that's artificial intelligence that lets us identify material as well as a person can, all these applications start to be opened the automation. So, we're seeing even application that side of recycling, our results are pretty preliminary so probably want to dwell too much on them. But absolutely you know you just imagine that this kind of… In robotics, we call it a pick and place problem. You're picking something and you're just putting it somewhere and gather they're ubiquitous kind of spreading our wings a little bit but we're doing that in a way that doesn't take our eye off the ball of recycling.

Liz: And then you said that AMP is digging in as deep as you can to see if you can bring down the cost of recycling. So, tell us about that. Do you see that starting to happen as well?

Matanya: Yeah, you know, so the kind of mission statement if you will about AMP is to change the fundamental economics of recycling. So of course, we're a startup. We try to be ambitious and haven't very, you know, Silicon Valley slogan. But, you know, where our hope is that the kind of the technology that we have this artificial intelligence can really open up new doors in recycling and really not just the incremental improvement although, of course that's kind of what we're contributing right now, but really be something substantial that can go pretty deep in the industry. So, we started with this problem of sorting different materials and trying to do that with a system that requires very little retrofit in these recycling facilities. And we think that's key, by minimizing the cost of deployment and essentially making it as easy to adopt these systems as possible. We think that's how they get sort of mainstream adoption and wide acceptance. But we see that is just the beginning. There's all these different pain points in the recycling industry that have been difficult to deal with.

So sorting is one of them but also maintaining quality, understanding operationally how well a facility is doing, knowing if a piece of equipment goes down. So, there's lots of things we're doing now with our vision system to try and provide that operational insight to facilities. And the reason it's so hard and recycling, is that it's very hard to make a Murph look like a manufacturing facility when you can't, when it's difficult to measure what is moving through a facility. There's some there's a saying, you know, what you can't measure you can't control. And if you want to know the purity of your fiber or something like that if you can't measure the fiber in the contaminants, you know, where do you even begin trying to address these other pain points using this artificial intelligence as a sensing mechanism using our vision system. That's one of the things we're doing but, also trying to look at other mechanisms where agents be used to have discussions about using it to control other equipment potentially even developing new kinds of equipment things like that.

So, we see the robots is just the beginning of a longer journey in terms of deploying this technology and this is just a version one and an exciting one we went after what we hope is kind of a big opportunity for us.

Liz: What do you see as your role or AMP's role in the circular economy and has that changed since you initially started out?

Matanya: Everything has changed. Yes, because, you know, when we when we first began we were a bit of I'd say outsiders to the industry, we didn't really know, I was I knew about as much about recycling as kind of most people, you know, when I started I started visiting these MURPHS. The first one I visited was points at hills in Los Angeles and then also visited early on eco cycle in Boulder and that's a lot of stupid questions. And I just try to figure out what was going on but in the sorting application was very clearly a challenge. You know, people would love to be solved. But I really didn't initially have kind of a broader appreciation for the implications and the importance of kind of a wider circular economy approach. But now it's something that we talk about a lot and it's really exciting. Maybe to give you a couple specific examples of how we think about this the artificial intelligence and the robots can be incredibly specific about what they identify. So not just identifying you know is this PDT or HDP but we can read the logos we can read the texts and graphics on all of these materials, which is how we do our identification and so we actually distinguish things like say Captain Crunch cereal box or you know what's a Pepsi bottle or what's a Coke bottle.

And so, what that does is we can actually have really deep insights into how packaging is moving through the waste stream and actually recover industrial volumes of specific materials. And so, we think that, you know, the technology opens up new avenues for kind of the circularity where you need a lot more specificity of what you're sorting, you need higher purity be able to kind of boost that wider circular economy story. So we think there's a lot of specific areas where we can make an impact but more broadly I think I'd say our vision systems ability to kind of monitor the material stream, we think we'll give insights that helps us really understand how do you create a circular economy effectively and really understand material flows and economics through that process. So, part of a wider theme that we think we can have a hand in.

Liz: I mean we know how it is with startups and you had a hand obviously in the technical side the programming side. Do you still get to do that now that you moved to the role of CEO and programming being your first love? Are you able to do both or is that impossible at this point?

