

Sue Nelson

Hello, I'm Sue Nelson and thanks for joining me on the Create the Future podcast brought to you by the Queen Elizabeth Prize for Engineering. Now, I like to think we're a topical podcast. In 1914 one of the greatest feats of engineering was officially opened. Its construction resulted in the biggest earth dam in the world at the time, as well as the creation of the largest man-made lake and it allowed, for the first time, travel from the Atlantic Ocean to the Pacific Ocean via a 48 mile long shipping route instead of over 15,000 miles around the South American continent. This shipping route is of course the Panama Canal and our guest Ilya Espino de Marotta has enjoyed a long career working on the canal and was chief engineer of the Panama Canal expansion project which was completed in 2016. After becoming the chief operating officer in February 2019 she's now taking up a new role as deputy administrator of the Panama Canal. Ilya welcome to Create the Future.

Ilya Marotta

Thank you, happy to be here.

Sue Nelson

Now you're from Panama, how were engineers treated in this country? Were they treated as gods because you had what is often called the eighth wonder of the world?

Ilya Marotta

Not really, actually engineering in Panama is not a very glamorous job. It's becoming glamorous.

Sue Nelson

Because of you.

Ilya Marotta

I think the expansion program had a lot to do with it. It's becoming more visual and we're making an emphasis for kids and young adults to go into engineering and STEM.

Sue Nelson

And obviously the Panama Canal must play a huge part of that?

Ilya Marotta

Of course. Every kid wants to work in the Panama Canal. We have not only engineers, we have a lot of different professions, but engineering is one of the driving forces.

Sue Nelson

Now why was it difficult to connect one ocean to another - because I suspect for many younger people listening you just think "what's the big deal?"

Ilya Marotta

Well the big deal is that you have to go through a mountain range. That's the main reason the original plan from the French to build a sea-level canal failed. The Panama Canal is basically a water elevator you have to climb, go across the mountains and go down on the other side.

Sue Nelson

There's a 28-meter height difference between the two coasts as well.

Ilya Marotta

Absolutely the difference is not the coast, the sea level is pretty much the same on both oceans, but to get from one to the other you do have to climb 28 meters worth of mountains.

Sue Nelson

So obviously you weren't there when the Panama Canal was actually originally built, but looking with your professional eyes, how do you view it now because it was quite a difficult job as well in terms of lots of illness at the time?

Ilya Marotta

It was an amazing job when you think that the engineers that designed that canal didn't have computers, didn't have all the technology we have today. The way we operate the original canal is the way they designed it, we haven't changed anything because of a requirement or change in technology as far as operational ability, but we have changed a few things to enhance because there's so much new technology that can give us more information than before. But it has worked perfectly fine for a hundred years the way they designed it.

Sue Nelson

Now you went to university in Texas in the United States, what made you study marine engineering?

Ilya Marotta

Actually, it was by chance and I'm really glad it happened. I was a marine biology major and had a Fulbright scholarship because I love scuba diving, that was my life. After a year and a half I went to Panama and it wasn't very promising in terms of what I wanted to do. I wanted to be by the water, that was my main driving force, so I went for oceanography. That didn't work very well either, so I said, "well what else is there?" - marine engineering. Designing ships and repairing ships, so that's how I ended up there and my first job was in the Panama Canal shipyard where I actually worked with ships and it was great. I fell in love with my career when I started working.

Sue Nelson

Well that's interesting, so it was, I suppose, I would hate to use the word fate as someone with a science background, but it does feel like it all came together.

Ilya Marotta

It came together in a very surprising way. I didn't know what expect, I just needed to get a degree, my dad said "you have four years, get it done" and when I went to Panama, working in the shipyard was amazing because you can feel how the engineers create something in an office and I would walk out to the shop see how it was being fabricated and then I'd see it onboard the floating equipment. It became like "wow, this is really amazing!" how you can design something and just see it built out there. The same happened with the expansion program. It was amazing to see something go from paper to reality.

Sue Nelson

I read somewhere that Jacques Cousteau, you mentioned you love scuba diving, but he may have played a little influence there?

Ilya Marotta

Oh, he was the biggest influence, he's the one that opened my eyes to the marine world, to the sea. I mean I love the ocean, I've been going to the ocean since I was a little girl. My grandparents had a house by the sea and I've always had this attraction to the sea, so because marine biology didn't work, marine engineering did.

Sue Nelson

So how did your early career progress at the Panama Canal?

Ilya Marotta

Panama Canal is a big company, we have over 10,000 employees. We have water portable plants, we have power generation, a shipyard... a lot of different areas. I basically started moving around all of the engineering disciplines. I lived on the Pacific side and I worked in the Atlantic and after traveling four and a half years I said, "let's see what else there is". So we have dredges, because we have to maintain the navigational channel, I applied to a job in the dredging division as an engineer and I moved over. That's kind of midway between the Atlantic and the Pacific. After while I put in for another job as a mechanical engineer because we have a lot of buildings, air conditioning systems, fuelling facilities for our tugboats so I had to do some mechanical designs for our fuelling facilities. So I moved into that job which was great. I also got a degree in engineering economics so then I went to work for accounting - quite different but it opened a new world. It was basically to define investment projects versus maintenance projects. Then I went to operations and opened another new chapter in my life. In 2002 when they decided to create a team to work on the Panama Canal master plan which included the third set of locks project, they called me up and said "are you up for it?" and I said "of course!". From 2002 until 2016 I worked on the expansion program from concept to design to execution and now operation which is fantastic.

