

“We Need Innovative Support Strategies to Sustain the Future of our Country”:
An Interview with Dr Thobeka Makhathini



(Pictured: Dr Thobeka Makhathini. Photo credit: Thobelani Mdletshe Photography)

In our ongoing Venture Builder (VB) series highlighting black women in the world of tech, we are honoured to feature Dr Thobeka Makhathini, a Senior Lecturer and Researcher in the Department of Chemical Engineering at Mangosuthu University of Technology (MUT). Dr. Makhathini's journey through the often uncharted territory of STEM has been marked by brilliance, resilience and a passion for innovation. In this interview, she spoke to us about how she got involved in engineering, some of the challenges she encountered as an black woman academic and industry practitioner, and her growing contributions to the field of engineering. We left the conversation confident and excited about the trail which she is blazing for future generations of black women in her field.

Dr Makhathini holds a PhD in Chemical Engineering from the University of Witwatersrand, a Masters of Engineering from the Durban University of Technology (DUT) and other qualifications in the engineering discipline. She also graduated from Rhodes University with a Postgraduate Diploma in Higher Education to enhance her teaching pedagogy. She is a recipient of the 2019 MUT Vice-Chancellor's Teaching Excellence Awards, where she won in a gold category. She currently serves as an assessor in the Engineering Council of South Africa (ECSA) education cluster. Before entering academia, Dr Makhathini worked as an Industrial Engineering Technologist at Huntsman Tioxide SA for eight years, where she gained the requisite industry experience and knowledge which she uses today. Her research focuses on environmental engineering with a specific interest in industrial wastewater reclamation, acid mine drainage remediation, pollution control, and climate change. She has published 11 articles in a number of journals accredited by the Department of Higher Education and Training (DHET), and is currently involved in projects with Umngeni-uThukela Water to support the Umhlathuze communities with access to clean water.

This article has been condensed and edited for clarity.

Khanya Mtshali: Hi Dr Makhathini. Thank you for agreeing to speak with me today. So I like to start off these discussions by asking how you are doing? How are you coping with life, work and everything else in between?

Dr Makhathini: Well, I am doing pretty okay in most areas of my life. I am a wife and a mother of two daughters, one of which is a teenager. She is 17 years old and she is a handful! Always keeping me on my toes! Like a lot of parents, I worry whether her grades will get her admission to her career of choice. On the work front, I can barely breath at the end of each day due to different work commitments ranging from meetings, administration duties, teaching, giving support to students, research and engaging with industry partners and so on. But all in all, I am coping.

KM: I wanted to go back in time and ask about your childhood. Did you always have aspirations to be in technology? What attracted you to the field you're currently in? Feel free to be as descriptive as you would like.

DM: To be honest, I had no idea what engineering and technology was about. However, my uncle was working for Spoornet, which is now called Transnet, so all I knew was that he was fixing trains and helping people get to their next destinations. It was only later when I was in high school, I started to understand that my uncle was doing engineering work with some

technology in it, so the trains could move from point A to B. I had this revelation through my Physics teacher, Mr Mfusi, who was so passionate about physical science that he would make examples using trains when he was explaining physics concepts. He would also talk about chemical engineering, which ended up being my career of choice later. He would refer to the oil refinery down the road from our school (namely SAPREF), teach us how the technology is able to convert crude oil into fuel which is used in taxis and cars. He would also narrate stories of how our peers in China were making the watches that we were wearing as craft work through innovation and advanced technology in their country. He would be telling us about these stories in the most animated way, so he made it cool and fun. This is when I started to develop a curiosity about this engineering and technology.

KM: There used to be a common perception that technology or anything related to STEM is for boys or men only. Thankfully, our world has made many strides in challenging the idea that fields in STEM cannot accommodate women. Was this something you thought about when embarking on your career path?

DM: Not necessarily. But I later realised that it was frowned upon for women to choose engineering and technology streams as their career paths because I had not seen anyone like me in the field of engineering before. As such, I did not have any role model to look up to so instead I had to become a role model for the women coming behind me. I believe I was amongst the first women to join the heavy chemical industry as an engineering technician at the time. I started tertiary education in 1999 so this was still a new field for women. When I was placed for in-service training in 2001, I remember there were no ablution facilities for women in the plant because there had not been a woman working there. All eyes were on me because the perception was that women could not survive in such an intellectually demanding environment. To be honest, before I got to the industry, I did not think about how deep the issue of gender bias was in the field because I had always been in the class with boys, and we were all treated the same. I knew my academic strength was higher than most of the boys in my class so it never dawned on me that there was something that could be perceived as for “boys only”.

KM: The American feminist writer and scholar Moya Bailey coined the term "misogynoir" to describe the double-pronged discrimination that Black women tend to face in the world — one that involves racism and sexism. Have you ever been on the receiving end of misogynoir in your career? And if you're comfortable enough, could you tell us in what capacity and context?

DM: I don't remember being directly discriminated against because of my sex or my race. There could be those instances, but maybe I was too naïve to pick up on it. If anything, I felt supported by older men in the industry who saw me as their daughter, and I think they were proud that I

was managing under such difficult circumstances. By “difficult” I mean being the only woman doing night shift amongst a team of about 40 men. And yes, sometimes I would feel like the eyes were piercing through my body when I was climbing up the stairs to get to the top of the tank to take samples – that would make me feel uncomfortable for sure.