Matanya: You know, I would say we're very fortunate to have a very talented technical team. We have a number of different sub teams in machine learning and what we call the robot stack. The guys who do that motion planning division passing great mechanical engineering team and so sometimes I would say I dabble. I'm still at it I'm certainly aware of everything that goes on, but I don't really contribute a lot. You know, we found team members of the team who are much better than me and more qualified and that frees me up. I'd like to think be strategic, but you know maybe just more of just a dabbler. But for me personally it's exciting because you know writing code creating a good mechanical design. It's obviously, it's a lot of hard work. And so, I get to rather than doing the hard work myself, I get to just kind of see all these things, issue dictates and see the results. And so, it's the technical side it's quite a bit easier in many ways. But also, even more rewarding because since I have my hands and so many things, I get to see it. It feels like the progress is just neck breaking. It's just so fast when you see when you kind of see the sum of what everybody's working on now.

Liz: I keep reading about robot tax even from people like Bill Gates. Do you do you think that when do you think that's going to go anywhere?

Matanya: So, I'll actually change your question into two… Do I think it'll go anywhere and do I think it should go somewhere. So these are my personal opinions, not necessarily the opinions of the AMP but there have been other periods where there's been heavy mechanization or automation of industrial processes. So, you know the industrial revolution is sort of one great example. And you know humanity got through it but you know there were times where life was actually pretty rough where you know if you read the story of Andrew Carnegie's family you know they did his hand loom weaving things, I'm not an expert in. But then the machines basically automated a lot of that and that was a challenge for his family and all these things. And ,so, I think broadly, you know, you're starting to see not just with artificial intelligence even things like optical sorters and other tools that can do the work of ten people but also with artificial intelligence and autonomous cars and things like that. You know, there are entire industries are facing these transition points where lots of work can be automated. And so, I think society does have to ask questions about you know what's the right way to handle that things like a robot tax are one mechanism to do that. And I think that that you know it has merit. You know we should be looking at that what is the how much

would that inhibit things, how do you actually tax that, what do you decide as robotic labor, and what isn't. You know all of these questions. But as a believer in the power of the technology, I see a real risk with the potential for this wide scale automation and so I think those are the right questions to ask.

So, to me my answer is you know should it happen. Maybe, I would say I probably some sort of tax or some sort of sensible way to deal with these issues. Do I think it will happen? You know, in the current political climate, it's hard for me to imagine that actually happening even if I was an advocate for it I think whether we sort of deal with this intelligently or not that's an open question even if it even if we should be right.

Liz: Very good answer. So now that you've been in this industry for a little while what else do you think we should be paying attention to in the world of waste, recycling and organics?

Matanya: Most of the things that come to mind are things I think people are already looking at which is you know these new pieces of technology from us and from other vendors. They're really opening new doors in terms of quality. And so, if I was even if I wasn't kind of in my current position, I would be heavily focused on okay, how do you really extract the most value out of all of this material. How do you get highly pure material, how do you run your facilities really hard with a lot of throughput to really maximize on the investments that have been made and I think I think that's what's happening right now all over the industry? You know, maybe even accelerated by the situation with China and what's going on with commodity prices right now where you know if you're in this business you're saying to yourself ,OK it's getting harder to, you know, what's expression… it's like squeeze blood out of the stone. So OK so let's put our heads together roll up our sleeves and figure out how to do exactly that. And when commodity prices recover, we're all going to we'll be in great shape. So, I think new technology is opening up doors that let us combat, you know, falling commodity prices and so that that's what I would be looking at. You know, as technical tools as a solution and of course, shameless plug I think robots are a great way to do that. You know, it's some of the work we're doing now bringing our robots to fiber lines, you know, increasing our throughput and getting really good purity is what we're trying to do is make that transition to heavy automation and allowing facilities to extract all the value they can out of those materials as easy as possible. But of course, you know we're one

tool among many and yet I see some of the things with the new optical sorters proved reliability of different things like the screens. Even though I don't run a MURPH, those things all make me excited as well.

Liz: And then you did mention your interesting partnership in Japan and that you had just traveled there and you're going to transition this technology into CND. Can you tell us a little bit more about how that will be done going from sort of the picking sorting determining contamination and then how that parlays into a CND facility?

Matanya: Yeah. So, for those listeners who might not have heard it or that this is that big news, but we started working with a group out of Japan named Rioshin who sells the India recycling equipment. And they asked us about using our technology for that material. At the time, we kind of doubt dabbled a little bit but hadn't really focused on it. But working together with them we transitioned over that. We started gathering a tremendous amount of data, testing our gripper and testing different technologies. They had a robot that they actually brought to the table to pick heavy stuff and we kind of brought our robots to the table, which are higher speed in terms of pick rate but lower mass per pick. Yeah, just to actually build some really great systems that we're really really happy with. And so those have now been launched in Japan. We started we did that at the end Expo. I think maybe three or four weeks ago now and just a great response within Japan. They have a lot of different demands due to their, I guess, their distribution of landfills their rules and regulations. Land there is a little bit more dear than it is here in the United States. So actually, a tremendous amount of CND recycling over there. What we had to do was see if the neural networks which is the name, we have for the piece of artificial intelligence that we've developed. See if those would adapt to a CND. So, we set up our vision system over in Japan to start recording data and that all type gets sucked up into our we call it the AMP cloud. But the infrastructure we have to sort of ingest that data and then allow us to look at what the neural networks are doing and the decisions they make and then make corrections.