Sue Nelson

Let's go into a bit of a detail into that expansion project, what needed changing?

Ilya Marotta

Basically, the original canal had, if we think of container vessels, had a capacity of putting a vessel that would carry five thousand containers maximum - but world shipping was increasing significantly in the world so we would have been relinquished to a local route if we didn't expand and allow bigger vessels. We needed to make a new lane to allow big ships. Originally, we thought the biggest vessel would carry 12,000 containers. Today we have vessels that have over 15,000 containers. So basically, we needed an additional lane that will increase our capacity, not only in number of ships but most importantly in size so we would continue to be a very important international maritime route.

Sue Nelson

Now you mentioned it's very big company with 10,000 employees. Only just over a thousand of those are women and I've noticed in photographs of you that you're often wearing a pink hardhat or a pink high-vis jacket, that's making quite a statement isn't it?

Ilya Marotta

It is, it's a female statement and I did it mainly because when I got to lead the expansion program, I heard that some people were a little bit reluctant that a woman could do the job, that's when I decided. If you look at my pictures of my first year, I'm wearing my regular standard white hard hat like everybody else but when I heard that some people were questioning the ability of a woman to run the project I said "huh, it's time to make a statement", so that's how the pink hard hat came to be.

Sue Nelson

Now is it quite unusual for an engineer to be there from the beginning of a project right through to the end of the project, because it was so huge and you had to build an extra lock as well?

Ilya Marotta

Well nine years, which was the execution of the project, is not a long time. One of the successes of the project was precisely that the people who started with the concept finished the project, because then you were so involved and know the project so well. It's a lot easier to manage and especially at the end when you get contractor claims, you know that contract by heart, you know the project by heart. I think it's a very good practice to have somebody from the beginning all the way to the end overseeing the project.

Sue Nelson

Did the people who were perhaps reluctant to see you take charge, probably a little bit of envy there, did they change their mind once the project was completed?

Ilya Marotta

I sure hope so, I'm sure they did because I never heard back from them. I think on the contrary, I think the fact that the project was successfully done can I reassure that gender equality, that we basically have the same abilities to do the same types of jobs, so I think it was a pretty good message all around.

Sue Nelson

Now, there were some quite challenging technical issues in terms of doing the expansion project. I read a few that made my eyes go "what!" but I'm gonna hear from you first to see just in case my one's not in it, what you felt were the most difficult parts of the job?

Ilya Marotta

There were there were two kinds of difficulties, my motto was "never a dull moment" because there was something to resolve every day. I think people were one of the most complicated issues because everybody thinks differently, everybody thinks they know best, everybody wants to do things their way. When you have a project of this magnitude you have a lot of bright minds. So everybody's right, but you need to have uniformity and standardization so you can please everybody. The biggest issue we had technically speaking, when we were doing one of the tests of the seals of the locks, testing one chamber full of water and the other chamber empty, which is never gonna be a condition for operation or maintenance but we had to test it - we had some cracks through the concrete. We had water gushing out of the concrete. It was not expected and of course the engineers went in right away to see what happened and it was a faulty design, they had not put in enough steel rebar to secure the strength of the water over the lock gate, so that was fixed. Another huge challenge we had was that we had to build a 2.3-kilometre dam. The foundation was quite fractured, so we had to do three to five times more grouting than we expected, so that project was delayed by two years, but because we started it so early it didn't impact the end of the project. Then we had a labour stoppage which was a contractual problem.

Sue Nelson

You had everything!

Ilya Marotta

Yes we had it all. Never a dull moment. It was pretty frustrating because you always have problems in the office with the contractors, with the contract, but when you see the project moving forward you're kind of like "hey, we have progress even though we have problems", but when they stopped the work for two weeks there was no moving of the project and problems in the office, so that was scary. We had to sit down with a contractor negotiator for three months even though they did go back to work after two weeks of negotiation. So we had it all. We had over 80 nationalities working in the project, over 200 contractors, so it was a challenge but with very good teamwork we accomplished the goal.

Sue Nelson

What's amazing as well is that in your answer you didn't include what for me raised my eyebrows, the fact that buried near the surface of places where you had to work there were old US military bases with explosives!

Ilya Marotta

Oh yes!

Sue Nelson

Now you remember.

Ilya Marotta

I remember now, it's funny because as time goes by you tend to forget. Yes, my husband worked for the canal, he's a retired now, a captain on a dredge. He came up with this suggestion that we used that land for this for a disposal site and he actually got an award from the CEO for his idea and we used it. We had over 500 hectares contaminated with explosives because there used to be a former US military base that had a shooting range, so the idea was that we cannot use this land because it's contaminated, let's clear it out and use it as a disposal site because it was right next to the works, we save a lot of money on hauling material far away and then we can use that land afterwards, so we did. They cleared one meter of land, detonated whatever was found there and then we used that as a disposal site and now its usable land.