KM: I'd like to pivot to discussing imposter syndrome which is broadly defined as a kind of doubt and insecurity that arises in high-performing individuals. This is a phenomenon to which many people can relate, regardless of their background yet studies have found that it is especially prevalent in women and women of colour. Have there ever been moments where you felt imposter syndrome and how, if relevant, have you dealt with it?

DM: It's funny because I have been feeling this way in recent years while I was finishing off my PhD. I doubted my skills, and often questioned whether my intellectual capacity was adequate for this level of study. So I guess it always comes back when I'm in an unfamiliar environment, and desperate to do well because I have always been a high performer. I'm not sure if it is prevalent in women, or maybe it is because women can easily share their emotions whereas men tend to brush them off. I think yes, at the beginning of my career, it did affect me a lot because I would be compared to a male peer I was placed with at the same time. For example, if we were given a task to complete which required information and input from operators in the plant, since he was a man, he had the social capital to source the information quickly during a conversation about soccer, for instance. He was able to sit with the male operators during lunch so they trusted him and could comfortably give him information to complete his tasks. On the other hand, I would struggle to engage the operators to solicit the information and as a result, I would fall behind. It made me doubt myself. And of course, in the meeting, my peer will give a full report on the task and the operators would even give him suggestions for solutions. And then here I was with half-completed tasks! That messed with me mentally, even though I knew I had the capacity to do the work. But unfortunately, you are judged by your performance which, for me at the time, was mediocre.

KM: What are some of the high points of your career? Was there ever a moment where you felt like, "wow, I've made it"?

DM: It's sad that those “wow, I've made it” moments were short lived because I'd quickly be thinking, “what's next?”. I know this is not good for myself, but I can't help it. Sometimes it feels like it is not enough, or I haven't done enough. There are a couple of instances where I have felt [I've made it] like when I got my professional registration as a technologist with the Engineering Council of South Africa (ECSA). It was a big deal because it meant all my years of engineering work in the industry and academically were worth it and it was recognized by an engineering panel of experts. When I graduated with a Master of Engineering with distinction [from DUT], it

said to me, “you still have it in you Thobeka”, “you’re a high achiever indeed”. Further to that, I received an award as the top achiever in my cohort for that year. The latest achievement was when I was awarded a PhD in Chemical Engineering from Wits. Honestly, that got me to say “I did that!”.

KM: Are there any innovations or technologies from other Black women in your field or yourself that you are proud of, or feel excited about?

DM: My PhD focused on co-treatment technological strategies of acid mine drainage with other waste streams, which are few and far in between. Most research in this area focuses on diluting Acid Mine Drainage (AMD) for alkalinity production, but fails to address some problematic pollutants, specifically from the substrate stream. There was little to no published work regarding the co-treatment of acid mine water and hospital wastewater using fluidised bed reactors, and it seems this study was amongst the first ones. For the first time, the removal of pharmaceutical compounds was considered in the co-treatment of acid mine drainage. My work brought innovative ideas to tackle the challenge of two hazardous waste streams using the bioreactors approach, which was developed and tested. I’m excited about this innovation because it uses one stream to treat the other, which means it is a double-saving; we are saving the environment and saving the costs of waste disposal. This work also speaks to the circular economy concept to wastewater management, focusing on beneficiation, reclamation, resource recovery and valorisation.

KM: I want to bring up the Venture Builder (VB) project, which Professor Nokuthula Sibiyi, Deputy Vice-Chancellor: Research, Innovation and Engagement at MUT, is part of. Essentially, this project is bringing together universities of technology and other stakeholders to build a venture builder that will be inclusive of innovators and technopreneurs from diverse backgrounds and produce successful spin offs. Are you familiar with the concept of a venture builder and do you think it can tackle issues related to economic empowerment, representation and transformation within the deep tech sector and society at-large?

DM: Well, I heard about the VB project for the first time through Professor Sibiyi. I think it’s a good initiative that will accelerate commercialisation of technology innovations through a well-thought-out structure. As researchers, I think we bring many innovative ideas forward through generating literature and producing dissertations; however, all these ideas end up on the shelves in our offices or somewhere in the library. But then, we should ask a question, what was the point of producing so much work through your research if it is not for the betterment of our society? As such, I believe the VB project will bridge this gap by looking at technological innovation, finding appropriate skilled teams, deriving a business model, and commercialising

the innovation. This is what our country needs right now with the unemployment rate at an all-time high. We need innovative support strategies to sustain the future of our country.

KM: Throughout the design phase of the VB, we have spoken about the novelty of this project. Do you think this is something that you or your institution could benefit from? Do you believe collaboration, particularly amongst and for black women in the tech and innovation space?

DM: MUT could potentially benefit from this project because we are rooted in the community of Umlazi, which is one of the older townships in South Africa. We have many young men and women who come to us with innovative ideas and seeking a supportive environment to build on their ideas and make them into proper businesses. Moreover, we have a Technology Station in Chemicals, which mainly assists small businesses and entrepreneurs in turning their ideas to businesses. This means we have some sort of experience in this area as an institution. But we can still learn and share through collaboration with other institutions to make people's lives better.