So, we've actually been doing that for a while now. So, I think maybe even as much as six months. What we saw was that we have a tremendous dataset of municipal solid waste and a lot of expertise that we've built up over time. And I'd like to say it was really a huge challenge but really, we crushed it. CND just fit right into what we're doing. And, you know, what was nice is we were kind of worried about like, oh OK but, you know

how many different kinds of wood are there, how many different kinds of aggregate but really there's, you know, when we go out to identify cartons, I don't know how many there are, but let's say there's thousands of different kinds of cartons. There's really only a couple dozen types of wood that you're trying to identify. Like there's only so many you know walnuts or maple trees that'll be invented. So, so the consistency actually helped us out quite a bit. And yeah. And so, once we saw that the next focus was just the gripper and we've just had great success with suction technology and a lot of the work we did there also transitioned over. So, it was kind of we think we went from beginning to end within six months to move the technology over there and it was a testament to the engineering that we've done so far. And then also just the great support we've had from our partners at Rio should they just find it. It's just been like kind of fun to work with them. And it's it's just great when you have kind of a team with a similar mindset that just kind of has fun with these technical problems.

Liz: So, you're speaking at WasteExpo in a session called Robots and Recycling: A Dynamic Duo. I'm sure attendees are gonna love this one. Do you have any idea of what key takeaways they can expect, at least from your perspective?

Matanya: Well I what I hope they come away with is a sense of. For those who haven't been exposed yet you know a real understanding of what this robot stuff means where it can be useful in their facilities and then you know I think it's really good we have both me and William Hancock from Plexus and maybe, you know ,who's with them selling the Zen robotic system, you know, giving a variety of perspectives on the robots but also the operators who will be there one of which is Bill Keegan from Def Con. And so, they can speak to kind of what their real-world experiences with the robots. What I hope the attendees see is that these robots you know last year I was kind of oh OK. These things are here people are saying they're working but you know they're kind of just getting their legs underneath them. Now you're starting to see really wide scale deployments a lot of robots going in some really substantial success stories. And so, you know kind of this feeling of or at least is the feeling I have not that I'm biased, but you know these things are here to stay and they are working and they're providing true value and now they're really battle tested too. And so, you know, we can start to talk about making a broader impact in the industry and not, you know, I think it's very reasonable to be skeptical even still but especially last year kind of, you know, really how well is this going to work and where is it going to be well suited. A lot of those questions can be pretty well

answered now. We can start to talk about you know making improvements all across the country. Inside these facilities.

Liz: So, you've accomplished so much in such a short period of time in our industry. What advice would you give to professionals who are considering entering our industry?

Matanya: I would say that the industry, I think there's this perspective that well especially with the recent press that, you know, recycling is a tough industry to be in. There's not any money to be made and it's kind of like this old school grimy thing that's kind of crummy to be in and I haven't found that to be the case at all. It's a very dynamic industry. Lots of things are changing, of course and regulation, but with the technology. But when I go to facilities most facilities I visit have a tremendous amount of know how about what works well to operate the facilities and I think people are really starting to leverage that know-how and really drive down their internal processing cost and kind of accelerate the pace at which they're able to extract value out of all of these materials. A lot of facilities that I visited are able to still do well despite these depressed commodities prices. And so yeah, it just creates for this dynamic industry where a lot of these facilities are actually growing. And I just find that very exciting. It's a much more of an exciting industry than I think people recognize. And yeah, it just makes it fun. And yeah, a lot of the and just kind of on a personal level, a lot of people that I've dealt with in business it's just been, I don't know they're kind of I just feel like they're my kind of people. Yeah, just you know they're looking to do the right thing and just you know build a real business and just build something substantial. And I just feel like what could you ask for the colleagues you work with.

Liz: Yeah that's so true and I agree. It's much more exciting than people might think it is and also there's such an entrepreneurial spirit. From the grassroots hollers to what you were doing and the innovation of the industry it really is an exciting time to be in.