Sue Nelson

That's pretty incredible. For you then what was the most rewarding part of that job, was it the people side or is it the engineering side?

Ilya Marotta

It was both.

Sue Nelson

You know what, I knew you were gonna say that.

Ilya Marotta

It was both, everybody was saying "wow this is amazing talking about the project, the engineering" and I thought this is my everyday job, it really didn't seem that big of a deal until the first day I saw our testing ship come by. That day it was like a realisation that this is amazing, this is big. But working with so many people, I developed a lot of negotiating skills, I developed a lot of conciliatory ways of getting things done, and I mentored a lot of people. So I grew a lot personally in my people skills, so I have to say they were both magnificent. I mean I loved the gates being fabricated in Italy, that was my favorite part of the whole project, how they were built, how they were transported and how they were installed, so it was a magnificent project all around.

Sue Nelson

As a child did you provide hints of where you would end up? I know for a lot of Engineers they look back and they say "I was obsessively making things, taking things apart, putting them together, playing with LEGO. I know you said about this love of marine biology and scuba diving but was there anything else that looking back that you think, "oh there are the seeds!".

Ilya Marotta

Not really, I was always good in math but I loved biology, so when I came to the realization that marine biology or oceanography wouldn't work my thinking was that I'm pretty good in math, why not engineering. So it was

like a second thought but when I started working in engineering it was like a whole new world opened my eyes, just like Jack Cousteau opened my eyes to the underwater world, my first job in the canal opened my eyes to engineering. So it wasn't a driving force as I was a kid but once I started working I realized how underestimated engineering is and how it's not glamorous but it really is once you're in it. I think people need to understand how amazing engineering is to solve the problems of the world, how we make life better for human beings, without engineers that wouldn't be possible.

Sue Nelson

And how can we get more women into engineering because it's not just your company, in most companies around the world women are in very much the minority.

Ilya Marotta

I think there's so many engineers and you always hear about the traditional ones, so I think we need to start exposing the different types of engineering and that could be maybe more appealing or more attractive to women or once women understand how amazing it is to resolve, to be creative it's innovation you know?

Sue Nelson

I was just going to say the c-word there, I think creativity is something that people often foolishly don't apply to engineering or science and it is!

Ilya Marotta

Of course, people think creativity is art, it's not - it's art and more. To have a problem and to find a solution to a problem, you have to be creative, it's that simple. One thing is for art and another thing is for engineering, so I think that needs to be brought out. I was giving a speech to these kids young kids, 11 years old to 15 year olds about engineering and I was telling them when a person gets injured and loses an arm that prosthesis it's made by an engineer. I was showing them the basic things that people don't think about, the chairs you're sitting in the materials that things are made of, material engineering. There's so many engineers I think that need to be spread out so people understand and then become attached to it.

Sue Nelson

How is your job going to change as deputy administrator?

Ilya Marotta

I will be more in policy, more strategy, less doing. I'm kind of looking forward to it because there's a lot of things I think and can get better in the canal, we're doing good but we can always do better, you can always do better. So it'll be nice to be able to impact beyond what I've been doing in the canal.

Sue Nelson

Now you are in London because you are a judge of the Queen Elizabeth Prize for Engineering, what's it been like examining other people's engineering projects?

Ilya Marotta

It's been mind-blowing. I had to learn a lot about things I didn't know and I didn't manage on a daily basis to be able to evaluate which was the one that we thought should get the prize. It was amazing, it opens your eyes to how much is happening in the world in different areas, in the medicine field it's amazing, GPS - who doesn't use GPS today? You take things for granted so to me being a judge was amazing, I'm learning a lot and I'm seeing other areas that I'm not familiar with, so it's a good interchange because we're so many judges from different countries, areas and specialties that you grow, you definitely grow.

Sue Nelson

And that sort of sums up to me engineering as well, in the same way that you studied economics and you has an interest in marine biology and then to engineering, engineering often brings together different disciplines.

Ilya Marotta

That's the beauty, I was telling the kids last week, to build these locks you had to have electrical engineers, civil, structural, environmental, hydraulic engineers... engineering is a profession that makes you work as a team because not one single solution is just one kind of engineer.

Sue Nelson

Now Forbes magazine, I'm gonna embarrass you now, included you in its 50 most powerful women in Central America list, do you want to be considered or thought of as an engineer, a female engineer or as a powerful woman... or all three?

Ilya Marotta

I think a female engineer, if I can touch people's lives to make them be a better professional, if it's an engineer or not, to me that's the most meaningful thing. If I can have people look at engineering in a different way that's a wow.

Sue Nelson

Ilya Espino de Marotta from the Panama Canal thank you so much for joining me on the podcast. Do join me next month for another insight into the world of engineering on our Create the Future Podcast.