

On this episode, we speak to Rashmi Urdhwareshe former director of the automotive research association or ARAI, a cooperative industrial research association by the automotive industry, as well as the Ministry of Industries. Rashmi is an automotive safety, emissions, e-mobility, and sustainable transport expert, among others. She did a graduation degree in Electrical Engineering in 1981 and completed a post-graduation in Electronics and Telecommunications subsequently. An unusual and challenging choice of career for a woman in India at the time. Rashmi is the recipient of the Nari Shakti Puraskar, a woman empowerment award, an annual award given by the government of India for her outstanding contribution to automotive technology.

Through Word to the W.I.S.E, we will continue to build on our legacy: driving transformative change in pursuit of a safer and more resilient society by inspiring more young women to a career in the field of STEM.

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Host: Rashmi Urdhwareshe, thank you for taking the time to speak to us on the Word to the WISE podcast

Rashmi Urdhwareshe: Hello.

Host: Rashmi you did your degree in Electrical Engineering and Master's in Electronics and Telecommunication in the Eighties, but what motivated you to pursue a career in Automotive Engineering?

Rashmi Urdhwareshe: Well, my career in Automotive engineering is just by chance while I was doing already my Master's degree in the second year itself there came in an opportunity at automotive research association of India.

They had announced a position for trainee engineers. And I thought let me try and one of my friends at the time was working there and she gave a feedback that it's a good position and I should try it out. I actually did try I applied and the interview was quite rigorous. In fact, during the interview, I came to know a lot about what is expected for a new trainee engineer to work in a very, very tough environment..

I did accept the challenge. And I joined in the instrumentation laboratory. I continued there. I had various opportunities. My growth happened, the entire career span of 37 years happened. And finally, I retired from the same Institute as the director..

Host: And that's quite an amazingly long tenure to stay with one industry, one organization, but let's just go back to your time when you studied and accomplished so much in the institutions you studied in. Clearly at the time they were male bastions. It was unheard of, of women choosing such degrees, as well as choosing a career path like this. What was it like then? And what were your takeaways from your experience studying in these institutions?

Rashmi Urdhwareshe: Yes, I think the career and its struggle started in engineering colleges. I took admission in 1977 in a regional college of engineering at Nagpur. That was truly a male dominated college and we were handful of us girls students in the class. We had to struggle. Those four years taught me a lot. And in fact, when I received my award from the same colleges, distinguished alumnus, I expressed this to the girl students there. And the struggle was really real.

And that gave me a lot to take away when I started the career without any fear, in fact in automotive engineering. The initial years itself we had an opportunity to visit on a fellowship for six months to United Kingdom and Germany that opened up a lot of ideas for us to work together.

It removed a lot of restraints constraints, et cetera, and brought a very healthy atmosphere, at least in the working level. And then of course, when I kind of was in a position to manage my teams much differently, much in an able manner. That made a great impact. The initial formative years were very important for me.

Host: And in those formative years looking at the way, the industry, the domain of engineering sciences has grown the way women have contributed. What do you believe is the message for women when they're up against the similar challenges?

Rashmi Urdhwareshe: I think going back and looking back at how I was able to manage it. My mindset always has been to give the best to where I belonged. Be it at family be it at personal commitments or be it at the career. I would go out of my way to perform well, to help out others to be a good team member as well as to be a good mentor. That always has helped me in not just a passive manner to be supportive or to be building up my own position, but also leading. Being able to lead a male dominated group is something very, very different in automotive. My supportive role actually got started to change into a leadership role. And while I joined as a project engineer my role got extended, expanded because I could perform or outperform by learning new skills by also acquiring the higher or technical requirements that were needed at those specific roles.. So my message would be to do your best and also believe in yourself. Women have greater strengths women have different strengths and women also have different capabilities. It is this realization, not just to a woman, but also to the other colleagues that enables the team to perform much better and take the women along in their own career paths.

Host: And from all one is read about you. You've also helped develop many firsts; controls for the hydraulics of testing machines, then on emission control, as well as methods of measurement of emissions. What do you think helped you strike out and forge your own career path?

Rashmi Urdhwareshe: I think most of my career happened around Research and Development for which, I was very passionate about. Although it was hydraulics my control engineering skills enabled me to quickly change to mechanical controls then to electronic

controls. And then I was able to design the first electronic engine management system. I had at that time, no knowledge about engines, but I had fairly good idea about my own subjects of electronic controls.. So applying my knowledge into something which was a real world, I was handling the engines, or the vehicles for the first time that enabled me and gave me a great confidence in the integration of various technologies that could further shape up the world. That, actually also enabled me to work on electronic engine management, working for fuel economy, working for safety, working for emission controls and so on and so forth. Slowly what happened is the regulations played a major role in tightening the norms, also bringing in a new safety as well as the emission control systems on vehicles.