Matanya: Yes absolutely. Yeah. I really wonder how things will look in five years or something like that when a lot of these things that are you know-hows continued to spread a lot of the technology that's kind of growing rapidly as its kind of becomes the old school technology and everyone that we'll take for granted robots and these extremely efficient optical sorters and all of these things that you know screens, I don't

need that much maintenance and I just I actually think that the industry as a whole is I don't know it seems like it's advancing very quickly.

Liz: It does feel that way. And thank you for adding to that because that's the spirit we need in order.

Matanya: Yeah. Thank you.

Liz: So are you still naming your robots something human? Or have you moved on from that since you're getting a little more industrial?

Matanya: Oh yeah. So actually, so our product our robots are called the M cortex. But all the press we initially got on the first one when actually called it the nickname that we've given it which was Clark so they actually always had the cortex name but yeah we give facilities the opportunity to name them and it's good because, you know, we kind of need a unique identifier within our system. But yeah, we've had Clark was our first one we name that we didn't let Alpine name it because that was our first our first baby but after that we've had one named hot dog. So the sorters found a name plaque in the material by the robot and it was hot and a D.A.W.G and they just put it on the robot. At another facility, they found a Transformer toy and put it on the robot so that one's Optimus Prime. And yeah. So, most of them get names if they don't then we give them a really boring serial numbers and try to get the guys to give them names.

Liz: That will convince them I'm sure.

Matanya: Yeah yeah yeah. ACD005 does it roll off the tongue.

Liz: So, what else keeps you busy outside of work. I know you're crazed but are you enjoying outdoor life in Colorado?

Matanya: Yeah, we tried it. So. So me and my wife my wife works at the National Renewable Energy Lab and she's frequently actually flying around the country as well so. So, to be honest right now we see this as kind of our career building time and so we don't do a whole lot but we're fortunate to live in Golden Colorado which has just a tremendous amount of hiking. So, we just kind of sneak out grab a quick hike in and

then we try to align our travel schedules as much as we can. We're fortunate to actually be seeing a lot of the country right now and that's a lot of fun. But yes, I guess I'd say travel a little bit of hiking is kind of our forte.

Liz: Well that's great. And what a great way to see each other by trying to coordinate the travel. That's brilliant.

Matanya: Yea, when it works. Yeah, a lot of the time it devolves until both of us sitting across from each other in the hotel room writing e-mails, Bbut that's a date too.

Liz: Exactly. At least you're productive together. That's good.

Matanya: That's right.

Liz: So how can listeners hear more from you and more from AMP Robotics?

Matanya: We've recently brought on our V.P. of Marketing Chris Worth and so he's for those of us who have been following, I haven't been that good about updating things with news articles and such, but Chris is setting up a whole bunch of infrastructure and so if you contact us through our website, we'll put you on the mailing list and get you a whole bunch of stuff. And we have a Twitter feed and LinkedIn that's much more active now. But then of course yeah, we're also in a number of the publications but yeah getting on our Twitter I think would be the main way we've put just about everything on there.

Liz: Speaking of hiring, I see that you also hired… Is it a V.P. of operations as well?

Matanya: Yeah. Rob Espinosa and Rob is just a fantastic asset to AMP Robotics and the some of your listeners may know him he seems to know everybody in the recycling industry. He's been around a while, but you know one of the exciting things that we're working on right now is going from one or two or three robots to much a much wider scale set of installations, you know, now in Japan even internationally. And so, we have a really strong need to be a strong need to build a just an excellent operations and services organization. And so, we are a fortunate to bring along, or bring on, Rob Espinosa for that role and so he's building kind of our service delivery team our ability to

fabricate these systems and just a whole whole bunch of it. Rob has so much work right now but he's so much fun. Anybody who knows him knows he's the first guy to roll up his sleeves and have a good time doing it and that's kind of how I am. So, it's just it's been a blast working with him.

Matanya: Sounds like you have a really great team there.

Matanya: Yeah I'd like to think so. I think you know especially these days it's a lot of work we're trying to build a big company pretty fast and you know what's nice is we're able to do that since we're seeing traction in the market. But we try to have fun doing it and we're just honestly. When we interview people the main thing, I look for is just are they a nice guy. Yeah, it's just I guess it's just a fun team of people to be working with.

Liz: Well we're really looking forward to celebrating you at the 40 Under 40 awards at WasteExpo and hearing your session. This has been great. Thank you for being an awesome guest than spending so much time with that.

Matanya: Thank you very much. It's true honor and yeah, myself and the wider and wider and team is really grateful to be recognized in this way it means a lot to us.

Liz: Ok. Well congratulations again well-deserved. Thank you.

Matanya: OK. Thank you. Have a great day. Take care.