And we as research and development engineers, therefore assumed a central role rather than just a supportive instrumentation engineering role. That entirely changed my perspective. I realized quickly that it's time to move on with the next or the higher roles. And I no more, therefore only focused on electronics engineering, but quickly acquired or moved on with safety and emission regulations, and then subsequently for electric mobility. We were the first ones who started working on it at ARAI, and slowly we took a leadership role there. So that's how the actual journey got to be established and I'm very proud. What was made as beginning there has now resulted into a centre of excellence on e-mobility and emission regulations have, resulted into moving directly to Bharat stage six norms now. We are very proud as design engineers and now the leaders of automotive technology.

Host: So your focus on research, your passion for design and for applying it to real life problems. These seem to really be your trademark. How important are these things then for women looking to make a difference in the fields of science and engineering, especially as career options, seem to be growing so quickly now.

Rashmi Urdhwareshe: Yes. I think when we are in engineering colleges automotive is nowadays seen as a glamour career. I think it's much different than that. It's much basic. It is much more wider and not just that, it integrates very greatly the skills that span across all the disciplines of engineering. Not just engineering, in fact all the STEM education that is available all across is something which is significantly to be kept in view. When it comes to women, especially. Women are known to be having very good ability or very good analytical ability, excellent tools are available these days in designing and development using simulation tools. There are opportunities that are opening in quality assistance . Quality of product and its applicability to the end user are very significant trends that are currently happening in automotive. Women have a very great role to play. I can now highlight here one you know, incidents, which happened 35 years ago in fact. I was on fellowship at Ford motor company that time in Germany and they were designing a new steering system. And power steering was new at that time. It so happened that I was working on instrumentation for measurement of the torque that is needed for moving the steering column and my manager that time he was a German and he came to me and he said, Rashmi , can you please sit on this, steering seat, on the driving seat and try out the steering we want to measure how much is the torque. I said, but why? There are of course test engineers and why can't they do that. And they said, they're looking for a women driver and that too with a certain height and dimensions, and I am five feet, two inches, and that fits into something called 50th percentile women population. That was a revelation and then I realized that it's important for the women also to take part in what gets to be designed primarily as a male dominated product. That is automotive. So that always remained at the back of my mind. And I encouraged all the women engineers also to participate therefore directly into designing the products that are suitable, not just for men, but also for women.

Host: And as former head of ARAI, which was an apex research body. Where do you see, and just following on, from your example that you just gave at your time at Ford, where you were asked to test the steering system, where do you see the need for greater inclusivity? When it comes to critical issues like design and development, safety, e-mobility, and transportation needs.

Rashmi Urdhwarshie: Absolutely. Women are 50% of the population, as we all know, the transportation needs are , expanding. It could be personal mobility and then of course we have two wheelers and passenger cars are , typical sectors in which women very extensively use this. . There were times where scooters were specifically designed keeping women in mind. The scooters were small wheeled vehicles and the wheels were covered for the safety of the flying garments, et cetera. So those were good concepts. And I think that started off giving women an opportunity to use the vehicles extensively. That was in fact a very good breakthrough . We didn't that time call it inclusivity.

It's just that the market also was expanded to include women inclusivity, concept started coming in much later. Where the same product needs to be also, being used by men and women alike. In fact I would extend it further inclusivity also includes being able to use the product by differently abled people. I have extensively worked on vehicle designs to be made, suited. For those who have lost ability of one or more of their limbs. There are regulations which were established with a thorough research on those lines and India specific situations where we are not a very friendly kind of infrastructure to enable people to differently abled people to use vehicles. Then comes of course, public transportation and it's suitability for women. Its suitability for women is a very big subject. In fact, public transportation is shunned by many women because of unsafe operations. So safety of women saying it could be through Nirbhaya Scheme or it could be for designing the vehicle seats for having better seating arrangements or even for women being able to drive the buses ,trucks and for that matter construction and mining equipment also. So these are the areas which are opening up now. In fact, through ACE we have a wide competition for designing off Highway vehicles that is the agriculture tractors and it implements for suitability for women. agriculturists. So the horizon is just expanding and I'm very happy that we are opening up the opportunity for women to make their impact there.

Host: So design, transport needs and even safety. So where must that change actually begin? What role did ARAI under your leadership play in bringing more gender equity within the automotive industry?

Rashmi Urdhwarshie: Gender equity is policy that the corporates are very extensively following. We at ARAI also had gender equality as one of our core values. Our participation in not just in research and development programs, but manager and leadership programs included women extensively. The ratio is something which always speaks about organization's success. We were fortunate to have good diversity ratio especially in the technical field . We had less number of women working in other laboratories or for the testing, et cetera, but they were a good number in our R&D departments and technical technologies. We also had very good number who were working on safety systems. In fact many of our key contributors, they worked on safety systems. I had colleagues who specialized in doing crash testing, crash instrumentation and their insights into how the safety systems should work and be made suitable for women in transportation, was something which was very, very highly contributed. There were several technical papers, which were presented by women engineers. And also one more area is analysis of various safety

regulations. That was led by many of our safety experts. Even the emission laboratory, our key resources were women. They had a very great insight on ambient air quality related projects. They also had represented not just ARAI, but they represented India at the international forum on ambient air quality discussions, as well as carbon neutrality, which is the topic of today, now. . This has been our core areas of working..

Host: And can you give us some examples from the sector where just looking at vehicular design, safety testing and user experience from a gender lens has really had a massive impact?

Rashmi Urdhwareshe: Yes. I think going back again on time women were seen as one of the major market for vehicles.. As soon as that became a significant factor, the vehicles started to be designed as suitable for simple applications. For example, start stop of a scooter. Women were seen to be, preferring the electronic start. When it was introduced into vehicles it no more remained as something special for women. It was so convenient and it was so inclusive that it became an industry standard. The second example I can. give is again, a safety of the vehicles. Women are known to comply to the regulations. They have the keenness to adopt regulations to a greater extent .When women in Pune started wearing helmets, rest all of them started kind of following it up. The third example is again, wearing of seat belts.. I do remember several instances where we used to travel on tour. And even if I'm sitting at the rear seat I would insist on wearing my seatbelt and the driver would say, Madam , this is not compulsory to wear a seatbelt, if you are seated at the rear, I would say, yes, it's not compulsory, but I would choose it for my own safety. So slowly those examples, start perpetuating and it goes on further for everybody else to follow. So they can make a difference through behaviours for sure .They can make a difference through showing on the data. I remember some meetings where some of the lady colleagues would bring in some photographs which showed some unsafe designs. That would begin a discussion in the meetings to lead to better safety and control systems related to vehicles, for example, sharp corners or projections on vehicles or for that matter safety of tires also, was one of such subjects where one woman brought in into the meeting room experience, which she had when she was traveling. And she was left with a flat tire and no opportunity to change it because her vehicle didn't have a spare wheel. And that came in as a requirement in the Indian regulations that the vehicles must be fitted with the spare wheel.. So such examples show that women can make a difference when it comes to safety of not just as a passive vehicle user, but very active contributor to the controls.

Host: And just coming back to the industry and working conditions, how important is the role of women in changing the way the industry is perceived? Because I asked this because the impression is that work in the automotive sector entails very long hours.. Where design, testing validation requires in fact, getting on behind systems and driving out into difficult terrain and so on and so forth.

Rashmi Urdhwareshe: Yes, but the things are changing now. We don't have to physically depend on doing the testing a hundred percent on test tracks. We have simulation tools. Also, there are opportunities for doing the control systems designing, in the hardware in loop in the laboratory itself. So suppose there is a suspension testing going on. You don't have to sit into the vehicle to test the suspension on a rough terrain. You can cleverly design the suspension sitting into the comfort of the laboratory by fitting the suspension into hydraulic controls and simulating the road. So gone are those concepts, that one has to work hard and long hours. Of course, there's no substitute for hard work as such. But that concept has really moved from a

rough environment to a mix of environments. Of course every woman also has to experience what finally the vehicle has to undergo to that effect of course participation in testing on field is important. But the roles are changing. Roles are definitely changing for betterment for the better safety. And of course the vehicle designs are also getting changed. There are systems now, which will help the driver in case he makes an error. For example, we are moving towards autonomous driving or we are moving towards driver assist systems on those, before they even are tested on Indian roads or for that matter, any roads they have to be rigorously simulated and tested, and that's where women have been contributing greatly in system designing, vehicle designing, the testing validation, quality control, failure mode effect analysis. So these are in my view, great opportunities for women to start their careers. They can work on material designs. There are smart structures, there are smart materials which are designed these days, for better and safer systems. So physicists, chemical engineers, and several other disciplines can contribute greatly. Vehicle is no more a dominant trait of mechanical engineers. It's a mix of electronics engineering, electrical engineering, with so much of power train changes. We have now electric vehicles coming in. So much of it is coming from power electronics. So much of it is coming from materials research. So these are the new areas where women can start making their very serious careers.

Host: So power electronics, new mechanics, but what about future tech? You know, alternative energy, but now even future tech has become a major consideration of R &D in the auto sector. Where can women play a role? What are the opportunities there?.

Rashmi Urdhwareshe: In the future technology you rightly mentioned about alternate energy and with our national vision now of carbon neutrality in near future, the year is not important. The direction is very critical for all of us to pursue. Alternate energy is moving is going to decide the future of our success in mobility engineering. Hydrogen as the future is coming up, very clearly electric mobility powered by green hydrogen, hydrogen produced from green means is something which will fuel the fuel cells. That is the future. We should also not forget that there is a huge opportunity of using the biofuels. We have a large agro-based industry. Agriculture is one sector, which is a very, very good, kind of field to work upon for developing and also utilizing bioenergy by, recovering energy from the agriculture waste. There I think a self-sufficient economy can be built around agro-based regions. So the regions which can produce at zero waste can also plough back the biofuels that are produced through green mechanisms. We also have a great opportunity to work on solar energy. Abundantly we are blessed with solar energy as a country. And that's the future of fuel for which we all can, aim at. Of course along with alternate energy, there is a vision zero, that is Safety, no person will die on Indian roads due to traffic accidents. That is a vision. How that can be achieved is multiple ways. One is of course, vehicle engineering, design the vehicles in such a way that there is a least risk to the occupants. The other dimension is to design also the infrastructure in such a way that the vehicle runs safely and the infrastructure provides the necessary safety. The third pillar as they say is enforcement,. Although the regulations further tighten up vehicle controls infrastructure. But the enforcement is something which comes out of behavioural aspects. So that is the third aspect and the fourth, is emergency. In case anything should go wrong with any of these aspects the immediate response of emergency that is recovery out of that accident, which has happened. These are the four pillars based on which the vision zero can be developed. So these are excellent areas for anybody to make a career. I would very strongly encourage women to consider these as their future careers. We all are concerned about the lives that are lost on Indian roads. We are concerned about the degradation of the environment that is around us. So that's a commitment women can make to themselves as also to the nation and start a career there..

Host: So Rashmi , you're also the recipient of the Nari Shahti Puraskar , women empowerment. Award, clearly a Testament to how much work you've done in automotive technology. What did that award mean for you?

Rashmi Urdhwareshe: I think that's something which happened towards the end of my career. And I looked at it as a, pinnacle, , as a tribute, to my own career. I started off with the humble background as a trainee engineer. I was lucky to work in an environment which enabled me to give my best. To not just myself, but also to the organization, also to the nation. I committed to give what best I could do. And that was recognized through the award. So I looked at it as something which when I actually went on the stage to receive the award at the hands of honourable President behind me, I saw a big organization .Behind me I saw my family, my parents who were instrumental in shaping up my career also. So everybody who could make it happen I thought of all of them and I was very thankful to ARAI. To all my colleagues and to my family and on their behalf, I thought I'm receiving that honour. That was my feeling. I also felt when I talked with all other recipients who also came from very similar humble beginning . All of us had never kind of worked to achieve anything in life and we had not aimed to win that award, et cetera. It just so happened., That we all have made an impact to our lives as well as to the society that brought us that award .

Host: And finally, Rashmi for women listening to this conversation, what is the one message you have for them as they consider careers in electronics, automotive engineering, and fields? What qualities do they need to not only pursue a career in STEM, but also persist in STEM fields.

Rashmi Urdhwareshe: I think I would give them three points. My first and foremost important consideration is commitment. Commitment to yourself as well as to everybody else who is around you. The second one is self discipline, be it your own, career, be it your own personality, be it your own health. We must have a self-discipline .And the third is values and the upbringing and the belief in your own selves . There are times where, the organization or the colleagues feel differently than what you are. It is very important that our values, give us guidance all the time. So we have to be faithful, truthful to our own selves, which are guided by our values and beliefs. So these are the three principles which had helped me personally. And I would add to it, do your best. There's always a pursuit towards higher learnings. Always acquire the necessary skills on your way as you build a career. You start off as a graduate or a post graduate at a particular level that attracts you to you know, certain height, but that is not enough. The life is a journey towards, or a pursuit towards excellence and knowledge. I think we should follow that path. That's how the careers, I look at it.

Host: That's fantastic. So commitment ,self-belief, value, technical ability and a long view. Rashmi Urdhwareshe Thank you ever so much for speaking to the Word to the WISE podcast.

Rashmi Urdhwareshe: Thank you. And all the best for everybody who is listening.